

MISCELLANEOUS PUBLICATIONS
MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN, NO. 44

THE BIRDS OF BUCKEYE LAKE,
OHIO

BY
MILTON B. TRAUTMAN

ANN ARBOR
UNIVERSITY OF MICHIGAN PRESS
MAY 7, 1940

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FREDERICK M. GAIGE
Director of the Museum of Zoology



EDWARD S. THOMAS

MALE PRAIRIE MARSH WREN AT NEST WITH FOOD

The nest, containing five young, was composed of and was in a tuft of broad-fruited bur reed, in a sedge and cattail marsh which bordered the canal north of Sellars Point. Photographed July 8, 1928.

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PREFACE

WITH the white man's invasion of the area now known as the state of Ohio, there began the recording of its avifauna. During the early years of the invasion, in the eighteenth century, the recording of birds was largely incidental to the general description of the country and its resources. Later, in 1808, there began, with Alexander Wilson's first volume on American ornithology, the first of a long series of scientific publications which definitely recorded certain species of birds within the boundaries of the state. In 1838 J. P. Kirtland published the first list of the birds that were then known to occur in Ohio. Since then the list of the birds of the state has been revised several times. With the beginning of the twentieth century the tendency among workers on Ohio birds has been to specialize more and more upon small areas within the state and to investigate these areas in a more or less thorough manner. In the present publication an attempt has been made to give as complete a conception of the status of each bird species in the Buckeye Lake area throughout historic time as is possible with the data at hand.

There is included in this paper a brief account of the interglacial and postglacial history of the Buckeye Lake area, from Wisconsin time to the beginning of historic time; a brief discussion of the invasion and occupation of the area by the white man, and his influence and effect upon the topography, flora, and fauna, especially as regards birds; and a compilation of the literature concerning the bird fauna, and of unpublished data on it and on conditions in the area before February 1, 1922. Thereafter, the results of twelve years of bird observations made between February 1, 1922, and February 1, 1934, are given. The observations were made principally by me, but some were made by other members of the Wheaton Club of Columbus, Ohio, various members of the Columbus Audubon Society, a few other ornithologists, game protectors of the Ohio Division of Conservation, a few residents at the lake, former market hunters, and sportsmen. Finally, I discuss the numerical status and habits of the 282 species and six subspecies of birds which have been recorded and observed.

It is evident that intensive and well-conducted studies of the avifauna in a comparatively small area over a several-year period are of much scientific importance. Such studies add to the general knowledge of the life history of the species concerned and give a fairly accurate conception of such factors as the past and present status of the species, the yearly populations, and the influence of the white man. A number of such local, intensive studies made in several widely separated localities in Ohio will give a better conception of birds and their habits in the state than could be obtained by a cursory examination of the entire state.

Such local, intensive studies are of considerable importance from the standpoint of the conservation of the entire bird population; for it is only when the basic facts concerning a bird and its relations to other animals and to its environment in general are known that it is possible to assist the species or for man to utilize the bird to his advantage. These intensive studies point out reasons why certain species of birds have greatly increased in numbers during certain periods and within a certain area; why other birds have maintained their numbers, sometimes despite seemingly adverse conditions; and why still others have been unable to maintain their numbers, or have become extirpated from a given area. These studies likewise indicate which species are in danger of decrease in numbers, in many instances give a practical method for the prevention of such a decrease, and make it possible to establish future policies which will result in the greatest and most lasting benefits to both the bird species and to man.

An investigation such as this one envisions a usefulness for a future time. A twelve-year study of the Buckeye Lake area made later in the same manner will demonstrate changes and their causes in the status of any species. It was partly in the hope of such a comparative study that much of the detail concerning existing conditions between 1922 and 1934 has been given.

ACKNOWLEDGMENTS

In the course of this study I have been greatly assisted by many friends. From 1922 until his death in 1930, Professor James S. Hine gave much helpful advice, and his encouragement was most stimulating; Mr. Edward S. Thomas greatly assisted with advice and information and donated some of the photographs used here; Dr. Charles F. Walker aided with field work and in the collection of birds and preparation of some of the bird skins; Mr. Edward L. Wickliff joined in many of the field trips and assisted in the accumulation of data; and Dr. Josselyn Van Tyne contributed much advice and criticism during the preparation of the manuscript.

Other Wheaton Club members have helped in many ways, particularly in the field work. Dr. Robert B. Gordon has helped greatly by discussing and checking the botanical phases of the paper; Mr. Thomas M. Earl gave several interesting records obtained before 1922 and has assisted in the preparation of bird skins; Mr. Roscoe W. Franks has presented several photographs and has assisted in other ways; Mr. J. Stanley Douglass, Dr. Robert M. Geist, Professor James C. Hambleton, Mr. Arthur R. Harper, Dr. Lawrence E. Hicks, Mr. Harold S. Peters, Mr. F. Dale Pontius, and Mr. Frederick W. Wood have assisted in various ways; Dr. W. Storrs Cole has given advice upon glacial conditions and their effects.

The active interest of Mr. William G. Fargo since the early stages of the field work has been most stimulating, as has the encouragement given me

during the preparation of the report by Professor Frederick M. Gaige. Dr. Carl L. Hubbs has assisted in many ways. Dr. Edward L. Rice and Dr. Lynds Jones gave information concerning the area before 1922.

Three conservation officers of the Ohio Division of Conservation, the late Earl McPeak, Mr. Fred Harlow, and Mr. Louis L. Ludwig, assisted in the field in many ways; two Buckeye Lake residents, Mr. William Harlow and Mr. Stephen Holtzberry, helped greatly with their information concerning conditions in the area between 1860 and 1922. A host of other residents of the area have assisted in innumerable ways, such as showing me the birds or nests they had found. The many land owners of the area were particularly helpful, for without exception they gave me permission to study conditions on their properties.

Acknowledgment is also made to the Horace H. Rackham School of Graduate Studies for the grant which made this publication possible.

I wish to express my appreciation to Miss Elsa K. Hertz for the typing of the manuscript.

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THE BIRDS OF BUCKEYE LAKE, OHIO

INTRODUCTION

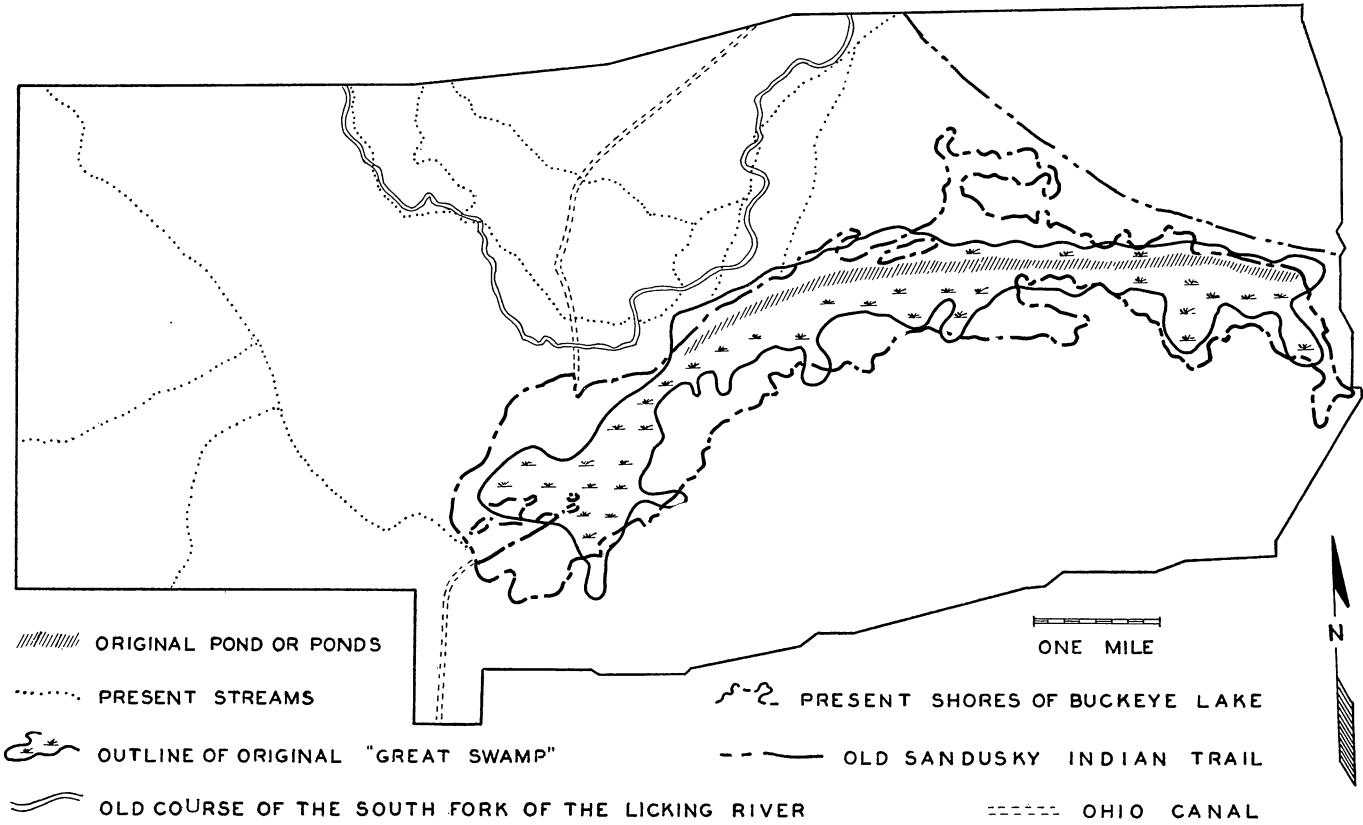
PART I

LOCATION AND SIZE OF THE BUCKEYE LAKE AREA

THE Buckeye Lake area (Map 2: No. 47) is approximately thirty miles east of Columbus, Ohio, in the east central part of the state. It is situated between $39^{\circ} 53'$ and $39^{\circ} 58'$ N. Lat. and $82^{\circ} 24'$ and $82^{\circ} 37'$ W. Long., and is in parts of Walnut Township, Fairfield County, Union and Licking townships, Licking County, and Thorn Township, Perry County. The area is very irregular, though roughly rectangular in shape, and has been limited by purely arbitrary boundaries as follows: by the National Highway on the north from the village of Kirkersville eastward through the village of Hebron to the village of Jacksontown; on the east by the Jacksontown and Thornville road as far south as the village of Thornville; on the south by the Thornville and Millersport road as far west as its intersection with the Millersport and Thurston road, thence directly south to the southern boundary of Section 4, Walnut Township, Fairfield County, west on the southern boundary of Section 4 to its southwestern corner, thence north along the western boundary of Section 4 to its northwestern corner, then west along the road that runs due west of Millersport to its intersection with the Kirkersville and Baltimore road (southwest corner of Section 25, Liberty Township, Fairfield County); and on the west by the Kirkersville and Baltimore road from the intersection last mentioned, north to Kirkersville. East and west the area is approximately ten miles long, and its greatest width is five miles. It contains a little less than forty-four square miles.

HISTORY OF THE BUCKEYE LAKE AREA

To obtain a fairly comprehensive understanding of a group of animals in any given locality during any given period it is necessary not only to make a detailed study of the group and its present and recent past but also to investigate fully the present and past geological, topographical, and climatological conditions of the place, the present flora and the changes in the flora during the recent past, and certain other animal groups which have affected the group in question, or which will assist in giving a fuller understanding of it. In many instances full, accurate data upon past geological, floristic, and faunistic conditions are impossible to obtain, and occasionally it becomes necessary to speculate slightly in order to reconstruct the entire picture. In the following several pages a brief history of the Buckeye Lake area is given, from interglacial and early postglacial



MAP 1.—The Great Swamp and the course of the South Fork of Licking River as of the survey of 1799. Over this is superimposed Buckeye Lake and the present drainage systems. The old Sandusky Indian trail is also shown.

times to February of 1934, with a discussion of the effects of the various changes upon the avifauna throughout historic time.

INTERGLACIAL AND EARLY POSTGLACIAL HISTORY

The interglacial and early postglacial history of the Buckeye Lake area has been studied in considerable detail during the past sixty years. The various investigators¹ are generally in agreement on the early history of the area. A summary of their principal conclusions are as follows:

Glaciation.—The immediate bedrock underlying the Buckeye Lake area is composed of the Waverly series of shales, siltstones, and sandstones (Bownocker, 1920). At least two glaciers, the so-called Illinoian and Wisconsin (and possibly an earlier ice sheet), have passed over it and have deposited a mantle of drift upon the bedrock. This drift completely covers all of the immediate underlying bedrock except a small outcrop at the eastern end.

Leverett (1902: 224–25, and Pls. 2 and 13) has shown that the Scioto lobe came from a northerly direction and by spreading eastward covered completely the area and extended past it some twelve miles to the present line of Licking and Muskingum counties. He (1902: 226–27) has indicated that the Scioto lobe of the Early Wisconsin glaciation extended over the entire area, and that probably the Late Wisconsin glaciation likewise invaded it, for he stated that “the late Wisconsin drift seems to reach about to the border of the early Wisconsin and possibly in places beyond it, in central and eastern Ohio. . . .”

A preglacial or interglacial river.—During preglacial or interglacial times a deep and broad river flowed through the area. The existence of this river and its valley, which since postglacial times has been almost completely filled with drift, was first mentioned by Read (1878: 348). Later, Tight (1894: 47–50; and 1903: 18 and Pl. 2) outlined the course of this river and suggested that it be called the Newark River. Tight has shown that in preglacial times² the waters from the upper section of the present

¹ See Dachnowski, 1912; Davis, 1899; Detmers, 1912*a* and 1912*b*; Lamborn, 1932; Leverett, 1902; Read, 1878; Sharp, 1932; Stout and Lamb, 1938; Tight, 1894 and 1903; and Wright, 1884.

² The major point of dissension between present geologists and those of the past concerns the time of formation of the Newark channel and its tributary valleys. Read, Leverett, Davis, Tight, and Detmers considered the Newark River to be a preglacial stream, and that its valley was principally formed in preglacial times. More recent investigators are of the opinion that the Newark River was an interglacial stream which existed between an early Pleistocene ice sheet and the Illinoian ice sheet, and which was formed in interglacial times during the period known as the “Deep Stage” (White, 1934: 373; and Stout and Lamb, 1938: 72–73). The pertinent facts are that this valley and its tributaries existed and were later almost completely filled with glacial drift (Sharpe, 1932; and Lamborn, 1932).

Muskingum drainage basin did not flow south from Dresden, in Muskingum County, to the Ohio River as they do today. Instead, these waters flowed southwest from Dresden through the now abandoned Newark Valley to the city of Newark, in Licking County, thence southward through the Buckeye Lake area, and then southwestward to the vicinity of the village of Lockbourne, in Franklin County. Here they joined an old river system, part of whose valley is now occupied by the present Scioto River.

The presence of the Newark River has been corroborated by Leverett (1902: 155), who outlined its course:

Tight has shown that the greater part of the Muskingum drainage system was formerly connected with the Scioto system by a broad valley leading from Dresden [a few miles above Zanesville] westward past Newark to the Licking Reservoir and thence into the Scioto Basin near Circleville. The present southward course past Zanesville is through a much narrower valley than the old line leading westward to the Scioto Basin, and the rock floor is markedly higher along the present course of the Muskingum than the old course.

Along the old line of discharge there is, for about 10 miles an open valley, 1 to 1½ miles in width, leading westward from Dresden past Frazersburg. This open valley is now drained by a small stream, Wahatomaka Creek, which enters it from the north near Frazersburg. The old outlet of the Muskingum continues broad and open as far west as the eastern border of Licking County, where it becomes obstructed by a great accumulation of drift, which fills the valley to a height of 150 feet or more above the level of the broad bottom on the east. This filling obstructs the valley in this manner for only a couple of miles, and even there but half fills it, for the bluffs rise about 300 feet above the broad bottom just mentioned. At Hanover an open valley sets in, which extends westward to Newark and thence southwestward along the south Fork of the Licking River to the vicinity of the Licking reservoir, where it is so filled with drift as to render its further course difficult to determine. A series of gas borings, however, indicate that it passes southward about to Hadley Junction and there turns westward, passing near Canal Winchester and Groveport and coming to the Scioto River about midway between Columbus and Circleville, where it seems to have joined the old Kanawha system.

Detmers (1912a: 529), through a study of the depth of the drift as recorded by gas-well borings, verified the conclusions of Read, Leverett, and Tight, relative to the course of the Newark River from the city of Newark, to the Buckeye Lake area, and thence to the Franklin County line.

Lamborn (1932: 452) recently reviewed the work of his predecessors and clearly outlined the old Newark River channel through the area:

From the west edge of Newark the old Newark River channel is directed a little west of south passing a short distance east of Hebron to the north shore of Buckeye Lake. Here the valley turns to the west and extends beneath the western end of the lake as far as Millersport where it again turns to the south and passes about a mile northwest of Thurston to a point approximately one mile south of Baltimore. The maximum thickness of the drift in this part of the valley is about 350 feet. In the region lying immediately north of Buckeye Lake wells penetrate drift ranging from 65 to 345 feet in depth. The lowest point of which we have record in the old channel in this vicinity was reached in the Cliff Sturgeon No. 3 well located on the north shore of the lake about one mile southwest of the

electric railway terminal. The drift here has a thickness of 344 feet and the elevation of bed rock is about 540 feet.

Two tributary valleys of the Newark Channel.—Two drift-filled tributary valleys join the southwest-northeast Newark channel in this area, the one entering from the northwest and the other from the east. The now shallow valley entering from the northwest at Kirkersville is at present almost entirely filled with drift and contains the upper half of the South Fork of the Licking River.

The valley entering the Newark channel from the east has in its former headwaters a stream known as Jonathan Creek, which flows eastward in a reversed direction up the former tributary valley to break through a col at the extreme head of the valley and to continue eastward until its confluence with the present Muskingum River (Davis: 1899). The lower half of this tributary valley enters the Buckeye Lake area from the east at Thornport and continues westward to join the Newark channel at the present western end of Buckeye Lake. This lower half of the partly drift-filled valley contains a long narrow depression, formerly the "Great Swamp" and now Buckeye Lake (Lanborn, 1932: 453-54).

The retreat of the Wisconsin ice sheet.—During the period of maximum extension of the eastern edge of the Scioto lobe of the Wisconsin glaciation, the ice sheet extended over the Buckeye Lake area and for several miles to the eastward. Because of the ice action the Newark channel and its two tributary valleys in the area were almost completely filled with glacial drift, which was likewise deposited over the uplands on both sides of these valleys. Throughout the eastern half of the area the glacial drift is relatively thin, and consists of a great number of moraines that are from a few feet to two hundred feet in height. Because of the thinness of the drift the terrain is largely controlled by the drift-covered bed rock. In the western half the moraines are low or absent, and the till plains have typical sag and swell topography. In fact, Tight (1894: 38) believed that this level area, and more to the north, was the site of an old shallow postglacial lake, to which he gave the name Lake Licking. Detmers (1912a: 517-21) later proved that while there may have been a very temporary large lake in this region during the early retreat of the Scioto lobe, it did not remain sufficiently long to deposit lake silts or clays or to form lake beaches, and that much of the till underlying this western half was composed of sands and gravels that were evidently an outwash deposit from a glacial outlet.

Formation of the "Great Swamp."—With the retreat of the Wisconsin ice sheet from the eastern half of the present Buckeye Lake area, a loop moraine was formed across the eastern tributary valley at Thornport, which completely blocked the then eastward flowing glacial stream. At this time the western or lower portion of the Newark channel was still blocked with

ice so that the waters from the receding glaciers were ponded behind the moraine, converting this lower portion of the old eastern tributary into a lake. The ponded waters continued to rise until they eventually spilled over the loop moraine, and in so doing made a well-defined overflow gap. Still later, and before the loop moraine was entirely cut through, another outlet was formed to the westward which reduced the ponded water level until it was lower than the gap in the loop moraine. This latter outlet, which probably entered the South Fork drainage basin, was not sufficiently low to drain entirely the ponded waters in this partly-filled eastern tributary between the loop moraine and the high till plains to the west. As a consequence, a finger-like lake was formed. At the time of the white man's first visit in 1751, this lake had been reduced to a long, narrow swamp with a small finger-like lake in its central portion (Detmers, 1912a: 522-23). The swamp and the lake consisted of approximately four thousand acres (Dachnowski, 1912: 86).

As further proof that the "Great Swamp" dates from early post-Wisconsin times Detmers (1912a: 523-25) points out that the swamp contains a rather typical postglacial cranberry-sphagnum bog. This bog also contains other northern plants that are accepted as relicts of early postglacial times, which, because of favorable conditions, have survived in this swamp far south of their present center of distribution.

Summary of the glacial history.—The Buckeye Lake area formerly contained a portion of the huge Newark River channel, which bisected the area in a northeast-southwest direction.

Two tributary valleys entered the Newark channel in the central part and opposite each other, the one entering from the northwest, the other from the east.

At least two glaciers, the so-called Illinoian and the Wisconsin, have passed over the area, modified the bedrock hills, and almost filled their valleys with drift; they have deposited many moraines in the eastern half and left a rather level till plain in the western half.

A loop moraine in late Wisconsin times blocked the eastern tributary valley near the present site of Thornport, and thereby blocked the then eastward flowing stream; this resulted in the establishment of a large temporary lake.

The waters of the lake continued to rise until they overflowed the loop moraine; later, however, another and lower outlet was formed to the westward.

This outlet, though lower than the gap in the loop moraine, did not entirely drain the lake, for the lake lay in a depression in the lower valley of the eastern tributary, between the loop moraine on the east and the higher part of the till plain to the west.

The finger-like lake thus formed in the lower valley of the eastern tributary continued slowly to decrease in size. When the white men first visited the area in 1751 this lake had been converted into a long, narrow swamp with a greatly reduced finger-like lake in the long central part.

TOPOGRAPHY

The Buckeye Lake area is situated in a re-entrant of the till plain (possibly low plateau; see White, 1934) into the west-facing escarpment of the glaciated portion of the Appalachian Plateau. The area therefore reflects to a marked degree two major topographical features: the hilly, well-drained, glaciated eastern half, which in most respects greatly resembles the adjacent, hilly, unglaciated country to the eastward, and the flat, poorly-drained western half, which is similar to the slightly rolling prairie-like country of the central lowland of central and western Ohio. Within the area are two large drainage systems; the Muskingum River to the east, which drains the great part of the area, and the Scioto River to the west, which drains the southwestern corner.

For convenience in describing the topography of the area, it has been divided into three parts: (1) the dissected, hilly eastern section; (2) the slightly rolling, till plain, western section; and (3) the former "Great Swamp" section, now covered by Buckeye Lake.

The eastern section.—This half of the area lies east of a line drawn from Hebron, south to the southern border of the area; but it does not include that part of the "Great Swamp" which is a re-entrant projecting eastward. The land has a distinct morainal hill and valley topography, with considerable dissection by small streams and with the knolls of the morainal hills broad and rounded. The hills range to 170 feet in height. The lowest elevation in this section is 880 feet above sea level and is in the extreme northern portion, where at present the South Fork of the Licking River crosses the National Road. The highest elevation, 1070 feet, is on the crest of the hill at the northeastern edge of the lake.

The eastern section is entirely within the South Fork of the Licking drainage (part of the Muskingum River system), and the small tributaries which drain it flow directly into the South Fork or else into the former "Great Swamp" (now Buckeye Lake) and then into the South Fork. With the exception of the South Fork itself, all of the streams are small, and during recent years have in dry periods ceased to flow. Their valleys are mainly broad and open, though some are distinctly V-shaped, and a few have well-defined ravines.

The drift, primarily of boulder clays with boulders as large as four feet in diameter, is usually many feet in depth, but at a few places northeast of the lake there are small outcroppings of Waverly sandstones.

The western section.—This section comprises the half of the area west of a line drawn from Hebron, south to the southern border of the area, but does not include the section now occupied by the western end of Buckeye Lake. This western part is mainly a flat till plain interspersed with gently sloping hills and shallow valleys. The lowest elevation, 880 feet, is along the South Fork of the Licking; the highest elevation is on the crests of the gently sloping morainal hills of the western and southern borders and is about one thousand feet. The greater part of this section is uniform in altitude at approximately the lowest elevation.

All of the streams except the South Fork are of small size and are largely intermittent in character, for they flow only during the rainy periods of the year; also all except a few are now dredged and have had their courses straightened. The South Fork itself is rather small, for during most of the year it is only fifteen to forty-five feet in width, with a maximum depth of eight feet, and it, too, has been almost entirely dredged and straightened. All except the small southwestern part of the western section drains into the South Fork, either directly, or into the "Great Swamp" (Buckeye Lake) and then into the South Fork. The small southwestern portion which does not drain into the South Fork is in the Little Walnut drainage, a part of the Scioto River system.

The entire western section was originally dotted with swamps, which ranged in size from less than an acre to several hundred acres. By 1934 all except a few of these swamps had been drained and were under various stages of cultivation. The soil of the western section consists of light and heavy boulder clays with varying amounts of fine and coarse gravels, with occasional large boulders. In the swamps the clays and gravels have been covered by black loam or peat deposits, sometimes to a depth of forty feet.

The "Great Swamp" section.—This section was originally the "Great Swamp" proper; when flooded it became the Old and New reservoirs, and still later Buckeye Lake. The western half lies in the center of the Buckeye Lake area, and the eastern half extends almost to the eastern border. Before its conversion into a reservoir and lake, the entire swamp section was low, rather level country which contained one or more long narrow ponds³ that apparently extended throughout the center of its long east and west axis. The subsoil consists of glacial clays and gravels of the same type as are present over much of the entire area; because, formerly, a large lake

³ There has been considerable discussion concerning whether the "Great Swamp" contained one or more ponds. The Indians and early settlers told of the presence of two ponds which they called "Two Lakes" or "Big and Little Lake" (Detmers, 1912b: 9); but the surveys of 1799 (Dachnowski, 1911: 7) and 1801 (Simpson, 1912: 6) show only one long narrow pond. In an 1825 report of the canal commissioners to the General Assembly of the state of Ohio it is clearly shown that there was a chain of ponds which became one large pond during periods of high water (Kilbourne, 1832: 105).

and later a swamp and bog were present, the topsoil consists of loam and peat deposits. The artificial lake has, since its construction, entirely flooded all except a small portion of the "Great Swamp." During recent years the water level of the lake has been at or near 892 feet above sea level; since the lowland immediately north of the "Great Swamp" section is only 880 to 890 feet above sea level, it is lower than the impounded waters in the lake.

THE INVASION OF THE WHITE MAN, AND HIS ACCOUNTS OF THE AREA
FROM 1751 TO 1820

The interesting journals of Christopher Gist (1893) give the first known record of a white man in the Buckeye Lake area. Gist, a native of Maryland, was one of the earlier explorers of the Northwest Territory. In the fall of 1750, he was chosen by the Ohio Land Company of Virginia to explore the Ohio country, and in late October of that year he journeyed to Shannopins Town (then situated where Pittsburgh, Pennsylvania, now stands). He arrived there on November 19, 1750. A few days later he went westward to a town of the Wyandot Indians, which was on the Muskingum River near the present site of Coshocton, Ohio, and which was called Muskingum. Here he spent Christmas and met two traders, George Croghan and Andrew Montour. On January 15, 1751, these men⁴ left the Indian town of Muskingum, and journeyed in a southwesterly direction, until on Thursday, January 17, 1751, they came to a "Great Swamp" (Gist, 1893: 42; and Johnston, 1898: 122), which is now part of the Buckeye Lake area. Unfortunately, Gist does not give further details of the "Great Swamp." On the next day the men went southward to Hockhockin, a small town of the Delaware Indians, at the present site of Lancaster. Gist later went into southwestern Ohio, visited the Twigtrees (Miamis) in their town at the mouth of the Great Miami River, crossed the Ohio River, and went through Kentucky, southern West Virginia, and Virginia, to his home, which was then in South Carolina.

At the time of his visit, and apparently for several years before, the region about the "Great Swamp" was primarily inhabited by the Wyandot and Shawnee tribes, and to a lesser extent by the Delawares (Hill, 1881: 199); and the "Great Swamp" itself was used by these tribes as a hunting and fishing ground. Two important Indian and game trails passed through or near it. The more important one came down the Muskingum River from the north to the present site of Zanesville, crossed the river there, continued south of west across Perry and Fairfield counties, and passed on the south side of the "Great Swamp." The other trail, the one used by Gist, fol-

⁴ Gist was also accompanied on this day and on his entire expedition by a seventeen-year-old negro servant.

lowed the Muskingum River south to Dresden, where it crossed the river and bore southward to the "Great Swamp," and to the headwaters of the Hocking River. This trail probably passed through or on the northern edge of the "Great Swamp" (Map 1).

In 1755, a few years after Gist's visit, another white man visited the area. This young man of eighteen years was James Smith (1870), who earlier in that year had been captured by Indians and taken to Fort Duquesne (later Pittsburgh). The same year Smith was taken to Tullihass, an Indian village composed chiefly of Delawares, Caughnewagas, and Mohicans, and which was at or near the confluence of the Mohican and Kokosing rivers (now in Newcastle Township, Coshocton County, Ohio). Here he was adopted by the Indians and shortly thereafter was taken on a hunting expedition. Upon leaving Tullihass the hunting party went in a southerly direction until they came to a buffalo lick. According to Smith (1870: 168) this was in the Buckeye Lake area; however, from his description I believe it may have been north of this area, possibly in central Licking County. He (1870: 21) stated:

We then moved to a buffalo lick, where we killed several buffalo, and in their small brass kettles they [Indians] made about half a bushel of salt. I suppose this lick was about thirty or forty miles from the aforesaid town [Tullihass], and somewhere between the Muskingum, Ohio and Sciota [rivers]. About the lick was clear, open woods, and thin white-oak land, and at that time there were large roads [Indian and game trails] leading to the lick, like waggon roads. We moved from this lick about six or seven miles, and encamped on a creek.

Smith also related that near this lick the Indians killed an elk and a number of deer, and that the Indians and he hunted for turkeys. The hunting party apparently remained encamped at the creek for several days before returning to Tullihass. After traveling over much of what now is Ohio during the next few years, Smith finally escaped from his captors and returned to his family in Pennsylvania.

In 1773 the eccentric "Chaplain Jones" and an Indian trader by the name of David Duncan came from the Shawnee towns on the Scioto River eastward to Hockhockin (Lancaster), and on February 10, 1773, they passed the "Great Swamp" along the same trail which Gist had followed in 1751, but in the opposite direction. After 1773, and especially after the close of the Revolutionary War, visits to this area became more frequent, though it was not until twenty years later that the pioneers began the actual settlement of the surrounding country.

When the pioneers came it was principally along the newly made Zane's Trace, which was built by Jonathan Zane during 1796 and 1797, and which traversed southeastern Ohio from opposite the present site of Wheeling, West Virginia, westward past the southeast corner of the "Great Swamp,"

to opposite Maysville, Kentucky, on the Ohio River. With the increase in emigration from the east which began at the beginning of the nineteenth century over Zane's Trace, the pioneers began to settle the country surrounding the "Great Swamp" and to lay out towns. Thus to the north, Newark was settled in 1802, and Granville in 1806; at the east end of the swamp Thornville was laid out by 1815, though a few families had been living in the vicinity for five years; to the south Lancaster came into existence in 1800 and Somerset in 1807. By 1820 there were several small towns within twenty miles of the swamp, and the deforestation and the establishment of farms in the Buckeye Lake region had begun.

THE PRIMARY VEGETATION AND AVIFAUNA OF THE AREA BETWEEN 1751 AND 1820

In order to understand some of the changes in the bird fauna which have taken place within the Buckeye Lake area during historic time it is necessary to reconstruct as accurately as possible the primary vegetation and the avifauna as they existed in early historic time, and to demonstrate in what manner they have become modified. Unfortunately, early accounts of the flora and avifauna are rather meager, and in many instances are obviously unreliable or incorrect; however, sufficient accurate information⁵ does exist to give some conception of past conditions. This information and a knowledge of the flora and fauna remnants that still exist, and of plant and animal successions⁶ make possible the general reconstruction of the flora and avifauna.

As stated in the remarks on topography, the area may be divided into three major sections. In the following account of the primary vegetation it can be readily seen that these sections each contained a distinctive type of vegetation.

The eastern section.—During the period between 1751 and 1820 the eastern section was heavily forested, and apparently with few or no openings or clearings other than those made by Indians or early pioneers. The forests which covered these uplands could probably be classified as belonging to the oak-hickory-chestnut-maple association, which graded into a beech-maple forest on the lower slopes of the hills, and, in the intervalles, into a beech (*Fagus grandifolia*)⁷ forest. The "majestic oaks," which according to

⁵ Some of the following information on the flora and avifauna of the past has been obtained from Dachnowski (1911 and 1912), Detmers (1912*b*), Hill (1881), Graham (1883), Schaff (1905), Smith (1870), and Smucker (1876); further information upon the flora as it probably existed during early historic times was given me by Dr. Robert B. Gordon and Dr. Edgar N. Transeau, of Ohio State University.

⁶ For an account of the numerical status of some mammals throughout historic time in the Buckeye Lake area see Trautman, 1939*b*: 133-43.

⁷ The scientific name of a plant is given the first time that the name of the plant is used. The common and scientific names have been taken from Schaffner (1928).

Schaff (1905: 81) and others, were six feet or more in diameter and which towered "royally fifty and sixty feet without a limb," were mostly white oaks (*Quercus alba*), and the remainder were largely red oaks (*Q. rubra*). The shagbark hickory (*Hicoria ovata*), although present, was perhaps not very numerous; the chestnut (*Castanea dentata*) was probably very abundant and must have dominated the gravel knobs and glaciated ridges. The maples of the uplands included the sugar maple (*Acer saccharum*), red maple (*A. rubrum*), and a few black maple (*A. nigrum*).

Besides these more numerous species there undoubtedly were in the upland forests, some sassafras (*Sassafras sassafras*), flowering dogwood (*Cynoxylon floridum*), and an occasional tulip poplar (*Liriodendron tulipifera*), linden (*Tilia americana*), redbud (*Cercis canadensis*), black cherry (*Prunus virginiana*), red mulberry (*Morus rubra*), persimmon (*Diospyros virginiana*), and hop hornbeam (*Ostrya virginiana*), as well as occasional clumps of Juneberry (*Amelanchier canadensis*), witch hazel (*Hamamelis virginiana*), black haw (*Viburnum prunifolium*), and staghorn sumac (*Rhus hirta*). The sumac was probably in the more open areas.

The overdrained portions of the upland forests, such as the "clear, open woods, and thin white-oak land" described by Smith (1870: 21), undoubtedly contained a large proportion of white oak and chestnut. In the upland forest the undergrowth was apparently sparse, and no doubt included several species of tick-trefoil (*Meibomia* sp.), bush-clover (*Lespedeza* sp.), common wild-oat-grass (*Danthonia spicata*), woodland sunflower (*Helianthus divaricatus*), small wood sunflower (*H. microcephalus*), broad-leaf panic-grass (*Panicum latifolium*), gray goldenrod (*Solidago nemoralis*), Virginia rose (*Rosa virginiana*), possibly the ebony spleenwort (*Asplenium platyneuron*), and other associated plants. Ferns were scarce, and no evidence exists that there may have been pitch pine (*Pinus rigida*) or scrub pine (*Pinus virginiana*) as there was, and still is, a few miles south of the area.

The slopes and intervalles of the eastern section probably contained an occasional specimen of the trees, shrubs, and herbs that were present upon the knobs and overdrained uplands. In addition, the slopes and intervalles may have also contained, as they still do, white ash (*Fraxinus americana*), an occasional hackberry (*Celtis occidentalis*), black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), bitternut (*Hicoria cordiformis*), and clumps of pawpaws (*Asimina triloba*).

The ground cover of the slopes and intervalles must have been denser than it was on the overdrained uplands, except when they had been recently fired by the Indians or pioneers. Without fires the ground cover should have contained many of the spring-flowering herbs and sedges. Such spring flowers as the bloodroot (*Sanguinaria canadensis*), roundlobed and sharp-

lobed liver-leaf (*Hepatica hepatica* and *H. acutiloba*), anemones of several species, including the Canada anemone (*Anemone canadensis*) and wind-flower (*A. quinquefolia*), rue anemone (*Syndesmon thalictroides*), Jack-in-the-pulpit (*Arisaema triphyllum*), Greek valerian (*Polemonium reptans*), yellow and white dogtooth lilies (*Erythronium americanum* and *E. albidum*), spring beauty (*Claytonia virginica*), and several species of trilliums, such as the large-flowered trillium (*Trillium grandiflorum*) and sessile trillium (*T. sessile*). Several species of ferns should have been present, such as the Virginia grape-fern (*Botrychium virginianum*), maidenhair fern (*Adiantum pedatum*), marginal shield-fern (*Dryopteris marginalis*) and Christmas fern (*Polystichum acrostichoides*), as well as such herbs as shining bedstraw (*Galium concinnum*), running strawberry bush (*Euonymus obovatus*), early meadow rue (*Thalictrum dioicum*), blue cohosh (*Caulophyllum thalictroides*), white baneberry (*Actaea alba*), wreath goldenrod (*Solidago caesia*), zigzag goldenrod (*S. flexicaulis*), and common blue wood aster (*Aster cordifolius*). If there had been fires recently, then there could be expected an increase in woody vines, such as the several species of wild grapes, particularly the northern fox grape (*Vitis labrusca*) and summer grape (*Vitis aestivalis*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*), as well as an increase in the amount of blackberry bushes of such species as the black raspberry (*Rubus occidentalis*) and high blackberry (*R. alleghaniensis*), black cherry, and an increase in abundance of the Compositae. With these there was a corresponding decrease in the abundance of spring flowering herbs and ferns.

When and wherever the trees were removed by such agents as windstorms there undoubtedly occurred an increase in the amount of saplings of many species and particularly black cherry, oaks, chestnut, pawpaw, stag-horn sumac, smooth sumac (*Rhus glabra*), wild grapes of several species, Virginia creeper, poison ivy, and blackberries of several species. With the increase of these plants there also occurred a decrease in abundance of ferns and some spring-flowering herbs, except the spring beauty, sessile trillium, common blue violet (*Viola papilionacea*), and striped violet (*V. striata*). The latter may have even increased in abundance for a short period following the destruction of the forest. Undoubtedly, too, there was a great numerical increase in the Compositae and in several species of grasses.

The western section.—The vegetation of the upper slopes and crests of the moraines in the western section of the area was essentially the same as that present in the hilly, upland, eastern section. In the lowlands, which comprised most of this western section, the primary flora was considerably different, for here the elm-ash-soft maple type of swamp forest was dominant. In this swamp forest two species of elm trees were apparently present in large numbers, the white elm (*Ulmus americana*) and the slippery elm (*U. fulva*).

There were at least four species of ash trees, the white ash (*Fraxinus americana*), red ash (*F. pennsylvanica*), green ash (*F. lanceolata*), and black ash (*F. nigra*), and the first of these must have been abundant. The silver maple (*Acer saccharinum*) and the red maple undoubtedly were very numerous, as were the swamp white oak (*Quercus bicolor*), pin oak (*Q. palustris*), and shellbark hickory (*Hicoria laciniosa*). Other species present in at least small numbers were the American beech, red oak (*Quercus imbricaria*), linden, box elder (*Acer negundo*), black cherry, hackberry, tupelo (*Nyssa sylvatica*), black walnut, butternut, bitternut, blue beech (*Carpinus caroliniana*), and mulberry. Along the stream courses there must have been an occasional tree or small group of the Ohio buckeye (*Aesculus glabra*), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), black willow (*Salix nigra*), and white willow (*S. alba*). The shrub layer of the swamp forest contained elderberry (*Sambucus canadensis*), prickly ash (*Zanthoxylum americanum*), witch hazel, black haw, wild black currant (*Ribes americanum*), prickly gooseberry (*Grossularia cynosbati*), and spicebush (*Benzoin aestivale*). The last named shrub was probably not very numerous, except in those parts of the swamp forest which had recently been disturbed.

Scattered throughout the swamp forest of the western section were several more or less treeless swamps of various sizes, and these contained a plant community conspicuously different from that of the surrounding forest. The centers of these swamps were either devoid of bushes and trees or else contained only scattered individuals or clumps and were water-covered throughout several months of the year. They contained a grass-sedge-bulrush habitat, in which were such species as the tall slough grass (*Spartina michauxiana*), inflated sedge (*Carex vesicaria*), and wool grass (*Scirpus cyperinus*). The brush community which bordered these open swamps contained the smooth alder (*Alnus rugosa*), possibly the hoary alder (*Alnus incana*), poison sumac (*Toxicodendron vernix*), red osier dogwood (*Cornus stolonifera*), silky dogwood (*C. amomum*), sheepsberry (*Viburnum lentago*), elderberry, buttonbush (*Cephalanthus occidentalis*), wild rose (*Rosa carolina*), withe rod (*Viburnum cassinoides*), and black chokeberry (*Aronia melanocarpa*). Interspersed in this brush community were such trees as the red maple, honey locust (*Gleditsia triacanthos*), wild plum (*Prunus americana*), hawthorns (*Crataegus* sp.) of several species, pussy willow (*Salix discolor*), and pin oak. On the borders the brush community gradually merged into the swamp forest.

Beside this type of swamp there was also the cranberry-sphagnum bog-swamp, which contained peat deposits in varying depths, and of which the Bloody Run swamp⁸ was the largest in the western section. The treeless

⁸ Said to have originally contained "near 1000 acres" (Kilbourn; 1832: 106).

part of such a bog-swamp contained a dense ground mat of the large cranberry (*Oxycoccus macrocarpa*) and sphagnums of several species (*Sphagnum cymbifolium*, *S. parvifolium*, *S. acutifolium*, *S. recurvum*). This part of the swamp was also interspersed with, and surrounded by, clumps of swamp loosestrife (*Decodon verticillatus*), alders, poison sumac, elderberry, button-bush, wild rose, withe rod, chokeberry, and winterberry (*Ilex verticillata*). Among the cranberries and sphagnum grew such bog plants as the thin-leaf cotton-sedge (*Eriophorum viridicarinatum*), Virginia cotton-sedge (*E. virginicum*), and bluejoint reed bent grass (*Calamagrostis canadensis*); along the borders and ridges of the swamp were the red maple, silver maple, black cherry, pin oak, shingle oak, honey locust, several species of ash, black willow, pussy willow, and bog willow (*Salix pedicellaris*). In the thicket and along the margins of the bog-swamp grew such vines as the groundnut (*Glycine apios*), bittersweet (*Celastrus scandens*), hedge bindweed (*Convolvulus sepium*), and Gronovius dodder (*Cuscuta gronovii*). Some of these bog-swamps also contained patches of shrubby cinquefoil (*Dasiphora fruticosa*).

The literature contains frequent references to "prairies," "wild plum prairies," and "bowling greens." Hill (1881: 166) in writing of the early history of Licking County, stated that "of prairies, there were few and none contained more than a very limited number of acres." He also stated, however, that "there were several prairies along the southern border of Union Township [Licking County and in the Buckeye Lake area], one being of considerable magnitude." From such statements and from present conceptions of conditions in early historic time, it appears probable that these were not tall grass prairies, such as were present in portions of western and central Ohio (Transeau, 1935). Rather, they were either dry prairies, containing such plants as big bluestem (*Andropogon furcatus*) and little bluestem (*Andropogon scoparius*), and were probably caused by frequent burning, or were wet, marshy prairies, which contained such plants as the broad-leaf cattail (*Typha latifolia*), narrow-leaf cattail (*T. angustifolia*), inflated sedge, wool-grass, tall slough grass, tall smooth panic grass, purple joe-pye weed (*Eupatorium purpureum*), common boneset (*E. perfoliatum*), blue vervain (*Verbena hastata*), tall ironweed (*Vernonia altissima*), Jerusalem artichoke (*Helianthus tuberosus*), purple-stem aster (*Aster puniceus*), tall cone-flower (*Rudbeckia laciniata*), bushy fragrant goldenrod (*Euthamia graminifolia*), swamp thistle (*Cirsium muticum*), swamp milkweed (*Asclepias incarnata*), and a host of other marsh species. On the ridges and edges of the wet prairies the same shrub and the tree communities occurred that were previously described as occupying the borders of the open swamps. Apparently, in these "prairie" openings, the wild plum was particularly numerous.

The "bowling greens" mentioned in the literature appeared to be chiefly grasslands containing scattered walnut trees of large size. These "greens" must have been the result of former burnings by aborigines. Apparently no "bowling greens" were actually known to have been present in the Buckeye Lake area between 1751 and 1820, but there were several a few miles to the eastward, in Bowling Green Township, Licking County.

The "Great Swamp" section.—This section of the area comprised the original "Great Swamp" which later became Buckeye Lake. Only a very small part of this lowland section was as much as ten feet above the surrounding area. It contained one or more long, narrow postglacial lakes, said to be very clear (Graham, 1883: 308). Undoubtedly, they also contained a considerable amount of submerged aquatic vegetation, such as several species of pondweeds (*Potamogeton*), water-weed (*Philotria canadensis*), tape grass (*Vallisneria spiralis*), and hornwort (*Ceratophyllum demersum*), and such emergent aquatic vegetation as the yellow water lily (*Nymphaea advena*), tuberous white water lily (*Castalia tuberosa*), and water lotus (*Nelumbo lutea*). Parts of the shores of the lake probably contained marshes of cattails and their associates, such as the broad-fruited bur-reed (*Sparganium eurycarpum*) and several species of the genera *Carex* and *Scirpus*.

As evidenced by the peat deposits still present, and by Cranberry and other islands, a considerable part of this section was a cranberry-sphagnum bog-swamp, and it is quite possible that the original lake or lakes were almost entirely surrounded by such a bog. This surely must have contained, besides the large cranberry and four or more species of *Sphagnum*, such bog plants as the thin-leaf cotton-sedge, Virginia cotton-sedge, bluejoint reed bent grass, white beak-rush (*Rynchospora alba*), blunt spike-rush (*Eleocharis obtusa*), bristly sedge (*Carex comosa*), inland sedge (*Carex interior*), cinnamon fern (*Osmunda cinnamomea*), roundleaf sundew (*Drosera rotundifolia*), and buckbean (*Menyanthes trifoliata*). Scattered through the bog and along its outer border there unquestionably were such plant species as alder, swamp loosestrife, poison sumac, elderberry, wild rose, withe rod, black chokeberry, winterberry, red osier and silky dogwood, swamp rose mallow (*Hibiscus moscheutos*), small beggar-ticks (*Bidens discoidea*), groundnut, poison ivy, bittersweet, wild grape, hedge bindweed, red maple, pussy willow, black willow, bog willow, hawthorn, and wild plum. Apparently hawthorn and wild plum were rather abundant, for Graham (1883: 308) stated that these and the cranberry were "very plentiful" in Thorn Township, Perry County, in the locality "now nearly all covered by the waters of the Reservoir." According to Graham (1883: 307), the township of Thorn was so named because of the abundance of "thorn bushes, bearing red berries, which grew in early times adjacent to the little lakes."

On the higher ground of the swamp there was a forest of large trees of such species as the swamp white, red, pin, and shingle oaks, white and slip-

perly elms, red and silver maples, white, black, and green ashes, beech, black cherry, shellbark hickory, honey locust, and hackberry; on the better-drained ridges there probably were some white oak, black and sugar maple, shagbark hickory, walnut, and their associates. Some trees of the swamp were of mammoth size, for stumps four feet in diameter were recorded by Detmers (1912b: 12), and a few of these large stumps could still be seen in the shallow waters of the lake as late as 1934.

Some estimate of the relative proportions of forest, brush, open swamp or bog, and lake in the central portion of the "Great Swamp" in 1828 is obtained from a report by Isaac Minor, an early president of the Ohio Canal Board. This report, dated January 17, 1828, was written before the filling of the "Old Reservoir" with water. Minor (Kilbourn, 1832: 303-4) wrote that "from the survey which has recently been made, it appears that the area which will be covered by the water of the [Old] reservoir when filled, contains upwards of two thousand four hundred acres,"⁹ of which probably twelve hundred acres was in "heavy timber," five hundred acres in "light timber and under brush," and the remainder, about seven hundred acres, in "lake and open swamp with a growth of very light brush."

A most enlightening description of the "Great Swamp" previous to 1825 is given in the third annual report of the Canal Commissioners to the General Assembly of Ohio (Kilbourn, 1832: 105), dated January 8, 1825:

About one mile northeastwardly from the highest point¹⁰ in the summit, commences an extensive marsh, which stretches in an eastwardly direction about eight miles—varying in breadth from a quarter of a mile to upwards of half a mile. This marsh encloses a chain of ponds, which stretch along its center, of from fifty to three or four hundred yards in breadth. The longest of these ponds is something more than a mile in length. This marsh is surrounded with a bank of high dry land, which is generally abrupt and well defined, except on the northwestwardly side, where it approaches the South fork of Licking. The country which surrounds the marsh, on its south, east, and part of its north side is high and hilly. On the northwestwardly side it is generally low, rising but a few feet above the level of the marsh. The waters of this marsh are discharged by three short out-lets from its northwestern side into the South fork of Licking, which approaches within less than half a mile. When this branch of Licking is much swollen by floods, its waters rise over its banks, and flow through a shallow ravine, which extends from the west end of the marsh to the creek some distance above. The current in the out-lets of the marsh is also inverted and the waters of Licking flow through these channels into it. By these means much of its surface is covered with water to a depth of two or three feet, and in some places deeper. When the floods of Licking subside, the water flows into it from the marsh, through the out-lets above described.

The avifauna.—From a knowledge of the primary vegetation which covered the area between 1751 and 1820, and from the bird records of the period, the avifauna can be named with a fair degree of accuracy. The

⁹ The "Old Reservoir," when finally completed, contained about three thousand, seven hundred acres.

¹⁰ This is immediately south of Millersport (see Map 2: No. 11).

forest birds were in the majority, and the woodland nesting birds must have been more numerous as regards individuals and species than they have been since. Such woodland-nesting species as the Red-tailed Hawk, Ruffed Grouse, Wild Turkey, Great Horned Owl, Whippoorwill, Pileated Woodpecker, Wood Thrush, Yellow-throated Vireo, Cerulean Warbler, Ovenbird, and Redstart undoubtedly were fairly numerous or abundant during this period. Some of the water birds which nested in trees or cavities were probably also numerous, particularly the Wood Duck, for it was a common nesting species throughout the state at that time. Birds which nested in swamp thickets were probably present in fair numbers, but the field-nesting species, especially those which nested in sparsely vegetated, well-drained fields, must have been rare or absent. It is rather difficult to imagine the Prairie Horned Lark, or many pairs of Vesper Sparrows, nesting in the area during this early period. The Meadowlark, too, must have been very uncommon or absent.

The bird species specifically mentioned as occurring for this period are relatively few, and are all of the game bird type. Chief among them was the Turkey, which if the many reports are true, was surprisingly numerous for so large a bird. It is reputed to have appeared either singly or in small groups, and occasionally in flocks of as many as fifty individuals. Hill (1881: 176) stated that "wild turkeys were also very abundant in pioneer days [Licking County], and so continued for many years, affording no inconsiderable portion of the food of the early settlers. They were so numerous and tame that they could be procured by the hunter on very short notice." There are frequent references in the literature concerning the large number of Turkeys in Ohio prior to 1820, and of the ease with which the pioneers captured the birds. It appears probable that as an article of food, the Turkey was as important, or more so, than the deer. The earliest mention (Smith, 1870: 23) of any bird in the area records that in 1755 while James Smith and his Indian captors were camping in the vicinity he went out Turkey hunting. He failed to mention whether or not he saw a Turkey.

Another frequently mentioned bird is the "pheasant," as the Ruffed Grouse was called. This species was reputed to have been fairly numerous during early historic time, but according to Hill (1881: 176): "Pheasants were not so numerous as the turkey." This statement can readily be believed when it is remembered that the Ruffed Grouse does not attain its greatest numbers in unbroken forest.

The Passenger Pigeon is little mentioned until after 1820. It may be that before 1820 this pigeon was not as concentrated in its nesting or feeding as it became when the deforestation of Ohio and adjacent states was in a more advanced stage.

It is interesting to note that no specific mention of the Bob-white is made before 1820. The bird must have been very uncommon or absent, for the only situation at all suitable for it must have been the plum thickets, small "prairie openings," or sedge borders of the ponds and lakes. The literature concerning the Bob-white for the entire state before 1820 is meager indeed. When mention of the Bob-white is made, it is to refer to its absence or scarcity in early historic time, or to state that "quails are not natives of the wilderness" (Hill, 1881: 176). The most authentic illustration of the scarcity of Bob-white is given by H. E. Jones and N. E. Jones (1898: 203), both of whom refer to an incident which occurred to one of their relatives (Wheaton, 1882: 450):

At the time of the first settlements in Ohio, it is quite probable Quail were scarce, and found only in certain localities. The extensive and dense forests, covering almost the entire territory, made it ill-adapted to their nature; and those who were enabled to perpetuate their existence occupied only some of the limited open tracts of land then found here and there over the country. In support of this conclusion I will here refer to the facts contained in a statement made by my great-grand-father who emigrated to this State directly after peace with the Indians was effected by General Wayne under Washington, and, in the Spring of 1798, located with his family on what was then named and since known as the "High-bank Prairie," near Chillicothe [Ohio]. In this seemingly favorable locality he resided several years before the voice of the Quail was heard; so long that he abandoned the anticipation of Quail shooting, and questioned if it would ever be recognized as a sport in Ohio. One day in early summer he thought he heard a well-recognized though suppressed sound, "*Bob-White*." Somewhat doubting the sense of hearing, he immediately made observations and procured additional evidence, that of sight. Yes, he actually heard and saw the bird. Elated with the good news he proceeded to the cabin and told his discovery with so much excitement and enthusiasm that it created a laugh at his expense. He excused his manner, however, by saying it was sufficient to excite any one, to know that a highly esteemed and familiar bird had found its way through such an interminable wilderness, and announced his arrival in that modest and meaning way.

If the Bob-white was absent or uncommon about the "High-bank Prairie near Chillicothe," in one of the important prairie centers of Ohio, then the species must certainly have been absent or rare in the vicinity of the "Great Swamp," which was outside a prairie center and apparently contained so small an amount of semidry or well-drained brush or open land. Wheaton (1882: 449) was also of the opinion that the Bob-white was rare in Ohio in early historic time:

This well-known bird is an exception to all others of the order, in that it was probably absent or at least confined to but few localities in the State at the time of its first settlement, and has steadily increased in numbers as the forest has been cleared away, while others have diminished.

Summary of the primary forest conditions and the status of the birds between 1751 and 1820.—The area was forested at the coming of the white

man. The uplands contained a maple-oak-chestnut-beech association; the lowlands were in swamp forest with a primary association of elm-ash-soft maple; there were sphagnum-cranberry bog-swamps and swamp thickets, a few wild plum prairies, and a few "prairie openings" of sedges and grasses. The white man removed comparatively little of the primary forests, and general floristic conditions were little changed.

The forest-inhabiting species of birds were undoubtedly the dominant group; the brush- and bog-inhabiting species were less numerous; the open field or grassland species were rare or absent. Among the upland game birds the Turkey was very numerous, the Ruffed Grouse was less so, and the Bob-white must have been rare or absent.

THE PERIOD BETWEEN 1821 AND 1890

Between 1821 and 1890 the white man immigrated to the Buckeye Lake area in large numbers, greatly changing the topography and the landscape. Before 1820 the few roads that existed were impassable during a considerable part of the year, and the transportation of large quantities of farm products was impractical or impossible. As a consequence, the pioneer farmer sold little to the outside world and bought little in return. His simple and few needs were satisfied by his own efforts from his cleared land or the neighboring forest. As no market existed for excess land products he raised only that which was needed for his own consumption or for that of his immediate neighbors. This demanded the cultivation of only a few acres of ground. His cattle were left to forage in the woods or in deadenings and clearings. Because of this simple way of living there was little need to disturb the existing flora and fauna.

After 1821 a marked change began to take place, for the citizens of Ohio began to demand more efficient means of transportation. As a result, during the next few years, the Ohio and Erie canal was constructed, and the National Road was built. Both of these units directly affected the Buckeye Lake area, for the canal ran through its center, changing the "Great Swamp" into two huge reservoirs, and the road bordered its northern edge.

The canal and reservoirs.—After several years of discussion relative to the merits of a state-wide canal system, an act was passed early in 1825 by the Ohio legislature, authorizing the building of the canals. One of these, known as the Ohio and Erie, was to connect Lake Erie with the Ohio River, from Cleveland southward through Akron, Dover, and Newark to the Buckeye Lake area, then in a southwesterly direction to the Scioto River and thence south to Portsmouth on the Ohio River. The Buckeye Lake area was on the divide between the Muskingum and Scioto watersheds, where it was necessary to build a reservoir to supply water for the canal. The "Great Swamp" was chosen for the site of the reservoir.

The construction of the canal was begun on July 4, 1825, in Licking County about six miles north of the "Great Swamp." By 1826 the work had reached the area itself, and a few years later the canal was completed. The canal bisected the western half of the area, entering it from the north at the present village of Hebron, and passing along the western end of the future "Old Reservoir" to the present village of Millersport, where it turned due south and left the area at its extreme southwest corner.

In 1826 work also began on the construction of the "Old Reservoir." The basin of this reservoir was to include almost all of the "Great Swamp," and, in order to raise the water level nine feet above the water level of the old lake or lakes, it was necessary to construct two dikes. One of these extended from what is now the village of Buckeye Lake westward to Sellars Point, a distance of approximately two and one-half miles. The greatest height of this dike, eighteen feet, was at the present site of the Black Diamond cottage, about halfway between the village and the point, and also at the old outlet that drained the overflow waters from the lake or lakes into the South Branch of the Licking River. In building the dike the old outlet was closed, but even as late as 1933 its course could still be traced northward to its confluence with the old bed of the South Branch. The second dike extended almost due south from Sellars Point, about three-fourths of a mile, then turned abruptly southwestward for another three-fourths of a mile to the high ground near Millersport. The canal, which ran from Sellars Point to Millersport, used this last portion of the "Old Reservoir" dike as its easterly bank and for its towpath. The two dikes were the only retaining walls required in building the reservoir, for a rim of hills bordered the swamp to the south, east, and northeast. The trees and brush were left standing in the basin.

The dikes were completed in 1830 and the "Old Reservoir" was then filled with water to a depth of nine feet above the level of the original lake or lakes. The brush and timber below this level were submerged; however, some of the more fibrous top layer of the cranberry-sphagnum bog community separated itself from the ground mat and floated to the surface. When first filled with water this huge reservoir of approximately thirty-seven hundred acres with its floating bog islands and partly submerged forest must have presented a strange appearance.

A few years later, after the partly submerged trees had died, they were cut down in winter close to the level of the ice, and about the same time a channel was cut along the northern edge of the reservoir from Sellars Points to Thornport for the canal boats. The felled trees were left on the ice and later floated about, finally lodging in windrows along the shores of the reservoir and of the islands. As late as 1900 the windrows were still present in many places.

When the canal opened it was discovered that the impounded water in this "Old Reservoir" was wholly inadequate, and in 1836 another reservoir of some five hundred acres was built immediately west of the old one. A dike was built from Sellars Point westward for a distance of approximately one mile, and this formed the northern border of the "New Reservoir." No dike was needed elsewhere, as there was high ground in the vicinity of Millersport, and the Sellars Point-Millersport portion of the "Old Reservoir" dike became the border for the new reservoir to the south and east. Realizing that it had been a mistake not to have cleared the "Old Reservoir" basin of timber before filling it with water, the builders cleared the basin of the "New Reservoir" of trees, though the stumps were left. Even with this additional water supply, there was not sufficient water to meet the late summer and fall demands by the canal, and consequently its operation had to be curtailed during these seasons.

The stumps, timber, and brush in both reservoirs prevented all except a slight amount of wave action, and, consequently, because of the tremendous basic fertility of the soil of the bottom, and the relative shallowness of the reservoirs, conditions were most favorable for aquatic plant growth. Within a few years both reservoirs were choked with vegetation.

The National Road.—Prior to 1820 there were few or no wagon roads in the area, and none of the important coach roads, except Zane's Trace, came near it. Because of the lack of roads and the general impassability of the "Great Swamp," the area was less affected by the white man before 1820 than were most sections of eastern Ohio. In 1825, however, conditions began to change, for in that year construction of the National Road (then called the Cumberland Road) was begun along the northern border. This road, construction of which was begun at Cumberland, Maryland, in 1812, extended through Maryland and Pennsylvania to the northern tip of West Virginia, thence across West Virginia to Wheeling and the Ohio River. By 1833 or 1834 this road had been completed along the northern border of the area and as far west as Columbus, Ohio (Schaff, 1905: 63; and Hill, 1881: 597).

The building of the National Road had a pronounced effect upon the Buckeye Lake area and the adjacent country. Schaff (1905: 71-72) portrayed this effect:

As soon as the road [was] located, the land all along it was rushed into the markets in lots to suit purchasers. Some bought whole sections, others a few acres, and with almost magical speed the woods were peopled. The building of the road itself gave employment for many men and teams, as all of the stone for the bridges and for macadamizing had to be hauled from quarries eight and ten miles distant. It must have been a busy scene, as the road made its way between Kirkersville and Etna. The axemen went first, cutting a swath eighty feet wide through the timber, others, as fast as the trees fell, cut them into logs which the teams dragged off to one side. Men then grubbed

around the huge stumps till they could be pried up, when they followed their magnificent trunks, to rot under the shade of their more fortunate fellows. Then came ploughs and scrapers, till the grading was done. Hundreds of men found employment and under their labor the road almost walked over the land.

During the course of construction of the road several new villages, such as Jacksontown (1829), Hebron (1827), Luray (1827), and Kirkersville (1832) were laid out, and these grew rapidly. Upon completion of the road a huge tide of immigration came into Ohio, many of the immigrants settling in the villages, along the road, or in the interior of the Buckeye Lake area, and in a few years much of the land along the road was in farms or was being cleared. With the opening of the National Road it became possible to transport farm products to outside markets, and with an outlet for the products thus created, the farming of much of the area became profitable. As a consequence settlement continued at a greatly increased rate, and as the area became populated the number of secondary roads in it increased in number.

The railroads.—About 1855, railroads were introduced and almost immediately became an important factor in the transportation of farm products, as well as another incentive to the further clearing and draining of the land.

Changes in the flora and fauna.—Undoubtedly more profound changes took place in the flora and fauna of the Buckeye Lake area during the period between 1821 and 1890 than during any other period within historic time. It was in this period that the greatest amount of deforestation and conversion of land into farms took place, the "Great Swamp" was flooded, and the status of many mammals and birds was drastically changed.

Flora of the eastern section.—As land in this section could readily be converted into farms it was one of the first sections to become largely deforested. When the trees were removed the majority of the forest herbs and ferns rapidly decreased in number or disappeared entirely, and they were replaced by saplings of such trees and shrubs as black cherry, hawthorn, smooth and staghorn sumac, black haw and pawpaw, tangles of blackberry, rosebush, grape and poison ivy vines, and field grasses and herbs. Some of the lumbered areas or deadenings were not cleared for farming, but were left to become brushland and later secondary forests; however, many of them were used for cattle grazing, and for that reason the majority of the ferns and herbs which constituted the greater portion of the former forest shrub and ground layer did not return. In these grazed woodlands only such plants survived as could tolerate grazing—spicebush, Virginia creeper, wild rose, and blackberry, and even these disappeared when grazing became severe.

The deforested areas and deadenings cleared for farming or pasturing must have quickly lost their former forest ground and shrub layer. In

those fields which were not plowed the forest plants were primarily replaced by field grasses, sedges, and herbs, and, particularly, species of the Compositae. In the plowed fields all except a few of the native plants were extirpated. During the period such dry prairie plants as the little and big bluestem should have invaded this section and established themselves on the more barren and overdrained hill crests and slopes, or if already present, should have increased in abundance.

In lumbered areas which were eventually permitted to become woodlands the comparative abundance of many species of trees must have been very different from that of the original forest; some trees, such as the hickory and black cherry, probably became more numerous, and many climax forest trees, such as chestnut and beech, greatly decreased in number.

Flora of the western section.—The changes in the flora of this lowland section, while considerable, were probably less pronounced than they were in either of the other sections, during this period; for as long as well-drained uplands were available for farms, the ill-drained lowlands and swamps were left largely undisturbed. In this section the well-drained ridges and slopes of the moraines were undoubtedly deforested and farmed first, and thereafter the swamps which could be readily drained. With the removal of the elm-ash-soft maple forest association, many of the forest shrubs and herbs must have disappeared, to be replaced largely by such saplings as honey locust, shingle oak, pin oak, and red maple, such shrubs as alder, blackberry, wild rose, and red osier dogwood, and smaller plants such as grasses, sedges, bulrushes, and field and brush Compositae. With heavy grazing it is possible that the wild plum trees became less numerous, while in those uncut forests or lumbered woodlands which were grazed, many of the forest shrubs must have disappeared, leaving only spicebush, blackberry, and rosebushes as the principal plants of the shrub layer. With the efficient draining of the sedge-bulrush type of swamps, plants of the dry prairie type either invaded these areas, or greatly increased numerically.

Flora of the "Great Swamp" section.—Undoubtedly it was here that the greatest changes in the flora occurred, for early in the period this section was converted into two large artificial lakes. At this time the huge swamp forests, cranberry-sphagnum bogs, and bog-thickets were submerged and, except for a small portion, destroyed. With the increase in the size of the original ponds from a few hundred acres to several thousand, there occurred an increase in the amount of aquatic vegetation of both the submerged and emergent types. Apparently this increase was very great, for men who were acquainted with the reservoirs between 1860 and 1890 report that during late summer the beds of aquatic vegetation were so large and dense that it was sometimes impossible to row a boat across the water. With the creation of the reservoirs, new and larger cattail marshes became estab-

lished, and, undoubtedly, these marshes reached their greatest development during this period.

The avifauna.—Between 1821 and 1890 the status of many species of birds was changed as drastically as was the status of the larger mammals. The general deforestation had a pronounced effect upon the forest-nesting species, and as a group they must surely have decreased greatly in abundance and become restricted to the forest remnants. Such species as the Turkey must have left the partly deforested uplands during the first half of this period and become restricted to the larger swamps, such as the Bloody Run swamp. Schaff (1905: 93) stated:

Wild turkeys, the most royal of all feathered game, were very plentiful when our people moved into Ohio [near Kirkersville, about 1829 or 1830]; they were everywhere through the open woods, and their gobbling the pioneers heard every morning. . . . My father found one of their nests in the Marshall woods [northeast corner of the area or immediately adjacent to it], not a third of a mile from the house, and put the eggs under a tame turkey.

Schaff (1905: 96) further stated that "that last of this wildest and best of our game birds was in Bloody Run swamp as late as 1853 or 1854" (see p. 228).

Those species of birds which chiefly inhabit forest-brush habitats must have increased greatly during the first half of the period, although later they may have decreased again. Among these must have been the Ruffed Grouse, which tolerates primary forests but which reaches its greatest abundance in a forest-brush-field habitat. It is possible that this species increased during the first third of the period,¹¹ was abundant during the middle third, and decreased throughout the last third, when the brush land began to decrease markedly in amount and the hunting of the bird increased. The same must have been true of the Woodcock, another forest-brush-field inhabitant, which did not occur in large numbers in the original forests, but which increased when the forest land was converted into brush land. The Woodcock, because of its preference for lowland brush, was much more abundant during the latter third of this period, according to the old hunters, than was the Ruffed Grouse, and summer Woodcock shooting remained one of the principal sports until after the end of this period.

The brush and field species undoubtedly increased greatly and it is possible that several field-nesting species invaded the area during this period. With the conversion of a lowland forested area into brush land, such brush-nesting species as the Alder Flycatcher and Yellow Warbler must have invaded it; and with the conversion of an upland forested area into brush land, such species as the Field Sparrow must have begun nesting in it. The removal of unbroken brush land, the restriction of the brush to fence rows and gullies, and the establishment of fields of forage crops, grains, or pasturage,

¹¹ Probably these general trends were complicated by cyclic fluctuations.

greatly increased such species as the Meadowlark, Grasshopper and Vesper sparrows, and Bob-white in abundance. It appears that a greater proportion of the Buckeye Lake area was suitable for the Bob-white between 1840 and 1875 than during any other period within historic time, for then there was more brush land and apparently more food. Thereafter, the Bob-white apparently began to decrease in abundance, because of the decrease in suitable habitat and the greater number of persons hunting it. Schaff (1905: 100) considered the Bob-white a numerous species during his boyhood, between 1840 and 1858, for he wrote: "Quails—we generally called them partridges . . ., made every wheat field and every meadow joyous [with song]."

The change in the status of the Wild Turkey, Ruffed Grouse, and Bob-white, from early pioneer days to 1860 is clearly indicated by a report of the Ohio Senate select committee upon Senate bill 12 for the 1860–61 session of the legislature (Collins, 1860: 384). This report stated that the Wild Turkey should be protected by law from February 2 to August 31, but that despite protection from hunting these birds "must gradually disappear as their haunts are disturbed in the process of improvement." The Ruffed Grouse should have been given the same protection as the Turkey, but the committee added that the bird could not "be preserved long in Ohio, except in particular localities." The statement concerning Bob-white is different: "The quail, or Virginia partridge, is the best true game bird, native to the State, which can be permanently preserved and increased."

As can be seen from the preceding, the Turkey, Ruffed Grouse, Woodcock, and Bob-white were important game birds during some portion of the period; however, the Passenger Pigeon overshadowed them in importance during much of this period. Before 1830 the pigeon apparently was not of such primary importance, but after that until 1865 it was much sought after, and thousands were trapped, netted, knocked down with poles, or shot. As the upland forests disappeared these birds apparently concentrated more and more in the Bloody Run swamp, which was their last retreat in this part of Ohio. Their numbers in the swamp during their greatest concentrations must have been very great, for Schaff (1905: 103) wrote that they darkened the sky and that "millions of them flew over Etna Township as they travelled to and from their feeding ground to their roost in Bloody Run swamp." He also stated that General W. T. Sherman said that "Kirkersville [meaning the Bloody Run swamp] had the biggest pigeon roost in the world." This roost was of considerable monetary importance to the community, for Schaff (1905: 131) wrote that "the great Pigeon Roost brought hunters from all parts of the country"; this statement has been verbally confirmed by the older residents of the area (see p. 269).

The flooding of the "Great Swamp" and the establishment of the "Old" and "New" reservoirs undoubtedly affected greatly the numbers of some

bird species. Those species which nested principally in the cranberry-sphagnum bog-swamp must have been adversely affected, at least temporarily; and some land birds, such as the Turkey, which used the swamp as a final refuge, were forced to abandon it. The species which nested in cattails may have decreased somewhat in nesting abundance immediately following the filling of the reservoirs, but upon the re-establishment of the large cattail marshes these species should have become much more numerous than formerly. Such marsh-nesting species as the King and Virginia rails, Prairie Marsh Wren, and Eastern Redwing, should have increased tremendously in nesting abundance. The lowland species which nest near water and in the cavities of trees or snags, such as the Wood Duck, Tree Swallow, and Prothonotary Warbler (if the latter was present then), should also have increased in nesting abundance. The great increase in water area following the filling of the reservoirs undoubtedly increased greatly the numbers of migrating ducks, Coot, gulls, and shore birds, for the reservoirs contained an immense basic food supply, and a great quantity of food was exposed during late summer and fall after much of the water had been drained from the reservoirs to supply the needs of the canal.

The exploitation of the game resources reached its greatest proportions between 1821 and 1890, and especially during the latter two-thirds of the period. This was the heyday of the market hunter, and according to statements of the old residents, there were at one time as many as thirty men in the business of trapping, snaring, and shooting game for the market. From 1845 to 1860 much of the market hunting was for Passenger Pigeons, but after that, the market hunting was for ducks. As the game decreased in amount market hunting became less profitable, and the hunters became guides for sportsmen.

The majority of the sportsmen who hunted in the area before 1890 came from the towns and villages within a radius of sixty miles of the lake, some came from such cities as Cincinnati and Pittsburgh, and a few came from as far away as New York. Duck hunting was the principal sport throughout the spring, followed in late July, August, and September by Woodcock shooting, and during the fall and winter by quail and duck shooting. Pigeon shooting was indulged in whenever the birds were present.

The principal markets for the game were Columbus, Cincinnati, Cleveland, and Pittsburgh. A small portion of it was shipped to the eastern markets, especially during the latter years of this period.

Summary of the 1821 to 1890 period.—Greater changes took place during this period than during the one which preceded. The canal and reservoirs were constructed, the principal portion of the "Great Swamp" was flooded, the National Road and many of the secondary roads were built, the railroads began operations, the population greatly increased, the area was almost

entirely lumbered, much of the land was cleared for agricultural purposes, the forest habitat became subdominant, the amount of brush land greatly increased, and many of the swamps were drained.

The effect of these changes was reflected in the status of many bird species. Such birds as the Wild Turkey and Passenger Pigeon were extirpated or driven from the area; many forest-nesting species must have decreased in nesting abundance, whereas forest-brush and brush-field species increased, at least during the first half of the period; the Woodcock and Bob-white became the principal "upland" game birds during the latter portion of the period; certain water birds that nest in cattail marshes or in holes or cavities of dead trees near water should have invaded the area or become more numerous; and the exploitation of birds by both market hunters and sportsmen was very great.

THE PERIOD BETWEEN 1891 AND 1920

Between 1891 and 1920 the alterations in the topography and the landscape were neither so spectacular nor so obvious as in the preceding period, yet these changes markedly affected the flora and fauna. Many of the alterations which took place during this period were gradual modifications or "improvements" rather than drastic ones; in fact, this might well be termed the "era of improvement" in contrast to the preceding one, which might be called the "era of drastic change."

Canal and reservoirs.—During the latter years of the preceding period canal transportation began to decrease in amount, chiefly because of competition by the railroads. This decrease continued during the first decade of the present period, so that by 1900 there remained little traffic upon the canals and that only of a local nature. During the succeeding few years this traffic also decreased in amount, and in 1908 canal transportation ceased entirely in the area. With the cessation of traffic the canal north of the reservoirs was used only for the purpose of carrying away their surplus waters; southwest of the lake the canal remained idle until several years later, when a portion of it was converted into a fish hatchery by the Ohio Division of Conservation.

Early in the preceding period the reservoirs were used for hunting, fishing, and other recreational purposes. As time passed, this at first incidental use increased in importance, so that by the beginning of the present period the reservoirs were used chiefly for recreational purposes. In 1894 the General Assembly of Ohio, realizing this change, passed an act which reserved the reservoirs as a public park and recreational center and changed their name from Licking Summit Reservoirs to Buckeye Lake. Following the recognition of the lake as a public park, the state legislature appropriated money for the repair of embankments and for the general improvement of the lake.

The state also began, on a greatly increased scale, to lease ground to private individuals or business concerns for cottages and amusement parks. By 1900 a large number of cottages had been built, the number and size of the amusement parks had been increased, and Buckeye Lake had become a recognized recreational center.

Railroads and interurban lines.—For several years before the beginning of this period the railroads had been one of the principal transportation units of the area, and they retained this status during the early years of the present period. Later their importance greatly diminished, first because of the competition of the electric interurban lines, and later because of the automobile.

In November, 1901, the electric interurban line was completed between Columbus, Buckeye Lake, and Newark. This new method of transportation to and from the lake was at first very successful, and greatly increased its popularity as a recreational center. The interurban cars ran at frequent intervals throughout the day, made very rapid and comfortable trips, and in other ways made the journey between the lake and Columbus or Newark more enjoyable than it had previously been. For several years after their installation the interurban lines did a flourishing business, and great numbers of people used them. With the increasing use of automobiles in the latter years of the period the interurban lines gradually ceased to be an important method of travel to and from the lake.

Roads and automobiles.—As previously stated, the National Road and all except a few of the other roads which bordered or traversed the area were built during the 1821 to 1890 period. For many of these roads, however, little attempt had been made to construct a road bed, and as a result, they were usable only during the drier periods of the year. With few exceptions the roads were very narrow and the roadsides densely overgrown in brush and weeds. With the advent of the automobile the roads were widened and received foundations of gravel, stone, or concrete, or were tar-bound or macadamized. The changes in the roadsides were equally great for much of the brush was removed, the weeds were mowed at periodic intervals, and, in many instances, grasses largely replaced the former brush and herbaceous plants. The general change in roads is well illustrated by the changes in the National Road in this area. As late as 1914 it was impossible to travel over it in an automobile, except during the drier summer months, and even then it was rather an adventure; but by 1920 this road was partly concrete and the remainder was macadam; and it was then possible to travel over it in an automobile at any season of the year.

The automobile affected the area in many other ways. More important to the birds was the tremendous influx of sportsmen and vacationists the automobile brought in, for where formerly there had been hundreds of persons there now were thousands. Furthermore, sportsmen from a radius of sixty

miles or more could now travel to the lake in only a small fraction of the time that it formerly took them to do so. This ease and speed in travel to the lake resulted in a greatly increased amount of hunting and fishing.

Before the advent of the automobile the majority of the cottages were grouped about the railroad or interurban lines. With the automobile the need of grouping cottages about the train or interurban lines disappeared, for almost any portion of the lake could be conveniently reached. Consequently, cottages were built along parts of the shores which heretofore contained none, and areas which a few years previously had been brushland were now converted into real-estate developments.

"Improvements" about the lake.—This was a period of rather intensive "improvement" of the lake and its shores. There was a distinct boom in the building of cottages, and several hundred were built. The attendance at the amusement parks multiplied many times, and the number of fishermen and hunters greatly increased. Launches and motorboats became very numerous. Principally because of the insistence of the owners of powerboats the "North Bank" was reinforced with masonry, concrete retaining walls were built elsewhere on the shores and islands; the "Middle Bank" or towpath from Sellars Point to Onion Island, which heretofore had separated the "Old" from the "New" reservoirs was removed; and thousands of old floating and sunken logs, stumps, and snags were taken from the waters. These "improvements" had a pronounced effect upon the lake itself, for formerly the "Middle Bank" and the stumps and logs prevented excessive wave action. This lack of wave action was particularly favorable to the growth of rooted aquatic vegetation. With the removal of these barriers, wave action was greatly increased, and this resulted in the rapid diminishing in size and final elimination of the vast beds of aquatic vegetation in the exposed portions of the lake. The propellers of powerboats also assisted in removing aquatic vegetation by wave wash and by pulling up vegetation with the revolving blades. According to residents there was a marked increase in turbidity of the waters after the "Middle Bank" and the logs and stumps were removed and the beds of aquatic vegetation had disappeared. This is undoubtedly true, as formerly wave action was not sufficiently severe to stir the lake bottom, whereas after the barriers were removed and wave action was greatly increased, the stirring of the bottom and consequent roiling of the water was readily accomplished.

The increase in the number of sportsmen and of powerboats and the various improvements had still other important effects upon the lake. The sportsmen took a greater yearly toll of fish and birds than was formerly taken, and the removal of the stumps and logs and the disappearance of the aquatic vegetation decreased markedly the basic food supply of the fish and birds. These factors were among the primary causes for the tremendous decrease in abundance of fish and game which occurred during this period.

General changes in the land flora.—The major changes in the land flora were caused by increased activity in the development of the farms. The removal of timber and the conversion of woodlands into fields continued during this period at a greater rate than did the reproduction of the forests. Lumbering likewise changed the numerical status of several species of trees; notable in this connection was the almost total disappearance of the chestnut.

Increased grazing in woodlands.—Increased taxes and need of cleared land for purposes other than grazing brought about an increased use of the woodlands for the grazing of cattle, sheep, horses, and hogs. A moderate amount of grazing caused a thinning out of the shrub layer and prohibited or delayed the growth of the saplings of many of the more desirable trees. Continued grazing eliminated the desired saplings or shrubs and increased the rosebush and blackberry tangles. Overgrazing or rooting by hogs exposed and dried the roots of the larger trees, then the tops of the trees died, and, finally, if grazing was continued long enough, the trees were killed. Usually, when the farmer saw that his overgrazed woodland was devoid of food for browsing and rooting animals and that his trees were beginning to die he cut down the woodland and converted the land into pastures or cultivated fields.

Intensive cultivation of fields.—This period saw great changes in the technique of farming. Previous to this time the farmer had great difficulty in controlling the growth of weeds and brush, and often they were too much to cope with, and, consequently, he lost his crop. Tremendous strides had been made in perfecting farm implements to control weeds, and with these machines the farmer not only successfully cultivated his fields, but he cultivated more land than ever before. Added to this was the beginning of decreasing soil fertility, which also resulted in less profuse weed growths. The decrease in the abundance of weeds and especially in those which grew in rich soil and produced heavy seed crops resulted in a decreased food supply for many bird species.

Reduction in waste land.—With the lumbering almost completed and with more land cultivated than was formerly possible, more brushland was converted into cultivated fields. In the past the farmer had usually left generous strips of fallow land along the winding rail fences, but with the introduction of wire fences and improved machinery these strips were reduced to a few feet in width. The cultivation of this fallow land reduced the food supply, cover, and nesting sites for several species of birds.

Draining.—There was increased activity in the draining and tilling of marshy meadows and swamps. By the aid of newly devised ditching machines it became possible to dig large drainage ditches, thereby successfully draining lowlands. In the past, attempts at draining the Bloody Run swamp had been unsuccessful, but during the early years of this period all except a few remnants of it were drained and converted into fields of onions,

celery, vegetables, and grains. By 1912, according to Detmers (1912b: 10), "all of these swamps except Buckeye Lake, [had] been drained, the smallest . . . now mere depressions in meadows or cultivated fields and the largest, Bloody Run Swamp, . . . almost wholly under cultivation." However, small portions of many swamps were not entirely drained, or else they were permitted to revert to swampy conditions again, for throughout the period between 1921 to 1934 there still remained several Bloody Run swamp remnants.

Changes in the native land flora.—The same trend from forest to brush to fields and finally to prairie grasses and sedges, which began during the previous periods, continued. The forest remnants decreased but at a reduced rate; the brush lands were greatly reduced in amount; and the prairie grasses, sedges, and herbs began to dominate the overdrained hillsides. Even in well-drained lowlands, such plants as the little and big bluestem began to make their appearance. With the successful drainage of swamps there came a change in the status of many of their plants; some swamp species entirely disappeared, while many upland species invaded the former swamps and became the dominants. The intensive real-estate developments in the vicinity of the lake affected the vegetation in that section, for much brushland was removed, cattail marshes were drained or filled in, and the land was converted into grassy meadows and lawns.

Further results of the intensive improvement of land.—The results from the intensive "cleaning up" of the woodlands and fields began to show during the latter years of the period, and in some instances they were neither favorable nor anticipated. Few farmers who permitted their stock to graze and root in the woodlands realized that they were endangering the existence of these woodlands. The average farmer felt that only good would come from intensive use of the land, and his enthusiasm for weed removal and general "cleaning up" of fence rows, fields, and gullies was seemingly unlimited. The majority viewed with pride the ever increasing and costly drainage projects, not realizing that by converting a few acres of former swamp land into cultivated fields the upland fields and woodlands might become overdrained. Furthermore, the farmer failed to realize that the decreased weed crop in fallow fields might mean decreased fertility of soil, and that the little gullies, washes, and other soil erosion types, might eventually prove a serious detriment to his farm.

The avifauna.—The changes in the bird fauna, begun during the preceding period, continued. Thus, there was a reduction in the abundance of forest-nesting species, a decrease in the numbers of the brush-nesting and brush-inhabiting birds as more and more brushland was converted into cultivated fields and pastures, and an increase in the abundance of the field-nesting and field-inhabiting species.

With the draining of the many brushy swamps and lowland meadows, such swamp-nesting species as the Alder Flycatcher, Yellow Warbler, Redwing, and Bobolink probably decreased in nesting numbers, to be replaced by birds which prefer drier and better-drained situations. In the cattail marshes adjacent to the lake which were filled in or drained, such swamp-nesting species as King and Virginia rails, Least Bittern, Prairie Marsh Wren, and Redwing disappeared. With the removal of the snags, logs, and stumps, which contained nesting cavities, from the waters and shores of the lake, there undoubtedly occurred a decrease in certain hole-nesting species. Chief among these must have been the Tree Swallow, for according to the older residents of the lake this bird markedly decreased in nesting abundance with the removal of the snags and stumps.

The two remaining, important, native "upland" game birds, the Woodcock and Bob-white, also lessened in nesting abundance during this period. The decrease was chiefly due to (1) less nesting territory and cover and (2) an increased annual kill by man. The draining of swamps and lowland meadows, and the disappearance of brushlands apparently had a much more adverse affect upon the Woodcock than did the reduction of their numbers by hunting. The destruction of swamp and brushland, while important, was not as disastrous to the Bob-white, a brush- and field-inhabiting bird, as to the Woodcock, for the Bob-white habitat apparently decreased in size slowly; however, the yearly kill of Bob-white through hunting was very large, and it consequently declined alarmingly in numbers, particularly after 1910, and in 1912 the state legislature passed an act prohibiting the hunting of Bob-white. With complete protection from hunting the bird again increased in numbers.

Market hunting, and waterfowl hunting for sport.—A considerable amount of market hunting was done in the first decade of this period. During the next years market hunting greatly diminished because of a decrease in game and increased state and federal restrictions. Early in the last decade of the period market hunting was prohibited by law. Thereafter, for the first time, the hunting of birds became, theoretically at least, entirely a matter of sport.

Duck hunting as a sport apparently reached its greatest importance during the middle portion of this period, when there was both a spring and fall shooting season. Of these two seasons the spring one was by far the more important, and the spring kill was much the greater. In spring the Redhead, Lesser Scaup, Ring-necked Duck, and other sea ducks made up the majority of the kill, the remainder of it consisted principally of Baldpate, Pintail, Mallard, and Blue-winged Teal. During the first half of the fall season the Blue-winged Teal and Wood Duck comprised most of the kill, in the latter half the sea ducks, principally Lesser Scaup, Redhead, and Ring-neck, formed the greater portion of the bag.

In 1914 the spring shooting of ducks was prohibited by law, and the total number of ducks taken a year was reduced by more than half. With the closing of the spring season the heyday of wildfowl shooting was over, and the sport of duck hunting began to decline in both popularity and economic importance.

Summary of the 1891 to 1920 period.—No radical changes occurred, and those that took place were in the sequence already begun.

Canal transportation was discontinued and the use of the reservoirs for recreational purposes greatly increased in importance and economic value.

The name of the reservoirs was changed from the Licking Summit Reservoirs to Buckeye Lake.

The effects of the railroad were most important during the first third of this period. In 1901 the interurban lines began operation, and it became possible for more sportsmen and vacationists to visit the area than ever before.

During the middle years of the period the automobile began to become important as a method of transporting sportsmen and vacationists to and from the area, and by the end of the period the automobile was one of the primary methods of transportation. With the automobile came improvement of the roads.

There was a greatly increased number of cottages about the lake, and the amusement parks became larger and more numerous. Many "improvements" were made on the lake, such as the reinforcing of the "North Bank" with masonry. The removal of a part of the "Middle Bank" and of stumps and logs from the lake caused increased wave action, which brought about a great reduction in the size and number of the beds of aquatic vegetation. There was a marked increase in the number of powerboats.

Lumbering was continued, though at a reduced rate. Grazing in woodlands increased in amount and intensity and, in some instances, resulted in killing many trees; whereupon the woodlands were converted into pastures or cultivated fields.

The draining of the swamps and marshy meadows was continued on an increased scale, until only a small remnant of the former swamps and marshes remained. The cultivation of the fields was intensified, and there was a reduction in the amount of fallow land. Erosion on the crests and slopes of the hills began to be evident.

The decrease in the abundance of forest-nesting and forest-inhabiting bird species apparently continued; there was probably a more marked decrease in the number of brush-nesting and brush-inhabiting species; there should have been a considerable increase in the number of field-nesting and field-inhabiting birds. The two principal "upland" game birds of the period, the Woodcock and Bob-white, decreased in nesting abundance, due to the disappearance of their nesting and feeding habitats and to the increased kill through hunting.

During this period market hunting lessened in amount and importance and was finally prohibited by law. From 1890 to 1914 the sport of duck hunting was of considerable economic importance, but with the prohibiting of spring shooting in 1914 the sport declined greatly in importance.

THE PERIOD BETWEEN 1921 AND 1934¹²

All of the important changes in this period were continuations of changes begun during one of the preceding periods. In general, the trend was toward further improvements of the lake and its shores and toward an ever increasing and more intensive use of land. During this period I gathered the field data upon which this study is primarily based.

The lake and adjacent land.—No such striking alterations took place as occurred during previous periods; there was, however, a continuous succession of minor alterations throughout the entire time. Of these so-called improvements the most significant seemed to be the intensive dredging operations to deepen the channels, and to remove some of the lake bottom to build banks or levees. In some instances this dredging made little material difference in the status of the flora and fauna of the lake, but wherever large channels were cut through beds of submerged or emergent aquatic vegetation, or where these beds were destroyed by the removal of some of the lake bottom it adversely affected the lake flora and fauna. This was particularly true of the western half of the lake, for further reduction in the amount of aquatic vegetation here was undesirable, as very little still remained, and what did remain was highly attractive to the majority of the people and necessary to the welfare of birds, fishes, and other animal life. At the narrow and sheltered extreme eastern end the aquatic vegetation was still profuse (Pl. I, Figs. 1-2 and Pl. II, Figs. 1-2). Here the water was relatively clear, and in the openings among the vegetation the lake bottom could be seen through a depth of water as great as four feet. Here, too, the largemouthed bass, the most important game fish in the lake, was still relatively numerous. In the weedy eastern end the early fall concentrations of Coots and ducks were greater than elsewhere. These beds of aquatic vegetation were not left entirely undisturbed, however, for private individuals were cutting channels and raking out the vegetation near their cottages throughout the entire period, and during the latter years the Ohio Division of Conservation attempted to assist them by cutting the aquatic vegetation with a weed cutter during the summer months when the submerged weed growths were most profuse.

Throughout the preceding periods the water levels of the reservoirs and, later, the lake were lowered each late summer or fall, first by the removal

¹² The description of the lake and of certain woodlands, swamps, and islands, as they appeared during this period, is given in Part II of the Introduction, under "Existing Conditions in the Area Between 1922 and 1934."

of water to operate the canal, and later when the canals were abandoned, to facilitate the repairing of levees, to make possible the removal of stumps and logs, and to protect the embankments in winter and early spring. The lowering of the lake level in late summer and fall was continued in this period, but after 1926 the practice was abandoned because of protests of the fishermen who believed that the lowering of the water level was injurious to fish life, and because of the objections of the powerboat owners who wished to operate their crafts during those seasons. Despite the careful manipulation of the surplus water the lake level rose during the rainy spring, while during drought periods, the almost total lack of inflowing water and loss by evaporation lowered the water level considerably. During the drought in the late summer of 1930 the water level was twenty-seven inches below normal.

In this period the "cleaning up" of the shores became very general and was continued on an increasing scale (Pl. II, Fig. 2, and Pl. III, Figs. 1-2). Many lawns were established and cultivated shrubs planted where formerly existed woodlands, thickets, and meadows. A large number of concrete retaining walls were built in front of cottages, and the stumps, logs, and aquatic vegetation which still remained in front of these cottages were removed. Wave action increased and eventually washed away the soft organic debris, muck, and lake silts until a harder bottom of clay or gravel was uncovered. In those areas where the change from a soft to hard bottom took place, there was a marked decrease in the abundance of bottom organisms.

Number of cottages.—There was a decided increase in the number of cottages throughout the period. The increase was greatest during the first eight years, for then business conditions were favorable and much money was spent upon summer homes. During the last four years of the period business conditions were very poor and relatively few cottages were built.

Transportation.—The interurban line continued throughout the earlier years of the period, but on January 31, 1929, it was forced to suspend operations. Thus another method of transportation became obsolete in the area.

By 1930 the automobile conveyed all but a few of the thousands of visitors who annually came into or left the area. This resulted in a demand for better roads, and the widening, concreting, or macadamizing of roads proceeded more rapidly than ever before. With the improving of the roads came the further removal of brush and weeds from the roadsides and the planting of grasses which could be frequently mowed. The brush and weed removal from the roadsides destroyed a considerable amount of food and cover for many bird species. Many birds were killed by the fast moving machines.

Farming.—The cultivation of the soil was more intensive than ever before, and especially between 1924 and 1930, as there was then a considerable

demand for farm products. The removal of the remnant forests and brushlands continued, the lowlands were drained through the digging of larger and deeper ditches, and more land was placed under cultivation. It was in this period that the average farmer's enthusiasm for a weedless, brushless, intensively cultivated farm reached its height. It was so great as to leave the impression that the farmer had developed an almost innate hostility to all nature other than the plants he cultivated and the animals he owned (Pl. IV, Fig. 1). In fall he plowed and raked under more vegetation than ever before, and by so doing left barren fields during the ensuing winter that almost wholly lacked food and cover for birds; he also permitted his stock to overgraze his land, so that by midwinter there remained only a small fraction of the winter food and cover which would have been present at that season on his farm a few decades before.

As the period progressed the effects of very intensive cultivation became more evident. The effects were most noticeable on the more hilly farms; in fact, in some hill fields the soil became so poor that cultivation became impracticable. On some hillsides the small gullies and washes increased in size at surprising speed, and a few gullies which I observed eroded so rapidly that their size was doubled each year. By the end of four or five years these gullies covered most of the hillside.

*The avifauna.*¹³—In this period most of the forest-nesting species continued to decrease numerically with the reduction in amount of the remnant forests. Many brush-nesting species also declined in abundance, as did several species that nested in brushy swamps, wet meadows, and cattail swamps. The most notable decrease in abundance appeared to be in the nesting hawk and owl populations. Only among the birds which nested in cultivated fields was there any noticeable increase in abundance.

Nesting hawks and owls.—This period saw an increased amount of hawk and owl shooting. The farmer had been killing these birds since early historic time, for it has been his belief that he was thereby protecting his poultry. Later in historic time the sportsmen also began shooting hawks and owls whenever feasible, as a means of gaining the favor of the farmer. By killing these birds he assumed he was eliminating bird and mammal predators. In addition, a large hawk or owl was a very tempting target.

By the opening years of this period the tradition had existed for a century. The increasing hosts of sportsmen had become aroused over the game bird, mammal, and fish supply, and they began to look for the reason for its decrease. As there were many tales of the destructiveness of hawks and owls, and possibly some hunters had seen a hawk capture a bird, these men, as a group, came to the conclusion that hawks and owls were responsible. Many

¹³ The status of each bird species is given under the text of each species; only the general groups of birds and a few individual species are discussed here.

more of these birds were killed, and by the latter half of the period the desire of the average sportsmen to kill all hawks and owls amounted almost to a passion. "Vermin shoots," in which large numbers of men participated, were organized by sportsmen's organizations. In some "shoots" two groups of men competed with each other.

In their earnest zeal for more game the sportsmen forced the Ohio Division of Conservation to conduct campaigns for the destruction of hawks and owls. With the state, sportsmen's clubs, and farmers engaged in killing hawks and owls, and with fewer woodlands and nesting sites for these birds, their numbers continued to diminish. Apparently the Sparrow Hawk and Screech Owl were the least affected, though probably they also decreased in numbers with the removal from the roadsides, fields, and woodlands of the old trees which contained their nesting sites.

The kill of ducks.—In spite of the growing number of duck hunters the annual kill of ducks continued to decrease in amount. In earlier years most of the duck hunting had been from blinds over live or wooden decoys, but during this period this effective method of hunting was little practiced. Instead, the sportsmen hunted ducks by rowing a boat about the lake and shooting at any thing which was considered in gun range. The numbers of sportsmen made a large kill impossible, as most of the ducks were frightened before coming within gun range. With this less effective hunting method there was a definite decrease in the number of ducks which visited or remained on the lake, and there were also greater restrictions in the hunting of these birds.

The Coot.—The rowing of a boat about the lake may have been an ineffectual method of hunting ducks, but it was very effective for hunting Coots, as these stupid birds usually allowed the hunters to approach well within gun range before attempting to fly away. With the decrease in the number of ducks, more and more Coots were killed, until the annual kill of Coots outnumbered the total kill of all species of ducks.

The Woodcock and Bob-white.—The hunting of the once-important Woodcock had entirely ceased, for few of these birds visited the area during the hunting season. During the twelve years in which I made field observations in the area, I saw only one Woodcock that was shot during the hunting season; I collected this bird on November 2, 1929. The Bob-white remained a common resident throughout the period and showed a definite decrease only on those farms, usually the more hilly ones, whose woodlands and fields were badly overgrazed. In this period there was no open season on the Bob-white.

Summary of the 1921 to 1934 period.—Few changes took place which had not begun in earlier periods.

There was a considerable amount of dredging. In many instances this made little material difference to the lake as a whole, but when it was done in the cattail marshes or through beds of submerged aquatic vegetation the

effect was adverse. The decrease in submerged and emergent aquatic vegetation continued until only a small part of the former great mass of it remained in the extreme eastern end of the lake. At this end the aquatic vegetation was still profuse, but continued attempts were made by the state and by private individuals to dredge, cut, or otherwise remove it.

The vegetation, stumps, and logs were taken from the waters in front of many cottages, and this resulted in greater wave action which scoured the lake bottom, thereby removing the fertile softer soils and organic debris until a harder, less fertile bottom was reached. All these improvements tended to lower the basic food supply of the lake, and this undoubtedly affected adversely most birds and fishes.

The number of cottages increased, and this resulted in the further destruction of woodlands, brushy thickets, and meadows.

The use of the automobile increased to such an extent that by 1930 and after, it was virtually the only method of transportation to and from this area. The interurban line discontinued operations in January, 1929. With the increase in automobile transportation came further improvement of roads. Removal of brush and weeds from the roadsides adversely affected many bird species.

The cultivation of fields and the removal of brush and weeds was more intensive than formerly. There was much fall plowing and dragging under of vegetation and, consequently, a decrease in winter cover and food for birds. The effects of overfarming, such as soil erosion and decreased fertility of the soil, became more apparent.

There was a slow though continued decline in the abundance of forest-, forest-brush-, and brush-nesting bird species, as well as a decrease in those species which nested in brushy swamps, wet meadow, and cattail marshes. Only among the field-nesting birds was there a maintenance or an increase in abundance.

Hawks and owls were killed in greater numbers than formerly, and there was a marked reduction in abundance of most species.

The sport of duck hunting continued and possibly a greater number of people hunted ducks than ever before, but the annual kill was less, due to different hunting methods and greater restrictions in wildfowl hunting. During this period the Coot became a game bird of greater importance than all species of ducks combined.

The Woodcock and the Bob-white were no longer game birds, the former existed in insufficient numbers and the hunting of the latter was prohibited.

CHANGES IN THE STATUS OF VARIOUS GROUPS OF BIRDS AND OF INDIVIDUAL SPECIES THROUGHOUT HISTORIC TIME

Forest-inhabiting birds.—When it is recalled that during historic time the Buckeye Lake area has been changed from a primarily forested area to one

of remnant woodlands, brushlands, pastures, and cultivated fields it becomes obvious that there has occurred a decrease in nesting abundance of most, or all, truly forest species. It must be remembered, however, that species entirely restricted to mature forest conditions are relatively few and that most of the so-called "forest birds" do not attain maximum numbers in mature forests but in those sections where a disturbance has increased brush and shrub growth.

The list of nesting birds which have numerically decreased or have become extirpated from the area due to forest removal is rather large and includes such nongame species as the Acadian Flycatcher, Wood Pewee, Wood Thrush, Yellow-throated Vireo, Black and White Warbler, Cerulean Warbler, Ovenbird, Kentucky Warbler, and Redstart. In these species hunting by man has not been a factor in the decrease; his influence has been felt through the conversion of the forest into small woodlands, brushland, and fields.

In other forest species, such as the Wild Turkey, Passenger Pigeon, and Pileated Woodpecker, hunting has been a factor in their decrease and extirpation. Each of these species will be discussed separately.

The Wild Turkey must be classed among the forest species, for though the bird appeared to have maintained its numbers fairly well in forest interspersed with brushlands and fields, its greatest concentrations seemingly were in almost unbroken forest. This species was much hunted for food and sport, and it appears probable that its early extirpation was greatly hastened by hunting. Even though the bird became extirpated before suitable habitat conditions disappeared, it is obvious that if not a single Wild Turkey had been killed for food or sport the species would not have survived to 1900, because of the disappearance of its habitat.

The extirpation of the Passenger Pigeon seems to have been caused almost entirely by excessive trapping and hunting. The bird apparently was a forest dweller which nested and inhabited mature forests, and it is conceivable that the species would have decreased in numbers with forest removal; however, it seems very probable that it could have survived in at least small numbers throughout late historic time had it not been excessively hunted. The wholesale slaughter of the species on its nesting ground and the total lack of protection by the state were sufficient to extirpate the bird while a considerable amount of suitable habitat still remained.

The Pileated Woodpecker was undoubtedly a forest bird which would have inevitably decreased in numbers with forest removal and probably would have disappeared even though it had not been hunted or intentionally persecuted. Strange as it seems today, the Pileated Woodpecker and the Flicker were considered game birds, the Flicker until at least 1900, and were eaten. Furthermore, many persons who did not desire the Pileated Woodpecker as food considered it a legitimate and fascinating target, and appar-

ently many of the birds were shot for that reason. Because of this its decrease and extirpation preceded the disappearance of its habitat.

Forest-brush-inhabiting birds.—When the white man first came into the area the forest-brush-inhabiting birds must have been primarily restricted to two situations: (1) on lands where the forest had been previously destroyed and in returning to mature conditions again had reached the forest-brush stage, and (2) the edges of bogs, marshes, and swamps where forest and brush intermingled. With the removal by man of some of the trees in the forests there occurred an increase in brush and brushy openings and in the amount of habitat suitable for this group; but wherever and whenever very many mature trees were removed, leaving only small brush, these birds again decreased in abundance. In this group were such nongame species as the Whippoorwill, Red-eyed Vireo, and Towhee. Some of these, like the Whippoorwill, disappeared or became very uncommon as soon as the forest-brush communities became discontinuous and were surrounded by cultivated fields; others, such as the Red-eyed Vireo and Towhee, were numerous in the remnant forests and in the forest-brush communities at the end of the investigation in 1934.

Chief among the hunted and trapped species of the forest and brush group was the Ruffed Grouse. This splendid game bird undoubtedly was fairly numerous at the advent of the white man, and it probably increased greatly with the enlargement of the forest-brush habitat. Later, when this habitat began to be converted into brushy and cultivated fields, the species again dwindled in numbers. Early in the twentieth century the suitable habitat for the grouse entirely disappeared; however, the bird had disappeared as a nesting species before that condition had been reached. According to William Harlow the species was much hunted by market hunters and sportsmen until it was extirpated from the area (see p. 223).

Upland brush-inhabiting birds.—Few of the so-called brush-nesting species were entirely restricted to brush habitats, for most of the members of this group were in a greater or less degree tolerant of forest-brush and brush-field conditions. Upon the advent of the white man, the group must have been rather restricted, inhabiting primarily the openings in the mature forest which were in the brush stage. Such brush communities were surely rather uncommon in early historic time. Later, and with the beginning of forest removal and the increase of brushland, the group undoubtedly increased greatly in number of individuals, and species not formerly present may have invaded the area. Still later, with less brushland, there occurred a decrease in the abundance of some species of this group; this continued until the end of the investigation.

In the brush-nesting group were such species as the Brown Thrasher, Northern Yellow-throat, Yellow-breasted Chat, Cardinal, and Field Sparrow:

As with many other groups of birds most of these species were not affected by hunting or intentional persecution, and therefore all except a small portion of the changes in abundance of these nongame birds were caused by modifications in the amount and type of brushland.

Field-inhabiting birds.—The open field or dry meadow species present in early historic time must have been represented by only a few nesting pairs, for dry open fields or meadows were then almost entirely absent. With the conversion of forest and brushland into fields this group undoubtedly increased greatly in abundance, and many of the species have apparently continued to grow in numbers. Among the more prominent species of this group were the Prairie Horned Lark, Meadowlark, Grasshopper Sparrow, and Vesper Sparrow. Some of these birds, such as the Meadowlark, were among the most abundant species found in the area.

Forest-brush- and field-inhabiting birds.—There apparently is a group of birds which attains greatest abundance in localities where the land is divided into remnant forests or woodlands of small size, brushland, and weedy fields. Most of these birds are benefited by moderate agricultural practices. It can be assumed that species belonging to this group must have been somewhat uncommon in early historic time and that they increased with the removal of the extensive forests and with their replacement by brushland and fields. Later, with much forest and brush removal and a very large proportion of open fields the members of this group began to decrease numerically. To this group belong species which were still rather abundant in late historic time, such as the Red-headed Woodpecker, Crow, Catbird, Robin, and Bob-white.

The Bob-white represents the forest-brush-field group well, for this species attained greatest abundance when there yet remained a fair proportion of forest, much brushland, and a moderate number of fields. Unlike many other species of the group, it was a game bird. Its decline in abundance in the latter half of the nineteenth century, after its increase in the first half of that century, was principally due to two causes: the decrease in forest and brushland and increase in cultivated fields, which resulted in less food and cover; and an increasingly heavy drain through trapping and hunting. In 1912 its hunting was prohibited, and thereafter the species again increased in numbers. According to the older men, after hunting was prohibited the Bob-white, however, did not become as abundant as it had been between 1860 and 1890. This is accounted for by the lack of suitable habitats in the period after 1912.

Wooded and brushy swamp, wet meadow, and cattail swamp birds.—The species which nest primarily in wet situations have been fluctuating in numbers throughout historic time. Although on the whole the group increased or decreased in unison, there were a few species which increased in

abundance while the remainder were decreasing, for too much or too little water adversely affected some species whereas it benefited others.

In the wooded and brushy swamp group were such tree-nesting species as the Great Blue Heron and Wood Duck, such brush-nesting species as the Alder Flycatcher and Yellow Warbler, and such ground-nesting species as the Woodcock. Apparently, the removal of the large trees and persecution by man caused a decline in the numbers of nesting Great Blue Herons; they finally were extirpated from the area about 1920. The Wood Duck seems to have been a common nesting species until about 1890, when, because of spring and summer hunting and the removal of the old trees which contained its nesting sites, it began to decrease in numbers. During the latter years of the nineteenth century hunting was probably the major reason for the marked decrease in the number of these ducks. Later, during the twentieth century, when hunting ceased to be a factor, the Wood Duck remained a rare nesting species because of the almost total absence of suitable nesting sites (see p. 189).

The brush-nesting group of birds, such as the Alder Flycatcher and Yellow Warbler, was probably moderately numerous in earliest historic time and might then have occupied primarily the brushy edges or centers of the more open swamps and cranberry-sphagnum bogs. This group must have suffered a decrease in nesting habitat with the flooding of the "Great Swamp" and its conversion into reservoirs; but later, with the re-establishment of brushy swamp conditions, these species probably again increased in numbers. Some species may have even exceeded their former numbers. In the lowlands outside the "Great Swamp" proper these species probably flourished with the swamp forest removal and the increase in brushland, but later, when the swamps were drained and the brush was removed, the group must have decreased in abundance.

Species, such as the Woodcock, which nest on the ground in brushy lowlands must have been present in small numbers in earliest historic time. The Woodcock apparently increased greatly in nesting abundance with the removal of the mature swamp forest and its replacement by brushy swamplands. Conditions were said to have been particularly favorable for the nesting of this species between 1860 and 1900. As the Woodcock was a game bird of great importance and as large numbers were annually killed during the summer hunting season, it can be assumed that hunting between 1860 and 1900 had an adverse effect upon its nesting abundance. It is possible that hunting was an adverse factor thereafter, but since 1920 the Woodcock season has been so late in the fall and so few birds have been shot that hunting has not been much of a factor in the decrease of the nesting Woodcock in the area itself. The shooting of the Woodcock on its wintering ground or during migrations may have adversely affected the

Buckeye Lake nesting population; but, if true, the adverse effect must have been very slight, because in late historic time there has been very little suitable nesting habitat available to support anything but a very small nesting population.

In the group which nests in wet meadows and cattail swamps were such species as the American and Least bitterns, King and Virginia rails, Prairie and Short-billed marsh wrens, Redwing, and Song Sparrow. These species probably nested in fair numbers in the cattail swamps, bog meadows, and open wet prairies which existed in the area at the advent of the white man. With the flooding of the "Great Swamp" there may have been a sharp decline in the nesting abundance of these species, but with the re-establishment of the large swamps and marshes around and adjacent to the shores of the reservoirs, these birds must have increased in nesting abundance. In the remaining lowlands they may have increased in nesting numbers wherever the swamp forest was removed and replaced by wet meadows or sedge or cattail marshes. As the size of the cattail marshes about the reservoirs diminished, and dredging and draining operations began in the lowlands, most of the species of this group must have decreased in abundance.

Hawks and owls.—There have been considerable modifications in the nesting abundance of every species of hawk and owl which nested in this area during the historic period. In the early part of this period the Horned Owl was undoubtedly well represented as a nesting species, and the Red-tailed Hawk nested in fair numbers, as it did throughout the remainder of central Ohio. There is evidence that the Bald Eagle and Osprey were also nesting species. All of these had ceased to nest in this area by 1929. Their failure to nest may have been directly caused by man, but even if they had not been persecuted it is doubtful whether any of them would have nested in this area after 1930, for by that period there remained little or no suitable nesting territory.

A moderate amount of forest removal apparently did not adversely effect such species as the Red-shouldered and Cooper's hawks; these birds may have benefited by a decrease in the amount of forest land. The forest removal and the establishment of woodlands, brushlands, and fields undoubtedly increased the abundance of such species as the Barred and Screech owls and Marsh and Sparrow hawks. Later, with the still further reduction in size and number of woodlands and brushlands, and the increase in well-drained fields and meadows, these species dwindled in numbers. Persecution by man became sufficiently severe between 1922 and 1934 to threaten the Red-shouldered Hawk and Barred Owl with extirpation in the area, even though there remained a fair number of suitable nesting habitats.

Waterfowl.—On the whole the waterfowl are transients, whereas the other groups discussed here primarily nest in the area.

As a group the transient waterfowl must have been numerous at the advent of the white man. With the establishment of the reservoirs and the consequent great increase in waterfowl food and habitat the group must have become more abundant during migrations and must have been of considerable economic importance. In the twentieth century two progressively adverse conditions appeared which reduced the transient waterfowl numbers: (1) the waterfowl population of North America decreased, and (2) the amount of food and cover in the area diminished so that transients either did not stop, or they remained for a shorter time. The smaller number of waterfowl during the twentieth century caused the group to lose much of its former importance, for market hunting was prohibited and the sport of wildfowling became increasingly restricted.

The Wood Duck was exceptional among the waterfowl, for it nested in fair numbers in this area. According to market hunters broods of Wood Duck were rather numerous until about 1890 and were sufficiently abundant before that time to warrant the summer combing of swampy fields with dogs in order to capture the larger ducklings and adults in the flapper stage. From 1890 to 1910, because of overhunting, the species decreased greatly in nesting abundance, although a fair number of nesting sites remained. In 1914 hunting of the Wood Duck was entirely prohibited, but the bird did not show any material increase in nesting abundance, for by that time all except a few of the nesting sites had been destroyed, and only a few remnants of its habitat remained.

Species which benefited by adopting artificial nesting sites.—The birds that have more or less altered their nesting habits and thus have taken advantage of changed conditions include the Nighthawk, which nests on the level roofs of buildings; the Chimney Swift, in chimneys; the Phoebe, under bridges and joists of cottages; the Barn Swallow, in barns and under bridges; and the Martin, House Wren, and Bluebird in bird houses. It appears possible that most of these birds have maintained their nesting abundance throughout historic time by adopting these so-called artificial nesting sites; a few species, such as the Phoebe, undoubtedly increased greatly in nesting abundance within historic time. There were not many suitable nesting sites for the Phoebe at the advent of the white man into the area.

Introduced species.—A few exotic species have been introduced or have invaded the area within historic time. Among the purposely introduced birds are the Ring-necked Pheasant and European Partridge; the first has become of economic importance as a game bird, and its introduction appears to have been justified. The species introduced elsewhere in the United States which have later invaded the Buckeye Lake area, such as the English Sparrow and the Starling, are of questionable value.

Conclusions.—The presence of the white man and the various changes made by him in the topography, flora, and fauna have apparently modified the numerical status of every bird species which nested in the area during historic time.

The group of birds whose numerical status has been most adversely affected embraces the forest-nesting and forest-inhabiting species. Several of these species, such as the Wild Turkey, Passenger Pigeon, and Great Horned Owl have been extirpated; others, such as the Cerulean Warbler and Yellow-throated Vireo, were on the verge of extirpation at the close of the investigation in 1934.

There were not many birds primarily nesting in and inhabiting brushlands at the advent of the white man. This group began to increase with forest removal and the expansion of brushlands until in the middle of the nineteenth century they became the dominant group as regards number of individuals; later, these birds began to decrease in numbers as more and more brushlands were converted into cultivated fields.

The marsh-, swamp-, and wet meadow-nesting birds were moderately numerous in early historic time. The group apparently increased in abundance after the marshes about the reservoirs had become established and after some of the swamp forests had been converted into marshes and open or brushy swamps. With the reduction in extent of the marshes about the reservoirs or lake and the draining of many inland marshes and swamps during late historic time, the group began to decrease in nesting abundance.

The group which primarily nest and inhabit well-drained pastures, meadows, and fields was numerically very small at the advent of the white man. The group began to increase in number of individuals, and possibly in number of species, with forest and brush removal and the establishment of fields. In late historic time these birds became the numerically dominant group.

The transient waterfowl were fairly abundant in early historic time. Because of the greater amount of food and cover afforded, the group increased in numbers during migrations shortly after the reservoirs were built. In late historic time the waterfowl numbers began a rapid and continued decrease, caused chiefly by the decline in the North American wildfowl population and the diminishing food supply and cover in the Buckeye Lake area.

The native upland game birds decreased or increased in abundance with the corresponding changes in size of their particular type of habitat, except when too great a drain was inflicted upon them through hunting. Whenever the hunting drain became very great the population was less than the habitat could support. With a few species, such as the Passenger Pigeon, the kill for the market, food, and sport became so great that the birds were

extirpated from the area while there was still a considerable amount of favorable nesting habitat. With other species, such as the Wild Turkey, extirpation at an early date may have been caused by overhunting at a time when a suitable habitat still remained; however, their eventual extirpation was inevitable, because of the total destruction of suitable habitat.

There was unquestionably a sharp increase in the abundance of the Bob-white in the early and middle period, following an increase in suitable habitat, and in spite of moderate hunting and trapping for food and sport; later there began a downward trend in abundance, because of a decrease in the amount of suitable habitat and more hunting and trapping. This trend continued until 1912, when it became necessary to prohibit hunting and trapping entirely. Although the population again increased, it did not attain its former size because of the decreased amount of suitable habitat.

Throughout historic time most of the hawk and owl species declined in abundance with a decrease in the amount of their habitat, or increased in numbers with an extension in the available habitat if the drain through persecution was not very severe; during late historic time several species have sharply decreased, through persecution, and some species, such as the Red-shouldered Hawk, were rapidly approaching extirpation even though there still remained a considerable amount of nesting habitat, food, and cover.

There was a small group of birds sufficiently plastic to adopt so-called artificial nesting sites; some of these species were exceptional in that they did not decrease in abundance with the disappearance of their original nesting sites, but either maintained or increased their nesting abundance.

From the evidence presented it can be stated that:

Each nesting species of bird in the Buckeye Lake area required particular types of nesting, food, and cover habitats.

With few exceptions the abundance of a not excessively hunted or persecuted nesting species was in direct proportion to the amount of available nesting, food, and cover habitats.

Only in the excessively hunted and intentionally persecuted species was the nesting population habitually lower than that which the area could support.

If the kill through hunting or persecution became too great the species was extirpated even though the area contained suitable nesting, food, and cover habitats.

Each nesting species had a definite saturation point as regards numbers. Once this point was reached the number of nesting individuals failed to increase even though habitat conditions improved.

From these studies it can be postulated that: under average conditions and with no excessive hunting or persecution drain the size of the nesting

population of a bird species in an area is definitely regulated by the nesting, food, and cover habitats present. When this is realized it becomes readily understandable why so many past attempts to introduce a species in a given area have failed; why attempts to increase a species by the repeated introductions of individuals into the area have failed; and why an area that formerly contained a large population of a given species does so no longer. These fundamental facts are not new, yet their significance by conservationists has been repeatedly ignored, and with unfavorable results. Only when these facts are realized can a sound conservation policy be formulated and put into effect.

THE FUTURE FOR THE BIRDS IN THE AREA

It is impossible to predict the exact future changes that will take place in the flora and fauna of the area, for it is at present impossible to foretell what future policy of land and water use man will adopt. It is, however, possible to indicate what the modifications in the flora and fauna will be if certain policies are adopted. In this discussion two types of policies will be outlined and their results predicted.

The first policy is a direct continuation of the policy of the past. In this past man has seemingly been activated by a primary objective—removal of all the flora, fauna, or other factors which to him seemed to hinder the immediate use or exploitation of the land and water. In early historic time he destroyed forests with fire and ax so as to obtain land quickly for pastures and fields; later the forest removal continued and he also began intensive brush and weed removal and the draining of swampland; more recently the forest, brush, and weed removal and the draining of swampland were greatly intensified, until most of the area was under intensive cultivation. Throughout this entire period the primary motive was immediate use of land. Very little thought was given to future land use.

If this policy is continued and carried to an extreme in the future it can only result in the disappearance of all the remnant forests and the larger brushlands and in the complete drainage of all swamps, except Buckeye Lake. All except a small part of the area will be under an intensive state of cultivation, which will result in such decreased soil fertility and so great an increase of erosion that the land must eventually be removed from active farm use. With this type of land exploitation the continued dwindling in nesting abundance of those bird species which inhabit forests, brushlands, swamps, and marshes is inevitable; and the too intensive cultivation of the fields will result in a diminishing in nesting abundance of even the field group of birds.

A continued "cleaning up" of the lake by dredging the marshes and removing the vegetation and debris will cause greater wave action, whereby the shallower portions of the lake bottom will be scoured and the soft, fertile

portions of the bottoms will become hard and less fertile. The scouring of the lake bottom will also result in the suspension in the water of the soft fertile, organic matter of the lake bottom; this in turn will produce increased turbidity of the water, and, what is more important, the suspended matter will eventually be carried away by overflow waters and lost. With the decreased fertility of the land drained by the lake the inflowing waters will lessen in fertility also, so that the basic food supply will be diminished. These factors can only result in a general decrease in the numbers of nesting and transient birds, just as the declining fertility of the lake has resulted in a decrease in the abundance of birds. This condition will also be reflected in a greatly decreased fish population.

If the "cleaning up" of the lake shores and islands continues there will eventually be no marshes adjacent to the lake. If concrete retaining walls are built at the same rate as between 1922 and 1933, it will only be a comparatively short time until there will be a continuous artificial shore line surrounding the entire lake and islands. With the removal of the marshes adjacent to the lake the nesting marsh birds will disappear.

This policy of exploitation is indeed a dreary portrayal of what the future may hold for the birds of the Buckeye Lake area. During the latter years of this 1922 to 1934 investigation, however, there was evidence that in the near future a change might be made in the policy of land and water use. In view of the decreased fertility of the soil and the erosion of the land the farmer began to realize that the "cleaning up" of a farm was not the ultimate goal of farming. In these latter years the agricultural departments of both state and federal governments became less concerned with weed removal and drainage projects and more interested in increasing soil fertility and in preventing erosion. The public at large began to take an interest in the preservation of the existing forest, swamp, and marsh remnants. The desire for the preservation of these remnants has been reflected in the establishment of the game refuges (see pp. 68-70), which temporarily at least, have assisted in preserving some of the marshes.

If this new tendency continues there may ensue a policy in land and water use which will be much more favorable to the birds of the Buckeye Lake area as a whole. This policy would involve a husbanding of woodlands, an increase in soil fertility through less intensive cultivation and curtailment of overgrazing, an increased use of brush growth to prevent erosion, a reduction of wave erosion in the lake to a minimum, the encouragement of beds of aquatic vegetation wherever practical, and the saving for posterity of some of the larger marshes and swamps. If this policy is adopted, and if there is a decrease in the persecution of hawks and owls and a continuation of only a moderate amount of hunting of game birds, the groups of birds which have been dwindling throughout late historic time will have a much better chance of survival in the area.

PART II

LOCALITIES AND CONDITIONS BETWEEN 1922 AND 1934

To obtain some understanding of the general conditions in the Buckeye Lake area between the years 1922 to 1934 in relation to birds, it becomes necessary to describe in some detail the lake and its islands, some of the lowland and upland remnant forests, and the fields and farms. Thereby it will be possible in the future to compare conditions with those of the 1922 to 1934 period and to note the changes.

Buckeye Lake.—During this period the lake was a long, narrow body of water with its greatest diameter east and west; it was approximately seven and one-eighth miles long, and varied in width from one-fourth of a mile in the eastern part to one and one-half miles near the western end; it covered an estimated forty-two hundred acres (Pl. V, Fig. 1). As shown by soundings made by the Ohio Division of Conservation the lake was relatively shallow; its average depth was only slightly more than seven feet, and the maximum depth, just south of Avondale, was only twenty-two feet, one inch, at normal lake level. Until 1926 the annual fluctuation of the water level was great, for, in addition to the changes caused by evaporation or excessive rainfall, during some late summers and early falls the Conservation Department drained off enough water to lower the lake as much as two and one-half feet. After 1926 this practice was discontinued.

Probably because of the scarcity of lakes and ponds in east central Ohio there were surprisingly large transient summering and wintering populations of waterfowl on the lake, even though there were numbers of people present. Throughout the winter there were usually present several hundred ducks, which represented from one to fifteen species; one to three species of gulls; a few other species of water birds; and an occasional eagle. When the lake was entirely frozen over the numbers of waterfowl species and individuals were few, but when there was much open water the numbers were generally high. Occasionally over fifteen hundred waterfowl were present at one time. Groups of aquatic birds were seen on every portion of the lake, though most of them wintered in the western end in the vicinity of Sellars Point, where the largest expanse of water was found.

With the beginning of migration in the spring the numbers of waterfowl species and of individuals greatly increased until there were at times several thousand aquatic birds present. In this early spring period there were few rowboats or powerboats upon the lake, and the birds were little disturbed. As the season advanced the waterfowl population tended to decrease in numbers, though occasional large groups of birds, mostly terns, were present until early June. With warm weather the number of persons and boats became greater, until on some days in May and June as many as two

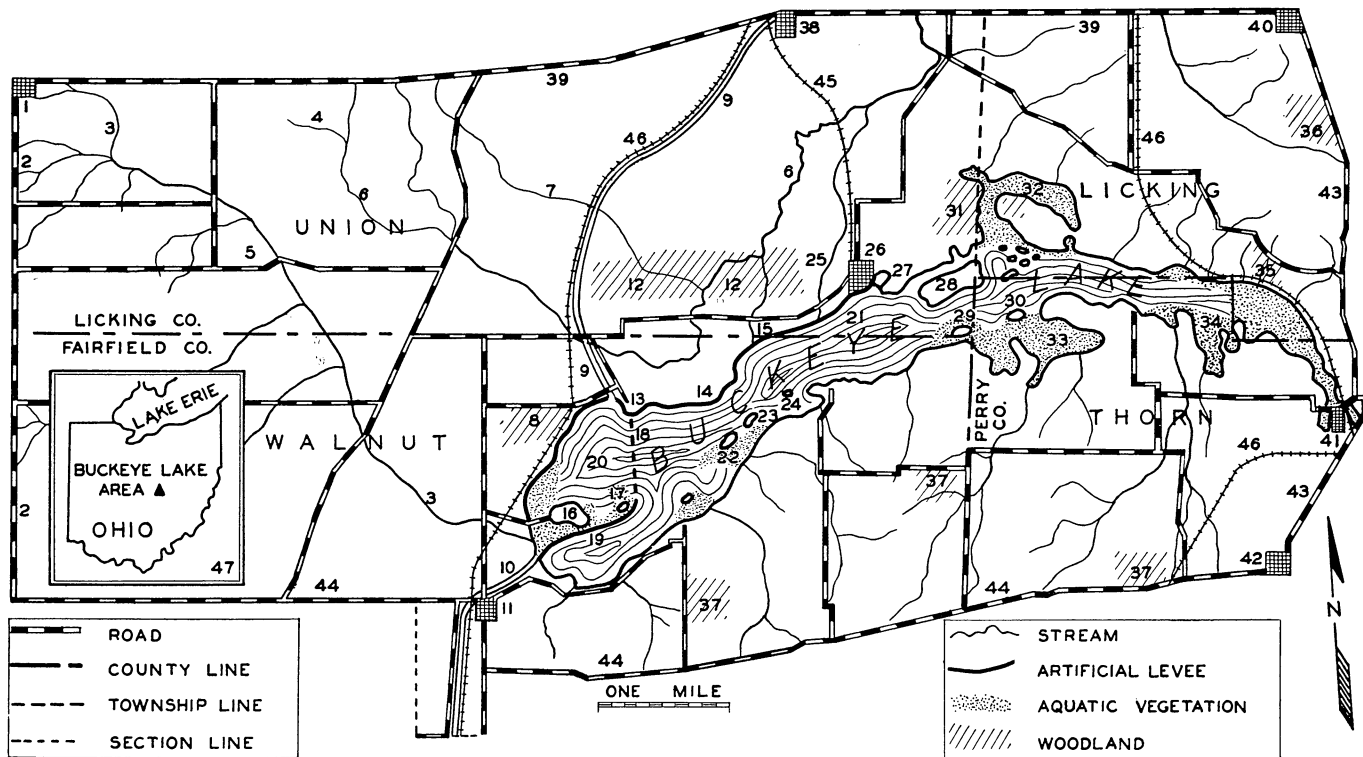
hundred and fifty people were riding about in boats or fishing from them, and there were as many more on the shores.

The waterfowl population about the open waters of the lake was generally low during early summer and midsummer, whereas the number of persons about the lake was greater than it was at any other season. With the beginning of the southward migration in late summer and early fall the number of aquatic birds began to increase. This was particularly true of the smaller or less timid shore birds, which at that time began to frequent the then exposed peat islands and mud flats. Because of the large human population on and about the lake at this time the more easily frightened birds were usually absent, and those timid species which appeared apparently did not remain long. With the advent of cold weather there was sharp increase in the number of waterfowl, and throughout late October and November the daily average number of birds was high, often surpassing fifteen hundred individuals a day. Because of the fall hunting season most of the waterbirds did not remain about the lake for so long a period as did the spring transients, and the average daily numbers for each fall were much less than were those for each spring.

Cranberry Island and adjacent islands.—Cranberry Island was parallel to and within a few hundred feet of the north shore of the lake, and about one-half mile east of the village of Buckeye Lake. It was by far the most interesting island on the lake (Map 2: No. 28; and Pl. V, Fig. 2). Before the "Great Swamp" was converted into reservoirs this island was part of a large cranberry-sphagnum peat bog, which lay on the north shore of one of the long, narrow lakes then present. When the "Old Reservoir" was filled with water the fibrous top layer of the bog separated itself from the ground mat and floated upon the surface. It has continued since to rise and fall with the fluctuating water levels of the reservoir and lake, and occasionally during violent windstorms small portions of this island have broken from their anchorage and have drifted downwind, to lodge finally in the shallows. The floating cranberry-sphagnum peat mat was thin in some portions, and in walking across it one's foot occasionally broke through. Though the island supported some red maple trees of medium size it quaked as one walked across it.

Detmers (1912b: 34) stated that it "is a long, irregularly shaped island, 3,250 feet long by 750 feet wide in its broadest part, and has an approximate area of 45 acres, according to a survey made in the winter of 1910 by Professor Chamberlin of the Civil Engineering Department of the Ohio State University." Its actual size between 1922 and 1934 is not known, but there appears to be no reason to believe that its size or shape has greatly changed since 1910.

The flora of the island was composed primarily of boreal plants which were glacial relict species (see Dachnowski, 1911, 1912, and 1939; Det-



MAP 2

KEY TO THE NUMBERED LOCALITIES

1. Village of Kirkersville.
2. Kirkersville-Baltimore road, and western boundary.
3. Southwest feeder, a dredged ditch and stream.
4. Bloody Run swamp.
5. De Weese's Pond.
6. South Branch of the Licking River.
7. Luray puddle.
8. Lakeside Woods.
9. Canal between Sellars Point and Hebron.
10. Canal between southwest corner of the lake and the southern edge of the area. The 'Deep Cut.'
11. Village of Millersport.
12. Big Woods.
13. Sellars Point.
14. Stony Point.
15. North Bank, which extends from Sellars Point to the village of Buckeye Lake.
16. Liebs Island.
17. Onion Island.
18. Portion of Middle Bank that is normally under water.
19. Portion of Middle Bank above water.
20. New Reservoir.
21. Old Reservoir.
22. Journal Island.
23. Orchard Island.
24. Round Island.
25. Wastewir and outlet which drains the overflow waters from the lake into the South Branch of the Licking.
26. Village of Buckeye Lake.
27. Crane Pond.
28. Cranberry Island.
29. Charleston Island.
30. Rabbit Island.
31. Jack's Neck or Bounds Woods.
32. Maple swamp.
33. Little Buckeye swamp.
34. Honey Creek marsh.
35. Wooded ravine.
36. Hill woods.
37. Upland woods (the three largest are numbered).
38. Village of Hebron.
39. National Road, extending from Kirkersville to Jacksontown and forming the northern boundary of the area.
40. Village of Jacksontown.
41. Village of Thornport.
42. Village of Thornville.
43. Jacksontown-Thornville road and eastern boundary.
44. Thornville-Millersport road and southern boundary.
45. Electric railroad.
46. Steam railroad.
47. Insert map of Ohio showing relative position of the Buckeye Lake area in the state.

mers, 1912a and 1912b). Among the more conspicuous plants, during the twelve-year period, were four or more species of sphagnum, the large cranberry, swamp loosestrife, smooth alder, poison sumac, thin-leaf and Virginia cotton-sedge, red osier dogwood, red maple, royal fern, cinnamon fern, and the introduced pitcher plant (*Sarracenia purpurea*). Because of this unusual flora the bird fauna of the island was very carefully studied, as it seemed possible that some species of bird would be found nesting which did not nest elsewhere in the area. None was found, though the island contained a large nesting population of several interesting species and at times a very large transient population. Transients were particularly numerous during late summer and early fall, coming to the island to eat the poison sumac berries and cranberries, which grew there in profusion.

The lake bottom surrounding Cranberry Island consisted largely of peat masses. When the waters warmed gas generated in the peat from bacteriological action, and portions of the peat bottom filled with gas and rose to the water's surface to form flats or islands. These ranged in size from a few feet in diameter to two hundred feet in length (Pl. VI). The portions which were six or more inches above the surface of the water were speedily covered with vegetation, and conspicuous in this were several species of *Bidens*. From their first appearance in summer until the first hard freeze of late October or November these islands supported a considerable bird population, principally various species of shore birds, pipits, doves, and goldfinches. Whenever the Conservation Department lowered the level of the lake in late summer and early fall, as it did prior to 1926, these islands, as well as other islands and bars elsewhere about the lake, were larger and more numerous. With the advent of cold weather most of the peat masses disappeared. During exceptional and sudden cold snaps, accompanied by high wind, peat masses have disappeared within the space of one or two hours.

Charleston Island.—South of Cranberry Island and on the opposite side of the lake there was an island of slightly less than ten acres known as Charleston Island (Map 2: No. 29). During the investigation this brush- and tree-covered island contained no cottages and was surrounded by a wide zone of rooted aquatics. About 1930 a channel was cut through a low central section of the island, and channels were also dredged around the two halves. This dredging reduced the size of the beds of rooted aquatics. Throughout the earlier years of the investigation there was a large nesting population of Redwings and Prairie Marsh Wrens and a fair number of nesting King Rails and other marsh species, but because of the cutting of channels and the destruction of much aquatic vegetation the numbers of nesting marsh birds had become greatly reduced by 1934.

Liebs Island.—This island at the extreme western end of the lake was connected to the western shore by a causeway and bridge (Map 2: No. 16).

The island was approximately thirty-five acres in extent, was roughly oval in shape, and contained several cottages. It had a moderate number of marsh-nesting species and individuals, and in the small cattail marsh at its eastern end there was a small though distinct concentration of marsh-nesting birds. Because of the building of additional cottages and roads, the "cleaning up" of shores, and the dredging of channels through and around the island, the nesting population of marsh birds had greatly decreased by 1933.

Onion Island.—This island (Map 2: No. 17) of only a few acres was several hundred yards to the west of Liebs Island and was two-thirds cattail marsh. Although the island contained a dense population of marsh-nesting birds of such species as Redwings, King and Virginia rails, Least Bitterns, and Alder Flycatchers, because of a decrease in the amount of marsh and increasing disturbance by man the nesting population had decreased by the end of the twelve-year period. There were two cottages on this island. Surrounding it were several beds of submerged and emergent aquatics, which, with the beds of vegetation in the vicinity of Liebs Island, contained most of the rooted aquatic vegetation in the western half of the lake.

Other islands.—There were about fifteen other islands scattered over the lake. These ranged in size from a fraction of an acre to approximately five acres. About half of them were unoccupied by man and contained a few trees and shrubs. The remaining ones, including Journal (Map 2: No. 22), Orchard (Map 2: No. 23), Round (Map 2: No. 24), and Circle islands, contained one or more cottages, as well as a few trees, lawns, and shrubbery. These occupied islands were partly or entirely surrounded by concrete or stone retaining walls. All of the islands, and particularly the ones containing cottages, were of negligible importance as far as marsh birds were concerned.

Immediately west of Journal Island (Map 2: No. 22) there was a long, rather narrow stand of cattails, which consisted principally of the narrow-leaf cattail. During the early years of the investigation this stand was more than two acres in extent and so dense that fall duck hunters could push their boat into it and conceal both the boat and themselves without the aid of a blind. With each succeeding year this cattail stand diminished in size and density until in 1933 there remained only a small remnant, and the plants were so few and sparse that in October of that year, they could not conceal a bird the size of a Coot. In the early years this stand contained a number of nesting Prairie Marsh Wrens, Redwings, and Least Bitterns, and an occasional Virginia Rail, but with each succeeding year the nesting population decreased until in 1933 there was only one nesting pair of Redwings. Wave action had undermined the cattail stand, and moving ice had sheared off the plants or pulled them out by the roots.

Middle Bank.—The Middle Bank or towpath was that portion of the "Old Reservoir" levee which extended south from Sellars Point to Onion Island,

then southwestward from Onion Island to the higher ground near Millersport. Previous to 1922 the height of that part of the levee from Sellars Point to Onion Island had been sufficiently lowered so that it was from one to three feet beneath the water's surface at normal water level (Map 2: No. 18). Whenever the water level was lowered several feet in the fall, as it was annually during the early years of the investigation, this part of the Middle Bank was then exposed. At such times the exposed portion provided a feeding and resting ground for many bird species, particularly shore birds, gulls, terns, ducks, Pipits, Horned Larks, and Snow Buntings. Then also, duck blinds were built upon the bank, and these offered particularly fine vantage points from which to observe waterfowl, and especially the migrations of ducks, gulls, and loons.

The eastern end of the lake.—The narrow, eastern end of the lake from Honey Creek marsh eastward contained much aquatic vegetation (Pl. VII). In the deeper waters such plants as hornwort, waterweed, water lotus, and white water lily grew in great profusion, and in the shallower waters and along the shores such emergent types of plants as the two species of cattails, yellow water lily, pickerel weed, and several species of sedges and bulrushes formed borders and small marshes. Throughout the entire twelve-year period there were almost continuous dredging operations or attempts at weed removal in this section of the lake, but these attempts did not greatly decrease the total amount of vegetation. Because of favorable conditions the population of marsh-nesting species was high, and it was here that the majority of the nesting Florida Gallinules and the two pairs of nesting Coots were found. During migrations this vegetated eastern end of the lake usually contained large numbers of Coots, and under the more favorable conditions, an abundance of grebes, herons, ducks, and shore birds.

The game refuges.—On June 15, 1926, the Division of Fish and Game of the Ohio Department of Agriculture¹⁴ converted three tracts of open water, marsh, and land into game refuges for a period of five years. The refuges were on state-owned property, were encircled by a strand of wire, and were posted as game refuges; the public was barred from entering. They were known as the Maple swamp game refuge, the Little Buckeye game refuge, and the Honey Creek game refuge. Their chief purposes were (1) to give added protection to hunted species during the hunting season, (2) to give added protection and seclusion to nesting, spawning, and breeding species of birds, fish, mammals, and other animals, and (3) to preserve the marshes with their flora and fauna for posterity.

The Maple swamp refuge was situated in the upper section of Maple swamp (Map 2: No. 32) and consisted of approximately one hundred acres of water, marsh, and land. Of the three refuges, this one proved to be the

¹⁴ Since changed to Ohio Division of Conservation and Natural Resources.

least satisfactory, for surrounding conditions, and particularly adjacent real-estate developments, were such as to destroy the value of the refuge. It was abandoned at the close of the five-year period, and this portion of Maple Swamp was again opened to the general public and to hunting (Pl. VIII).

The Little Buckeye refuge, situated in the Little Buckeye swamp (Map 2: No. 33) southeast of, and across the lake from, Cranberry Island, contains ninety-five acres of water filled with dense beds of aquatic vegetation, cattail marsh, and brushy and wooded shores. This refuge proved to be satisfactory. With the cessation of disturbances by fishermen and others the more timid transient waterfowl again resorted each spring to this refuge in comparatively large numbers. The increase in the nesting abundance of the smaller birds was very marked, and such species as the King and Virginia rails, Prothonotary Warbler, and Tree Swallow increased in numbers in the area during the first few years.

When this tract was first designated a sanctuary the muskrat population in the entire Little Buckeye swamp was very low, for during the preceding few years this region had been heavily trapped, and only a few of these animals were left. Two years after the establishment of the refuge a definite increase in the number of muskrats was noted. By 1930 this had become marked, for in that year from four to fourteen muskrats were seen on each monthly inspection of the sanctuary, and in that fall there were recorded a total of sixty-eight new muskrat houses. With the increase in the muskrat population in the sanctuary itself, there also occurred a corresponding increase in the number of animals trapped about its edges during the legal trapping season. It was the consensus of opinion among trappers that after 1930 more muskrats were caught yearly in the Little Buckeye swamp outside the game refuge than had been trapped in the entire swamp during any of the five years previous to its establishment.

The bullfrog was another animal whose increase in the refuge was very spectacular. For several years previous to 1926 only a few pairs of these frogs were yearly seen breeding, or the males heard calling, and in 1926 when this marsh was first designated a game refuge, this once abundant species was on the verge of extirpation. With the hunting drain by man removed the number of frogs greatly increased, in spite of the drain caused by increased numbers of herons, Red-shouldered Hawks, Ospreys, and other frog-eating animals that congregated in the refuge to prey upon the frogs. Some conception of the extent of increase which occurred after the frogs were given the added protection can be obtained from the fact that on May 29, 1931, I recorded over two hundred individuals. On that day the adult frogs were very conspicuous, as they were then in the midst of their breeding cycle and the males were calling almost constantly.

Before part of the Little Buckeye swamp was designated a refuge such fish species as the largemouthed bass, bluegill, pumpkinseed, and black bull-

head were caught by fishermen in large numbers throughout the waters of the entire swamp during much or all of the spawning season of the species; large numbers of male bluegills and pumpkinseeds were caught while they were guarding their nests. With the establishment of a refuge the fish in it were unmolested by man.

Before 1926 such summering birds as the various species of herons and ducks were frequently disturbed in the swamp, and the more timid species were unrepresented there, but after the area was closed to the general public conditions for these birds became much more favorable, and there was a very definite increase in their numbers and species. Throughout the fall hunting season this refuge was a haven for harassed waterfowl, as it afforded food and protection to a fair proportion of transients. At times the concentration of birds was very great, and upon a few occasions the monthly waterfowl census for the entire lake showed a greater total number of ducks and Coot in the Little Buckeye and the Honey Creek refuges than on the remainder of the lake.

Before 1926 the many boats and hunters that entered the Little Buckeye swamp had an adverse effect upon the beds of aquatic vegetation, and much of the cattail marsh was tramped down or burnt over during the fall hunting season. With the establishment of the refuge these adverse factors were eliminated, and there were more profuse growths of vegetation, which provided more food and cover for birds and such other animals as muskrats. The profusion of vegetation was especially favorable to many small wintering birds and to a few larger ones, such as the Bob-white and Ring-necked Pheasant, for it afforded food and cover for them. By the end of the five-year period, in 1931, the beneficial results of this refuge had become so obvious that the Ohio Division of Conservation continued the refuge for another such period.

The Honey Creek game refuge was situated on the south side of the lake immediately east of the mouth of Honey Creek, and in a portion of the Honey Creek marsh (Map 2: No. 34). It consisted of about fifty acres of marsh and shore. Although smaller in size and less secluded than the Little Buckeye refuge, similar changes occurred in it, and it, too, was designated a refuge for another five years.

The canal.—Throughout this period the canal was divided into two sections, one of which was southwest of the lake and the other north of it. The southwest section extended one and three-quarters miles, from the southwest corner of the lake to the southwest edge of the area (Map 2: No. 10). Part of this section was known as the "deep cut," as it bisected the crest between the South Fork of the Licking (Muskingum drainage basin) and the Little Walnut (Scioto drainage basin) watersheds. At the crest the banks were very steep and high—they were said to have been originally as high as fifty

feet. During this investigation the west bank was largely covered with brush and trees and contained a large nesting population of many species of the smaller land birds. During migrations there were at times an unusually large concentration of transients along this bank, particularly of flycatchers, warblers, and sparrows; in winter there was a moderate population of small land birds. The east bank was less favorable for birds, as it had few trees and little brush and was primarily in short-grass pasture, and sections of the soil were heavily eroded. This southwest section of the canal usually contained water throughout the year.

The north section of the canal extended from Sellars Point northward to the village of Hebron (Map 2: No. 9; and Pl. IX, Figs. 1-2), an approximate distance of three and one-half miles, and was in level, lowland country. Its banks were low, and in a few localities the canal bed was higher than the surrounding land. This section contained water throughout its entire length and was used to carry overflow water from the lake. The edges of the canal and, in some places, the central portion contained a profuse growth of aquatic plants, of which cattails, bulrushes, and sedges were among the dominants. These vegetated parts had a moderate population of nesting marsh birds, particularly of Prairie Marsh Wrens and Redwings, and also an occasional pair of Least Bitterns and Virginia and King rails. During migrations this section was frequented by many marsh-inhabiting birds and waterfowl, and in winter afforded food and cover for a large population of such small land birds as Tree and Song sparrows.

Remnant swamp forests.—In 1922 there still remained about twenty swamp woodlands in the north and west portions of the area; these ranged from a few acres to almost one thousand acres in extent. By 1934 at least half of these woodlands had been cut down and the land converted into fields or pastures; the remaining woodlands had been either decreased in size or their stands of timber thinned by lumbering. These forest remnants formed a well-defined unit, with similar avifauna and flora. Because of this marked similarity it seems unnecessary to describe each remnant in detail; therefore, only the three woodlands will be described in which were made the largest number of observations of swamp-forest birds and their respective habitats.

Jack's Neck or Bounds Woods.—This remnant swamp forest of approximately two hundred acres was situated on the west side of Jack's Neck Bay, about three-quarters of a mile northeast of the village of Buckeye Lake (Map 2: No. 31). This woodland contained a larger percentage of tall and mature trees than did any other tract in the area. In the slight depressions of the rather level forest floor, water or ice was present throughout winter, spring, and early summer, and about these depressions the elm-ash-soft maple forest predominated; on the better-drained and slightly higher ground the beech-hard maple-white oak community was dominant (Pl. X, Figs. 1-2). During

the investigation period a small percentage of the trees were removed, and grazing by livestock increased in intensity; yet, despite these alterations, this woodland was less affected than were the other two larger swamp forests later described. The population of nesting swamp-forest and woodland birds was rather large throughout the entire period, and such species as the Crow, Red-bellied Woodpecker, Wood Pewee, Red-eyed Vireo, and Redstart were particularly numerous; other woodland species, such as the Red-shouldered and Cooper's hawks, Barred Owl, Crested Flycatcher, Wood Thrush, Ovenbird, and Towhee nested in fair numbers. During migrations this woodland often contained a rather heavy concentration of transients. The number of wintering birds was also rather large.

Big Woods.—This remnant forest (Map 2: No. 12) was by far the largest tract of woodland in the area. It was roughly rectangular in shape with its long axis northeast and southwest; it was about one and one-half miles long and was one-half mile wide at its greatest width. It contained in the neighborhood of one thousand acres. This woods was situated in the lowlands north of the lake, parallel to and about one-half mile north of the "North Bank"; it extended from the canal northeastward to within three-quarters of a mile of the village of Buckeye Lake. The average elevation of the woods was only 885 feet, whereas the normal water level of the lake was 892 feet. The floor of the woods was rather level and before 1930 was ill drained; the slight depressions contained water throughout the winter, spring, and early summer. In 1930 the South Branch of Licking River, which previously had meandered through the woods, was dredged and straightened, and thereafter the drainage was more efficient. The Big Woods was a splendid tract of swamp forest until in 1924 lumbering operations were begun; these continued until 1930. The stand of timber was considerably thinned by that time, and distinct changes had occurred in the flora. Notable among these changes was the increase in abundance of herbaceous plants and brushy tangles.

Throughout the entire period many woodland species were to be found nesting in this woods; such birds as the Red-bellied Woodpecker, Hairy Woodpecker, Crested Flycatcher, Wood Pewee, Blue Jay, Crow, Tufted Titmouse, Blue-gray Gnatcatcher, Red-eyed Vireo, Ovenbird, Redstart, and Towhee were fairly numerous; and one or two pairs of the Acadian Flycatcher, Wood Thrush, and Yellow-throated Vireo nested there yearly. During the early part of the period such birds of prey as the Cooper's and Red-shouldered hawks, and Great Horned and Barred owls were represented, but by 1933 the Great Horned Owl had been extirpated and the others were reduced to one or two pairs. Along the brushy edges and in the openings of this swamp forest, the Woodcock, Alder Flycatcher, Catbird, Yellow Warbler, Yellow-breasted Chat, Cardinal, Indigo Bunting, and Song Sparrow nested in considerable numbers.

Lakeside Woods.—This sixty-five acre woodland was situated in the lowlands within a few hundred feet of the northwest shore of the lake, and one-half mile west of Sellars Point (Map 2: No. 8). It was rectangular in shape and was bordered by roads on its north and west side. As with the other swamp forests, this one contained an elm-ash-soft maple association in the wetter and lower portions, and a beech-sugar maple-white oak and associated flora on the better-drained ground; it differed from the others in having a proportionately larger number of honey locust and pin oak trees. This entire woodland was little above a poorly-defined swamp stream which meandered through it. The stream was choked or widely bordered with a sedge-bulrush-grass community and during heavy rains widely overflowed its banks, flooding all except a small portion of the woodland. When the waters receded several woodland pools were left which usually contained water from early winter to early summer.

In 1922 and for a few years thereafter this woodland had a good stand of timber. About 1925 lumbering of the tract began on an increased scale, with the result that the stand was greatly thinned. Until 1930 the drainage was very poor, but in that year a ditch was cut through the tract which totally eliminated the swamp stream and efficiently drained the woodland. Because of tree removal and efficient drainage, conditions in the woodland were greatly modified after 1930. Notable among the modifications was the conversion of the ground layer from a plant association consisting chiefly of swamp-forest or marsh sedges, grasses, bulrushes, and woodland flowering plants, to a plant association dominated by blackberry bushes, rosebushes, and many species of herbaceous plants, sedges, and grasses, whose principal habitat was well-drained fields on the edges of woodlands. In the latter years the tract was heavily grazed.

During the early years of the investigation and despite their small size the Lakeside Woods contained a relatively large number of woodland-nesting species; such birds as the Red-bellied Woodpecker, Hairy Woodpecker, Crow, Tufted Titmouse, Blue-gray Gnatcatcher, Red-eyed Vireo, and Redstart were unusually numerous. As the investigation progressed the nesting pairs of woodland birds became less numerous, so that by 1934 there apparently were less than half as many nesting pairs as there had been in 1922. In the early years there were annually present at least two nesting pairs of Cooper's and Red-shouldered hawks and Barred Owls, but by 1933 the hawks had been extirpated, and there remained only one pair of owls. Throughout the twelve years this woodland contained an unusually large transient bird population. I spent much time in observing these transients.

Lowland swamps and swales.—In the years between 1922 and 1925 there still remained throughout the northern and western sections of the area more than fifty wet lowland meadows, swales, and brushy swamp remnants.

These were of various sizes, ranging from a fraction of an acre in extent to about forty acres. Because of the poor drainage conditions during this early part of the period all of the lowland swales and swamps contained some water throughout late winter and early spring, while a few became rather large ponds during rainy weather. The ponds usually attracted ducks, shore birds, and other transient waterbirds.

Between 1925 and 1930 there occurred a rather gradual decrease in the number of swamp remnants, for they were being drained, the brush, if present, was being removed, and the land converted into cultivated fields or pastures. During this period, too, a few of the larger swamps were markedly reduced in size. In the late spring of 1930 there began an intensive drainage project which was completed late in 1931. This project included the deepening and further straightening of the South Branch of the Licking River and many of its tributary streams and ditches. The immediate result of this work was the drainage and conversion into cultivated fields of more than half of the swampy areas and the reduction in size of several of the remaining ones.

The result in 1934, of the numerous drainage attempts which had been made during historic time, was the almost complete draining of the entire area, except for about fifteen small swamp remnants. The average observer in passing through this former lowland would never realize that it once had been a most distinctive type, markedly different from the rest of the central Ohio region.

To illustrate further the conditions which existed in the lowlands during the twelve-year investigation a description will be given of the more interesting swampy areas as they were in 1922, and of the manner in which some were modified.

Bloody Run swamp.—This once extensive swamp, originally second in size only to the "Great Swamp" itself, was situated in the northwest corner of the Buckeye Lake area; it originally covered almost all of sections 7 and 8 of Union Township, Licking County (Map 2: No. 4). By 1922 much of this swamp had been drained and was under intensive cultivation; however, several remnants still persisted, and these contained a fair or large nesting population of such species as the Alder Flycatcher, Redwing, Yellow Warbler, and Song Sparrow. Less than half of these Bloody Run swamp remnants remained in 1933.

Throughout the entire period, though primarily before 1930, a fair number of the highly cultivated fields adjacent to Bloody Run or its tributaries were subject to frequent inundations, which resulted in the formation of puddles or "sky ponds." Usually these fields were flooded in March and April, and when so flooded contained several species and many individuals of ducks and shore birds. Occasionally a heavy rain occurred in the latter

half of May after the fields had been plowed, and at such times they occasionally contained a population of ten or more species of shore birds. Because of such adverse factors as extremes in the amount of water and methods of cultivation Song Sparrows and Northern Yellow-throats were the only species which nested in them in any numbers. There were often colonies of Redwings and Bobolinks in those fields which, during early summer, were swampy, fallow, in high grass pasture, or in forage crops. In the better-drained fields that were in forage crops or small grains there was a rather large population of Bob-whites, Meadowlarks, Grasshopper Sparrows, and their associates. In the fall many fields, especially those that were fallow, had a most profuse growth of weeds, and as the ground was very rich the weed seed crop was unusually large. Large numbers of Mourning Doves, several species of blackbirds and sparrows, Starlings, Meadowlarks, and other summering and transient species resorted to these fields in large numbers. If the fields were not flooded in late fall or winter they contained a rather large population of wintering birds.

Luray puddle.—Between 1922 and 1927 there was, in the extreme southeastern part of section 9, Union Township, Licking County, a lowland field through which meandered a small, intermittent stream. During or immediately following a heavy rain the stream flooded the field, and in receding left a puddle varying from one-half acre to two acres in size. This temporary body of water I called the "Luray puddle" (Map 2: No. 7). Whenever this puddle was present during March or April, it usually contained a moderate to large number of ducks, shore birds, and other transient waterfowl; if present in May, and particularly if the field previously had been plowed, the puddle usually contained a large shore bird population, consisting of from seven to sixteen species and from twenty-five to four hundred individuals. In 1928 a ditch dug through the field eliminated the puddle.

De Weese's Pond.—During the first half of the investigation, the shores of a rather permanent pond of some five acres, known as De Weese's Pond (Map 2: No. 5), in the northeast corner of section 18 of Union Township, Licking County, and adjacent to the reservoir feeder, were fringed with willows, some more than forty feet in height; there was a considerable amount of cattail at one end, and in the pond itself was a profuse stand of yellow water lilies and other rooted aquatic plants. In early spring the pond usually contained a number of ducks and other waterbirds. Throughout the nesting season several species of marsh birds nested there in fair numbers, including King and Virginia rails, Least Bitterns, Green Herons, Prairie Marsh Wrens, Tree Swallows, and Redwings, and it was there that the only actual nesting evidence for the Mallard in this area was obtained. In late summer the pond was greatly reduced in size by drought conditions, and then the Great Blue, Green, and Little Blue herons, Black-crowned

Night Heron, American Egret, American and Least bitterns, and King, Virginia, and Sora rails congregated in fair to large numbers to feed upon the abundant food supply. In late summer and fall the weed-grown edges of the partly dried pond harbored a large population of small land birds.

About one-fourth of a mile south of De Weese's Pond and immediately south of the east-west road, was a wooded and brushy five-acre swamp, which, during the first half of the investigation, contained a relatively large nesting and transient population of marsh and land birds. In 1930 the reservoir feeder beside this wooded swamp was deepened, as was the same feeder opposite De Weese's Pond. This deepening resulted in a partial draining of both this swamp and De Weese's Pond, with marked modifications in the flora and nesting and transient avifauna of both swamp and pond.

Lowland meadows west of the Lakeside Woods.—Immediately west of, and across the road from the Lakeside Woods (Map 2: No. 8) were about thirty acres of lowland meadows. Between 1922 and 1930 these lowland meadows were in pasture and contained, besides several species of grasses, a profuse sedge-bulrush community that was interspersed with clumps of rosebushes, blackberry bushes, a few alders, sapling elms, hawthorns, honeylocusts, and willows. During this period these meadows had a large nesting population in which Bobolinks, Redwings, and Song Sparrows predominated. It was also during this period that several pairs of King Rails, a few pairs of Marsh Hawks, a pair of Short-eared Owls, and a pair of American Bitterns were found nesting there. In 1930 a drainage ditch was dug through these meadows, effectively draining them, and by 1933 the sedge-bulrush community and clumps of shrubs and saplings had almost entirely disappeared; the meadows were in pastures or fields of corn, small grains, or forage crops; the Bobolinks, Redwings, and Song Sparrows were greatly reduced in numbers; and Meadowlarks and Grasshopper Sparrows had invaded the fields and were nesting there in considerable numbers.

Lowland farms.—With few exceptions the lowland farms contained more fertile land, more brush, a greater amount of "weeds," and, consequently, more food and cover for birds (Pl. IV, Fig. 2) than did the upland farms. On the whole the uplands originally did not contain as rich a soil as did the swamps, and they had been cultivated intensively for many years prior to the cultivation of the lowlands. The lowland farms contained a relatively larger number of individuals and species of birds at all seasons. During the spring migration there was generally a rather large population of Doves, Crows, several species of blackbirds, Starlings, Meadowlarks, several species of sparrows, and many other transient or nesting birds. Wherever there were ponds from one to twelve species of ducks, one to sixteen species of shore birds, and other waterfowl were found. In late spring and summer the farms of the lowland section contained a recorded number of

ninety-six species of nesting birds, the most characteristic of which were the Bob-white, Ring-necked Pheasant, Red-headed Woodpecker, Crow, Alder Flycatcher, Yellow Warbler, Northern Yellow-throat, Redstart, Bobolink, Meadowlark, Redwing, Indigo Bunting, Goldfinch, and Song Sparrow. On most farms, other than those which had been flooded in late spring, the concentration of nesting pairs and species was very large. In the fall migration the numbers of transient land birds was large; this was especially true of the weed-seed-eating birds, such as the sparrows. The waterfowl, however, were often conspicuously absent during the average autumn, chiefly because of a lack of ponds or other suitable habitat. In winter the bird population was also high, and consisted of such characteristic species as Cooper's Hawk, Rough-legged Hawk, Marsh Hawk, Bob-white, Ring-necked Pheasant, Dove, Barn Owl, an occasional Short-eared Owl, Crow, Tufted Titmouse, Starling, Goldfinch, and Song Sparrow. In the dense weed areas there were also large numbers of such universally common species as the Hairy Woodpecker, Downy Woodpecker, Carolina Chickadee, Carolina Wren, English Sparrow, Cardinal, and Song and Tree sparrows.

Remnant upland forests.—Scattered throughout the northeast, east, and south portions of the area were about twenty upland woods (Map 2: No. 37) which ranged in size from a few acres to seventy acres. Fourteen of these woodlands were south of the lake, and these comprised a well-defined unit (see p. 78). The remaining woodlands to the east and northeast were different in topography and plant association from those south of the lake. Two of the most interesting of these eastern upland woods are here described.

Wooded ravine.—Approximately one-half mile east of Avondale, and on the north side of the lake, was a wooded ravine (Map 2: No. 35; and Pl. XI). The entire ravine was about one-third of a mile in length and less than twenty-five acres in extent; through it a small intermittent brook flowed southward to the lake. The slope of the hill which bordered the ravine to the east was steep and its lower half was wooded, the upper half and crest were in meadow. This hill was rather high, as its crest was approximately one hundred and fifty feet above the surface of the lake, which lay at its base. The hill which comprised the west slope of the ravine was approximately one hundred and ten feet in height and was wooded to the crest and beyond; some of the white oak trees on its slope and crest were very large. Despite its rather small size, this ravine contained a large nesting population of birds, including such woodland species as the Acadian Flycatcher, Yellow-throated Vireo, Cerulean Warbler, and Scarlet Tanager.

Hill woods northeast of the lake.—In the east central part of section 9, Licking Township, Licking County, and adjacent to the west side of the Jacksontown-Thornville road was a hill woods of about seventy acres (Map 2: No. 36). The crests and the upper slopes of the hills contained an oak-

hard maple forest, with a subtype of oak-hard maple-hickory-beech; in the intervalles and in the one small valley the beech association was dominant. An intermittent stream flowed through the small valley.

Between 1922 and 1926 the amount of timber removed from this woods was slight, but in the next few years lumbering removed 30 to 50 per cent of the stand. This allowed an increased amount of sunlight to reach the woodland floor, and by 1930 there were many more herbaceous plants and shrubs. Between 1922 and 1926 such woodland nesting species as the Barred Owl, Hairy Woodpecker, Acadian Flycatcher, Wood Thrush, Blue-gray Gnatcatcher, and Red-eyed Vireo were well represented; but after 1927 the woodland species were fewer. Almost simultaneously with this change came an increase in the abundance of woodland-brush species, such as the Catbird, Northern Yellow-throat, Yellow-breasted Chat, Cardinal, and Field Sparrow.

The vascular flora of this hill woods more closely resembled the flora of the unglaciated, Sugar Grove region than did any other woodland in the Buckeye Lake area. The similarity of this tract to the woodlands of the Sugar Grove region was reflected in the avifauna, for during the twelve years such more or less typical Sugar Grove nesting species as the Whippoorwill, Yellow-throated Vireo, Kentucky Warbler, Yellow-breasted Chat, and Scarlet Tanager were found nesting there. From this evidence it can be assumed that when this type of woodland was more extensive in the Buckeye Lake area, as it was during early and middle historic times, such species as the Whippoorwill, Wood Thrush, Yellow-throated Vireo, Black and White Warbler, Worm-eating Warbler, Blue-winged Warbler, Cerulean Warbler, Kentucky Warbler, Hooded Warbler, Scarlet Tanager, and Summer Tanager probably nested in these woodlands. Further evidence supporting this theory was obtained in the woodlands immediately to the east of the area, where the flora and topography were exceedingly similar to those of the hill woods. During the years I was studying the Buckeye Lake avifauna, I found nesting in these woodlands several of the species mentioned above.

Throughout the twelve-year period the nesting population of the hill woods was high. Both in migrations and in winter the Junco was one of the most numerous of the birds noted in this woods.

Upland beech-maple woods.—In the uplands south of the lake there were fourteen remnant woodlands which ranged in size from a few acres to approximately fifty acres in extent. In most respects except size these woodlands were very similar to each other, and they formed a well-defined unit. All except a small portion of these woodlands belonged to the beech-hard maple type (Pl. XI), with a subtype on the more fertile slopes of beech-white oak-red oak-hickory-hard maple, and with another subtype of beech-elm-ash

in the intervalles. Originally the chestnut was said to have been a dominant in these woods, but by the beginning of this investigation it had disappeared, though an occasional chestnut stump could still be found. In all of these woodlands the ground and shrub layers were sparse. The comparative lack of vegetation was probably caused by overdrainage and low soil fertility. The nesting avifauna of these woodlands was meager, when compared with the more densely vegetated hill woods northeast of the lake and the swamp forests north of it; and no species of bird, except possibly the Acadian Flycatcher, appeared to be more numerous in the upland than in the lowland woods. In many instances, too, nesting species such as the Alder Flycatcher, Yellow Warbler, Ovenbird, and Redstart, present in the swamp forests or along their brushy borders, were entirely absent in or about these upland woods.

The transient individuals and species of birds frequenting these woods in migration were usually much fewer in numbers than they were in the remnant swamp forests. In the winter the paucity of birds was most marked, for then the barren upland woods were almost devoid of birds and seldom contained more than a pair of Screech or Barred owls, a Red-tailed or Cooper's hawk, a few species of tree gleaners such as the Downy Woodpecker, Carolina Chickadee, Tufted Titmouse, and White-breasted Nuthatch, and possibly a few Tree Sparrows. Throughout the entire winter all species of birds, except the Junco, were usually less numerous in these upland woods than they were in the lowland ones, and even with the Junco the brushy and weedy fence rows appeared to be more important than were the woodlands.

Upland farms.—During the years between 1922 and 1934 the average upland farm contained less fertile land, less brush, fewer weeds, a smaller weed seed crop, and altogether fewer, less diversified bird habitats, than did the average lowland farm (Pls. VII and XII). Because of these adverse factors the upland farms contained fewer birds throughout the entire year. Midsummer droughts on these well- or overdrained uplands were not conducive of profuse weed or shrub growths.

In overgrazed upland pastures or fields with sparse vegetation, the number of nesting bird species was very small and consisted principally of the Prairie Horned Lark, Vesper Sparrow, and an occasional pair of Meadowlarks. In fields of grain and forage crops, high grass pastures bordered by brushy and weedy fence rows, and gullies containing shrubs and herbaceous plants, the avifauna was more varied and the number of individuals greater. There nested such species as the Bob-white, Dove, an occasional pair of Kingbirds, Brown Thrasher, Bluebird, Meadowlark, Cardinal, Northern Yellow-throat, Goldfinch, Grasshopper Sparrow, Vesper Sparrow, Field Sparrow, and an occasional pair of Song Sparrows. Only seventy-eight nesting species were recorded in the entire uplands; ninety-six were recorded

for the lowlands. In a few species, such as the Prairie Horned Lark and Grasshopper, Vesper, Field, and Chipping sparrows, the number of pairs nesting in the uplands was greater than the number nesting in the lowlands.

Roads.—Although the roads and roadsides were only a small part of the entire area, they directly affected many bird species in various ways. The roads and roadsides of the early and mid-historic periods were favorable to bird life; whereas in late historic time the changes made in these roads and roadsides produced much less favorable conditions. The change to a less favorable condition was very pronounced during the investigation. In that period many roads were converted from narrow dusty pikes with weedy and shrubby roadsides favorable to bird life, to wide highways made dangerous to birds because of fast moving vehicles, and the highway roadsides contained little bird food and cover. In fact, by 1934 the status of the roads and roadsides, as a whole, had definitely become distinctly unfavorable to bird life.

CLIMATIC CONDITIONS

There has never been a U. S. Weather Bureau station in the Buckeye Lake area, and it is therefore impossible to obtain actual climatological data for the area. Such data have been recorded from four stations within thirty miles of the lake, and these give a rather accurate conception of the climatic conditions (see Alexander and Patton, 1929).

The four stations are situated at Columbus, Franklin County; Pataskala, Licking County; Lancaster, Fairfield County; and Somerset, Perry County. The Columbus station, approximately thirty miles west of the Buckeye Lake area, has an elevation of 919 feet above sea level; continuous records have been obtained from it for fifty-one years immediately prior to 1929. The Pataskala station is about five miles northwest of the area at an elevation of 1015 feet; the records cover a continuous period of thirty-seven years immediately prior to 1929. The Lancaster station is about fifteen miles south of the area at an elevation of 898 feet; the records are continuous for thirty-seven years immediately prior to 1929. The Somerset station is approximately ten miles southwest of the area at an elevation of 1080 feet; the records are continuous for twenty-two years prior to its discontinuance in 1919.

Because of the close proximity of Pataskala to the Buckeye Lake area, and the similarity in elevation,¹⁵ it is probable that climatic conditions at this station were more similar to those of the area than were climatic conditions at any of the other stations. Table I gives climatological data for the four stations.

¹⁵ The station at Pataskala has an elevation of 1015 feet, the Buckeye Lake area ranges from 880 to 1090 feet above sea level.

Winter.—During the 1922 to 1934 period the winters in the Buckeye Lake area were of a rather mild nature. The temperature was between 10° and 45° F. throughout the greater part of each winter. In each winter there occurred one to seven cold periods, when the temperature during the night or early morning was at zero or a few degrees below, and even in midday the temperature was seldom higher than 25°. Such "cold snaps" were of short duration and seldom lasted more than four days. During each winter there also occurred one to seven warm periods, when for two to seven days the temperature remained between 25° and 70° and the weather was definitely springlike. When such warm periods occurred, especially in February, there was also an influx of very early transients. If the lake had been completely frozen over, the ice on the lake either "broke up" and disappeared, or long "leads" or lanes of open water appeared.

The average daily mean temperature for the three coldest winter months (see Table I) was apparently about 30° during a normal winter. The lake remained frozen or partly so throughout most of these months (December, January, and February) and the ground partly or entirely snow covered for periods of from four to fourteen days. In normal winters the ice of the lake "broke up" during the last week of February or the first week of March.

During the warmest winters the average daily temperature was above 32°, as it was at the four stations, and this resulted in an "open winter," when the lake was largely free of ice, and the ground was snow-covered for periods of four days or less. In "open winters" the number of individuals and species of birds was usually large, and there were present in considerable number those species, such as the Bluebird and Towhee, whose normal winter range was primarily south of this area. The warmest winter, by far, was that of 1931-32, when the lake never froze over completely nor was the ground entirely snow-covered until after March 1. In that winter there remained a few individuals of several species of birds that were not recorded during any of the other eleven winters, and the total number of species noted, which was eighty-one, was larger than for any other. In the coldest winters the lake was ice-covered from early December until early or mid-March, and the lake did not contain a single "open hole" or "lead" for as long as three weeks at a time. In the coldest winters some snow was present upon the ground for almost the entire three-month period.

Usually, upon the level, there was less than five inches of snow, and only on a few occasions was it a foot deep. Deep snow appeared to be a greater adverse factor as regards the wintering birds than was low temperature, and the size of the winter bird population was definitely correlated with the amount of snow (Pl. XIII, Fig. 1). Whenever snow covered the ground to a depth of more than two inches for more than a day, the wintering Towhees and Winter Wrens disappeared; when the ground was snow-covered to a

TABLE I
CLIMATOLOGICAL DATA FROM FOUR U. S. WEATHER BUREAU STATIONS WITHIN THIRTY MILES OF THE BUCKEYE LAKE AREA*

	Columbus	Pataskala	Lancaster	Somerset	Average
Annual mean temperature	52.2°†	50.9°	52.1°	52.5°	51.9°
Normal daily mean temperature for December, January, and February	30.6°	29.0°	31.2°	30.3°	30.3°
Normal daily mean temperature for March, April, and May	50.9°	50.0°	51.4°	51.7°	51.0°
Normal daily mean temperature for June, July, and August	72.8°	71.2°	71.5°	73.2°	72.2°
Normal daily mean temperature for September, October, and November	54.5°	53.4°	54.3°	54.7°	54.2°
Normal daily minimum temperature for December, January, and February	23.9°	.....	.....	.....	.....
Normal daily maximum temperature for June, July, and August	84.8°	.....	.....	.....	.....
Lowest temperature recorded for December, January, or February	-20.0°†	-24.0°§	-23.0°||	-26.0°§	-23.0°
Lowest temperature recorded for July, the warmest month	50.0°	42.0°	40.0°	46.0°	44.5°
Highest temperature recorded for December, January, or February	72.0°†	73.0°||	73.0°||	72.0°||	72.5°
Highest temperature recorded for July or August	104.0°¶	104.0°**	103.0°¶	107.0°**	106.5°
Annual mean precipitation, in inches	36.28	41.53	41.07	37.95	39.21
Normal monthly mean precipitation in inches for December, January, and February	2.80	3.15	3.13	2.74	2.97
Normal monthly mean precipitation in inches for March, April, and May	3.30	3.78	3.85	3.41	3.59
Normal monthly mean precipitation in inches for June, July, and August	3.40	3.97	4.07	4.06	3.88
Normal monthly mean precipitation in inches for September, October, and November	2.58	2.94	2.63	2.43	2.65
Normal annual amount of snowfall, in inches	24.20	30.40	20.90	33.00	27.10
Greatest average snowfall for any month, in inches	8.0||	8.9||	6.3||	11.8||	8.75

TABLE 1—(Concluded)

	Columbus	Pataskala	Lancaster	Somerset	Average
Average date for last killing frost in spring	April 18	May 2	April 25	April 23	April 24
Average date for first killing frost in fall	Oct. 19	Oct. 7	Oct. 13	Oct. 15	Oct. 13
Average length of growing season in days	184	158	171	175	172
Average amount of evaporation in inches from May to October	26.84†	.....	.....	.....	.....
Prevailing wind direction	SW.	.....	.....	.....	.....
Average velocity of wind in m.p.h. for December, January, and February	11.4	.....	.....	.....	.....
Average velocity of wind in m.p.h. for March, April, and May	11.0	.....	.....	.....	.....
Average velocity of wind in m.p.h. for June, July, and August	8.4	.....	.....	.....	.....
Average velocity of wind in m.p.h. for September, October, and November	9.7	.....	.....	.....	.....
Maximum wind velocity recorded, in m.p.h.	63.0	.....	.....	.....	.....
Annual percentage of possible sunshine	54	.....	.....	.....	.....
Normal monthly percentage of possible sunshine for December, January, and February	38	.....	.....	.....	.....
Normal monthly percentage of possible sunshine for March, April, and May	55	.....	.....	.....	.....
Normal monthly percentage of possible sunshine for June, July, and August	68	.....	.....	.....	.....
Normal monthly percentage of possible sunshine for September, October, and November	55	.....	.....	.....	.....

* The data in this chart has been principally taken from Alexander and Patton (1929) and includes twenty-two or more years immediately preceding 1929. For meteorological data for Columbus between 1929 and 1935 see Nice (1937: 224-25).

† Temperature Fahrenheit.

‡ January.

§ February.

¶ July.

** August.

†† From 1918 to 1928.

depth of more than four inches for several days, there occurred a noticeable decrease in the number of such sedentary species as the Bob-white and Carolina Wren. From the finding of half-starved coveys and dead Bob-whites, it is assumed that the Bob-whites, at least, did not retreat southward at such times. Immediately following deep snows there were sometimes fewer Red-tailed, Rough-legged, Sparrow, and Marsh hawks, and it is assumed that these birds deserted their wintering territories because of adverse hunting conditions. Upon the re-establishment of favorable conditions these territories were again occupied, and some of the hawks returned following the return of favorable hunting conditions.

Frequent "sleet storms," in which falling rain upon reaching the earth covered the ground and every exposed object with a coating of ice, effectively sealed the food supply of many bird species. Whenever this lasted more than a day the effect upon the birds was often great. The "sleet storms" of early winter were usually fewer in number and of much shorter duration than were those of late winter, when the accumulated frost in the ground, the increased amount of rain, and other weather conditions were particularly favorable to storms of long duration. Such storms came at a time when the accumulative effects of winter had lowered the vitality of the birds, and when the food supply was often lower than at any other period of the year. These storms were particularly severe upon such supposed residents as the Bob-white (Trautman, Bills and Wickliff, 1939: 99-101), Tufted Titmouse, Mockingbird, and Carolina Wren, and following such storms there could be noted in these species a marked decrease in number that persisted throughout the spring nesting season; after the largest "winter kills" two or three years elapsed before some of the species regained their former numbers.

Immediately following "sleet storms" many such wintering birds as Redwings, Grackles, and Tree and Song sparrows were tailless. It is assumed that the tails had become frozen to perches during the storm and that when the birds attempted to leave the perches their tails were pulled out in the struggle to free themselves. Tails of sparrows and other birds were found frozen to limbs of trees, corn stocks, shrubs, and top rails of wooden fences. Upon a few occasions after storms I have seen flocks of ten to one hundred Mourning Doves of which 70 per cent or more lacked tails.

Extreme and rapid changes in temperature were not infrequent during the winter, and were more extreme at that season than during any other. A drop of 50° within twenty-four hours or less was not unusual; upon a few occasions a decline of approximately 70° in less than twenty hours was noted. High winds often accompanied such changes. Throughout the season there was much cloudy weather, and the least amount of sunshine¹⁶ for any month, 38 per cent of the possible total amount, occurred in December.

¹⁶ At Columbus and presumably at the lake area also.

Spring.—The months of March, April, and May were usually mild—the daily mean temperature of the four stations surrounding Buckeye Lake averaged 51° . Even March was comparatively mild, for the daily average mean of that month was 40.8° ; May averaged 61.1° . During all except the most unusual springs the lake was free of ice and the ground of snow by March 20. "Cold snaps" after March 20 were generally of short duration, and the snow that fell usually remained upon the ground for less than twelve hours. Snow storms after April 15 were rather uncommon, and only upon two occasions did I note a trace of snow in the air in May. Because of the prolonged and gradual transition period between winter and summer, which in reality lasted about three and one-half months, the spring migration of birds appeared to be rather prolonged. For most transients it extended more than a month.

In March and May the prevailing wind direction at the Columbus station was southwest, in April it was northwest. This was the only month when the prevailing winds were not from the southwest or south. Sudden drops in temperature were frequent during the spring, though they seldom were greater than 55° in twenty-four hours. The wind velocity was about the same as in winter (see Table I).

Summer.—Throughout June, July, and August the daily temperature usually ranged between 55° and 95° . Normally the coolest portion of the day was just before sunrise, the warmest was shortly after noon. The cooler periods of summer lasted from one to six days, when the temperature ranged between 40° and 80° ; in the warmest periods it was between 70° and 104° . Temperatures over 100° were rather uncommon. Usually such high temperatures were only of a few hours' duration. The prevailing wind direction for summer at the Columbus station, and apparently in this area also, was southwest, and the wind velocity lowest for any season of the year (see Table I). In summer the percentage of possible sunshine, 68 per cent, was greater than during any other season, the percentage in July, 70 per cent, was the greatest for any month.

Autumn.—September, October, and November appeared to be slightly warmer than were March, April, and May. September was particularly warm with a daily average mean of 66.2° for the four stations, as compared to 61.1° for May; November, with an average daily mean of 42.0° , was warmer than March with its average daily mean of 40.8° . The average daily mean for the three autumn months was 54.2° , for the three spring months it was 51.0° . All except a small portion of the northward migration occurred during the three spring months, and much of the fall migration took place during the three autumn months. March and November were the months of much of the duck, loon, grebe, and gull migration; in April and October the migration of sparrows was at its height; and in May and September the warbler and shore-bird migrations were at their peak.

In fall there were usually no severe frosts until about mid-October. The first snow storm generally did not occur before October 20, and the lake did not freeze over for the first time until after November 20. When the lake became ice-covered in November the ice "broke up" in a few days, and the lake again became almost or entirely free of ice. During the warmer autumns only an occasional skim of shore ice formed in November; in some winters, as in 1923-24, it was January before the lake became ice-covered.

Throughout the entire fall period the prevailing wind direction, as recorded at the Columbus station, was from the south or southwest. Sudden drops of 50° and 60° in temperature were unusual during September or early October, but occurred oftener after mid-October. These changes in temperature in late fall were usually accompanied by large and sometimes spectacular flights of waterfowl. The precipitation during the autumn months, as recorded by the four stations, was less than that of spring (see Table I), and the fall season was characterized by general drought conditions, in contrast to the usual abundance of water in the spring.

Storms.—Wind velocities of more than thirty miles an hour were unusual at the four stations about Buckeye Lake. When high winds did occur in the area they were usually of less than a day's duration and most frequently accompanied a thunderstorm or snow squall. During the twelve-year period there were four unusually severe storms. These were of the tornado type with a rapidly revolving funnel-shaped cloud. They occurred in June or July, and their paths were the same. Each storm began in the Bloody Run swamp and proceeded in a southeasterly course down the South Fork of the Licking to the village of Buckeye Lake, where it crossed the lake and continued eastward out of the area and down the Jonathan Creek Valley. In each instance the storms did comparatively little damage until they approached the north shore of the lake, where they uprooted trees, demolished cottages, and otherwise destroyed property. After crossing the lake the force of the storms became considerably lessened, and by the time they reached the Jonathan Creek Valley they were incapable of doing much damage. Of the four storms, the one of June 18, 1928, did the most property damage and was the most disastrous to the bird life. In tracing its path I found evidence of the destruction of nests, eggs, or young of the Yellow-billed Cuckoo, Screech Owl, Red-headed Woodpecker, Phoebe (nest on joist of overturned cottage), Purple Martin, Blue Jay, House Wren, Catbird, Brown Thrasher, Bluebird, Starling, English Sparrow, Redwing, Cardinal, and Chipping Sparrow. At the village of Buckeye Lake, where the damage was greatest, I also found the battered bodies of two adult Blue-jays which had been killed.

The violence of this storm is evidenced by the fact that several large pieces of sheet-iron, weighing more than thirty-five pounds each, were blown

from the roof of buildings at the village of Buckeye Lake, carried through the air over land and water for a distance of about one-half mile, and dropped upon Cranberry Island.

BIRD MIGRATION

Migration of waterfowl.—The isolation of Buckeye Lake from other large and permanent bodies of water made it particularly suitable for the observation of waterfowl migrations, and especially migrations of sea ducks.¹⁷ The isolation of the lake reduced the “trading”¹⁸ of waterfowl to a minimum, except on the lake itself, and because of comparative lack of trading it could be assumed that most of the flocks of waterfowl coming to or leaving the lake, or passing overhead, were actually in migration. Conditions in spring, and particularly as regards the puddle ducks,¹⁹ were sometimes not so favorable as in fall, for in spring there were occasionally large temporary ponds in the fields near the lake to and from which the ducks could trade. In spring, too, ducks and other groups of waterfowl were little disturbed by man, especially early in the season, and individual birds tended to remain for several days. These flocks of temporary residents were sometimes difficult to separate from truly transient birds. In fall, conditions were normally different, for then there seldom were ponds in the fields, and the intensive hunting on the lake and its vicinity so disturbed waterfowl that most of them remained on the lake for only a few hours before continuing their migration. With a comparative lack of temporary residents in fall and little or no trading, at least by certain groups, the study of migration was much simplified.

Fall duck migrations.—Waterfowl migration, and particularly the migration of ducks, has always greatly fascinated me, and as the opportunity to observe migrating waterfowl was very favorable in this area I spent many pleasant hours in observing the migrating birds. The method of observing waterfowl in migration was relatively simple. I usually chose a duck blind on the “Middle Bank,” on Onion Island, or in the cattail stand that was immediately west of Journal Island, for from any of these stations an excellent view of the large expanse of open water at the western end of the lake could be obtained, and there was an unobstructed view to the north and south whence the migrants came and left. In these observations 8× field glasses were used so that arrivals could be located and observed long before they could be seen with the unaided eye. I could distinguish between sea ducks and puddle ducks with a marked degree of accuracy, and while the birds were still far from the lake or high above it.

¹⁷ Sea ducks are also known as diving ducks.

¹⁸ Groups of birds flying back and forth from one locality to another, such as from one lake to another.

¹⁹ Puddle ducks are also known as the shoal-water or nondiving ducks.

The flocks of sea ducks which were observed in fall, were usually of rather large size; they ranged from fifty to one thousand individuals. These flocks were composed primarily of Lesser Scaups and Ringnecks, though other species such as Redheads and Canvas-backs were sometimes represented or occurred in flocks of their own kind; occasionally there were also present a few Buffleheads, Golden-eyes, Ruddy Ducks, and White-winged Scoters. Flocks consisting almost entirely of Redheads were usually small in size, though upon a few occasions I have seen flocks containing between six hundred and eight hundred of them. With two exceptions the flocks of Canvas-backs were always of less than sixty individuals. The exceptions were two flocks that contained between three hundred and four hundred birds, which passed overhead without stopping, as did all except a very few of the flocks of Canvas-backs. This habit of migrating through without stopping was highly characteristic of the Canvas-back, and the proportion of flocks which did not stop, to those which did, was greater than for any other species of sea duck. The few flocks of Bufflehead observed usually contained less than fifty individuals, though upon four occasions I saw a flock of one hundred to three hundred birds. All flocks of Ruddy Ducks except one were of less than thirty birds; the exception was a flock of 178 individuals which came to the lake and alighted upon it on the afternoon of November 22, 1928. Upon several occasions flocks of American Golden-eyes, of ten to thirty-five birds, were seen as they came high in the air from a northerly direction. The birds, by their manner, gave every indication that they were in reality a transient flock; however, this species was the only sea duck which habitually frequented the pools of small streams in the vicinity of the lake, and it was usually impossible to determine definitely whether these flocks were arriving transients or merely temporary residents that were trading from the streams to the lake. Even though the flocks were trading it is quite possible that their method of approach to the lake may have been exactly the same as the approach of transients.

In the fall all of the obviously migrating sea ducks came from a northerly direction, except a few flocks which came from almost due west. Upon some days all except a few flocks came from some particular direction, such as due north, northeast, or northwest, whereas upon other days the direction whence the transients came was more general, and they then approached the lake from all northerly directions. The outstanding feature of arriving flocks was their pronounced tendency to approach the lake at or within a fourth of a mile of Sellars Point. During the twelve years of observations at least 65 per cent of all arriving flocks came to the lake within a fourth of a mile of that point. The reason for this marked tendency is not known, though the flocks may have been attracted to the wide expanse of open water at that point. The remaining flocks first approached the lake at the west or

northwest corner, or else between Stony Point and Jack's Neck Bay. Apparently few or no birds came across the hills in a north or northeast direction between Jack's Neck Bay and the east end of the lake. During the entire twelve years I did not see a single flock of obviously migrating sea ducks come from a northerly direction to the east end of the lake, though during that period many flocks were noted approaching that end of the lake from a westerly direction.

With the aid of field glasses the approaching flocks of sea ducks could be seen high in the air, and while still far to the north of the lake. The distance a large flock could be seen was not determined, though some approaching flocks which were timed were first observed three minutes and ten seconds before they reached the north shore of the lake. Most of the flocks could be seen with the unaided eye when they were over the lake, though during clear weather some of the higher flying groups were too high to be seen without the aid of field glasses, even when directly overhead. The flocks approached or flew over the lake in almost every conceivable flock formation except that of one bird directly behind the other in single file, though usually the shape of the flock was either that of a long, horizontal, gently-curved arc with its slightly bowed center in the lead, or in the shape of a wide-angled V with its apex leading.

A flock migrating through without stopping almost invariably flew directly over the lake without altering its speed, altitude, course, or flock formation, or upon reaching the lake "bunched,"²⁰ and immediately afterward began to circle over the water between one to ten times before continuing onward. Each bird in a flock in the act of circling tended to set its wings and coast around a part of each circle. When the flock stopped circling and began to journey onward, the "bunched" birds again spread out over a greater area, and assumed one of the many migrating flock formations. Whenever two flocks approached the lake at the same time there was a marked tendency for them to "bunch" together upon reaching the lake or while circling over it; after the combined flock stopped circling and journeyed onward it either continued as a single flock or split into two or more flocks.

A flock that intended to alight upon the water approached the lake in the same manner and formation as a flock migrating onward. Upon reaching the lake the group "bunched," after which it executed one of three maneuvers: (1) immediately after "bunching" the individuals that composed the flock set their wings and the whole group rapidly descended to alight upon the water; (2) the flock executed one to five circles high above the water and then on set wings the whole group speedily descended to

²⁰ "Bunch" is a descriptive term applied by sportsmen to the action made by a flock of birds when it rather suddenly draws together, thereby making the flock more compact.

alight upon the water; or (3) the flock circled one to five times above the lake and then rapidly descended on set wings until within one hundred feet or less of the water, at which height the group checked its descent and upon rapidly beating wings circled about the lake before finally alighting upon the water. As the flock rapidly descended there was produced a loud sibilant noise that was made by the air passing between the primaries of the set outstretched wings. The sight of rapidly descending flocks, with their attendant hissing and tearing sounds, was among the most inspiring bird spectacles I have seen.

For the entire twelve-year period the ratio between the number of migrating flocks that were observed flying through the area without stopping, and those alighting on the lake, was about three to one. The proportion for any day, between the number which passed over and those which alighted, was governed chiefly by weather conditions. Whenever there was "bluebird weather"²¹ and it was warm and there was no wind, all or most of the flocks migrated through the area, and on such days I have seen as many as fourteen large flocks pass overhead without alighting. On such afternoons, too, the duck population on the lake was usually very small. It was the prevailing opinion of duck hunters that during "bluebird weather" no ducks were migrating, and that they did not migrate until the weather had become stormy.

The few flocks which did alight during "bluebird weather" were almost always of small size, though on a few occasions a large flock did so. The most spectacular of the large flocks which did alight and which I observed was one containing at least one thousand Lesser Scaup. This flock dropped down from migration on the sunlit, warm, and windless afternoon of October 31, 1923, and alighted upon the water southeast of Sellars Point. The noise produced by this large flock as it descended to the water was sufficient to attract the attention of the duck hunters, and not many minutes passed before several boats containing hunters were rowing toward the flock. The newly-arrived birds seemed very tired, for upon alighting most of them tucked their bills under the feathers of their back or wings and apparently went to sleep. Their rest was of short duration, for the flock was soon forced into the air by the hunters, and after the birds had been chased about the lake for some time they departed in a southerly direction in flocks of from fifteen to one hundred individuals. On this same afternoon I saw six other large flocks of sea ducks pass over the lake without alighting.

When stormy weather prevailed the number of flocks that alighted upon the lake equaled the number that migrated through; during the more severe storms which were accompanied by high winds, all or almost all of the flocks observed alighted upon the water.

²¹ A local term used by sportsmen for the most pleasant of Indian summer days.

Throughout most of the fall hunting season the pursuit of ducks was so intense that most or all birds arriving during the average hunting day were forced to leave the lake before the evening of that day. Because of this almost complete elimination of each day's flight it was possible to estimate the number of sea ducks that had come in during the night, by observing the duck population that was present at daybreak. On cloudy nights with low flying clouds there were generally few sea ducks on the lake at daybreak and few flocks either alighted upon it or passed overhead during the first few hours of daylight. After 9:00 A.M. E.S.T. flocks began coming in or passing overhead at rather regular intervals and continued to do so until about 3:00 P.M. When the nights were cloudless and there was no moon, there were generally few sea ducks upon the lake at daybreak, though soon afterward flocks began to arrive and to alight upon the water or pass overhead. This continued at more or less regular intervals until about 3:00 P.M. On the nights when there was a moon, there was often a large number of sea ducks upon the water at or shortly after daylight. From these observations I have concluded that such sea ducks as Lesser Scaup, Ringneck, Redhead, and Canvas-back did much of their migrating into or through the area in the daytime, at least from daybreak until 3:00 P.M., and that what migration took place at night was largely done on cloudless, and particularly, moonlit nights.

The former market hunters and experienced sportsmen insisted that there was a "noon flight" of sea ducks into this area, and these men were usually in their blinds or upon the lake between 11:00 A.M. and 1:00 P.M. to take advantage of this influx of "green" or newly arrived birds. My observations in fall tended to substantiate the theory of a "noon flight," for upon many days I have seen more sea ducks come to the lake or pass overhead between 11:00 A.M. and 1:00 P.M. than during the entire, remaining part of the day. According to the older men the ducks left Lake Erie at or near daylight and reached Buckeye Lake about noon. Most of the birds which I identified in the "noon flight" were Lesser Scaup and Ringneck, with a few Redhead and Canvas-back. According to the older men, before 1915, the Redhead was at least as abundant as the Lesser Scaup and Ringneck together.

In autumn cloudless nights, with or without a moon, were usually accompanied by frost, and at daybreak following these nights there was often a distinct flight of Ruddy Ducks and occasionally of a few White-winged Scoters. Apparently these two species migrated on such nights as much or possibly more than at any other time, and because of their appearance following frosty nights the Ruddy was locally known as the "Little Frost Duck" or "Little Frost Sprigtail" and the White-winged Scoter as the "Big Frost Duck" or "Big Frost Sprigtail."

From the actions of flocks of sea ducks upon the water it was usually possible to foretell when they were going to migrate onward. Flocks that had

been feeding or resting quietly upon the water, when about to migrate, became exceedingly restless, flapping their wings and swimming rapidly for short distances in various directions. There was much calling, and from the flocks of Lesser Scaups and Ringnecks came a frequently repeated, guttural "blurrtrt blurrtrt blurrtrt" and an occasional sharp "scaup"; when Redheads were present there would be a growling "whrrraah whrrraah" or a distinct and plaintive "me-ow."²² After several minutes of increasing restlessness one or more of the birds from a flock rose into the air, flew about, and later returned to the flock again. Other individuals soon followed the actions of these ducks until at times a large proportion of the flock was in the air. Finally the whole flock rose, formed a compact mass, and began to circle about over the water. Once the birds were in the air they ceased to call, and as the flock circled it gained in altitude. Upon reaching an estimated height of three hundred to five hundred feet the flock ceased circling and flew southward. After leaving the lake and usually when about to disappear in the distance the birds "spread out"; the group was then less compact and of increased size. Some of the flocks changed in shape from an oval or rectangle to a wide-angled V or gently curved arc.

The observations on the migrations of puddle ducks were fewer in number than were those for sea ducks and upon the whole were less satisfactory. Unlike the sea ducks, the puddle ducks usually migrated into or through the area at night or between daybreak and 9:00 A.M. At daybreak flocks of newly arrived puddle ducks could be seen on the water or about the shores and marshes, and for the next hour after daybreak flocks of them could be observed coming to the lake at irregular intervals or passing overhead. Two hours after daybreak the flocks of ducks almost or entirely ceased to appear, and the flight was over for that day. During some days there was a fair or large number of newly arrived ducks upon the water at daybreak, but after daybreak none were seen coming to the lake or passing overhead. On other days few ducks were seen on the lake at daybreak, but shortly afterward they began to arrive and alight, or pass overhead, and upon a few occasions the flight continued until noon or an hour later.

Just previous to or at the beginning of a "big freeze" in late November or December there occasionally was a huge migration of puddle ducks, primarily of Black Ducks and Mallards. Unlike the migration during an average day, the movement during a "big freeze" continued throughout the entire day and into the next night as well, and upon such nights the unusually low flying flocks could be heard hurrying onward in the darkness. During such a migration the number of puddle ducks passing through the

²² This "me-ow" note of a Redhead was sometimes so similar to the call of a domestic cat that it caused the cats along the shore to prick up their ears and show other evidence of excitement. On two occasions I heard and observed cats "me-ow" in apparent answer to the Redheads' call.

area was unquestionably very great, and in a few of these migrations as many as an estimated three thousand puddle ducks have been seen on the lake at one time.

From observations on the migrations of puddle ducks it is concluded that the group was not averse to migrating by night in cloudy weather, as the number of birds present at daybreak after cloudy nights was fully as great as following clear or moonlit nights. Some migration occurred in daylight hours.

As with the sea ducks all observed flocks of migrating puddle ducks approached the lake from a northerly direction, except for a few flocks of transients which came in almost directly from the west. Unlike the sea ducks, however, the flocks of puddle ducks did not approach the lake at any one point in particular, but came to or migrated over the lake at all points along the north, northeast, and northwest shores.

The shape of the majority of the arriving flocks, or those migrating onward, was roughly some variation of an oval, circle, or rectangle, and the remainder were in the shape of a gently curved arc or wide-angled V, such as was frequently assumed by the flocks of sea ducks. The approaching flocks of puddle ducks and those migrating through were almost invariably in less compact groups than were those of sea ducks, and even when the puddle ducks "bunched" the group was less compact than were the flocks of sea ducks. The puddle duck flocks averaged smaller than did the flocks of sea ducks, for usually there were less than two hundred individuals in a single group, and only upon a few occasions did flocks of puddle ducks contain four hundred to eight hundred birds. There was a decided tendency for each species to flock by itself or flock with another species of the same size; for instance, Black Ducks and Mallards often migrated together, Baldpates and Pintails did likewise, and so also did Blue-winged and Green-winged teals. Whenever a migrating flock was composed of several species of puddle ducks, or a flock of puddle ducks contained a few sea ducks, there was a decided lack of unity. Apparently the difficulty was caused by inability of the flock to adjust its flying pace to accommodate the several species. Inability to fly together was particularly noticeable in the slow flying flocks of Black Ducks or Mallards which contained a few of the faster flying Blue-winged or Green-winged teals.

Flocks of puddle ducks appeared to be very cautious in their approach to the lake or in alighting upon the water, and they seldom set their wings and descended abruptly to the water as did many of the flocks of sea ducks. Upon arriving above the lake the average flock of puddle ducks first decreased its speed and then began to circle. The individual birds comprising the flock appeared to survey the water, shore, or marsh below, and if after the inspection all seemed well the group began its descent, at which time

there developed a tendency for individuals in the flock to "weave."²³ If all below continued to appear favorable, the flock settled upon the water, shore, or marsh, but if in dropping downward one of the birds became suspicious it immediately "flared"²⁴ and was followed by most or the rest of the flock. A flock which flared usually ascended and either carefully surveyed the situation again or, if badly frightened, flew away to alight elsewhere. Throughout the whole process of approaching the lake and alighting upon it, as well as during its sojourn in the area, the average flock of puddle ducks seemed much more wary than did the average flock of sea ducks. This was particularly true of Black Ducks, Mallards, and Pintails. If an area was regularly baited with corn or other grains and the puddle ducks became accustomed to feeding there they became surprisingly tame and returned again and again in spite of rather persistent gunfire or other disturbances.

As with the sea ducks it was usually possible to foretell when a flock of puddle ducks was about to migrate onward. The first indication was a sharp increase in restlessness among the group, indicated by a flapping of wings, rapid swimming to and fro, and in much calling by both sexes. After several minutes of such activity a few birds in the rear rose in the air, hovered a moment, and flew onward to alight at the front of the flock or else to circle over the water before alighting at the front. Other birds upon the water quickly followed the example of those in the air; soon a large proportion and, finally, all were flying. Sometimes the flock flew a short distance and alighted, and then the whole performance was repeated. Usually, once the flock was in the air it did not alight again but began to circle and ascend; the scattered birds came together to form a well-defined flock, and finally the calling or quacking diminished and ceased as the group continued its ascent. After circling between two and eight times and having gained an altitude of more than one hundred and fifty feet the flock left the lake in a southerly direction. The shape of the departing flock was usually rectangular or circular and often so remained as it disappeared from sight. Occasionally a flock assumed the wide-angled V or gently-curved arc before disappearing.

Of the three species of mergansers, the Red-breasted Merganser was the only one for which abundant observations on migrations were obtained. The manner in which it approached or left the lake or alighted upon the water was in most respects very similar to that of the sea ducks. The mergansers frequently flew in an arc or V formation, and when over the water the flocks tended to "bunch" and assume a rectangular or circular shape.

²³ The term "weave" appears to be rather local and implies a more or less horizontal shifting of individual birds from one part of the flock to another.

²⁴ The term "flare" implies an abrupt ascent by one or more birds that are suspicious or have been frightened.

In the process of alighting they either descended rapidly to the water upon set wings or first circled one to five times over the water and then set their wings and alighted.

The flocks of Red-breasted Mergansers usually consisted of between forty and five hundred individuals, but a few groups contained between five hundred and twelve hundred birds. The number of flocks of mergansers migrating through without stopping was greater during clear than during stormy weather. There was this difference between other ducks and mergansers: in any type of weather the proportion of mergansers which on any day flew over the area without stopping was almost invariably greater than for any other species, except possibly the Canvas-back, and it was not unusual, even in moderately stormy weather, for all of the flocks of mergansers to pass overhead without alighting.

The majority of the flocks of migrating Red-breasted Mergansers were observed between daybreak and 10:00 A.M.; nearly all of the remainder were seen before 3:00 P.M. My observations indicated that the number of individuals which passed over the area each fall must have been very great, for upon two to five days of several autumns, I have seen from ten to twenty-five flocks passing overhead, and each contained between thirty and one thousand birds. The estimated daily total number of individuals from the combined flocks ranged from twelve hundred to four thousand, and of the total number for any particular day less than 10 per cent interrupted their migration to alight upon the water. The average flock of Red-breasted Mergansers which did alight in the fall usually remained for only a very short period of time. Often a flock remained for only a few minutes, or as the old hunters claimed, "only long enough to wet their feet and bills²⁵ and to take a drink of water."

Fall goose migrations.—During the twelve years of autumn observations the principal period of migration of geese, of which all except a few were Canada Geese, took place between October 25 and November 12, and most frequently between October 28 and November 7. The main flight for any year lasted six days or less. Before the main flight occurred few or no flocks were observed, but thereafter small flocks could be noted migrating southward for several days.

The number of flocks and individuals that were seen or heard during the twelve autumns fluctuated greatly from one year to another. The fluctuation was probably caused almost entirely by prevailing weather conditions at the time of the main flight. Whenever this occurred during calm cloudless weather the geese flew very high and could be seen and identified as

²⁵ It seemed to be the prevailing opinion among the former market hunters and sportsmen that if ducks flew for a very long period of time in cold weather without wetting their feet and bills, these parts of their bodies became dry and later chapped or became sore.

geese only with the aid of field glasses. At such heights the birds usually could not be heard calling. During calm cloudless nights the honking of the geese could be faintly though clearly heard as they passed overhead, indicating that possibly the birds flew at lower levels at night or their voices carried better. On cloudy or windy days all or some of the flocks migrated at lower levels, for then passing flocks could be plainly seen with the unaided eye, and the individuals could be heard calling above the noise produced by the wind. On cloudy or stormy nights the geese seemed to fly at even lower altitudes than on stormy days, and then they could be plainly heard passing overhead.

Whenever clear or moderately stormy weather prevailed during the main flight none of the larger flocks of geese attempted to alight in the area or seemingly displayed any interest in the lake itself, and during these flights few or none of the smaller flocks or individuals alighted. During extremely stormy weather accompanied by high winds an occasional small or large flock alighted, usually to remain only one or two hours. The one climatic condition which caused the birds to alight was fog. Geese are apparently greatly disturbed or incapacitated for migration by fogs, and when a fog occurred as the main flight was passing through the area many of the birds were forced to earth. A notable example of this occurred on the night of October 21-22, 1925. A mammoth flight of geese was caught in a fog which apparently forced many or possibly all of the birds to alight. On the morning of October 22 individuals and groups of confused geese were found scattered over eastern Ohio. Many had alighted in cities, where some of the more bewildered ones were found wandering about the streets, in the ponds of city parks, and upon the roofs of buildings. Various observers estimated that the Buckeye Lake area had between five hundred and five thousand individuals. The geese remained in the area until about 9:00 A.M. on October 22, when the fog disappeared, and they left. While in the area at least thirty, all Canada Geese, were shot by sportsmen. The flight consisted primarily of Canada Geese with some Blue Geese and a few Snow Geese.

The actions of geese that have become lost from the main flock are rather remarkable. The birds that remain in small flocks, or in what seemingly are family groups, often retain much of their usual sagacity. This is not true for an individual, for it generally is a "silly goose" indeed, as it repeatedly flies within gunshot range of sportsmen in blinds or rowboats or while sitting upon the water allows itself to be approached by hunters in boats. As the bird flies about it persistently calls and by other actions plainly indicates that it is lost and confused.

Possible destinations of fall migrating ducks.—In the autumn of 1930, J. Stanley Douglass²⁶ trapped and banded at Buckeye Lake a total of one

²⁶ Mr. Douglass was then associated with the Bureau of Scientific Research of the Ohio Division of Conservation.

hundred and twenty-seven ducks, consisting of twelve Mallards, nine Black Ducks, nineteen Green-winged Teals, thirty-eight Blue-winged Teals, six Pintails, forty-one Wood Ducks, one Ring-necked Duck, and one Canvas-back. Eight of these were killed several hundred miles distant from Buckeye Lake, and the information of their capture was sent to the U. S. Biological Survey. Of these eight birds, six²⁷ were taken during the same fall or following winter in which they were banded, and the records from these six birds are therefore indicative of the general direction in which they traveled after leaving the Buckeye Lake area. The records of the six long distance returns are given in Table II.

From Table II it can be noted that all six returns are from localities in the Gulf of Mexico drainage basin; none are from the Atlantic coast drainage basin. Only the Duluth, Georgia, return (Chattahoochee River drainage) is not in the Mississippi River drainage. All returns are from some direction west of south. It is concluded that most puddle ducks of those species which migrate through the Buckeye Lake area in autumn tend to go southwest after leaving the area.

As the banding of waterfowl appears to be at present the most practical means of obtaining information on migrating ducks, it is unfortunate that more intensive banding was not done during this investigation. As this was not done, evidence obtained outside of the Buckeye Lake area must be relied upon. Such evidence as that obtained by Lincoln (1935: 6, Fig. 1) and others indicates that there is a flyway or migration route which extends from northwestern North America, southeastward across the upper Great Lakes, the state of Michigan, Lake Erie, the northeastern half of Ohio, and across the Appalachians to the Atlantic coast in the vicinity of Chesapeake Bay, Virginia, and the Carolinas. Such a migration route passes through the Buckeye Lake area, and it may be that many of the innumerable fall flocks of sea ducks, Red-breasted Mergansers, and some flocks of puddle ducks which migrate over isolated Buckeye Lake are headed for the middle and south Atlantic seaboard.

It is hoped that in the future sufficient banding of sea ducks and other waterfowl species will be done in the area so that some indication of the possible destinations of the birds may be obtained.

Spring migrations of ducks and geese.—As stated under "Migration of Waterfowl" (see p. 87) adverse conditions in the spring often made duck migrations difficult to observe, and, consequently, less information was obtained in spring than during fall, when conditions were more favorable.

²⁷ One of the remaining two records was that of a Pintail, banded on October 19, 1930, with band bearing number A663256. This bird was shot on August 23, 1932, by an Indian at Kapisko, James Bay, Ontario, Canada. The other record was of a Blue-winged Teal, banded on October 22, 1930, with a band bearing number A504546. It was caught in a steel trap twelve miles east of Webb, Mississippi, on December 26, 1931.

TABLE II
RECORDS OF LONG DISTANCE RETURNS OF DUCKS BANDED AT BUCKEYE LAKE IN 1930

Species	Sex	First Banded	Repeated in Traps	Recaptured Outside of Buckeye Lake Area	Date of Recapture	Miles from Buckeye Lake Area	Direction from Buckeye Lake Area	U. S. Biol. Surv. No.
Wood Duck	Male	Oct. 12	Oct. 23-30	Duluth, Ga.	Nov. 18	500	South by southwest	A504548
Green-winged Teal	?	Nov. 4	.....	Horseshoe Lake, Madison Co., Ill.	Nov. 16	400	West by southwest	A504589
Green-winged Teal	Male	Oct. 21	.....	Reelfoot Lake, Obion Co., Tenn.	Nov. 27	400	Southwest	A504531
Wood Duck	Male	Oct. 22	.....	Jones Co. (south central), Miss.	Jan. 5	724	Southwest by south	A504511
Pintail	Male	Oct. 21	.....	Barrier Lake, New Orleans, La.	Dec. 13	900	Southwest by south	A663267
Green-winged Teal	Male	Oct. 21	.....	Kingfisher, Kingfisher Co., Okla.	Nov. 26	900	West by southwest	A504530

The information on spring migrations indicated that the various groups of ducks and geese tended to approach and leave the lake, or to alight upon it, in the same general flock formations, manners, and at the same periods of the day and night as did the fall birds. In spring a much larger proportion of the total number of observed flocks alighted, and in all types of weather in spring relatively few flocks passed over the lake without at least an inspection of it. The spring transients seemed to be in less of a hurry to leave or pass through, which may have been partly due to the comparative lack of disturbing influences.

During late February and March there were not infrequently huge migrations of ducks which lasted from one hour to three days. The principal transients were Black Ducks, Mallards, Pintails, Baldpates, Lesser Scaups, Ringnecks, and occasionally Redheads. While these migrations were in progress there appeared to be an almost constant stream of ducks coming to the lake from some southerly direction, and another stream leaving in some northerly direction, and upon the lake there frequently were many hundreds, if not thousands, of birds. This spectacle was most impressive, and it invariably reminded me of the coming and going of people, and the attendant bustle, in a railroad station. In these huge duck migrations there were several thousands of birds visiting the area every twenty-four hours.

Loon migrations.—Flocks of from nine to one hundred and fifty loons were observed in autumn migration. These flocks were usually horizontally rectangular or circular in shape though occasionally an arc-shaped flock was also noted. The most characteristic feature of the flocks was the large amount of space required by them, for usually each bird remained thirty to two hundred feet from its nearest neighbor. A flock of fifty individuals extended six hundred to one thousand feet across. As a further illustration of the wide space between migrating loons in flock formation, I have seen two flocks of Green-winged Teals, one of eleven and the other of eight birds, pass through a large migrating flock of loons without their passing inconveniencing either species or destroying the structure of the flying flocks.

Approximately two-thirds of the flocks of loons migrated through the area without alighting upon the water, and the majority kept flying onward without change of pace or elevation. The remaining flocks which passed over without alighting either descended in altitude upon approaching the water, or else descended and then circled one or more times before passing onward.

An approaching flock of loons which intended to alight upon the lake, usually began to descend in altitude when still some distance from the north shore, either upon set wings or with decreased wing motion. Upon reaching the lake the descending flock began to fly in huge circles until within seventy-five feet or less of the water, whereupon it stopped circling, and coasted

downward, until the leading birds were within a few feet of the water. Up to this point the flock acted as a unit, but when the leading birds were within a few feet of the water each loon acted more or less independently. When a loon was only a few feet above the water, it increased its wing beat so that its descent became more gradual; upon reaching the water the bird discontinued its wing beat and, half-closing its wings, coasted or bounced awkwardly along until all momentum was lost. Often a bird decided not to alight just as it reached the water, and it then rose again on rapidly beating wings to complete another circle and to make another attempt at alighting.

Once loons were upon the water all flock unity was seemingly lost, and the birds soon scattered widely over the lake. They occasionally flew from one part of the lake to another, singly or in groups of two or three; occasionally when two or more birds flew together they flew one directly behind the other. Whatever flock formation was assumed by trading loons, it was invariably characterized by the wide spacing of the birds. They were usually silent as long as they were upon the water and not about to migrate.

The first indication that they were about to migrate was an increased restlessness among the widely scattered birds. This uneasiness was manifested by much flapping of wings and guttural croaks or callings. When one rose from the water to fly over the lake at a low elevation it persistently called. The flying calling bird seemed to excite the loons upon the water, for they flapped their wings with increased vigor, and one after the other left to join the flying bird. After most or all of the loons in the vicinity had joined the flying bird, the newly formed flock began to rise slowly in ever ascending circles, and when an elevation of more than two hundred feet had been attained, the flock ceased to circle and began to fly in the direction of migration. These departing flocks were characterized by the wide spacing, but there was a constant shifting of individuals from one section of the flock to the other, as though each bird was attempting to attain a satisfactory position in the flock.

All flocks of loons that were seen approaching the lake or passing overhead did so between daybreak and 4:00 P.M.; though no direct evidence was obtained relative to loons migrating at night a few flocks have been noted coming to the lake or migrating over it at daybreak. These flocks undoubtedly had been migrating in the darkness. The loons migrated during all types of weather, though more than half of the transients observed, were noted when cloudy and stormy conditions prevailed. The largest flock, of approximately one hundred and fifty birds, was observed to approach and alight upon the lake during a severe wind and rain storm, which occurred about 8:00 A.M. on November 2, 1927.

Gull and tern migrations.—Many dozens of observations of gulls and terns in the spring and fall migrations were obtained during the investiga-

tion. The size of the migrating flocks of gulls was about the same for both migrations and consisted of between eight and two hundred individuals. The spring flocks of terns were larger than those of autumn, for the spring flocks ranged from ten to seven hundred birds, whereas the fall ones never contained more than three hundred.

Flocks of migrating gulls and terns were noted in almost every conceivable shape, although the gently-curved arc, oval, circle, and long column with one of the narrow ends in front were the types most often seen. The flocks migrating through with no intention of stopping were constant in their behavior. They generally flew high in the air, their wing beats were rhythmical, there was little sailing on motionless wings, and little or no shifting of individuals from one section of the flock to another. The high-flying flocks of Herring and Ring-billed gulls had a slow and steady wing beat superficially resembling that of geese; because of this they were often mistaken by sportsmen for geese or "brant."

A migrating flock of gulls or terns generally consisted of one species. If more than one species was present the birds usually were of nearly equal size and had a very similar wing beat and pace. The Herring and Ring-billed gulls rather frequently migrated together, but these large gulls seldom migrated with the much smaller Bonaparte's Gull. On the few occasions when one or more of the larger gulls were present in a flock of Bonaparte's Gulls, or vice versa, the larger gulls were invariably the Ringbills, a species which is smaller than the Herring Gull and therefore nearer the size of the Bonaparte's Gull. Except for these occasions, and when not in a flock of its own kind, the Bonaparte Gull migrated with the medium-sized Common Tern or with the smaller Black Tern. The Common and Black terns not infrequently migrated together, particularly when one species greatly outnumbered the other; but when there were a sufficient number of each species to form a migrating flock of its own kind, the two species apparently divided and each migrated as a separate unit. I have upon several occasions seen a mixed flock of Common and Black terns begin a migration from the lake and then split into two flocks of one species each before disappearing from view.

Flocks of gulls and terns in migration have been noted from daybreak until dark and in all types of weather. It is assumed that these groups migrated at night also, for I have repeatedly seen obviously migrating flocks coming to the lake at daybreak or leaving at dusk. Both groups of birds, but gulls in particular, have often been seen coming to the lake a few hours before a storm, or in the fall leaving it just previous to a sharp drop in temperature.

The individuals of an arriving flock of gulls retained their steady wing beat and group formation until directly over the lake, pond, or field where

they intended alighting, after which the flock generally began to circle and to descend; while so doing the individuals alternately soared and beat their wings until they alighted upon the water or land. Occasionally a flock circled and descended until about fifty feet above the earth, and then instead of continuing to descend until alighting it disintegrated, and each bird flew or soared over the lake independently of the others, to alight or fly onward in search of food. When a flock came to the lake the birds called very little except when about to migrate onward.

The arriving flocks of terns were very similar in their actions to gulls, except that terns almost invariably remained in a flock upon reaching their destination and did not tend to scatter. The terns did not soar to any extent, but maintained a rather even wing beat; they called often and persistently while coming into the area and during their sojourn. The shape of the flocks of terns was more often a gently-curved arc than was that of the flocks of gulls. (For additional data upon tern flocking see Trautman, 1939a: 44-45.)

The first indication that the gulls were about to leave the area was a persistent calling by one of the birds as it sat upon the water or flew about the lake. This seemed contagious, for shortly thereafter other gulls started calling, until most or all were so engaged. As the calling increased in volume these usually sedate birds became more and more restless; some of the gulls upon the water flapped their wings, and others partly opened their wings and swam about rapidly. The gulls on the land or upon objects extending out of the water also became restless and extended their necks and called lustily, flapping their wings and running or walking back and forth. The birds on the tops of stumps or pilings turned around and around as they called and flapped their wings.

After a few minutes of increasing restlessness, calling, and moving about, one gull after another rose in the air and began flying about. The flying birds soon formed a group, which later became a well-defined and circular-shaped flock. Once the flock had been formed it began to rise in ever ascending spirals. The ascending flock often contained one to three species of gulls, and as it rose most or all of the individuals of those species which were in the minority left the flock to fly away or to alight upon the water. At the same time a few of the same species of which the flock was principally composed, likewise left, as if they had decided not to migrate at that time. As the now purged and circular-shaped flock continued to rise upward in great spirals it almost invariably began to revolve slowly on its axis, meanwhile the individuals which comprised the flock alternately soared and beat their wings. After the flock had completed one to twenty circles and had reached a height of more than one hundred and fifty feet it stopped circling and flew away. As the flock started onward it usually changed in shape to an arc or broad-angled V.

The amount of circling and the height attained by a given flock before it left was largely determined by prevailing weather conditions. If the weather was stormy and the wind brisk the flock did little spiraling or soaring, and little or no revolving about its axis; but if the weather was calm and clear, especially in the spring, the flock generally ascended majestically in a long succession of spirals until it was almost or entirely beyond the vision of the unaided eye before it stopped circling and began its journey.

The actions of the flocks of terns which migrated from the area were similar to the actions of gulls, except the terns were usually in groups while in the area, and there were few solitary individuals present; the only flock-forming was when two or more groups merged together.

All flocks of terns were not in circular-shaped groups as they ascended in spirals, very frequently they were in an arc-shaped flock. These flocks did not revolve about their axis, as did some of the circular ones.

The terns usually did less calling than did the gulls as they flew about the lake immediately prior to their spiral ascent. Once the flock of terns spiraled upward, however, they were more persistent in calling, and unlike the gulls, they did not stop calling before they had completed their spiraling, but kept on even after actual migration had begun.

Shore-bird migrations.—The shore birds were a difficult group to observe in migration, for many of the species which were numerous during one or both semiannual migrations were of small size and hence difficult to locate if migrating high overhead. Their habit of flying in groups from one part of the area to another made it difficult to determine whether some flocks were long distance migrants or merely trading birds. Because of these difficulties few observations were made of shore birds in actual migration.

During the investigation all of the more numerous shore-bird species were heard and identified by their distinctive call notes as they passed overhead at night in apparent migration, and species with extremely distinctive notes, such as the Semipalmated Plover, Killdeer, Black-bellied Plover, Bartram's Curlew (Upland Plover), Spotted, Solitary, Pectoral, Red-backed, Stilt, and Least sandpipers, and Greater and Lesser yellowlegs were heard upon many occasions. Of all these species of night-flying shore birds the Bartram's Curlew was the most outstanding, for its distinctive "puttie-putt-putt" note could be heard almost nightly during the height of its spring and fall migrations, and some nights hundreds were heard passing overhead. These birds were heard in what seemed to be equal numbers during every hour of the night. It was impossible to observe the night migrating Bartram's Curlew, and therefore their flock formation during darkness is unknown; however, many flocks of this species have been observed passing overhead or descending earthward at daybreak, as well as during other portions of the daylight hours, and there is no reason to believe that the formations of birds migrating in the daytime differ from those in the darkness.

The flocks of migrating Bartram's Curlew were usually of two to ten individuals, though flocks of ninety birds have been noted. In spring, groups of two, which may have been mated birds, were often seen migrating together, and in fall, groups of three to six, which may have been family groups,²⁸ were the most numerous. The flocks of Bartram's Curlew were characterized by the wide spacing of the individuals in the flock; each bird remained ten feet or more away from its nearest neighbor, and at times the birds were so scattered that all flock unity seemingly was lost, and the group resembled a loose procession of birds. In migration the birds persistently and with considerable regularity uttered their "puttie-putt-putt" notes.

Other shore-bird species which were noted in night migration as often or oftener than in the daytime were the Killdeer, Black-bellied Plover, and Greater and Lesser yellowlegs. All of these species were outstanding as regards persistency and loudness in calling, and when seen in the daytime they were also characterized by the wide spacing of the birds in the flocks. These flocks were almost invariably more compact than were the groups of Bartram's Curlew, and their flock formation was usually of some definite shape. The gently-curved arc or some variation of it occurred most frequently; a long column with one of its narrow sides in front was next in frequency; and the oval, circular, or rectangular-shaped flocks were rare.

Among the more numerous shore-bird species the Spotted, Pectoral, Least, Red-backed, and Semipalmated sandpipers were seen or heard oftener in the daylight hours than at night. The species in this group flew swiftly and in compact flocks, and in migration did little calling; when the flocks began to descend prior to alighting the amount of calling was markedly increased. The rather high and shrill call notes of these species were not particularly loud. During migration each species most often migrated in flocks consisting only of its own kind, and these flocks usually varied from six to forty individuals, though occasional flocks containing fifty to two hundred birds were also seen. The small and medium-sized flocks were generally shaped like a column, oval, rectangle, or circle, but the largest flocks were most frequently in the shape of a gently-curved arc.

During the height of the spring and fall migration it generally was only a few hours after a favorable feeding and resting shore-bird habitat appeared before it contained a fair concentration of birds. Because of this it is assumed that several species were usually passing through the area in sufficient numbers to take advantage of any favorable condition that may

²⁸I have no direct evidence to support the theory that family groups migrated together. It was noted that once the young were out of the nest, they accompanied the adults, and in the evenings, after the young could fly, the entire family group soared and flew in seemingly endless circles until long after dark. Then one night the family group disappeared, and it seems plausible to conclude that they began their journey southward together.

have presented itself. Only when a tremendous amount of feeding territory was present did it seem to have fewer birds than it could readily support.

From these studies of shore birds in migration it is concluded that all species which were numerous during one or both semiannual migrations migrated in both daylight and darkness. It seems plausible that all species which regularly migrated through the area may have done so during both night and day. Some species appeared to migrate principally at night, others seemed to be chiefly day migrants.

Those species most often heard at night flew in a loose flock in which each individual was well separated from the rest. The call notes were loud and persistent.

Those species heard most often in daytime flew in compact flocks. Their call notes were high and shrill but not particularly loud. The individual species averaged smaller in size than did those which seemingly migrated oftener during darkness.

There may have been some correlation between loose flocks of persistent and loud calling birds and migration at night, and between compact flocks which called less loud and less persistently and which migrated principally in the daytime. Possibly there was less danger of night flying birds colliding with one another if well separated, and a greater need for them to call persistently and loudly.

During the height of migration a favorable habitat usually acquired its quota of birds within a few hours after coming into existence, and it is assumed that the transients migrating over the area during these periods were numerous enough to populate all available habitat.

Migrations of land birds.—The evidence obtained on land bird migration indicated that land birds as a group migrated primarily or almost entirely at night. Because of this habit of migrating in darkness accurate observations were very difficult to obtain, for it was only in late evenings or early mornings that they could be seen. The Buckeye Lake area was not particularly suited for the study of land bird migration.

During the twelve years it was obvious that a few species were either more conspicuous day migrants or that they migrated more in daylight than did the majority of land bird species. Outstanding among those most often noted in daytime migration were the various members of the family Icteridae, such as Bobolink, Eastern Meadowlark, Eastern Redwing, Rusty Blackbird, Bronzed Grackle, and Eastern Cowbird. Other conspicuous species were the Robin, Bluebird, and Crow. All of these will be here discussed except the Bobolink and the Eastern Meadowlark (see pp. 380–82).

The manner of migrating of the various species of blackbirds, Robin, and Crow, was more conspicuous and clearcut during the exceedingly large migrations of early spring, before the area contained many residents, and

during the last migrations in fall, than at other periods. At such times an almost constant stream of migrating flocks of blackbirds, Robins, and Crows could be observed. The flocks of blackbirds contained as many as four species, whereas the flocks of Robins or Crows were usually composed of one kind and usually consisted of fifty to twelve hundred individuals. In many respects the flocks of the various species were similar to one another.

Unlike most migrating flocks of waterfowl all members of a flock of land birds did not tend to remain on relatively the same level or plane. Instead, the birds comprising the flock flew at various levels, which gave depth to the flock. Flocks containing the various species of blackbirds differed chiefly from flocks of Robins and Crows in the compactness of the group and in its manner of rapidly changing shape. In some of the larger flocks of blackbirds the changing shape was decidedly sinuous in character as it traversed the sky. Flocks of Robins were usually less compact and less globular than were those of the blackbirds and tended more toward a plane type. These flocks were subject to less frequent and less extreme changes. Flocks of Crows were the least compact of all, and in many flocks there was a decided tendency for the birds to "string out" and become so widely spaced that much of the flock unity was lost.

The migration of these various species was of the interrupted type. The average flock rose from the ground or from trees and migrated onward for a distance of a few hundred feet to several miles. Upon alighting the birds usually began to feed, rest, or sing, and after remaining a few minutes they again moved onward. During the investigation I followed many flocks with the aid of an automobile as they migrated in this manner.

The Bluebirds migrated singly or in poorly-defined groups of two to ten individuals. Like the Migrant Shrike (see p. 335) the Bluebirds flew at a low elevation across fields, woodlands, and water in a succession of short flights, stopping to perch for brief periods upon trees, fences, telephone poles, or other objects in their line of flight. While in the air, perching, or feeding, the Bluebirds uttered their mellow lispings notes at frequent intervals. During the investigation hundreds of individuals and small groups were observed migrating over the lake, and upon many occasions one or more of the birds have been followed as they traversed the area.

Other land species which were much less conspicuous, though seemingly regular day migrants, included the Migrant Shrike, Ruby-throated Hummingbird, and swallows. The methods of migration of the shrike and hummingbird is described in the text concerning these species, and only the swallows will be discussed here.

I made comparatively few observations of flocks of swallows in actual migration. The flocks, which really were loose companies, generally consisted of twenty to two hundred and twenty-five individuals. When first noted,

such companies were usually fifteen to possibly three hundred feet above the earth, and were drifting along at a slow or moderate speed with most or all of the individuals circling and feeding inside the flock proper or adjacent to it. Occasionally a small portion of the flock lagged behind to feed in some location where insects were particularly abundant. These laggards continued to feed until the main group had almost disappeared from sight, whereupon they hurriedly flew onward to join the main group again. When the group reached a lake, a large pond, or other choice feeding grounds it sometimes remained there for the remainder of the day, and if other swallows were there previously the new arrivals merged with them.

Upon several occasions flocks of fifty to eight hundred swallows were observed leaving some favorable feeding ground, usually over the lake. The first indication that a flock was about to migrate was an increased amount of twittering and calling, particularly among the individuals that were about to begin their journey. After twittering excitedly for several minutes those intending to migrate rose above the level of the feeding and temporarily resident group, and, once separated, quickly formed into a loosely-bound but well-defined flock. The flock continued to ascend, and while ascending it began to revolve slowly about its center. After reaching a height of over seventy-five feet the flock stopped rising and circling, and began to move onward. These flocks did not feed on the wing, for they had been industriously feeding for some time previous to migrating and probably were not hungry. As they did not linger to feed, their progress was rapid. The height to which the flocks rose before beginning the migration depended upon weather conditions. If it was stormy the group rose to about seventy feet before beginning to migrate, but if the weather was clear and there was no wind the flock sometimes rose so high as to disappear from the sight of the unaided eye. Often the flocks of swallows, and particularly of Martins, consisted of only one species; if not, the flocks generally were composed of one species with a few other swallows present. On the infrequent occasions when a flock was composed more or less equally of two species of swallows, these generally were Rough-winged and Bank swallows, or Bank and Tree swallows.

The many species of sparrows and warblers were most conspicuous as night migrants, and comparatively few were heard or seen in the daylight hours. Migrating sparrows were most abundant during March and April, and October and November. In late February and in the first half of March the distinctive "chip" and notes of the Tree Sparrow were the ones most frequently heard in migration, as they also were in late November and early December, and during exceptionally warm periods in winter. In the last half of March the notes of the Fox Sparrow were often heard. The height of the spring sparrow migration occurred in April, and then the "chips"

and call notes of the White-throated, Chipping, Field, Song, and Vesper sparrows, and Junco could be heard almost nightly. In late September and throughout October the "chips" of these species in their southward migration could again be heard almost nightly.

Warblers in migration could be most frequently heard during nights in late April and in May, and in late August, September, and early October. During late April and early May the "chips" of the Myrtle and Black-throated Green warblers were the warbler notes most frequently heard in migration at night, in August the "chip" of the migrating Yellow Warbler was outstanding, and in October the "chips" of the Myrtle, Blackpoll, and Bay-breasted warblers were most conspicuous. In the latter two-thirds of May and in September, when the majority of the warbler species and individuals were migrating, the note of no warbler species stood out from the rest.

From the evidence obtained it was concluded that there was no especial period of the night when the migration of sparrows or warblers was particularly large. Migration seemed rather slight for the first hour of darkness; it increased sharply during the next hour, after which it remained stationary until about an hour before dawn, when it diminished.

Upon a relatively few occasions sparrows and warblers were observed migrating in daylight hours or descending earthward at the end of migration. Usually these observations were made immediately following daybreak. In each instance the groups consisted of five to one hundred and fifty birds. The individuals were persistently calling. These groups appeared to be loosely constructed companies rather than well-defined flocks, for all individuals were more than five feet and some were as much as one hundred feet away from their nearest neighbors. When the groups decided to alight the leaders abruptly changed their course from a more or less horizontal one and descended earthward at an angle of about 45°.

Sparrows alighted in trees, brush, or upon the ground. If the flock consisted of Juncos or Tree, Chipping, or White-throated sparrows the flock usually alighted in the upper parts of trees, and later moved to the lower portions of the trees and to brush. Field, Fox, Swamp, Lincoln's, or Song sparrows often alighted in brushy situations, but Savannah or Vesper sparrows, or Snow Bunting usually alighted directly in the fields. If the flock consisted of warblers of any numerous species except Northern Yellow-throats the individuals usually alighted in the upper half of trees, where they generally remained for a few minutes to rest before beginning to feed or to move toward their particular type of habitat. The Northern Yellow-throat was an exception, for it was often observed descending directly into a weedy field or brushy fence row.

Usually, the smaller flocks of sparrows, and sometimes the larger ones, consisted of a single species. If two or more species were represented, they

were almost invariably of the same general habits. The flocks of warblers upon alighting from migration often contained more than one species, and as many as six species have been recorded. When a flock of sparrows first alighted, the individuals in the flock continued to be quiet for at least a few minutes before becoming active and beginning to feed, sing, or move about; in a few instances I have noted birds that apparently were so exhausted that they did not become active for one-half to three-quarters of an hour after alighting. During this period the drooping wings, ruffled body feathers, closed eyes, partly open mouths, and heads resting upon the breasts gave every indication that the birds were very tired.

Factors influencing arrival and departure of transients.—Temperature seemed to be a particularly important factor in influencing the early spring and late fall migrations, especially when it was about 32°, for then it was capable of assisting in sleet and ice production.

The effects of temperature greatly influenced the time of arrival of the first large influx of such northbound transients as the Mallard, Robin, and Redwing. In the warmer winters many representatives of these species appeared as early as the middle of February; in the colder ones it was not until almost a month later that a large influx of these same species occurred. Temperature seemed to be a less important factor to mid-spring migrants, for then there was less than a thirteen-day difference between the arrival of the first wave of migration of any given species in the warmest years, and the arrival of the same species in the coldest years. During late spring temperature appeared to be even less important and such late transients as Wilson's Warbler were remarkably constant in their time of spring arrival. In spring the time of departure of the average species seemed somewhat less affected by temperature than was the time of arrival.

In fall the time of arrival of the first large groups of individuals of all species seemed to be less dependent on temperature conditions than it was in spring, and the time of fall departure of the last large groups of any species seemed more dependent upon temperature than did the departure of similar groups in spring. When the fall weather conditions were moderately mild, all species remained six to forty days longer than they did when the weather was unseasonably cold or there occurred a sudden and sharp decline in temperature. Most of the last groups of the late fall waterfowl transients varied more in the time of departure than did any other transients of autumn. The large groups of late waterfowl transients almost always remained until the first covering of the lake with ice—from mid-November until late December.

The amount of precipitation and the lack or abundance of water in the fields, streams, swamps, and lakes were important during a migration as factors regulating the time of arrival, departure, and abundance of many

bird species. This was particularly true of shore birds, for during their migrations they alighted in the area only when the precipitation and lack or abundance of water made feeding and resting conditions favorable. The duration of their sojourn and their abundance during any migration likewise depended to a large extent on the length of time the water conditions remained favorable.

Particularly favorable feeding conditions caused individuals of most species to remain in spite of lateness of season and adverse weather conditions (Trautman, Bills, and Wickliff, 1939: 86-90).

For instance, in the spring of 1928 the late Earl McPeak, Game Protector, was living in a houseboat on Liebs Island. The houseboat was on land, some fifty feet from shore, and on stilts that raised it some three feet above the ground. Early in the spring McPeak began throwing corn into the water in front of the houseboat, and soon a large flock of Coots was regularly feeding there. He succeeded in getting thirty-one Coots to feed under the houseboat. The Coots finally became so tame that when he beat upon a pan with a spoon, all within hearing distance came running, swimming, or flying to the houseboat. When the usual time of departure for Coots arrived, between May 18 and June 2, fifteen of them failed to leave, and it was not until June 12 that they departed.

In the fall of 1930 J. Stanley Douglass trapped and banded ducks and Coots in the Little Buckeye game refuge. A flock of five Blue-winged Teals and eleven Wood Ducks acquired the habit of visiting the traps at regular intervals to gorge themselves with corn and other grains. Instead of leaving in late October when the other Blue-winged Teals and Wood Ducks left, this flock remained for twelve days more.

During those autumns when there was a huge and constantly available weed seed crop, an unusually large number of many species of Fringillidae remained later than when the food supply was poor or less available. Large groups of Blue Jays, Flickers, Red-headed Woodpeckers, Crows, blackbirds, and other corn-eating species remained in large groups when much corn was left in the fields.

Gizzard shad.—Throughout the discussion of water birds frequent reference is made to gizzard shad. This fish was immensely abundant in the lake, and the young of the year formed a most important food supply for many bird species. The young fish were very sensitive to rapid changes in temperature, and especially to sudden declines in the fall. When such declines occurred, great numbers were benumbed or killed, and these feebly swam or floated near the water's surface. During these periods most water birds were forced out of the fields and marshes by hunters, or else their food supply in such places was ice-locked. At such times the food supply, other than shad, in the open, safer waters of the lake was very low or unavailable, and

the shad therefore offered a most needed emergency ration. It was surprising how acceptable the readily available shad were to most of the large water-bird species, and especially to ducks. Comments upon this phenomenon and on the examinations of the stomach contents of birds are made under many of the species.

For many bird species the shad was not only an emergency ration but a staple food supply, and one which unquestionably detained transients in large numbers and for long periods of time.

Segregation of transients in specialized habitat niches.—It has long been known that a bird species in migration is limited to such situations as are more or less suited to its needs. The Lesser Loon is limited to bodies of water, for only there can it obtain sufficient food and protection. The Cerulean Warbler, with habits and needs very different from those of the loon, is limited primarily to certain plant communities.

It is also known that, though loons can exist in migration on almost any body of water, a small pool in a creek having a limited food supply does not offer the food and protection present in large streams or lakes better stocked with food. Consequently, loons in migration are seldom found in small creeks and are often found on ponds and larger bodies of water. The Cerulean Warbler can exist in migration for at least short periods wherever there are land plants, but it is only in certain tree communities that the species finds optimum conditions.

In the twelve years of observations abundant evidence was obtained to show the wide range of conditions tolerated by transients. At the same time, observations disclosed an even more interesting phenomenon, that of a pronounced tendency for individuals of a species, and particularly of the smaller land-bird species, to segregate in some favored habitat niche. In a few instances the favored niche included almost all of a woodland, swamp, or field; but with many species a well-defined niche was less than an acre in extent, and sometimes consisted of only a single tree, a few shrubs, or a small section of a swamp or brushy fence row. These small niches continued to attract a species during successive spring or fall migrations, or both, until conditions in it were altered, after which the attraction disappeared.

The attraction to a niche was sometimes caused by abundant food supply in addition to adequate protection. In many instances the reason was not apparent, even after I had studied the niche for several years; yet the birds seemed to sense immediately such areas and were attracted to them. Upon many occasions I was fortunate enough to observe transients enter a habitat niche favored by the species and to note the reactions. These birds, before entering, had been wandering about in a very similar type of habitat where they had been feeding, resting, and, if males, perhaps singing a little. Upon entering the favored area the birds ceased to wander and, if males, the

amount of singing in most instances was notably increased. For example, during the spring migrations between 1922 and 1934 I found a total of fourteen Golden-winged Warblers in the area. Eleven²⁹ of the birds were seen in an area in the Lakeside Woods that was less than an acre in extent, and eight of the eleven were singing, feeding, and remaining in a small portion of this acre which was less than sixty feet in diameter. This area appeared to be no different from much of the remaining part of the Lakeside Woods, or from the other swamp forests, yet this small favored niche contained something which was not shared by the rest of the Lakeside Woods or by other swamp forests.

The transient Parula Warblers usually displayed a preference for large pin oak and shingle oak trees and a marked preference for one shingle oak in particular. This oak was in the Lakeside Woods, and more Parula Warblers were observed in it than in all of the remaining trees of the woodland. A transient often displays a marked preference for certain types of trees, but it appears unusual for a single tree among many of the same kind to retain yearly so marked an attraction for a particular bird species.

Contiguous to the Jack's Neck Woods (May 2: No. 31) was a brushy field of several acres. In the field there was an area of less than an acre in extent in which the Western Palm Warbler was usually present during its migrations, and in which the species concentrated whenever it became numerous. During four years the bird was so numerous in this favored niche that between 80 and 95 per cent of all Palm Warblers noted were seen in this niche, and as many as forty-five individuals were observed there at one time. It was most impressive to observe these concentrations in this area of less than one acre, and especially since the niche was surrounded by a type of habitat so similar that I could not recognize any consistent differences.

The rare or uncommon Connecticut and Mourning warblers were found, in at least one migration, in all of the lowland remnant forests as well as in a few other localities. Despite these widely-scattered records more than 90 per cent of all the individuals of these two species were found in two small habitat niches which together totaled less than one and one-half acres. One of these was in the Lakeside Woods, the other in the Big Woods. In the Lakeside Woods this favored niche consisted of about three-fourths of an acre of scattered saplings interspersed by mature trees and dense clumps of rosebushes and blackberry bushes. Part of the ground was generally covered by a temporary woodland pool. In this niche were found at least 85 per cent of all the singing males noted in the entire area, and it was obvious that some factors in this niche stimulated the males to sing.

²⁹ The total from six of twelve spring migrations in which one or more individuals were seen.

That usually uncommon spring transient, the White-crowned Sparrow, primarily frequented brushy thickets, fence rows, hawthorn thickets, and similar situations in its northward migrations. One or more individuals were found in all of the larger of these habitats during at least one of the twelve spring seasons. In the northwest corner of the area there was a brushy fence row of moderate length which in my estimation was exactly similar to dozens of other fence rows; yet this particular one contained one to twenty-five birds throughout most or all of each spring migration. The sparrows frequenting this fence row seemed to sing much more persistently than did other individuals elsewhere. In the fall the White-crown was generally much more numerous in the entire area than in the spring and at that season was to be found in consistently large numbers along this fence row. In the fall, too, most of the White-crowns that I heard singing were along this fence row.

There were many other instances of bird species displaying a marked tendency to be present in some certain tree, clump of shrubs, small section of woodland, swamp, or field, or some other small area during two or more consecutive migrations. These favored habitat niches seemed little or no different from many other similar areas.

The ability of a transient to select some restricted habitat niche, that seemingly is partly or entirely surrounded by a similar and often much larger habitat of like type, seems remarkable, especially so when it is remembered that a species which nests in the far north and migrates hundreds of miles southward to its wintering grounds in the tropics must visit strikingly different floral communities. The questions naturally follow: does a bird species recognize an optimum habitat niche in each of the many diverse floral communities which it visits in transit, and if so how many such habitats does it recognize? Is the primary reason for selecting a certain habitat niche the abundance of food? If so, then each year the usually small niche must contain sufficient food to enable it to retain a certain number of individuals throughout the entire migration period of the species. Does food alone stimulate increased singing? Is there a resemblance of the habitat niche to the bird's nesting environment, which the bird senses? Similarity to the nesting environment may be the primary reason for increased singing in some species. With others, such as the Parula Warbler, it seemingly is not the reason for the shingle oak tree in which the concentration of these conifer-nesting warblers occurred was unlike any nesting habitat of the species which I have seen in Ohio or northward. Can it be that the species of plants which constitute the cover is of relatively little importance, and that it is the distribution, density, and height of the plants themselves that is the most important? Lastly, can it be that these favored habitat niches combine many favorable conditions including the proper

distribution, density, and height of plants or other cover, amount and distribution of water, distribution and density of light, and a sufficient food supply?

Very rare, casual, and accidental transient visitors.—In Table III is given the state of maturity, sex, status of abundance, and other data concerning fifteen birds of fourteen species which are very rare, casual, or accidental in migration in the area and throughout the remainder of Ohio and surrounding states.

TABLE III
UNUSUAL MIGRANTS

Species	Plumage	Sex	Method of Sexing	Migra-tion	Status at Buckeye Lake
European Teal	Adult	♂	Plumage	Spring	Accidental
Cinnamon Teal	Adult	♂	Plumage	Spring	Casual
King Eider	Immature	♀	Plumage	Fall	Casual
Ruff	“Probably young”	♂	Gonads?	Fall	Accidental
Red Phalarope	Immatures	1 ♂, 1 ♀	Gonads	Fall	Very rare
Northern Phalarope	Immature	♀	Gonads	Fall	Very rare
Parasitic Jaeger	Immature	♂	Gonads	Fall	Casual
Long-tailed Jaeger	Immature	♂	Gonads	Fall	Accidental
Great Black-backed Gull	Immature	♀	.....	Fall	Very rare
Franklin's Gull	Adult	♀	.....	Fall	Very rare
Atlantic Kittiwake	Immature	♀	Gonads	Fall	Casual
Sabine's Gull	Immature	♂	Gonads	Fall	Casual
Harris's Sparrow ...	Immature	♀	Gonads	Fall	Very rare
Gambel's Sparrow ..	Immature	♀	Gonads	Fall	Very rare

It may be noted from Table III that only three of the fifteen birds were adult, and two of these were recorded in spring. The twelve birds in immature plumage were recorded in autumn. These facts may denote a tendency for immature birds to wander beyond the regular migrational limits of the species. Sex may not be a factor in causing birds as a group to wander.

WINTERING BIRDS

Factors determining winter population.—The number of species and the numbers of individuals of most species varied greatly from one winter to another during the investigation. In those winters when conditions were most unfavorable there were present approximately half as many species and less than half the number of individuals that there were during the most favorable winters. This fluctuation in numbers of species and individuals was caused by the presence, absence, or degree of intensity of many

factors, principal among which were the climatic conditions of the autumn preceding a winter (Trautman, Bills, and Wickliff, 1939: 86-90), the mean and extreme temperatures during a winter, and the amount of water, ice, snow, food, and cover. At no time did severe winter weather result in forcing enough northern wintering birds, such as the Snow Bunting, into the area to compensate for the loss of the "half-hardy"³⁰ species which left because of the conditions.

The climatic conditions of late autumn were very important in determining the bird population of the ensuing winter. Throughout the normal period of autumnal migration there was a pronounced tendency for a species to migrate onward whenever there occurred a sharp drop in temperature or there were adverse weather conditions. If a pronounced cold snap occurred during the late migration period of a species which occasionally wintered in the area, all individuals of the species migrated through or left the area, and if no more flights took place that fall no more birds were noted until the first migrations in the following spring. If there were no decided cold periods during the latter part of the migration of such a "half-hardy" species a few or many individuals remained. Once the normal migration period of a species was over the individuals remaining in the area obviously began to lose some of their migratory urge, and increasingly adverse weather conditions were necessary to cause these individuals to desert the area. By midwinter the remaining birds had become so firmly entrenched and the migratory urge was seemingly so low that despite the most adverse conditions they usually remained—sometimes until death resulted.

The effects of autumn conditions upon winter populations have been noted by several ornithologists. Mrs. Nice (1933: 222) suggested that the size of the winter population of Song Sparrows in the Columbus, Ohio, region is probably governed by weather conditions of the preceding October. Rowan (1931: 90-91) stated that some Mallards fail to migrate from Alberta each autumn and that "in years in which the fall is late and open, a far larger number stay behind."

The mean temperature throughout a winter determined to some extent the numerical status of such regular winter residents as the Song Sparrow. During the warmer winters the daily number of these sparrows remained high throughout the entire season, whereas in colder winters the daily numbers were lower. Severe cold snaps, particularly if accompanied by much snow, sometimes caused a decrease in the number of individuals of many regular winter residents.

³⁰ The term "half-hardy" is used here for convenience, and applies to those species whose wintering range was almost or entirely south of the Buckeye Lake area, in Ohio at least, and which were found in the area only during those winters when conditions were the most favorable.

A decided warm period in mid-January or thereafter usually resulted in an invasion of those "half-hardy" species which previously had been absent from the area or present in very small numbers. When the warm period took place in January or early February and was followed immediately by a cold period, the invading "half-hardy" species generally disappeared; they probably retreated southward. As the winter progressed fewer transients disappeared upon the advent of cold weather, and by early March they remained no matter how severe the weather conditions became. Apparently the tendency to retreat southward during adverse weather was offset, in late February and March, by the vernal urge to migrate northward.

The refusal to leave the area during adverse weather conditions in late February and March was particularly obvious among waterfowl. Upon many occasions during a warm period I have seen a large influx of such early transients as Mallards, Black Ducks, Pintails, Baldpates, Golden-eyes and American Mergansers. A few days after their appearance a cold period sometimes occurred which caused the lake to become almost or entirely ice-covered. Then the new arrivals, instead of leaving, huddled in a compact group upon the ice or in some small open hole and attempted to remain there until the weather moderated again. If the cold period did not last very long the birds succeeded in living through the trying period. If the cold period was intense and prolonged the puddle ducks became so weakened that they were unable to leave the huddled group to feed in the fields, and the sea ducks and mergansers were forced upon the ice when their feeding hole froze over. At such times some died.

An example of mortality among early transients occurred in March, 1932 (Trautman, Bills, and Wickliff, 1939: 86-99). The previous fall and winter had been very warm and more "half-hardy" species and individuals were present than during any of the other eleven winters. In the last week of February a large influx of ducks appeared, and by March 1 there were present more than three thousand ducks, two hundred Coots, and many other water birds. On March 5 a sudden drop in temperature occurred, followed until mid-March by the most severe cold period of the winter. The temperature became as low as 5° above zero, and the lake, except one hole, was covered with six inches or more of ice. The hole was kept open by the large group of waterfowl. During the first few days the birds about the open hole were not greatly affected, but by March 12 the group had become visibly weakened. That day I found about thirty-five ducks lying on the ice apparently dead, and over two hundred ducks and more than one hundred and fifty Coots were apparently unable to fly. Five Mallards, six Black Ducks, four Pintails, three Ring-necked Ducks, and eight Coots were identified among the dead birds. The remainder were not identified because they were lying out of reach on thin ice or frozen deeply in thicker

ice. I picked up two dead Mallards, one Black Duck, two Pintails, one Ring-necked Duck, and five Coots. An autopsy of the birds disclosed no concentration of parasites or any evidence of disease, and the primary causes of death seemed to be exposure and starvation.

Upon learning of the condition of the flock the Ohio Division of Conservation supplied the ducks with food. An airplane was sent, and from it the pilot, as he flew over the open hole in and about which the waterfowl were huddled, dropped five- and ten-pound paper bags of grain. Grain was also carried across the ice and scattered about. Once the birds were fed the vigor of the flock improved, and by the time the ice began to disappear, releasing a sufficient food supply, most of the birds were in fair condition. Undoubtedly this feeding save the lives of several birds.

The amount and availability of food was an important factor in determining the number of species and individuals remaining in the area throughout a winter. Whenever a large weed seed crop was constantly available the number of seed-eating birds was large throughout the winter. If there was a large amount of corn or other grains in the fields or of beech or oak mast in the woodlands, there was usually a large wintering population of such species as the Black Duck, Mallard, Mourning Dove, Flicker, Red-headed Woodpecker, Blue Jay, Crow, Tufted Titmouse, and Cardinal.

The size of the winter population of most hawk species was obviously governed chiefly by the abundance of small rodents, principally the meadow mouse, *Microtus pennsylvanicus*. Concentrations of rodents, usually in some high-grass, lowland field, invariably resulted in a decided concentration of hawks, chiefly the Red-tailed, Rough-legged, and Marsh hawks; the Sparrow and Cooper's hawks were less numerous. There were usually less than ten individuals, though upon a few occasions I have seen as many as thirty-five birds about a field where mice were particularly abundant.

It was the practice of some sportsmen during the period of this investigation and particularly between 1922 and 1930³¹ to bait localities with corn or other grains throughout the fall duck migration, so that the birds acquired the habit of feeding in the baited territory and remained in the vicinity. Upon the close of the hunting season the baiting (or feeding as it was often called) was stopped, leaving the birds with a greatly reduced food supply. In the Buckeye Lake area the harmful results of baiting were not very evident, for the practice was not extensive, and the birds that had been attracted could usually find sufficient food in the corn fields after baiting had been stopped.

In the marshes about Sandusky Bay and the western end of Lake Erie, however, baiting was conducted on a mammoth scale, and unquestionably

³¹ Prior to 1930 it was permissible to hunt ducks until December 31; in 1931 the season closed on November 15; in 1932, on December 15; and in 1933, on November 30.

“held over” large duck populations until late fall or winter, and whenever feeding was stopped during adverse weather conditions when the natural food supply in the marshes was covered by ice or snow, there was a heavy mortality (Trautman, Bills, and Wickliff, 1939: 87).

Tendency of individuals and groups to establish and maintain territories in winter.—Abundant evidence was obtained that many species of water-birds, hawks, owls, game birds, and most small land bird species established and maintained wintering territories. Territorial establishment was particularly pronounced among the “half-hardy” species and was usually more obvious among solitary or nonflocking individuals than among well-defined flocks. There were some marked exceptions, for a few “half-hardy” species did not establish wintering territories and a few flocking species did; among a few others, such as the Cedar Waxwing, there seemed to be no winter maintenance of territory.

The establishment of wintering territory by individuals of a species may have begun while many southbound transients of the species were still migrating through the area; however, little evidence was obtained because of the difficulties in separating or recognizing the transients from future winter residents. With the migration of a species almost completed it was evident that most individuals of that species were maintaining territory.

If adverse conditions occurred shortly after a territory was established in the fall an individual or group deserted it rather readily. The tendency to maintain territory increased as the season advanced and by January had become so pronounced that an individual or group deserted its territory only under the most adverse conditions. Throughout January and the first half of February the maintenance of territory continued to be pronounced, but with the coming of warmer weather, in late February and early March, it became less and less obvious and finally disappeared.

The size of the territory occupied by an individual or a group depended principally upon the species. The Red-headed Woodpecker was an example of a wide ranging species, for the wintering territory of a single bird or small group usually included all of a small or medium-sized woodland, and occasionally one or more of the birds wandered into the adjacent fields or a neighboring woodlot. The Swamp Sparrow had a highly restricted range, for one or more of these sparrows apparently remained throughout an entire winter in a specialized and isolated habitat niche that was less than two hundred feet in diameter (Pl. XIII, Fig. 2).

When in late fall or early winter an individual or group established itself in a given territory it obviously chose that territory because of the abundance of food and cover. If a constant supply of food and abundance of cover were always available, the individual or group wintered well. The reaction of an individual or group to adverse conditions depended to a great

extent upon the species. Strong fliers whose territory was large and poorly defined tended to leave whenever conditions became markedly adverse, and the same individuals often failed to return with the advent of favorable conditions. Weak fliers or birds with distinct habitat niches did not leave an established territory when conditions became unfavorable.

Once an individual or a group established a territory, its size and shape remained the same if food and cover were sufficient. If, as the winter progressed, a contiguous and not overpopulated area offered more food or better cover there was a tendency to include the neighboring area in the territory. Occasionally, an individual or group continued to encroach upon contiguous territory as the season advanced and at the same time deserted parts of the original territory, until by the end of winter an entirely different area was occupied.

The late fall of 1931 was extremely mild, as was the following winter, except March. Because of the mild fall and winter the bird population was large, and there was present throughout the entire period a number of waterfowl species and individuals, particularly of the "half-hardy" type. From early December to March I found two Horned Grebes, upon every occasion that I looked for them, in the bay between Sellars Point and Stony Point. Apparently these birds spent the entire winter in this small area. Upon many occasions throughout the same period I noted a Pied-billed Grebe, a flock of thirty-three Shovellers, two Ruddy Ducks, and one hundred and fifty to one hundred and eighty Coots in the bay that separated Liebs and Onion islands. Several different days during that winter I chased most of these waterfowl into adjacent waters, only to see them return immediately after I withdrew. A man who lived on Liebs Island and who had abundant opportunity to observe this group of waterfowl, told me that if undisturbed these birds never left the bay in the daytime. Whether all of the birds remained there throughout the night is not known; however, upon the nights that ice formed over the lake, the birds were always in the bay at daybreak, swimming about and feeding in an open hole. Their presence in the bay at daybreak indicated that at least some birds had been there throughout the night, otherwise the entire bay would have frozen. In early March there was a severe cold period and six or more inches of ice formed over the lake, except at a long open hole between Sellars Point and Liebs Island. The waterfowl were forced to go out to the open hole where there were more than three thousand other ducks and over one hundred and fifty Coots. On March 20 the bay between Liebs and Onion islands became free of ice, and it was immediately occupied by a Pied-billed Grebe, two Ruddy Ducks, thirty-one Shovellers, and about one hundred and twenty-five Coots. Of this group of birds I positively identified by peculiarities in color pattern the two Ruddy Ducks and several of the Shovellers and Coots as former

winter residents of the bay. It seems curious that this group should have elected to remain in the bay throughout so much of the winter, as they had ready access to all of the remaining portion of the lake.

The establishment and maintainance of wintering areas was particularly noticeable among some individuals of all species of wintering hawks.

The Bob-white offers a fine illustration of a nonmigratory species that established and maintained a well-marked wintering territory. Throughout September and October coveys of a few to twenty-five birds were scattered widely over the area, and because of favorable conditions at that time the species occupied a greater proportion of the land surface than at any other period of the year. There was a pronounced tendency for the birds to wander about, to fly over the lake, and to appear on the islands, streets of villages, and other unusual places. At this season, too, the number of birds and the size of the coveys in a given locality varied more from day to day than at any other period. This shifting or wandering of Bob-white in the fall has been often recorded and has received the apt term of "fall shuffling" (Leopold, 1931: 49-51). With the beginning of November the tendency to "shuffle" began to diminish sharply, and the establishment of winter coveys and wintering territory began to be evident. By December most of the coveys were maintaining territory, and this they continued to do until late February or early March. The tendency of a covey to remain in a small area throughout a winter had many obvious advantages. It had marked disadvantages when a covey insisted upon remaining in its territory despite a deficiency in food or cover. Upon several occasions a covey remained in an ice-coated field where there was little or no food until the birds became so weakened that some died. Had they left their territory when food became scarce, as did the Ring-necked Pheasants, they would have fared better.

As with other species the Bob-white sometimes shifted gradually into contiguous fields outside the original wintering territory, if those fields contained more food and better cover and were not overpopulated. By this process of slowly working into new territory coveys sometimes shifted far enough in a winter to be wholly outside of the original territory by spring. With the coming of March territory maintenance began to be less pronounced, by early April flock unity began to disappear, and by early May the establishment of nesting territory by the males became apparent.

Two Killdeers remained on the north shore of Crane Pond throughout the entire winter of 1931-32. The section along the north shore of the pond³² where the Killdeers spent the winter was approximately two hundred feet long by twenty feet wide. Because of the protection from the wind afforded by a concrete wall the mud in this section of shore froze only dur-

³² Crane Pond had been drained and was less than an acre in extent.

ing the coldest weather. It was there the Killdeers fed. A man living in a cottage beside the pond told me that they remained on the north shore of Crane Pond all of the time, except for an occasional absence, possibly once every three days, when they disappeared for an hour or two.

From November until April of 1928-29 I found on every occasion that I looked for it, a Red-headed Woodpecker in a small woodlot that was northwest of the Lakeside Woods. Apparently this bird spent all or almost all winter in this woodlot. That it was the same bird was obvious because of a recognizable peculiarity in color pattern.

Between December and April of the winter of 1932-33 I found a Prairie Marsh Wren, whenever I looked for it, in a small isolated cattail marsh. As the bird was always present it may be assumed that this individual spent the entire winter there. The marsh was only one hundred and twenty-five yards long by ten yards wide.

Each winter during the investigation several recognizable individuals of each of the more numerous wintering bird species, such as the Carolina Chickadee, Tufted Titmouse, Cardinal, and Hairy and Downy woodpeckers were found occupying territories throughout the entire winter season.

Unusual wintering birds.—There were two groups of unusual wintering species, (1) "northern invaders" which chiefly wintered north of the Buckeye Lake area in Ohio, and (2) "half-hardy" species which principally wintered south of the area in Ohio.

Northern invaders were represented by only a few species and individuals, and consisted of such birds as the Eastern Goshawk, Snowy Owl, Northern Shrike, and Redpoll. Conifer-inhabiting northern invaders, such as the White-winged and Red crossbills were conspicuously absent, probably because of the lack of conifers in the area.

"Half-hardy" birds were well represented, and included those species of which only one or a few individuals were recorded during some of the twelve winters. In this group were the Loon, Horned Grebe, Pied-billed Grebe, Great Blue Heron, Blue-winged Teal, Wood Duck, Red-breasted Merganser, Coot, Killdeer, Wilson's Snipe, Kingfisher, Yellow-bellied Sapsucker, Prairie Marsh Wren, Brown Thrasher, American Pipit, Migrant Shrike, Myrtle Warbler, Western Palm Warbler, Red-eyed Towhee, and Savannah, Grasshopper, Chipping, Field, White-throated, Fox, and Swamp sparrows.

Observations of "half-hardy" individuals, whose sex could be determined in the field, indicated definitely that at least 70 per cent were males. The predominance of males north of, or on the northern edge of, their wintering range has been noted and commented upon by several ornithologists. Recently Mrs. Nice (1933:222-23) has shown that in the Columbus, Ohio, region in winter the male Song Sparrows outnumbered the females. Con-

cerning birds in general Mrs. Nice wrote that she has "noticed that when an individual winters north of its regular winter range, it is almost always a male," and that "this was true of many different species in Oklahoma, and also of the specimens of such birds in the Ohio State Historical and Natural History Museum in Columbus."

The predominance of males was very evident among early transients that invaded the area during late winter, and whose sex could be determined in the field. Prominent among these early transients were such species as the Mallard, Pintail, Golden-eye, Robin, Redwing, Bronzed Grackle, and Cowbird.

At least one out of every eight "half-hardy" individuals that attempted to winter was obviously suffering from a passive or active mechanical injury or from disease. The "cripples" usually first became injured or their disease became pronounced while in the area as transients or summer residents. Because of the defect or pathological condition they failed to migrate during the normal migration period. Injured waterfowl were particularly numerous, for each autumn many were crippled by shot from the guns of hunters. The "cripples" that regained their powers of flight before the lake became ice-covered for the first time had a fair chance of surviving the winter. When ice formed over the lake for the first time "cripples" could be seen in the scattered, small open holes in the ice, which the birds kept open by constantly swimming around in them. The size of the holes depended to a large extent upon the coldness of the weather; when the temperature was about 30° above zero the holes were usually large in size, but when it was nearer 20° the holes were much smaller. The size of the hole was also regulated somewhat by the number of birds.

Although many flightless "cripples" were able to survive a cold period of several hours most of them died when it lasted for more than two consecutive days, as the holes froze over despite efforts of the swimming birds to keep them open. The birds were then trapped or cut off from their food supply, and death soon resulted. Occasionally an individual, usually a puddle duck, left the freezing hole and walked to the shore to seek refuge under a cottage or dock or in a cattail marsh or other cover.

In the colder season all flightless waterfowl perished long before the end of winter; only a few lived through a warm winter. In the extremely warm winter of 1931-32 several "cripples" survived, among these were two Horned Grebes, four Pied-billed Grebes, at least one Ring-necked Duck, two Lesser Scaups, one American Golden-eye, one Red-breasted Merganser and several Coots. The Red-breasted Merganser, a female, was the only individual of its species recorded wintering.

A male Wood Duck and a male Grasshopper Sparrow, "half-hardy" individuals that were injured or diseased, had the power of flight and were

TABLE IV
ONE HUNDRED AND NINETEEN BIRD SPECIES RECORDED BETWEEN
DECEMBER 21 AND FEBRUARY 20

*Lesser Loon	Red-bellied Woodpecker
*Horned Grebe	Red-headed Woodpecker
*Pied-billed Grebe	*Yellow-bellied Sapsucker
*Great Blue Heron	Eastern Hairy Woodpecker
*American Bittern†	Northern Downy Woodpecker
*Canada Goose	*Eastern Phoebe†
*Lesser Snow Goose	*Hoyt's Horned Lark
Mallard	Northern Horned Lark
Black Duck	*Prairie Horned Lark
*Gadwall	Northern Blue Jay
*Balpate	Eastern Crow
American Pintail	Carolina Chickadee
Green-winged Teal	Tufted Titmouse
*Blue-winged Teal	White-breasted Nuthatch
*Shoveller	*Red-breasted Nuthatch
*Wood Duck	Brown Creeper
*Redhead	Eastern Winter Wren
*Ring-necked Duck	*Bewick's Wren
*Canvas-back	Carolina Wren
*Greater Scaup	*Prairie Marsh Wren
*Lesser Scaup	Eastern Mockingbird
American Golden-eye	*Brown Thrasher†
*Buffle-head	Eastern Robin
*Old-squaw	*Eastern Hermit Thrush
*Ruddy Duck	Eastern Bluebird
*Hooded Merganser	Eastern Golden-crowned Kinglet
American Merganser	*Eastern Ruby-crowned Kinglet†
*Red-breasted Merganser	*American Pipit
*Turkey Vulture	Cedar Waxwing
*Eastern Goshawk	*Northern Shrike
*Sharp-shinned Hawk	*Migrant Shrike
Cooper's Hawk	Starling
Eastern Red-tailed Hawk	*Myrtle Warbler
*Northern Red-shouldered Hawk	*Western Palm Warbler
*American Rough-legged Hawk	English Sparrow
Northern Bald Eagle	Eastern Meadowlark
Marsh Hawk	Eastern Redwing
*Duck Hawk	*Giant Redwing
*Eastern Pigeon Hawk	*Rusty Blackbird
Eastern Sparrow Hawk	*Bronzed Grackle
*European Partridge	Eastern Cowbird
Eastern Bob-white	Eastern Cardinal
Ring-necked Pheasant	*Eastern Purple Finch
*American Coot	*Common Redpoll†
*Killdeer	*Northern Pine Siskin
*Wilson's Snipe	Eastern Goldfinch
*Iceland Gull†	*Red-eyed Towhee
Herring Gull	*Savannah Sparrow
Ring-billed Gull	*Eastern Grasshopper Sparrow
*Bonaparte's Gull	Slate-colored Junco
*Eastern Mourning Dove	Eastern Tree Sparrow
Barn Owl	*Eastern Chipping Sparrow
Eastern Screech Owl	*Eastern Field Sparrow
*Great Horned Owl	*White-throated Sparrow
*Snowy Owl	*Eastern Fox Sparrow
Northern Barred Owl	Swamp Sparrow
*Long-eared Owl	Allegheny Song Sparrow
*Short-eared Owl	Lapland Longspur
*Kingfisher	Eastern Snow Bunting
Northern Flicker	

† Recorded since the investigation.

able to remain in winter. The Wood Duck was noted throughout the winter of 1931-32 in the vicinity of the Little Buckeye refuge. Its right wing was injured. This was the only Wood Duck recorded wintering. The Grasshopper Sparrow was collected in an uncut timothy field, a favorable habitat niche, on December 29, 1928. Although able to fly well, its bill and feet were swollen and one foot was minus a toe (see pp. 409-10).

The list of wintering birds.—Table IV lists the species recorded in the area in winter. Those marked with an asterisk were rare or uncommon and were recorded in less than six of the twelve winters. Those without an asterisk were present in fair or large numbers during more than six of the winters.

NESTING AND SUMMERING BIRDS

For convenience, the so-called summer resident species³³ have been separated into two groups: (1) species which nested in the area, and (2) non-nesting species that remained during part or all of one or more summers. Those in the first group are termed nesting species, those in the second are summering species or summer visitants.

Nesting species.—As the abundance and habits of the one hundred and ten nesting species have been treated in the systematic account, this discussion will be confined to a few remarks concerning fluctuations of nesting abundance, territorialism, and the zoo-geographical position of the area as regards nesting bird species.

Observations indicated that the annual nesting number of many species seemingly remained constant throughout the twelve-year period and that the total number of all except a few species fluctuated less during a single summer, than it did during the autumns, winters, or springs. With comparatively few exceptions the yearly fluctuations in the nesting abundance of a species were directly correlated with fluctuations in the available nesting habitat. A decrease in the nesting abundance of one or more species, because of change of habitats, usually resulted in an increase in nesting abundance of those species benefited by this change. Because of this balancing factor the number of nesting pairs for all species during a year tended to remain more or less constant.

Among the nesting birds the so-called resident species appeared to vary most in annual nesting abundance. This fluctuation was especially marked among the species on or near the northern edge of their range that were adversely affected by severe winters. Prominent in this group were the Bobwhite, Tufted Titmouse, Carolina Wren, and Mockingbird.

A few nonresident³⁴ species near the northern edge of their nesting range fluctuated in nesting abundance from year to year. The Yellow-

³³ Late spring or early fall transients were not considered as summer residents.

³⁴ Nesting species that deserted the area during the winter.

breasted Chat varied from a possible one hundred and fifty nesting pairs in 1930 to fifty-five pairs in 1931. This fluctuation seemed in no way related to the variations in amount of available nesting habitat, for in some years every possible nesting site was taken, whereas in others only a few of the better sites were occupied. Apparently during some springs there was a large flight of chats into the area, and in others the flight was small.

There likewise seemed to be a tendency for those nonresident species that were on the southern edge of their nesting range when in the area, to fluctuate in nesting abundance from one year to another. The notably erratic Dickcissel, which was on the eastern edge of its regular nesting range in Ohio, showed a great fluctuation in yearly abundance. This fluctuation was not caused by a change in the amount of available nesting habitat, for each year there obviously were many suitable nesting fields.

Those nonresident nesting species well within their nesting range appeared to be the most constant in their yearly nesting numbers. It was primarily these species which fluctuated in nesting abundance only with and because of a corresponding variation in the amount of nesting habitat. This correlation was as true of the species that were restricted to a few nesting pairs as it was of those which nested in large numbers.

Territorialism.—Only a few general statements will be made concerning territorialism. The male bird of a territorial species defended his territory and was intolerant of other males of his species. Among many species of land birds he advertised his presence in his territory by song.

The territory defended by males of the same species varied slightly in size, whereas the variation in amount of territory occupied by males of different species varied greatly. Among some species which nested in colonies, such as the Prairie Marsh Wren, the actual territory defended by a male was occasionally less than ten feet in diameter. Among more solitary species, such as the Red-shouldered and Cooper's hawks, the territory defended by a male often included an entire woodland of several dozen acres. Boundary limitations seemed to be best developed among those species, such as the Song Sparrow, whose territory was moderate in size; it seemed less developed among those birds whose territory was very small or very large.

With few exceptions territorialism was very pronounced among the smaller land species. It was particularly evident among some of the most numerous nesting species, such as the Alder Flycatcher, White-breasted Nuthatch, Red-eyed Vireo, Yellow Warbler, Northern Yellow-throat, Yellow-breasted Chat, Redstart, and Vesper, Field, and Song sparrows.

The zoo-geographical position of the Buckeye Lake area, from the standpoint of nesting species, can best be illustrated by Table V, where the birds found nesting between 1922 and 1934 are listed. The species marked by an asterisk were found nesting in less than seven of the twelve nesting seasons; those without an asterisk were noted during more than six seasons.

TABLE V

ONE HUNDRED AND TEN BIRD SPECIES FOUND NESTING BETWEEN 1922 AND 1934

*Pied-billed Grebe	Northern Blue Jay
Eastern Green Heron	Eastern Crow
*Black-crowned Night Heron	Carolina Chickadee
*American Bittern	Tufted Titmouse
Eastern Least Bittern	White-breasted Nuthatch
*Mallard	Ohio House Wren
*Wood Duck	*Bewick's Wren
*Turkey Vulture	Carolina Wren
Cooper's Hawk	Prairie Marsh Wren
Northern Red-shouldered Hawk	*Short-billed Marsh Wren
Marsh Hawk	Eastern Mockingbird
Eastern Sparrow Hawk	Catbird
*European Partridge	Brown Thrasher
Eastern Bob-white	Eastern Robin
Ring-necked Pheasant	Wood Thrush
King Rail	Eastern Bluebird
Virginia Rail	Blue-gray Gnatcatcher
*Sora	*Cedar Waxwing
Florida Gallinule	Migrant Shrike
*American Coot	Starling
Killdeer	*White-eyed Vireo
American Woodcock	Yellow-throated Vireo
Bartram's Curlew	Red-eyed Vireo
Spotted Sandpiper	Eastern Warbling Vireo
Eastern Mourning Dove	Prothonotary Warbler
Yellow-billed Cuckoo	Eastern Yellow Warbler
*Black-billed Cuckoo	*Cerulean Warbler
Barn Owl	Ovenbird
Eastern Screech Owl	*Kentucky Warbler
*Great Horned Owl	Northern Yellow-throat
Northern Barred Owl	Yellow-breasted Chat
*Short-eared Owl	American Redstart
*Eastern Whippoorwill	English Sparrow
Eastern Nighthawk	Bobolink
Chimney Swift	Eastern Meadowlark
Ruby-throated Humming Bird	Eastern Redwing
Eastern Belted Kingfisher	*Orchard Oriole
Northern Flicker	Baltimore Oriole
Red-bellied Woodpecker	Bronzed Grackle
Red-headed Woodpecker	Eastern Cowbird
Eastern Hairy Woodpecker	Scarlet Tanager
Northern Downy Woodpecker	Eastern Cardinal
Eastern Kingbird	Indigo Bunting
Northern Crested Flycatcher	*Dickcissel
Eastern Phoebe	Eastern Goldfinch
Alder Flycatcher	Red-eyed Towhee
Acadian Flycatcher	*Savannah Sparrow
Eastern Wood Pewee	Eastern Grasshopper Sparrow
Prairie Horned Lark	Western Henslow's Sparrow
Tree Swallow	Eastern Vesper Sparrow
*Bank Swallow	*Eastern Lark Sparrow
Rough-winged Swallow	Eastern Chipping Sparrow
Barn Swallow	Eastern Field Sparrow
*Northern Cliff Swallow	*Swamp Sparrow
Purple Martin	Allegheny Song Sparrow

Nonnesting summer visitants.—These visitants include species of which no individuals were found nesting, but of which one or more birds were observed to remain throughout part of a summer season. They can be satisfactorily divided according to species whose nesting range was nearly always or entirely south of Ohio, and species whose nesting range was north of the Buckeye Lake area in Ohio, or which nested in the vicinity of the area.

The first group contained the American Egret, Snowy Heron, and Little Blue Heron. The herons were irregular in their visitations.

All except one of the second group were waterbirds:

Lesser Loon	Osprey
White Pelican	Eastern Solitary Sandpiper
Great Blue Heron ³⁵	Least Sandpiper
Black Duck ³⁶	Semipalmated Sandpiper
Blue-winged Teal ³⁵	Bonaparte's Gull
Ring-necked Duck	Common Tern
Lesser Scaup Duck	Caspian Tern
Hooded Merganser	Black Tern
American Merganser	Northern Pileated Woodpecker
Red-breasted Merganser	

Various nonnesting species and some nonnesting individuals of recorded nesting species remained throughout one or more summers in the area. They belonged to one or more of the following groups.

1. Some individuals were rendered flightless while in the area. During the investigation, all loons, at least one Black Duck, one Blue-winged Teal, two Ring-necked Ducks, one Hooded Merganser, and one Red-breasted Merganser remained throughout a summer because of inability to fly.

2. Some individuals of several species were rendered temporarily flightless during the spring migration, but remained throughout the following summer even though they had fully regained their powers of flight by late spring.

3. A few individuals remained that had become diseased or injured during their spring migration through the area. These birds were usually in wretched plumage, and their external sexual characteristics were often poorly developed.

4. Many immature birds whose general appearance indicated a normal condition were observed summering in the area. All except a few of the Bonaparte's Gulls and the Caspian, Black, and Common terns noted were of this type.

5. A considerable proportion of the Great Blue Herons nested or were raised within a few miles of the area.

6. Two species, the White Pelican and Pileated Woodpecker, were temporary summer visitors.

³⁵ Nested in the area in historic times before 1922.

³⁶ Was found nesting after 1933.

Observations on summering birds.—Summering birds incapable of flight were markedly pathological or were immature and displayed little or no desire to begin their courtship and nesting cycles. This was not true of some summering adults whose mechanical injury or pathological condition of the previous spring had ceased to affect them seriously and who had apparently regained full physical vigor. Such summering individuals, though outside of their nesting range, gave many indications of a desire to begin their courtship and nesting cycles. This was particularly true of duck species. Little seems to have been written concerning the actions of such summering birds, and it therefore appears desirable to record a few observations.

In late March, 1925, I found upon several days a male American Merganser swimming about at the western end of the lake. It was unable to fly because of an injured right wing. By mid-May the bird could fly again, but it did not migrate to its nesting ground. It soon began to spend a considerable portion of each day flying about over the lake, calling persistently, and in other ways indicating a desire to find a mate. Upon finding a late spring transient or summering duck of any species upon the water, the merganser began a courtship performance that consisted principally of puffing out the breast and swimming at great speed toward or in front of the object of attention, of jerking and bobbing the head, of persistently calling "krr-krr," and of kicking backward with one foot so as to project a jet of water as much as five feet behind him. This drake courted the Red-breasted Merganser, Blue-winged Teal, Wood Duck, and Lesser Scaup with seemingly the same persistency, and it was obvious that had a female American Merganser been present the pair might have mated and nested even though outside of their normal breeding range.

Besides the American Merganser summering drakes of such species as Black Duck, Ring-necked Duck, Lesser Scaup Duck, and Hooded Merganser, attempted to court ducks of other species.

Elsewhere in Ohio I have seen drakes attempting to court ducks of other species, and in most instances the drakes had been previously injured. A drake Baldpate was observed for several hours on June 7 and 9, 1932, in Toussaint Marsh, Ottawa County, Ohio. This bird, which flew in a faltering manner, spent most of his time in attempting to court passing female and male Black Ducks, Mallards, and Blue-winged Teals. Whenever a solitary duck or a female accompanied by one or more males, passed within two hundred yards of the Baldpate, he immediately started in pursuit. Upon overtaking the duck, or the leading duck if there was more than one, the Baldpate attempted to pass directly over and in front of it, and upon succeeding set and decurved his wings, threw his head backward against his back, spread his tail, and in other ways displayed his bright colors to advantage. While

in pursuit of other ducks and throughout courtship performances the Baldpate repeatedly called "whew whew whew." If he displayed before a female, she often began to quack loudly, just as when courted by a drake of her own species. If the Baldpate displayed before a female accompanied by one or more males of her own species the male or males would immediately begin to chase the Baldpate away or to attempt to prevent him from courting the female. When a male was chasing the Baldpate he seldom or never attempted to display before the female as he did when pursuing a male of his own kind but directed all of his energy toward driving the alien away.

From observations of the courtship behavior of the American Merganser, Baldpate, and drakes of other species, I conclude that probably such drakes may occasionally succeed in mating with individuals of other species, and that in some combinations of species such meetings might produce hybrids.

According to the old sportsmen and market hunters, when spring shooting of ducks was permitted in former years, there were many "cripples" sum-mering,³⁷ and during those years the men saw adult Gadwall, Baldpate, Green-winged Teal, Redhead, Ring-necked Duck, Canvas-back, Lesser Scaup Duck, and Ruddy Duck with broods of young. It may have been true that some crippled individuals of these species nested in the area during the days of spring shooting.

ECOLOGICAL NESTING SUCCESSIONS OF BIRDS IN THE SWAMP LOWLANDS

Realizing that the last of the lowland swamps north and west of the lake might soon disappear as the "Great Swamp" had done previously, I gave special consideration to the few remaining remnants of swamps, so that some understanding of the nesting successions of birds, from wet meadow to swamp forest, might be obtained. It was fascinating to observe the correlations between bird and plant successions, to watch each stage succeeded by another, and to note the relative stability of climax conditions. Fortunately, there was abundant opportunity to check each succession many times.

One tract of land was studied in particular, and it will be used to illustrate plant and nesting successions for a ten-year period beginning in 1922, and also for a hypothetical period from the end of the first ten years until the climax swamp forest condition will be attained. The thirty-five acre tract was situated in the west central portion of section 15, Union Township, Licking County, on the eastern side of the canal and north of the Big Woods. It was typical of those lowlands northwest of the lake that did not contain a sphagnum-cranberry bog-swamp in recent years. There was no more than a ten-foot difference between the highest and lowest elevations. The tract was roughly rectangular in shape, with its greatest length lying east and

³⁷In 1912 I saw a crippled female Canvas-back with several small young. These young were apparently Canvas-backs.

west. In the lowest portion, at the western end, swampy conditions have always prevailed, even with the best drainage possible. Here the ground was black in color and consisted primarily of a low grade of peat. The highest elevation was a low, ground moraine at the eastern end composed largely of light yellowish gray silt loams with a large amount of glacial gravel. Between the ends the soil was primarily a silt loam containing only a little exposed glacial gravel and, in color, shaded from light yellowish gray in the higher and more exposed parts through gray to black in the depressions. The canal, a few other swampy areas, and the remnant swamp forest to the south were near the tract, and the necessary seed plants for the natural migration, invasion, and establishment of swamp meadow, brushy swamp, and swamp forest were available.

Attempts at cultivating this tract had been made for many years previous to 1921, when it was planted partly in corn and the rest in meadow grasses, chiefly blue grass (*Poa pratensis*). In 1922 cultivation was discontinued and the tract was abandoned, except for a little grazing, until the end of the investigation. In this year a bulrush-sedge (*Scirpus-Carex*) community appeared in the swampy parts. In the drier parts there came a grass-pioneer weed association, comprising blue grass, various coarser grasses, and other herbs, some of the most prominent of which were blue vervain (*Verbena hastata*), white heath aster (*Aster ericoides*) and other asters, Canada goldenrod (*Solidago canadensis*) and other goldenrods, boneset (*Eupatorium perfoliatum*), and swamp milkweed (*Asclepias incarnata*).

In 1923 the Redwing was the principal nesting species in the wettest portions where the bulrush-sedge community flourished. The Bobolink nested about the edges of the swamper parts where the bulrush-sedge community merged into that of the blue grass-coarse grass-pioneer weed. The Song Sparrow nested in all except the wettest portions of the Bobolink's nesting area and also nested farther into the coarse grass-pioneer weed community. The few pairs of Grasshopper Sparrows nested in the most luxurious portion of the blue grass-coarse grass-pioneer weed association. The Meadowlark nested chiefly in the partially abandoned blue grass pasture and showed a slight preference for the drier and better-drained portion. The Killdeer nested on the more exposed slopes of the gravelly ground moraine which was sparsely covered with plants, and the Vesper Sparrow occupied the crest of the moraine where there was the best drainage and the least vegetation.

In 1924 both the bulrush-sedge and the grass-pioneer weed associations flourished, and the plants grew rank and tall. Blackberry bushes (*Rubus alleghaniensis* and *R. occidentalis*) and swamp rose (*Rosa carolina*) sprouts began to appear in numbers. A few seedlings of the white elm (*Ulmus americana*), slippery elm (*U. fulva*), red maple (*Acer rubrum*), and silver maple (*A. saccharinum*) appeared in the wetter portions, and the honey

locust (*Gleditsia triacanthos*), pin oak (*Quercus palustris*), and hawthorns (*Crataegus* sp.) in the remainder.

There were fewer Meadowlarks, Killdeers, and Vesper Sparrows, because of the encroachment of plants of the pioneer weed type. The Redwing increased markedly in the flourishing bulrush-sedge community. The Bobolink's numbers remained about the same, though the birds were forced back slightly from the swamp toward the outer border. The number of Song Sparrows increased, invading both the higher ground with its increasing vegetation and penetrating into the wetter sections where large clumps of bulrushes and sedges had become established. The Goldfinch, Northern Yellow-throat, and Kingbird invaded the tract. Had the swamp portion been more extensive such species as the Marsh Hawk, King Rail, Least Bittern, and Short-billed Marsh Wren might have nested in it at this time.

By 1929 the greater portion of the tract had become a thicket. Sapling elms of two species, two soft maples, black ash (*Fraxinus nigra*), button bushes (*Cephalanthus occidentalis*), arrowwood (*Viburnum dentatum*), red osier dogwood (*Cornus stolonifera*), and silky dogwood (*C. amomum*) had begun to dominate the swampy region, forcing out the bulrush-sedge community. Rosebushes and blackberry clumps had become well established. The middle section was slightly more open than the rest, and contained coarse grasses and other herbs interspersed with small groups or solitary honey locust and pin oak saplings. The higher land was thickly dotted with groups of sapling elms, white ash (*Fraxinus americana*), pin oak, honey locust, hawthorns, and clumps of blackberry and rosebushes. On this high ground there still remained isolated remnants of the high grass-pioneer weed community. Scattered throughout the entire tract were poison ivy (*Toxicodendron radicans*), bittersweet (*Celastrus scandens*), grape (*Vitis labrusca* and *V. aestivalis*) vines, and elderberry bushes (*Sambucus canadensis*).

As was to be expected, the modification of the flora in 1929 resulted in a change in the nesting bird fauna. The Meadowlark, Killdeer, and Vesper Sparrow had disappeared or were very rare. The Bobolink and Grasshopper Sparrow, inhabitants of brushless, high, coarse grass-pioneer weed communities were almost gone. The Redwing, because of its ability to nest in the small buttonbushes and other small trees as well as in a bulrush-sedge community, had maintained its numbers. The Song Sparrow had increased until it occupied all except the wettest, driest, or brushiest parts of the tract, and the Goldfinch and Northern Yellow-throat had increased until both could be considered prominent nesting species.

Many other birds had invaded the territory by 1929 and, with the above mentioned ones, had increased the number of nesting species to more than three pairs of birds an acre. Alder Flycatchers and Yellow Warblers had

begun to nest in the bushes and small trees in the swamp. The Bob-white, Ring-necked Pheasant, and Woodcock occupied the more open areas, and the Mourning Dove, Robin, Catbird, Yellow-breasted Chat, Cardinal, Indigo Bunting, Towhee, and Field Sparrow nested in and about the thickets. Brown Thrashers nested in the honey locusts and hawthorns. Cowbirds, attracted by the increased numbers of nests, were conspicuous throughout the nesting season.

By 1932, ten years after the tract's abandonment, the center of the swamp had become a buttonbush community, and along its edges were black willow (*Salix nigra*), elms of two species, and the two soft maples. The more open and better-drained middle section contained scattered saplings and small honey locust, hawthorn, and pin oak trees, under whose shade the pioneer weed community had died out. A thrifty thicket of white elm, pin oak, red oak (*Quercus rubra*), two species of soft maples, a few black ash, and a number of white ash and cottonwood (*Populus deltoides*) occupied the middle and higher ground. The highest trees reached a maximum height of twenty feet. A few white oak (*Quercus alba*), black maple (*Acer nigrum*), and sugar maple (*A. saccharum*) seedlings were to be found on the highest ground. The rosebush-blackberry clumps were slightly smaller, for the increased shade from the larger saplings had begun to starve them out.

The nesting population had changed since 1929. The Bobolink and Grasshopper Sparrow were gone. The Redwing was restricted to the center of the swamp where the smaller buttonbushes grew. The Song Sparrow had been crowded out of the denser and larger central brushy areas, and the Northern Yellow-throat and Goldfinch were concentrated in the more open spaces. Alder Flycatchers and Yellow Warblers retained their earlier numbers and nested in the small trees and bushes of the wettest sections. The Bob-white and Ring-necked Pheasant were restricted to the remnant pioneer weed communities adjacent to the thickets, and the Mourning Dove, Catbird, Thrasher, Robin, Yellow-breasted Chat, Cardinal, Indigo Bunting, Towhee, and Cowbird had maintained their numbers or had increased. The Field Sparrow had become very numerous. A pair each of Green Herons and Yellow-billed Cuckoos nested in the area.

From the many observations of the remainder of the swampy lowlands it is not difficult to predict the changing of the above tract from its 1932 condition into a swamp forest association. In this hypothetical treatment of the tract it must be assumed that drainage conditions and plant associations will remain the same, and it must be borne in mind that the tract will not be intensively grazed and that environmental conditions in the immediately surrounding swamps and remnant woodlands are to remain as they

were between 1921 and 1932, especially as regards drainage.³⁸ A complete draining of the swamp portions, such as is now under way, will greatly change the type of vegetation, and modify the nesting bird population.

Twenty years after the tract's abandonment, in 1942, the bulrush-sedge community will have been largely replaced by the willow, elm, soft maple, black ash, swamp white oak (*Quercus bicolor*), and honey locust group. Only a few buttonbushes will remain. The more open spaces between the honey locusts and pin oaks in the middle sections will contain seedlings and small trees of white oak, two species each of soft maples, ashes, and elms, cottonwood, blue beech (*Carpinus caroliniana*), and hop hornbeam (*Ostrya virginiana*). The thicket on the highest ground will resemble a secondary forest, and many of the smaller saplings that formed the first thicket will have been starved out and killed. The beech (*Fagus grandifolia*) will probably have made its appearance in the middle and higher sections.

The species and numbers of nesting birds will also have changed. The Redwing will no longer be a prominent bird and may be absent. The Song Sparrow will have decreased in numbers and will be found chiefly in the less wooded and more open sections. The Alder Flycatchers will possibly be gone, and the Yellow Warblers will be restricted to the edges of the thickets and the openings between them. The Goldfinches will have decreased in numbers, and the Bob-white and Ring-necked Pheasant, if present, will be confined to the more open portions. The Mourning Dove, Catbird, Cardinal, Towhee, and Cowbird will have maintained their numbers rather well. The Woodcock, Brown Thrasher, Robin, Yellow-breasted Chat, Indigo Bunting, and Field Sparrow will all have shown some decrease; at least they will be restricted to the brushier situations about the openings. A few Red-eyed Vireos may have made their appearance by this time.

The first trees in this area, especially the soft maples and willows, will contain some dead timber, and a few trees will be entirely dead; therefore hole-nesting species, such as the Carolina Chickadee and Downy Woodpecker, and possibly the White-breasted Nuthatch, should be present. The Carolina Wren may also be represented.

After thirty-five years of abandonment, in 1957, the tract will have taken on the appearance of a rather well-developed swamp forest. All that will remain of the swampy portion, which at first contained the bulrush-sedge community, will be a depression in which a woodland pool will be present during the wettest portion of the year. The elm-ash-soft maple

³⁸ Between 1934 and 1938 this tract was greatly altered by further drainage, brush removal, and grazing. In 1939 an act was passed by the General Assembly of Ohio, authorizing the building of a large federal fish hatchery on the tract and adjacent area, and work upon this project was begun in the same year. Because of these changes my predictions cannot be fulfilled.

blue beech community will dominate in this lower section. Throughout the middle portion the two species of elms, two or three species of ash, the two soft maples, the pin, swamp white, and red oaks, and beech will largely dominate. On the morainal ridge the white oak-hard maple association will prevail. The plants typical of the pioneer weed community will be almost gone. The shrub layer will be dominated by the spicebush (*Benzoin aestivale*) and its forest floor associates, such as the wood nettle (*Urticastrum divaricatum*) and jewelweed (*Impatiens biflora*), will have become abundant. There will be a ground mat of leaves.

The brushy thicket- and field-nesting birds will have been largely crowded out or restricted to the edges of the thickets and woods or to the openings, and the birds of the climax swamp forest will have begun to dominate. The Song Sparrow, Yellow Warbler, Goldfinch, Thrasher, Yellow-breasted Chat, Indigo Bunting, and Field Sparrow will have left the forest proper and will have confined themselves to the edges. The Mourning Dove, Catbird, Cardinal, Towhee, and Cowbird will maintain their numbers or will slightly decrease, and the Carolina Chickadee, Downy Woodpecker, White-breasted Nuthatch, Carolina Wren, and Red-eyed Vireo will have become well established.

The most recent invaders will be Cooper's Hawk, possibly the Red-shouldered Hawk, Screech Owl, possibly the Barred Owl, Flicker, possibly the Red-bellied Woodpecker, Hairy Woodpecker, Crested Flycatcher, Acadian Flycatcher (in the beech-hard maple portion), Wood Pewee, Blue Jay, Crow, Wood Thrush, Blue-gray Gnatcatcher, possibly the Yellow-throated Vireo and Ovenbird (in the wetter portion), and Redstart. A few Bluebirds and Red-headed Woodpeckers may be found about the openings or edges of the forest, provided these openings are sufficiently large and contain proper nesting sites.

Fifty years or more after the tract was last cultivated the mature swamp forest will have become firmly established. On the highest ground the beech-white oak-hard maple association should also be well established. The typical spicebush community should prevail in the shrub layer, especially on the lower ground if some grazing is done, and a well-formed ground mat of leaves and humus should cover the entire forest floor. As is usual in these lowland woods there will be some dead and down timber, and short-lived trees, such as the soft maples, will offer nesting sites for hole-nesting species—owls, woodpeckers, titmice, and nuthatches.

The typical swamp forest birds of this region will dominate—the Wood Duck, Cooper's Hawk, Red-shouldered Hawk, Barred Owl, Flicker, Red-bellied Woodpecker, Hairy Woodpecker, Downy Woodpecker, Acadian Flycatcher, Wood Pewee, Blue Jay, Carolina Chickadee, Tufted Titmouse, White-breasted Nuthatch, Wood Thrush, Blue-gray Gnatcatcher, Yellow-

TABLE VI (Continued)

	J	F	M	A	M	J	J	A	S	O	N	D
Green-winged Teal	-	-	-	-					-	-	-	-
Blue-winged Teal	-	-	-	-	-	-	-	-	-	-	-	-
Cinnamon Teal				-								
Shoveller	-	-	-	-	-				-	-	-	-
Wood Duck	-	-	-	-				-	-	-		-
Redhead	-	-	-	-							-	-
Ring-necked Duck	-	-	-	-	-	-	-	-	-	-	-	-
Canvas-back	-	-	-	-							-	-
Greater Scaup Duck		-									-	-
Lesser Scaup Duck	-	-	-	-	-	-	-	-	-	-	-	-
American Golden-eye		-	-	-								-
Buffle-head	-	-	-	-	-							-
Old-squaw	-	-	-	-								-
American Eider											-	
King Eider												-
White-winged Scoter			-	-							-	-
Surf Scoter				-							-	-
American Scoter			-	-							-	-
Ruddy Duck	-	-	-	-	-	-	-	-	-	-	-	-
Hooded Merganser	-	-	-	-	-	-	-	-	-	-	-	-
American Merganser	-	-	-	-	-	-	-	-	-	-	-	-
Red-breasted Merganser	-	-	-	-	-	-	-	-	-	-	-	-
Turkey Vulture	-	-	-	-	-	-	-	-	-	-	-	-
Black Vulture				-								
Eastern Goshawk	-	-	-									-
Sharp-shinned Hawk				-								-
Cooper's Hawk	-	-	-	-	-	-	-	-	-	-	-	-
Eastern Red-tailed Hawk	-	-	-	-	-	-	-	-	-	-	-	-
Northern Red-shouldered Hawk	-	-	-	-	-	-	-	-	-	-	-	-
Broad-winged Hawk				-	-				-			
American Rough-legged Hawk	-	-	-	-							-	-
Golden Eagle												-
Northern Bald Eagle	-	-	-						-	-	-	-
Marsh Hawk	-	-	-	-	-	-	-	-	-	-	-	-
Osprey				-	-	-	-	-	-	-	-	-
Duck Hawk	-	-	-	-	-				-	-	-	-
Eastern Pigeon Hawk				-	-				-	-	-	-
Eastern Sparrow Hawk	-	-	-	-	-	-	-	-	-	-	-	-
European Partridge	-	-	-	-	-	-	-	-	-	-	-	-
Eastern Bob-white	-	-	-	-	-	-	-	-	-	-	-	-
Ring-necked Pheasant	-	-	-	-	-	-	-	-	-	-	-	-
Sandhill Crane										-		

TABLE VI (Continued)

	J	F	M	A	M	J	J	A	S	O	N	D
King Rail				-	-	-	-	-	-	-	-	
Virginia Rail				-	-	-	-	-	-	-	-	
Sora				-	-	-	-	-	-	-	-	
Yellow Rail				-	-							
Black Rail						-						
Florida Gallinule				-	-				-	-	-	
American Coot	-	-	-	-	-	-	-	-	-	-	-	-
Piping Plover									-	-	-	
Semipalmated Plover					-	-		-	-	-	-	
Killdeer	-	-	-	-	-	-	-	-	-	-	-	-
American Golden Plover				-	-				-	-	-	
Black-bellied Plover									-	-	-	
Ruddy Turnstone					-	-			-	-	-	
American Woodcock		-	-	-	-	-	-	-	-	-	-	
Wilson's Snipe	-	-	-	-	-			-	-	-	-	-
Long-billed Curlew						-						
Hudsonian Curlew					-	-						
Bartram's Curlew				-	-	-	-	-	-	-	-	
Spotted Sandpiper				-	-	-	-	-	-	-	-	
Eastern Solitary Sandpiper				-	-	-	-	-	-	-	-	
Western Willet									-	-	-	
Greater Yellowlegs			-	-	-	-	-	-	-	-	-	-
Lesser Yellowlegs			-	-	-	-	-	-	-	-	-	-
American Knot					-							
Pectoral Sandpiper			-	-	-			-	-	-	-	-
White-rumped Sandpiper					-	-	-	-	-	-	-	
Baird's Sandpiper					-			-	-	-	-	
Least Sandpiper					-	-	-	-	-	-	-	
Red-backed Sandpiper					-	-				-	-	-
Eastern Dowitcher					-	-			-	-	-	
Stilt Sandpiper							-	-	-	-	-	
Semipalmated Sandpiper					-	-	-	-	-	-	-	
Western Sandpiper								-	-	-	-	
Buff-breasted Sandpiper									-	-	-	
Marbled Godwit										-	-	
Ruff												-
Sanderling					-			-	-	-	-	
Red Phalarope											-	-
Wilson's Phalarope					-							
Northern Phalarope									-	-	-	
Parasitic Jaeger									-	-	-	
Long-tailed Jaeger									-	-	-	

TABLE VI (Continued)

	J	F	M	A	M	J	J	A	S	O	N	D
Olive-sided Flycatcher						---			--			
Hoyt's Horned Lark	---	---	---									
Northern Horned Lark			█								█	
Prairie Horned Lark	---	---	█							█	█	---
Tree Swallow				█	█	█	█	█	█			
Bank Swallow				█	█			█	█			
Rough-winged Swallow				█	█	█	█	█	█			
Barn Swallow				█	█	█	█	█	█			
Northern Cliff Swallow				█	█	█	█	█	█			
Purple Martin				█	█	█	█	█	█			
Northern Blue Jay	█	█	█	█	█	█	█	█	█	█	█	█
Eastern Crow	█	█	█	█	█	█	█	█	█	█	█	█
Carolina Chickadee	█	█	█	█	█	█	█	█	█	█	█	█
Tufted Titmouse	█	█	█	█	█	█	█	█	█	█	█	█
White-breasted Nuthatch	█	█	█	█	█	█	█	█	█	█	█	█
Red-breasted Nuthatch	---	---	---							---	---	---
Brown Creeper				█	█						█	
Ohio House Wren				█	█	█	█	█	█			
Eastern Winter Wren			█	█	█						█	
Bewick's Wren	---	---	---									
Carolina Wren	█	█	█	█	█	█	█	█	█	█	█	█
Prairie Marsh Wren	---	---	---	█	█	█	█	█	█			
Short-billed Marsh Wren												
Eastern Mockingbird	---	---	---	---	---	---	---	---	---	---	---	---
Catbird				█	█	█	█	█	█			
Brown Thrasher				█	█	█	█	█	█			
Eastern Robin	█	█	█	█	█	█	█	█	█	█	█	█
Wood Thrush				█	█			█	█			
Eastern Hermit Thrush				█	█					█	█	---
Olive-backed Thrush				█	█					█	█	
Gray-checked Thrush				█	█					█	█	
Veery and Willow Thrush				█	█					█	█	
Eastern Bluebird	---	---	---	█	█	█	█	█	█	█	█	---
Blue-gray Gnatcatcher				█	█	█	█	█	█			
Eastern Golden-crowned Kinglet				█	█						█	█
Eastern Ruby-crowned Kinglet				█	█						█	█
American Pipit				█	█					█	█	---
Cedar Waxwing	---	---	---	---	---	---	---	---	---	---	---	---
Northern Shrike												
Migrant Shrike	---	---	---	---	---	---	---	---	---	---	---	---
Starling	█	█	█	█	█	█	█	█	█	█	█	█
White-eyed Vireo				█	█	█	█	█	█			

SOURCES OF ORNITHOLOGICAL AND OTHER DATA UPON WHICH THIS
REPORT IS BASED

Published information concerning general conditions during the various periods of historic time was secured from many journals. Information was obtained from the writings of Smith (1870);³⁹ Gist (1893); Graham (1883); Hill, Jr. (1881); Howe (1902); Huntington and McClelland (1905); Kilbourn (1832); Schaff (1905); and Smucker (1876).

Published interglacial and postglacial history was obtained from the writings of Cole (1934); Davis (1899); Detmers (1912*a*); Lanborn (1932); Leverett (1902); Read (1878); Sharp (1932); Stout and Lamb (1938); Tight (1894 and 1903); White (1934), and Wright (1884). Much data concerning the flora came from publications of Dachnowski (1911 and 1912); Detmers (1912*b*); Graham (1883); Hill, Jr. (1881); and Schaff (1905). Information upon climatic conditions was obtained chiefly from Alexander (1929).

The first reference to any bird species in or near the Buckeye Lake area was made by Smith (1870: 21), who stated that in 1755 he hunted turkeys in the vicinity of the "Great Swamp." The next definite reference accompanied by a year date, was made by the Reverend Howe (Schaff, 1905: 151). Concerning the circular hunt of 1825 Howe mentioned the killing of "sixty or seventy turkeys" and one owl. The next specific references to birds were made by Schaff (1905), who mentioned observing many species in or near the Buckeye Lake area between 1840 and 1858. Schaff's references to the bird life of mid-historic time are very important, and for the most part are apparently reliable; his statements agree in most respects with those of recognized Ohio ornithologists of the same period. All other references to birds between 1755 and 1850 were made by historians. These writers were not particularly interested in birds; consequently many of their references were unaccompanied by dates, and a few were obviously erroneous.

James M. Wheaton (1882) appears to be the first recognized ornithologist to visit the area and to record his findings. His observations were made principally between the years 1860 and 1882. About 1870 Theodore Jasper began collecting birds in the area. He was a physician by profession and an ornithologist of rare ability. Unfortunately, he published little concerning his findings. He did leave a fine collection of mounted birds and bird skins, many of which were from the Buckeye Lake area. Many skins of the Jasper collection are now in the Ohio State Museum.

During the last two decades of the nineteenth century Oliver Davie, a taxidermist of Columbus and a recognized ornithologist, visited the area and recorded a few birds which he or others found. About 1887 Thomas M. Earl, a former Columbus taxidermist, began recording data on all bird specimens

³⁹ See "Literature Cited," for complete citations.

he mounted or skinned, a practice he continued for more than forty-five years. He accumulated many interesting records of birds captured in the area. Upon learning of my intention of investigating the bird life there he kindly loaned me his data with full permission to use them.

During the last few years of the nineteenth century and the first few of the present one, Lynds Jones (1903) of Oberlin College and the late William L. Dawson (1903), then of Columbus, made occasional visits to Buckeye Lake. About 1900 I. A. Field (1903), then a student of Denison University, studied the birds in Licking County. His investigations included the part of the Buckeye Lake area in that county. Upon a few occasions in 1907 and 1908 Edward L. Rice, of Ohio Wesleyan University, visited the lake to observe birds. He has kindly given me the use of his unpublished records.

In May, 1908, Edward S. Thomas, Curator of Natural History, Ohio State Museum, began to make observations and records of birds in the area, and to collect nests and eggs. Since 1908 he has made frequent trips to the area. He has given me full use of his records, and many of his observations are in the present report. In 1917 Charles F. Walker and Frederick Wood, then of Columbus, visited the area to observe birds. They continued to record their observations for several years. About the same time Arthur R. Harper visited the lake and recorded observations. In the spring of 1917 the Columbus Audubon Society began to make field trips to Buckeye Lake for the purpose of observing birds. Several members have kept records of observations. In December, 1921, the Wheaton Club of Columbus was organized for "the scientific study of natural history with special reference to ornithology" (Geist, 1928: 5). From its beginning its members have made frequent visits to the area to observe its bird life.

About 1922 classes in ornithology from Ohio State University began to observe birds. During the early years the late James S. Hine was in charge of these trips; later E. L. Dakan took charge. A few observations made on these field trips have been incorporated in my report.

Much information was obtained from several old residents of the area or from sportsmen and former market hunters. Chief among this group were William Harlow and Stephen Holtzberry, both of whom have hunted and fished in the area since about 1870. The late Earl McPeak and Louis L. Ludwig, conservation officers during part of the period of my investigation, made many observations.

From 1906 I have written record of my own association with the area. From that year until 1912 I made infrequent trips into the area, chiefly for the purpose of fishing. From 1913 the number of trips increased slowly each year until the beginning of the investigation in 1922. Throughout these years I kept brief records of general conditions, but did not regularly put down my observations of birds.

On February 1, 1922, Edward S. Thomas, Charles F. Walker, and I visited the area for the purpose of observing and recording birds, and on this day my twelve-year investigation began. During these twelve years I made observations upon 541 days. I spent the least number of days a year in 1926 and 1927, with twenty-nine days each; the largest number of days was in 1929 (sixty-nine) and in 1928 (sixty-eight). The average for the period was slightly more than forty-five days a year. The length of time spent a day in observing birds varied from two to seventeen hours; the usual period was five to nine hours.

The days afield were rather well spaced throughout each year, though there was a slight average increase in number of days between April 20 and July 1. During the years before 1925 there was a slight concentration of field work during waterfowl migrations and the latter half of the nesting seasons. Between 1925 and 1930 the greatest amount of field work was done in late spring, summer, and early fall. Between 1931 and 1933 there was a slight concentration of field work during winter.

I traveled from one part of the area to another chiefly by automobile and by boat. It was possible to travel between any two points of land in the area in less than an hour, and a general survey with ample time for examining the better situations on foot could be made in a day. A boat could be rowed around the lake in a day, and when an outboard motor or motorboat was used the trip could be completed in half a day. Because of the narrowness of the lake it was possible to identify, while standing on land and with the aid of a field glass or telescope, many of the birds that were upon or over the central parts of the lake.

Usually, more of the land area was covered in winter. In the average winter most observations on the lake were made from shore, or by walking out on the ice. With the beginning of the northward migration, and throughout March and April, a considerable portion of a day afield was spent in observing birds from a boat and in investigating marshes and woodlands adjacent to the lake. In late spring the time spent on the open waters of the lake was much less than that spent during early spring; in the latter part of this season I worked most of the average day in the marshes, woodlands, and fields. At this period more of each day was employed in observing the habits of nesting birds than in listing species. During July, August, and September much of the average day was spent in hunting for and in making observations of the shore birds and other species attracted to the peat islands and mud flats and of the summer resident species and early fall transients inhabiting the weedy, brushy fields and woodlands. In October the marshes and open waters of the lake began to demand attention because of the increasing number of waterfowl transients, and in November more than half of the time was spent observing water birds.

Throughout the twelve years a record was kept of each day afield, in which was given a list of all species of birds seen, the number of each species identified, data concerning specimens collected, general weather conditions, and the names of persons accompanying me. A second set of records was kept in notebook form, which described the habits of birds, their nests or eggs, the lag or earliness of the season, and the stage and condition of the vegetation. A third set of records in diary form gave a running account of each day's trip and included a statement of the localities visited, the stage of the water levels of the lake and streams, and the habits of animals other than birds.

The many diverse bird habitats in the area made possible a varied bird life, and the ease in reaching and investigating these habitats made possible the recording of most of the regular species present during any day. Between twenty and forty species were recorded during an average winter's field trip. The number recorded a day fluctuated considerably, probably because the number of species wintering varied so greatly from one year to another. In eight field trips taken between January 1 and February 14 of the exceedingly warm 1931-32 winter, the average number of species recorded a day was 49.8; the largest number was 63 (January 1), and the lowest 33 (January 17). In the unfavorable winter of 1928-29 the number of species present was much lower, for during seven field trips between January 1 and February 14 there was an average of only 30.4 species a day; the largest number was 35 (February 2), and the smallest was 23 (January 5).

During the average field day in winter no attempt was made to obtain as large a daily list as possible; rather the day was spent in observing a few species or in studying individuals or groups. Upon a few days of each winter a census was taken to record as many species as possible. On census days between December 20 and February 15 from thirty-five to sixty-five species were usually recorded. The largest number recorded for a winter's day was seventy-four; this was on December 22, 1931 (Trautman, 1932a: 60). The number, although very large for winter, did not include all species present on that day, for at least five winter residents were not recorded. From a study of the species present before and after December 22, it is concluded that on that day there may have been as many as eighty species present. The number of individuals recorded on the average winter day usually ranged between one thousand and twenty-five hundred.

During the average field trip in early spring I usually recorded between forty and sixty species. No attempt was made to record as many species as possible during the average field trip. The largest number of species recorded in an early spring census was seventy-six; this occurred during the exceedingly large waterfowl and early land bird migration of March 18,

1928. On that day the number of individuals identified was 6,990. The number of individuals usually recorded during an average noncensus day was between fifteen hundred and three thousand.

In late spring between sixty and ninety-five species were recorded during the average day. During late spring and summer little effort was made to list all species present, and a greater portion of each day was spent in observing nesting birds. During census days between 100 and 135 species were usually recorded. The largest number recorded in a day was on May 11, 1929, during a huge migration of small land birds. Between 6:30 A.M. and 5:00 P.M. of May 11, I recorded 156 species and identified 2156 individuals. On that day there were more species in the area than those noted, for I failed to find at least ten species which were undoubtedly present. It appears probable that as many as 180 species were in the area during this migration. On the average late spring day between fifteen hundred and three thousand individuals were identified.

Between thirty-six and sixty species were listed during the average field day in June and early July. On a census day between seventy-five and ninety species were usually recorded. The largest number in this season, ninety-four species, was seen on June 2, 1928. On that day 1502 individuals were listed. The number recorded on the average day's trip, less than twelve hundred individuals, was lower than that for any other season. This low average number was caused by the comparatively short period of each day that I spent in recording individuals, the smaller amount of territory investigated, and the absence of large flocks of birds.⁴⁰

The largest number of species seen during a midsummer census was ninety-two; this was on August 9, 1930. The number of individuals recorded on August 9 was 2097, a very high figure for that season. On that day there was present a large number of nonnesting summering visitors and early southbound transients.

Between forty and seventy-five species were recorded on the average field trip in early fall. On a census day between 85 and 110 species were usually listed. The largest number ever recorded at this season was 130 species; this was during a large migration of small land birds on September 29, 1928. On that day 1848 individuals were identified. During the height of the southward migration there were fewer species recorded a day than at a similar time in the spring. This condition was caused by the greater ease in recording certain species in the spring. Individuals of many uncommon or rare land bird species were conspicuous and readily noted in spring because of their song; in fall these species did not sing and were much less often recorded. The bright breeding plumage of many species was readily

⁴⁰ In a given length of time it was possible to record more individuals of a species that occurred in flocks, than it was to record "singles" or pairs throughout the area.

identified among the rather sparse vegetation of spring, but the more obscure and less diagnostic plumages in the fall were much more difficult to identify, especially amid the profuse vegetation of the early part of that season. During a census day in the early fall I failed to record as many resident species, or species known to be in the area, as I did in the spring. Because of greater difficulty in observing fall birds it was concluded that in spite of the fewer species recorded a day there probably were present during the land bird migration in the fall as many species as there were in the spring.

In late fall between twenty-five and forty-five species were recorded during the average day's trip. Whenever a census was taken the number ranged between forty and fifty-five species. The two largest, late fall lists were made during important waterfowl flights. A list of sixty-two species was made on November 2, 1929, when 1046 individuals were recorded. On November 2, 1927, only fifty-eight species were noted; however, 3026 individuals were identified, and the number of unidentified birds seen was between ten and twenty thousand. One thousand to two thousand individuals were identified during the average late fall day.

The number of species recorded each year ranged between 210 and 239. I have identified 260 species, and, in addition, five subspecies. Nine additional species were recorded by others. In the average year nesting evidence on eighty-five species was obtained.

DISPOSITION OF COLLECTED BIRDS

Several public and private collections contain bird specimens from the Buckeye Lake area. The largest and most important collection, representing 236 species, is now in the Ohio State Museum. About 15 per cent of the more than five hundred birds in this collection were taken between 1860 and 1920, and most of these were originally in the private collections of Wheaton and Jasper. Most of the remainder were collected since 1922 by me. A few of the others were taken by Charles F. Walker.

Ohio Wesleyan University has eighteen mounted birds from the area, among which is a Ring-billed Gull collected in 1906. Denison University has a small collection. The most interesting specimen is a mounted European Widgeon, collected on March 29, 1902, which represents the first record for Ohio. Oberlin College has a few birds from the area, including a mounted Franklin's Gull, collected October 15, 1906, which represents the first record of that species for Ohio.

The University of Michigan Museum of Zoology and the Sunfish Club of Millersport, Ohio, each have a few specimens. A. T. Wehrle, of Newark, Ohio, has several mounted birds. With few exceptions his specimens are waterfowl; the two outstanding ones are an immature Parasitic Jaeger and an albino Coot. The private collection of Stephen Holtzberry of Buckeye Lake contains several mounted specimens, among which is a Whistling Swan,

shot on the lake in the spring of 1900. The private collection of Josselyn Van Tyne of the Museum of Zoology, University of Michigan, contains a few skins of birds collected in the area.

There are approximately six hundred specimens from the area in these collections. Two hundred and forty-seven species and subspecies are represented. Forty-one recorded species and subspecies are not in any collection.

THE LIST OF UNRECORDED BIRDS

It is of particular interest to note that, despite rather intensive observation of birds in the area over a considerable period of time, there are several unrecorded species which undoubtedly were present during some portion of historic time. These birds are of two types: those which have been extirpated or have become extinct, and those which were always of infrequent occurrence. Birds of the second group can be expected to be present in the future.

During early historic time the Swallow-tailed Kite (*Elanoides forficatus forficatus*) unquestionably was present, for as late as August 22, 1878, one was killed within fifteen miles of the lake (Wheaton, 1882: 419). The Whooping Crane (*Grus americana*) probably occurred at more or less regular intervals during migrations, as did the Eskimo Curlew (*Phaeopus borealis*) and Hudsonian Godwit (*Limosa haemastica*). The Louisiana Paroquet (*Conuropsis carolinensis ludovicianus*) was present at some period in historic time, for according to Wheaton (1882: 404-5) and others, it was not uncommon in central Ohio until about 1830, and as late as 1862 a flock of thirty-five or forty was observed in Columbus. The Southern Raven (*Corvus corax principalis*) also occurred during early historic time.

The Purple Gallinule (*Ionornis martinica*), Long-billed Dowitcher (*Limnodromus griseus scolopaceus*), Kirtland's Warbler (*Dendroica kirtlandi*), Bohemian Waxwing (*Bombycilla garrula pallidiceps*), Brewer's Blackbird (*Euphagus cyanocephalus*), Evening Grosbeak (*Hesperiphona vespertina*), Pine Grosbeak (*Pinicola enucleator*), Red Crossbill (*Loxia curvirostra*), White-winged Crossbill (*Loxia leucoptera*), and Canadian Savannah Sparrow (*Passerculus sandwichensis oblitus*) surely have been present within historic time and should occur in the future. It is particularly surprising that Kirtland's Warbler was not found, for between 1922 and 1933 various members of the Wheaton Club saw at least six individuals elsewhere in central Ohio. During the same period the Evening Grosbeak was seen once, the Red Crossbill once, and the White-winged Crossbill on six occasions (Walker, 1928b: 18).

EXOTIC SPECIES ESCAPED FROM CAPTIVITY

One exotic species, almost unquestionably a once captive bird, was recorded during the investigation. Throughout the last three weeks of

September and until October 15, 1933, a Mute Swan (*Sthenelides olor*) remained about the eastern end of Buckeye Lake. This individual could fly well and apparently came from some distance, for there were no birds of this species held captive in this area or the adjacent vicinity in 1933. Exotic birds of several other species were found elsewhere in central Ohio during the twelve-year period, including a male Baikal Teal (*Anas formosum*), a Band-tailed Pigeon (*Columba fasciata*), a Troupial (*Icterus icterus*), a species of paroquet, and several canaries (Trautman, 1935c: 16).

THE METHOD OF RECORDING DATA IN THE SYSTEMATIC ACCOUNT

The two hundred and eighty-eight species and subspecies in the "Systematic Account" (see pp. 155-433) are treated in the following manner: The scientific name of the bird is given, then the name of the describer, followed by the popular name. If the scientific name is preceded by an asterisk no specimen from the area is in any collection; if no asterisk is present one or more specimens are preserved and have been examined by me. A brief statement concerning the status of the species during the different seasons of the year follows. Unless otherwise noted this status applies principally or entirely to the period of investigation.

If the species is entirely or partially a transient that has occurred frequently in late historic time the dates of arrival and departure follow in a four-line tabular form. In the first line the earliest date of arrival in spring is given in the left-hand column, and the earliest date of arrival in the fall in the right-hand column. In the same seasonal order in the second, third, and fourth lines are given the median dates of arrival, median dates of departure, and latest positive dates of departure. The median date of arrival in spring was obtained by averaging all earliest dates of arrival, except an occasional date which was obviously aberrant. The same method of averaging gave the median date of arrival in fall and the median dates of departure for both spring and fall.

If a species was recorded regularly, eight dates (four spring and four fall) are given. If a species was rare and of irregular occurrence in spring or fall, or both, only the earliest dates of arrival and departure are given.

If a species was so numerous throughout winter or summer as to have made it impossible to observe the first or last transients, the first dates of arrival or departure are omitted. When a species was very rare in either spring or fall or both, or was a resident, all dates are omitted.

If one or a few individuals of a species have been observed throughout a winter, the latest date of fall departure and the earliest date of spring arrival are enclosed in parentheses. The same is true for the latest date of spring departure and the earliest date of fall arrival if a few individuals have been observed to remain throughout a summer. If many individuals

of a species have been observed to remain over winter and no latest date of fall departure or spring arrival is given, the median date of fall departure or spring arrival is enclosed in parentheses. This procedure is also followed for the median date of spring departure or median date of fall arrival if many individuals remained throughout the summer.

Unless otherwise stated the data in the text refer almost entirely to the period between February 1, 1922, and January 1, 1934. Some indication is given of the abundance of each species, and in many instances some indication is given of its yearly fluctuations in numbers, habitat niche, and habits.

EXPLANATION OF TERMS

Accidental: This term is applied to a species which is beyond its usual range. The Ruff, an Old World species which strays into the New World, is an example.

Casual: The term is given to a species, such as the Atlantic Kittiwake, slightly outside its usual range, which was recorded once or at widely spaced intervals.

Very rare: The term indicates a species that occurred infrequently and in small numbers during a certain period, or a species which was always scarce and on the periphery of its range when in the area. The Red Phalarope is an example of the latter type.

Rare: This means a species that was recorded rather regularly and in very small numbers at a certain period of time.

Uncommon: This signifies that a species occurred regularly and in small numbers throughout a certain period.

Common: The term is applied to a species which, considering its habits, was found in large numbers throughout a certain period.

Very common: This indicates that a species, considering its habits, occurred in very large numbers.

Abundant: This means that a species was so numerous as to be a dominant bird during a certain period.

Transient: This applies to a species in migration through the area, or to a newly-arrived or departing individual.

Transient visitant: This refers to a species not strictly transient which more or less wandered into the area and remained for a time.

Winter or summer visitant: These terms denote nonnesting species recorded in winter or summer.

Permanent resident: This indicates a species which was recorded in the area throughout the entire year, and especially those species whose individuals remained throughout their lives.

Summer resident: This refers to a species found nesting in the area.

The degrees of abundance, represented by the terms *very rare*, *rare*, *uncommon*, *common*, *very common*, and *abundant* are purely relative as regards the different bird groups or species. In some groups, such as the vultures and hawks, a species was *uncommon* when between five and ten individuals were recorded in a season, and *very common* when one hundred and one to seven hundred individuals were recorded in a season. In other groups, such as the Starling, the species became *uncommon* when 101 to 800 individuals were recorded in a season, and *very common* when 5001 to 200,000 individuals were recorded in the same length of time. In Table VII the terms are assigned numerical values.

AMOUNT AND SOURCES OF ERROR IN DETERMINING ABUNDANCE

There is no known method of obtaining information as to the actual and relative abundance of bird species in the field which does not contain some element of error. Despite the utmost carefulness the presence of probable errors made an accurate analysis of abundance impossible.

Certain species were always very conspicuous, and thereby an impression of a larger number than actually existed was obtained. Other species were always very inconspicuous and secretive and hence seemed fewer in numbers than they actually were. The Turkey Vulture was very conspicuous as it soared high in the air, and 90 per cent or more of the vultures could be recorded each day. Rails were exceedingly secretive, and the presence of individuals was usually detected only when a thorough examination was made of a portion of their habitat. Such an examination was so time consuming that only a small portion of the total amount of habitat could be investigated in a day; consequently, only a small percentage (possibly as low as 2 per cent) of the total number of rails could be observed in a day.

Certain species were more conspicuous at some periods of the year than at others, and this variation was the cause of error. The males of the Grasshopper Sparrow were rather conspicuous during the first half of their nesting season, for then they chose to perch and sing from the top of tall weed stalks, where they could be readily seen and heard. At this period a nesting census of the entire area, made principally with the aid of an automobile, gave a record of a large portion of the males present. A different situation prevailed in late summer, when the males had stopped singing, and both sexes kept well secreted in the profuse vegetation. To record the species under such conditions necessitated a thorough search on foot, of every field, and even then only a part of the birds present were recorded.

Another difficulty, and one adding to the amount of error, was the counting of an individual twice or more as it was repeatedly flushed. Because of the large amount of time necessary to record the birds in a single

TABLE VII
RELATIVE ABUNDANCE BETWEEN THE VARIOUS GROUPS OR SPECIES

SPECIES	VERY RARE		RARE		UNCOMMON		COMMON		VERY COMMON		ABUNDANT	
	A	A	A	A	A	A	A	A	A	A	A	A
	Year	Season	Season	Day	Season	Day	Season	Day	Season	Day	Season	Day
Larks	1	1	2-4	3 or less	5-75	4-8	76-200	9-50	201-1000	51-200	1001+	201+
Grebes	1	3 or less	4-7	3 or less	8-75	4-12	76-200	13-30	201-1000	31-300	1001+	301+
Pelican	1	1	2	1	3-10	2-4	.....	.....	.....	.....	.....	.....
Cormorant	1	1	2	1	3-10	2-4	11-100	5-20	101+	21+	.....	.....
Hérons and Bitterns	1	2 or less	3-6	2 or less	7-20	3-8	21-200	9-30	201-1000	31-100	1001+	101+
Swan and Geese	1	2 or less	3-4	3 or less	5-15	4-10	16-300	11-50	301-1000	51-200	1001+	201+
Ducks	3 or less	3 or less	4-20	8 or less	21-200	9-40	201-1000	41-200	1001-5000	201-1000	5001+	1001+
Vultures and Hawks	1	2 or less	3-4	2 or less	5-20	3-5	21-100	6-35	101-700	36-70	701+	71+
Gallinaceous birds..	5 or less	5 or less	6-12	2 or less	13-50	3-7	51-100	8-40	101-1000	41-150	1001+	151+
Rails and Gallinule	2	2 or less	3-7	3 or less	8-30	4-8	31-200	9-20	201+	21+	.....	.....
Coot	.....	.....	8 or less	8 or less	9-300	9-50	301-1000	51-500	1001-5000	501-1000	5001+	1001+
Shore birds	2	3 or less	4-8	2 or less	9-80	3-20	81-500	21-200	501-4000	201-1000	4001+	1001+
Gulls	1	3 or less	4-10	3 or less	11-100	4-15	101-500	16-230	501-1000	231-500	1001+	501+
Terns	2	2 or less	3-11	3 or less	12-210	4-30	211-600	31-300	601-1000	301-700	1001+	701+
Dove and Pigeon	.....	3 or less	4-50	3 or less	51-200	4-15	201-1000	16-200	1001-5000	201-3000	5001+	3001+
Cuckoos	3 or less	3 or less	4-6	1	7-12	2-3	13-200	4-25	201+	26+	.....	.....
Owls	3 or less	2 or less	3	2 or less	4-12	3	13-50	4-20	51+	21+	.....	.....
Goatsuckers and Swifts	2	1	2-12	2 or less	13-30	3-10	31-300	11-100	301-1000	101-500	1001+	501+
Hummingbird and Kingfisher	.....	.....	5 or less	2 or less	6-25	3-6	26-100	7-20	101+	21+	.....	.....
Woodpeckers	.....	1	2-5	2 or less	6-50	3-5	51-300	6-25	301-1000	26-200	1001+	201+
Flycatchers	2	1	2-3	2 or less	4-25	3-5	26-200	6-40	201-1000	41-500	1001+	501+
Horned Larks	4 or less	4 or less	5-12	5 or less	13-70	6-10	71-1000	11-300	1001-5000	301-1500	5001+	1501+
Swallows	.....	4 or less	5-7	3 or less	8-40	3-15	41-1000	16-300	1001-6000	301-1000	6001+	1001+
Crows and Jays	.....	.....	10 or less	2 or less	11-40	3-9	41-1000	10-200	1001- 10000	201-5000	10001- 50000	5001+
Titmice, Nut- hatches, and Creeper	5 or less	2 or less	3-5	2 or less	6-30	3-8	31-100	9-24	101-1000	25-300	1001+	301+

TABLE VII—(Concluded)

SPECIES	VERY RARE		RARE		UNCOMMON		COMMON		VERY COMMON		ABUNDANT	
	A Year	A Season	A Season	A Day	A Season	A Day	A Season	A Day	A Season	A Day	A Season	A Day
Wrens	3 or less	2	3-5	2 or less	6-20	3-7	21-250	8-125	251-700	126-250	701+	251+
Mockingbird, Thrasher, and Catbird			8 or less	2 or less	9-20	3-5	21-100	6-12	101-500	13-80	501+	81+
Robin, Bluebird, and Thrushes	3 or less	2	3-4	1	5-20	2-9	21-300	10-50	301- 10000	51-1000	10001+	1001+
Gnatcatcher and Kinglets	5 or less	1	5 or less	2 or less	6-40	3-7	41-300	8-50	301-800	51-200	801+	201+
Pipets and Waxwings		5 or less	6-10	2 or less	11-50	3-10	51-600	11-200	601-1000	201-500	1001+	501+
Shrikes		1	2-6	1	7-20	2-11	21-70	12-19	71+	20+		
Starling	5 or less	2	6-100	5 or less	101-800	6-100	801-5000	101-800	5001- 200000	801-15000	200001+	15001+
Vireos	2	2	3-5	1	6-15	2-4	16-150	5-40	151-500	41-150	501+	151+
Warblers	2	2	3-4	2 or less	5-35	3-6	36-1000	7-40	1001-6000	41-2000	6001+	2001+
English Sparrow ..					500 or less	50 or less	501-2000	51-75	2001-5000	76-500	5001+	501+
Blackbirds, Meadowlark, and Orioles	2	2	3-4	2 or less	5-40	3-6	41-1000	7-100	1001- 15000	101-4000	15001+	4001+
Tanagers	2	1	2-4	2 or less	5-12	3-5	13-40	6-25	41+	26+		
Cardinal				4 or less	35-100	5-10	101-300	11-100	301-700	101-300	701+	301+
Grosbeaks, Buntings, and Finches	2	1	2-6	3 or less	7-80	4-7	81-500	8-25	501-2000	26-500	2001+	501+
Towhees and Sparrows	2	2	3-6	2 or less	7-50	3-6	51-400	7-25	401- 10000	26-500	10001+	501- 6000

field in late summer it was impossible to cover more than a small part of the area in a day. This failure to investigate the entire area made it necessary to estimate the total number present for the day, to average the number present in the fields investigated, and to multiply the sum obtained by the estimated total number of fields. The result obviously contained a rather large element of error, in comparison to the estimate of the number of nesting birds, which contained a much smaller amount of error.

Certain species were more conspicuous at some periods of the day than at others, and this variation caused some error. During its spring migration the Connecticut Warbler was most secretive, except for a short period between 7:00 and 8:30 A.M. If an investigation was made of its habitat during the short period when the bird was fairly conspicuous, as many as fifteen individuals could be recorded; if an investigation was made later in the day seldom more than one was observed. Such variation in conspicuousness made it difficult to judge accurately the abundance of such a species.

There was a personal equation to be considered. As I gained experience with a species I found more individuals in a given time, and had I not been aware of increased ability to discover individuals I might have attributed the increase to an actual change in abundance and not to an ability to find birds. If I based my interpretation of abundance upon recorded numbers alone, these would indicate that the Henslow's Sparrow was absent between 1922 and 1925, that it invaded the area in 1926, and that it continued yearly to increase in abundance until 1934; however, I was largely unacquainted with the bird, its song, habits, and habitat until 1926, and as I became more acquainted with the species I discovered more individuals. I have concluded that it had more available nesting habitat before 1925 than after, and that it must have been present before 1925 and possibly in greater numbers than during and after 1926, when I first recorded it.

In the hope of indicating probable sources of errors in abundance I have, in the succeeding pages, given for many species some indication of their conspicuousness throughout their sojourn in the area.

SYSTEMATIC ACCOUNT OF THE 282 SPECIES AND 6 ADDITIONAL
SUBSPECIES OF BIRDS RECORDED FOR THE BUCKEYE
LAKE AREA

Gavia immer elasson Bishop

Lesser Loon

Uncommon spring and common fall transient, very rare summer and winter visitant.

Earliest date of arrival:	(March 23, 1934) ¹	(September 19, 1926)
Median date of arrival:	April 1	October 13
Median date of departure:	May 17	December 7
Latest date of departure:	(May 29, 1931)	(January 1, 1932)

During the 1922 to 1934 investigation of the birds of the area, the Lesser Loon always made its spring appearance on or before April 6; in several years it arrived before April 1. The peak of migration took place during the last 3 weeks of April and the first 2 weeks of May, and at that time 1 to 11 individuals were recorded daily. The last transients departed during the second half of May, and after that only an occasional crippled bird was found. In at least 2 years a crippled individual was noted throughout the summer.

The first fall transients appeared between September 19 and October 16. By October 25 the species was always present, and it remained until the lake was covered with ice in December. Even then a few hardy individuals, or crippled, flightless birds, sometimes remained in open holes until an extremely cold period forced them to leave or caused their death. In late October and November, 1 to 15 birds could be noted daily, and during the largest waterfowl flights of autumn between 16 and 200 individuals were observed each day. The largest recorded number, 200 birds, was seen during the phenomenally large waterfowl flight of November 2, 1927. Winter visitants were seen in January of several years, but none in February or early March.

The stomach of a bird found dead, October 23, 1929, contained 29 gizzard shad which averaged $2\frac{1}{2}$ inches in total length. The stomach of another bird found dead, November 24, 1932, contained 6 shad that averaged 3 inches in length.

Of 3 Ohio State Museum skins collected in the area, those labeled May 5, 1881, and November 21, 1897, are referable to *Gavia immer elasson*; the skin dated November 24, 1932, is of an intergrade between *G. i. elasson* and *G. i. immer*. Of 6 Ohio State Museum skins taken elsewhere in Ohio, 4 are referable to *elasson* and 2 are intergrades.

Market hunters and sportsmen who hunted in the area between 1860 and 1921 have told me that the Lesser Loon was a numerous spring and fall transient throughout that period. It has probably been a regular semiannual transient throughout historic time.

¹ For explanation of parentheses in this connection see pp. 149-50.

*²*Gavia stellata* (Pontoppidan)

Red-throated Loon

Very rare fall transient.

On the afternoon of October 17, 1926, while observing migrating waterfowl from a blind on the exposed "Middle Bank," I saw a flock of large birds, each flying about 35 yards from its neighbors and approaching the lake from the north. As they came closer I identified all except one as loons. This unidentified bird, because of smaller size, I first mistook for a duck, but upon closer inspection it proved to be a Red-throated Loon in fall plumage. Still later this individual flew and swam near my blind, and I had an opportunity to note the characteristics of the species. Occasionally the bird gave a guttural call that was very unlike the calls made by the *Gavia immer* with which it flocked.

On November 3, 1926, I found another at the western end of the lake. I spent the afternoon observing it and made several unsuccessful attempts to capture it.

I saw the third loon of this species on November 9, 1929. It also appeared to be only half as large as a *Gavia immer*. The bill was slightly upturned, the back was spotted with white, and the call note was guttural and distinctly different from that of *immer*. This bird was likewise at the western end of the lake.

The Red-throated Loon was seen elsewhere in central Ohio during the period of this study, and a female was collected from a small pond near Columbus, on December 12, 1923 (Geist, 1928: 5).

**Colymbus grisegena holboelli* (Reinhardt)

Holboell's Grebe

Very rare spring and fall transient.

Earliest date of arrival:	February 6, 1927	October 25, 1925
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	February 28, 1925	November 27, 1925

Holboell's Grebe was recorded only in 4 of the 12 years, and I and other Wheaton Club members succeeded in noting only 10 individuals: 1 on February 24, 1924; 2 on February 28, 1925; 2 on February 6, 1927; 1 on October 28, 1922; 2 on October 25, 1925; and 2 on November 27, 1925. Although all spring records were in February, this grebe has been found as late as May 20 (Walker, 1928b: 11) elsewhere in central Ohio.

The species was a transient in the area before 1882. Wheaton (1882: 567) wrote: "It has been taken several times at the lake [Lake Erie], at the

² An asterisk is used to indicate each of the 36 species of which no preserved specimen has been examined.

St. Mary's and Licking [Buckeye Lake] Reservoirs." In 1903 Dawson (1903: 629) stated that "last fall upon the Licking Reservoir, as I was lying in wait offshore for ducks, I was approached by what I took to be a bird of this species." Only one sportsman knew this species, and he told me that he had shot 1 or 2 during several autumns between 1880 and 1910.

Colymbus auritus Linnaeus
Horned Grebe

Usually a common spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(February 3, 1923)	September 7, 1924
Median date of arrival:	March 10	October 12
Median date of departure:	May 1	December 6
Latest date of departure:	May 12, 1923	(January 1, 1924)

The records of spring migrations of the Horned Grebe disclosed a marked irregularity in time of arrival, departure, and period of greatest abundance, and a great variation in the yearly numbers. In some springs the bird appeared immediately after the break up of ice in late February, and individuals could be seen daily from then until early May; in other years the species did not arrive until mid-March, or else disappeared by early April. In some migrations the period of greatest abundance took place in early March; in others it was in late March or early or late April; and in a few years the birds were so scarce that no peak of migration was indicated. When the birds were numerous as many as 60 were noted in a day.

Irregularities in time of arrival and departure and in period of greatest abundance, and variations in annual total number of birds were also marked in the fall migrations, though not so evident as in spring. The species could generally be found from late October until the entire lake was first covered with ice in December. During the 8 years when the species was numerous, the height of migration occurred in November.

Temporary winter visitants were noted in January and February of several years, and only during the abnormally warm winter of 1931-32 was an individual recorded throughout an entire winter.

This grebe captured and ate many fish, particularly the abundant gizzard shad. Stomachs of 5 birds, found dead upon the waters during the fall hunting season, were examined: 1, on December 14, 1922, was empty; 1, on December 12, 1923, contained 4 gizzard shad that averaged 3 inches in total length; 1, on December 14, 1933, contained 2 gizzard shad that were 3 inches long; 1, on December 14, 1933, was empty; 1, on October 22, 1927, contained 3 gizzard shad and 1 yellow perch, that averaged about 3 inches in total length, and the remains of 2 large dragonfly larvae.

The former market hunters and sportsmen, who hunted in the area between 1860 and 1921, stated that the Horned Grebe was usually a numerous spring and fall transient, that exceptionally large flights occurred in fall at

infrequent intervals, and that the last great flight took place sometime between 1912 and 1917. During this flight, which lasted about a week, hundreds and possibly thousands of birds were daily present; a hunter claimed he shot 42 in an hour. Apparently numbers of grebes were sold by market hunters. These men called the birds "silkie," in reference to the silkiness of the whitish breast and belly feathers.

Podilymbus podiceps podiceps (Linnaeus)

Pied-billed Grebe

Common spring and fall transient, very rare summer resident and winter visitant.

Earliest date of arrival:	(March 8, 1930)	(August 20, 1929)
Median date of arrival:	March 16	September 10
Median date of departure:	May 10	December 15
Latest date of departure:	(May 15, 1930)	(January 1, 1924)

In spring migrations during the investigation the time of arrival and departure and the yearly abundance of the Pied-billed Grebe were rather consistent. The first arrivals were seen between March 8 and 20, and migration was well under way by March 25. The largest concentrations took place during the last few days of March and the first 3 weeks of April, when between 5 and 50 individuals were recorded daily. During the last week of April there was a definite decrease in numbers, and the last transients usually disappeared during the first half of May.

Evidence of a successful nesting was noted once, though 1 or 2 summering individuals were recorded during several years. On June 15, 1929, I found an adult with 5 newly hatched young in the Little Buckeye game refuge, and on June 26 I saw this little family again.

The first arrivals of the southward migration appeared in late August or in the first half of September, and by mid-September the movement was definitely begun. The species was present each day of October and November, and there were distinct flights during the larger waterfowl migrations. On the average October and November day between 1 and 20 birds were noted, and during the larger flights from 20 to 55 were recorded daily. A decided decrease occurred in late November or December, whenever the lake was first covered with ice; after that only a few, usually crippled birds, remained. The migration was generally completed by December 20.

During each fall hunting season a considerable number of Pied-billed Grebes and other grebe species and loons were found floating dead upon the lake. They had been shot by hunters who mistook them for ducks and left them lying on the water upon realizing the mistake. I examined the stomachs of 5 birds, killed in this manner during October and November, 1929; they each contained from 2 to 5 gizzard shad $2\frac{1}{2}$ to 4 inches in total length. The grebes ate considerable quantities of fish, tadpoles, and frogs.

Some of the frogs were medium-sized green frogs and large leopard frogs. The contortions made by a grebe while swallowing a large frog were often very amusing.

Four individuals were recorded throughout the 1931-32 winter. An occasional temporary visitant was noted during January and February of several other years. Evidence indicated that the Pied-billed Grebe was a numerous transient throughout historic time, and probably a rather regular nesting species. The former market hunters and sportsmen stated that it was very numerous between 1860 and 1910 and that until 1912 they found adults and young each summer. Field (1903: 131) wrote that the bird was a "common spring and fall migrant," and that probably "a few remain as summer residents, breeding at the Licking Reservoir [Buckeye Lake]."

Pelecanus erythrorhynchos Gmelin

White Pelican

Very rare spring and fall transient and summer visitant.

Before 1922 the White Pelican was recorded by Wheaton (1882: 543), who wrote: "Four or five years since a specimen was taken in Fairfield county, near the Licking Reservoir [Buckeye Lake], which was preserved by Dr. Jasper." This is probably the specimen from the Jasper collection, now in the Ohio State Museum and labeled "October 25, 1874." Field (1903: 132), Jones (1903: 34), and Dawson (1903: 626) recorded the capture of a pelican on May 15, 1902, by Stephen Holtzberry. The bird was seen on the lake for several days before it was shot. Dawson stated that it was mounted and exhibited in a local clubroom, where it was later destroyed by fire. He also recorded that 3 pelicans were seen in the area during the spring of 1903.

Several records were made during the investigation. An individual was seen at frequent intervals from July 25 to August 2, 1927, by Edward L. Wickliff and others. This bird remained chiefly in the vicinity of Cranberry Island and adjacent peat islands, and there most of its fishing was done. On May 11, 1929, I found a pelican at the western end of the lake. It had been noted there the previous day. On May 12, 1929, 3 pelicans were observed flying over the lake. The last record is of a bird seen by many cottagers and fishermen in the last week of April, 1933.

The stomach of a specimen collected May 11, 1929, contained a gizzard shad slightly over 13 inches long.

Wheaton (1882: 542) considered the White Pelican a "not rare spring and fall migrant" in Ohio before 1882. Former market hunters and sportsmen stated that the species was not infrequently noted at Buckeye Lake between 1860 and 1910. The bird has probably been an irregular transient throughout historic time.

Phalacrocorax auritus auritus (Lesson)

Double-crested Cormorant

Uncommon spring and fall transient.

Earliest date of arrival:	April 4, 1925	September 13, 1929
Median date of arrival:	April 28	October 1
Median date of departure:	May 12	November 10
Latest date of departure:	June 13, 1931	December 15, 1927

The Double-breasted Cormorant was a regular spring transient. In a few spring seasons only 1 was recorded, and never more than 4 birds were seen in a day. The majority were observed during the first 10 days of May.

The first arrivals of fall appeared between September 13 and October 7. During the last 3 weeks of October the species was always present, and 1 to 5 individuals could be daily noted. The latest birds were recorded between November 2 and December 15, and, with 1 exception, left the area when the waters of the lake froze over for the first time. One bird remained from October 15 to December 15, 1927. During its sojourn ice 2 inches thick formed over almost the entire lake. That the bird remained during these unfavorable conditions is strange, especially since it was almost continuously pursued and shot at by hunters who mistook it for a "black brant."

The Double-crested Coromant has probably been a regular transient throughout historic time. Former market hunters and sportsmen noted its regular occurrence from 1860 to 1921. Wheaton (1882: 544) stated that he had seen specimens taken "recently" in migrations, and Field (1903: 132) wrote that "occasionally one is killed at the Licking Reservoir [Buckeye Lake]." Apparently the bird nested in the area in former years, for William Harlow told me that about 1880, 10 to 15 pairs nested in the dead trees on Liebs and adjacent islands. His description of nests, adults, and young leaves no doubt as to the correctness of his identification. Wheaton (1882: 544) stated that the species was "said to have nested years ago at the Licking Reservoir."

Ardea herodias herodias Linnaeus

Great Blue Heron

Fairly common spring and fall transient and summer visitant, very rare winter visitant.

Earliest date of arrival:	(March 10, 1928)	.....
Median date of arrival:	March 12	(August 20)
Median date of departure:	(April 20)	December 2
Latest date of departure:	.....	(December 22, 1928)

The first Great Blue Herons arrived between March 10 and 17 of each year, and by March 20 migration had definitely begun. Maximum spring abundance took place in the last week of March and in the first 2 weeks of April. During that period from 4 to 20 individuals were noted daily, and

whenever a complete census was taken of the area between 15 and 32 birds were recorded. About mid-April a gradual decrease in numbers began; this continued until April 20 or a few days thereafter, and by May 1 apparently only summer visitants remained. Censuses indicated that between 10 and 16 individuals could be found daily during May, June, and early July. These summer visitants did not nest in the area. A small colony of 4 to 11 pairs nested, during most of the years of the investigation, about 4 miles northwest of the area in a woodland on the banks of the South Fork of Licking River, in southern Harrison Township, Licking County. Individuals could be seen journeying between this heronry and the lake throughout late April, May, and June, and unquestionably many birds found in the area during these months came from there. Probably a few nonbreeding herons also summered.

A slight and gradual increase in daily numbers, principally of young birds, began in late July and continued until mid-August. Thereafter the increase was more pronounced. The maximum numbers for the year were usually reached in September and early October, when from 10 to 45 individuals could be found daily. About mid-October a decrease in numbers began, which continued until the lake was covered with ice in late November or December, and after that only occasional stragglers remained. Throughout late summer and fall this species was particularly numerous about the Little Buckeye and Honey Creek game refuges. In fall gizzard shad formed the principal food supply. Other fish species, frogs and tadpoles, snakes, crayfishes, and large aquatic insects were also eaten in considerable numbers.

Occasionally, a temporary visitant was found in winter, and in the last 3 winters of the survey, 1 to 3 Great Blue Herons remained throughout each season. These wintering birds, like others noted in late fall or early spring, when most of the lake was ice-covered, remained chiefly about the small, open streams and in fields. The birds were obviously hunting food in the fields, and upon 3 occasions I saw a bird catch and swallow a small rodent.

Older residents have told me that the "Big Crane" nested in the area from "as long as they could remember" (about 1860) until 1921. Before 1890 the species had heronries in several of the larger woodlands, such as the Big Woods and Jack's Neck Woods, and in other woodlands now gone, and "about 50 years ago" (1870 to 1880) there was a large nesting colony around Crane Pond (Map 2: No. 27). I found between 2 and 7 pairs nesting in the tallest trees of the central part of Lakeside Woods between 1915 and 1920, and during the opening years of the investigation the old nests could still be seen. Until 1910 the "Big Crane" was considered a game bird, and many of the birds were killed each year. The flesh, particularly that of the young, was highly prized by many people.

Casmerodius albus egretta (Gmelin)

American Egret

Occasional summer and early fall visitant.

Earliest date of arrival:	June 19, 1932	.....
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	.....	October 14, 1930

It was not until September 6, 1924, that I recorded the first American Egret for the period of investigation. On September 10 Charles F. Walker saw probably the same bird, and on September 24, I saw 1. In 1925 the species was often recorded between September 2 and September 10 by various Wheaton Club members. None of the birds was seen in 1926 or 1927, though in 1926 the species was recorded elsewhere in central Ohio (Gordon, 1928: 49). In 1928 Walker and I saw 5 egrets on July 21, and Walker saw 1 on August 24. No egrets were recorded in 1929, but that year the species was observed elsewhere in central Ohio (Hicks, 1931: 270).

An exceptionally large invasion of egrets took place throughout Ohio in the summer and early fall of 1930. On July 25 Edward L. Wickliff and I saw the first bird, by August 1 the daily number recorded had increased to 8, and by August 10 at least 15 were present. This number was maintained during the remainder of August and early September; from September 9 to September 20 at least 20 egrets were present daily. Shortly thereafter there were fewer, and the last bird was seen by me on October 14. During the summer and early fall of 1930 feeding conditions for herons were most favorable, for the severe drought caused the water level of the lake to become extremely low, exposing an abundant food supply.

In 1931 an egret was repeatedly observed between August 25 and September 3. In 1932 the first was seen on June 19; it was frequently seen throughout July and early August. About mid-August the number seen per day increased to 4, but declined to 1 by September 1. The last bird for 1932 was recorded September 10. In 1933 the first arrivals of a rather large invasion appeared on July 25, and from August 1 until mid-September 4 to 15 individuals were recorded during each field trip. The last bird for 1933 was observed by Wickliff on October 1.

It was apparent that a correlation existed between the numbers of American Egrets, the water level of the lake, and climatic conditions. The greatest invasions in Ohio were during periods of greatest drought, and the greatest number for any year, and for other heron species as well, was in direct relation to the water level of the lake. Whenever the lake level was extremely low, as in 1930, more were present here than elsewhere in central Ohio; in 1926 and 1929, when the water level was rather high, no birds were seen about the lake, though they were present in small numbers elsewhere in central Ohio.

Upon many occasions individuals were observed catching medium-sized leopard frogs, medium-sized green frogs, small bull frogs, large cricket frogs, crayfishes, fishes, small snakes, and large aquatic insects. Because the yearling gizzard shad schooled near the surface in shallow water they were readily captured, and enormous numbers were consumed. One day during a 4-minute period I saw an egret capture and swallow 19 shad, which averaged about 2 inches long. The stomach of a bird collected August 9, 1930, contained 4 largemouthed bass about 3 inches long, 1 large dragonfly larva, and a small bit of hornwort. When collected this bird was feeding in an isolated and almost dry puddle in which were stranded hundreds of fingerling largemouthed bass.

The history of the American Egret in the area prior to 1922 is interesting. The few men who remembered the period between 1860 and 1895 said that during those years there were occasional large visitations of "big white cranes." This agrees with Wheaton (1882: 501), who recorded the bird as a "rather common visitor in July, August, and September" in Ohio. Thomas M. Earl told me that he assisted Oliver Davie in mounting 50 or more of these herons, shot at Buckeye Lake and elsewhere in central Ohio, between 1887 and 1894. According to old residents at the lake the species disappeared about 1895 and was not seen again until during the investigation. This statement is partly substantiated by Dawson (1903: 472), Jones (1903: 55), and others, for they considered the species as of rather casual occurrence in Ohio about 1903. Seemingly, the scarcity of birds between 1890 and 1920 was caused by the depredations of the plume hunters; the reappearance of the birds is probably the result of recent protection.

Leucophoyx thula thula (Molina)

Snowy Egret

Casual summer visitant.

The Snowy Egret was noted twice. Field (1903: 134) wrote: "One record of August 20, 1901, at the Licking Reservoir [Buckeye Lake]."

The second record is of an immature collected by me on August 27, 1930. When first seen the bird was feeding upon a small mud island, some 50 yards south of Cranberry Island. I quote from my note published in the *Auk* (1931a: 112):

It [Snowy Egret] was feeding on a mud island in company with an American Egret. My attention was drawn to the bird by its very active movements. Indeed, the bird's behavior was the most conspicuous difference between it and the Little Blue Herons with which I later had an opportunity for comparison. In this specimen the toes and lower portion of the tarsi were a dull greenish yellow. The upper third was black, this color extending down farther anteriorly than posteriorly. In the Little Blue Heron the toes and tarsi were of a uniform greenish yellow. This difference in color was inconspicuous. The coloration of the bill was also similar to that of the immature Little Blue Heron; the

lores were, perhaps, a trifle more yellowish. There was, of course, no trace of slate on the primaries.

The stomach of this egret contained a half-digested gizzard shad, originally about 3 inches long; an adult Iowa darter, 2 inches long; a large-mouthed bass, 3 inches long; 3 crayfish (*Cambarus propinquus sanborni*) of medium size; and traces of 9 other crayfish.

I observed another Snowy Egret in central Ohio on August 19, 1933, at O'Shaughnessy Reservoir, Delaware County. I examined the bird with 8× glasses at a distance of less than 50 feet and noted that the characters of feet, bill, lores, and plumage were similar to those of the Buckeye Lake bird. The Delaware County bird, or another in identical plumage, was seen a few miles south of O'Shaughnessy Reservoir on August 23, 1933, by Lawrence E. Hicks and others (Hicks, 1934: 401).

Much confusion exists concerning records of this species and of the Little Blue Heron in the Buckeye Lake area and the remainder of Ohio. All except two Ohio records of "little white herons" before 1900, are for Snowy Egrets; the exceptions are Little Blue Herons (Jones, 1903: 55). In recent years the Snowy Egret has been a casual summer visitant in Ohio, whereas the immature Little Blue Heron has been rather regular in occurrence and has sometimes appeared in considerable numbers.

Florida caerulea caerulea (Linnaeus)

Little Blue Heron

Occasional summer visitant.

Earliest date of arrival:	July 25, 1930	.....
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	.....	September 17, 1930

On August 9, 1924, Arthur R. Harper and Roscoe W. Franks found a Little Blue Heron in Maple swamp, and the next day Robert C. Black and I saw it. Later, it was seen by many Wheaton Club members, and was last recorded in Maple swamp on August 12. One was seen on the south shore opposite Sellars Point on August 24, and on September 6, 2 were seen there. On September 18 Thomas M. Earl received for mounting a specimen found on the lake.

It was not until July 25, 1930, that another was recorded. During the remainder of the month there was a steady increase in numbers, and by July 30 at least 21 birds were present. On August 9 an incomplete census showed 77 Little Blue Herons, and unquestionably there were several unrecorded. In early September they began to leave and by September 17 only 5 remained. The species was not seen after that date. One reason for their concentration in 1930 was the excellent food supply (see American Egret). All Little Blue Herons were in the white phase.

Opportunities to observe feeding Little Blue Herons were exceptionally good. Unlike other herons, this species did not consume large quantities of fish. The food seemed to consist chiefly of aquatic and land invertebrates, small frogs, tadpoles, and crayfish. The stomach of a bird collected August 7, 1930, contained 1 small leopard frog, remains of 4 to 6 caddis fly larvae (Trichoptera), traces of at least 5 water striders (Gerridae), 2 marsh treader (Hydrometra), remains of both damselfly and dragonfly larvae (Odonata), 2 fly larvae (Diptera), and traces of 2 aquatic beetles (Hydrophilus). Besides the food there were 3 quartz pebbles which averaged 3 mm. in diameter.

It is curious that Little Blue Herons were not recorded during more than 2 years of the investigation, for elsewhere in central Ohio the species was also recorded in 1925, 1926, 1928, 1931, 1932, and 1933. Its status at Buckeye Lake before 1922 is not known. A few old residents stated that "little white cranes" were present during occasional summers before 1900; however, it is not known whether the "little white cranes" were of this species or were Snowy Egrets.

Butorides virescens virescens (Linnaeus)

Eastern Green Heron

Common spring and fall transient and summer resident.

Earliest date of arrival:	April 16, 1927	.....
Median date of arrival:	April 18	(July 20)
Median date of departure:	(May 18)	October 3
Latest date of departure:	.....	October 16, 1934

The Eastern Green Heron was very regular in its spring appearance; the first arrival was noted between April 16 and 21. By April 25 the birds could be recorded daily. Maximum spring abundance took place in the last few days of April and first 12 days of May. About May 15 they became fewer, and by May 22 apparently all transients had departed. During the height of spring abundance between 7 and 20 individuals could be daily observed.

Except for the Least Bittern this species was the most numerous of the heron tribe to nest in the area. Throughout the survey from 10 to 22 pairs nested yearly; however, the birds were slightly less abundant as the investigation progressed. With few exceptions all nesting pairs were in the vicinity of water or marsh. Cranberry Island, the formerly swampy area immediately north of the "North Bank," and the banks of the canal south of Millersport were favored localities. The poorly built nests of sticks and twigs were from 5 to 20 feet above the ground in trees. Many species of trees were used for nesting sites, though the crabapple (*Pyrus*), apple (*Malus*), hawthorn (*Crataegus*), honey locust, willow (*Salix*), red maple, and buttonbush were most often used. Six nests containing eggs were examined between April 26 and June 19. Two contained 3 eggs each, 1

contained 4 eggs, and 3 contained 5 eggs each. Eight nests with 3 to 5 young were found between May 10 and July 2, and young out of the nest were seen as early as June 12.

In late June there was a scarcely perceptible increase in the number of birds, particularly of immature ones, which continued throughout early July. Larger numbers were usually present during late July, and by early August and until mid-September the maximum numbers of the year were attained. At this time between 10 and 45 Green Herons could be daily recorded. A sharp decrease occurred during the first cool nights of mid-September, and after that and until its final disappearance in early October, the species was uncommon or rare.

Many observations indicated that the species fed largely upon fish, snakes, frogs and tadpoles, crayfish, and large aquatic insects. The abundant young of the surface-swimming gizzard shad were apparently the greatest source of food during the heron concentrations of August and early September, and upon many occasions a bird was seen to catch from 4 to 16 small shad in less than 5 minutes. The stomach of a heron collected May 15, 1928, contained a partly digested common water snake, originally about 10 inches long, and a medium-sized leopard frog.

According to former market hunters and sportsmen the species has been a numerous summer resident since 1860, and it is assumed that it has been nesting in the area throughout historic time.

Nycticorax nycticorax hoactli (Gmelin)

Black-crowned Night Heron

Fairly common spring and common fall transient, very rare summer resident.

Earliest date of arrival:	March 20, 1932	.....
Median date of arrival:	April 7	(August 10)
Median date of departure:	(May 10)	October 11
Latest date of departure:	.....	October 24, 1930

The first spring arrivals were recorded between March 20 and April 13 of each year, and from April 15 to May 5, the period of maximum spring abundance, between 2 and 12 individuals could be found daily. The last transients apparently left about May 8 to 15, and after that only the 2 to 10 summering birds remained. Most of these were immature, and all except a very few were visitants which either nested outside the area or were non-breeding individuals. The exceptions were 2 pairs of nesting birds, whose rather bulky nests were found by Arthur R. Harper and myself on June 18, 1929, about 40 feet above the ground in the upper forks of a white elm tree. This tree was in a small remnant of a once extensive swamp forest west of the Lakeside Woods. One nest contained 4 young that were almost ready to fly; the other was empty, though it had been previously occupied.

An increase in summer numbers became apparent in early August and continued until late August or early September, after which a slight decrease began. A sharp decline took place in early October, and by October 10 only an occasional straggler or small group remained. During the late August and early September concentrations the species was more numerous than at any other period, and from 20 to 65 birds could be daily recorded. In late summer most of the herons were in the game refuges, and on a few field trips between 36 and 42 individuals a day were recorded in Little Buckeye game refuge alone.

Like other large herons, this species fed upon fish, especially young shad, frogs, tadpoles, snakes, crayfish, and large aquatic insects. The stomach of a bird, collected April 26, 1928, contained an 11-inch queen snake.

According to the older residents this heron was numerous in spring, summer, and early fall throughout the 1860 to 1921 period. Its flesh, especially that of the young, was formerly prized as food by local residents, though few birds were sent to markets. Some hunters thought the young and adults were distinct species, as the plumage differed and the flesh of immatures was of superior quality. One man insisted that several pairs of night herons nested in the Great Blue Heron rookery that was present about Crane Pond between 1870 and 1880.

Botaurus lentiginosus lentiginosus (Montagu)

American Bittern

Common spring and fall transient, very rare summer resident.

Earliest date of arrival:	(March 23, 1929)	.....
Median date of arrival:	April 3	(September 10)
Median date of departure:	(May 12)	October 16
Latest date of departure:	.....	(November 6, 1926)

The first American Bittern of spring was recorded between March 23 and April 11 of each year, and by mid-April the species was well represented. The peak of migration occurred during the last half of April and first 10 days of May, and then from 4 to 20 individuals could be daily recorded. The last transients usually left before mid-May. Throughout this migration, and especially in its latter half, the courting song of the bittern could be heard coming from the larger marshes during each morning and evening. The bird did much "singing" in Honey Creek and in Little Buckeye marshes, where its thumping notes were among the most characteristic bird calls of the warm, quiet spring twilights.

The bittern was a very rare nesting species during the investigation, and only 1 authentic nesting was obtained. On June 3, 1928, I found a nest in the swampy meadow west of Lakeside Woods. The nest, which was made of *Scirpus*, was at the base of a clump of this rush and contained 5 small

young. From the persistent calling of a few males in the larger marshes during late May and June of several years, I assume that a few pairs nested during those years.

Southbound transients began to invade the area during the first half of September, and the peak of the fall migration was throughout the latter half of that month and the first week of October. The last birds of the year were seen between October 9 and November 6. It was difficult to determine the fall abundance because of the density of marsh vegetation and the quiet, secretive habits of the bird at that season. Ordinarily 1 to 12 individuals were noted daily during the fall movement, but when the marshes were persistently worked, between 25 and 37 birds were seen. On some fall days there must have been 100 to 200 bitterns present. After the investigation an individual was recorded on December 24, 1939, at the southeastern end of the lake. It was seen by several members of the Wheaton Club, while they were taking the club's Christmas census.

Frogs, particularly leopard frogs, tadpoles, snakes, and crayfishes formed a considerable part of the food. The bittern was seldom observed feeding upon fish, partly because it usually inhabited marshy situations where fish were absent or relatively scarce. Robert K. Enders told me that in Little Buckeye marsh on the evening of August 15, 1930, he saw a bittern capture and swallow a water snake (*Natrix*) estimated to be about 18 inches long.

According to market hunters and sportsmen the American Bittern was a very numerous transient and fairly numerous summer nesting species between 1860 and 1910. William Harlow informed me that until about 1910, it nested annually on Liesbs and Onion islands. Field (1903: 134) in 1903 recorded the bird as a "tolerably common summer resident," and one which therefore nested in the area. The species was taken in considerable numbers before 1910. Its flesh was regarded highly by local residents, but was seldom sold in the markets.

Ixobrychus exilis exilis (Gmelin)

Eastern Least Bittern

Very common spring and fall transient, common summer resident.

Earliest date of arrival:	May 2, 1925	.....
Median date of arrival:	May 7	(August 15)
Median date of departure:	(June 2)	September 20
Latest date of departure:	.....	September 29, 1928

Few waterfowl species were as consistent in arrival and departure as was the Least Bittern. The first spring transients were always seen between May 2 and 10, and during 8 years the first arrival was noted between May 6 and 8. By May 10 the species was usually rather numerous, and the

maximum spring numbers occurred during the last half of May. A sharp decrease in abundance took place about June 1, and the last, loose groups of transients left on or before June 6. The actual numerical status of the species during the spring migration was difficult to determine because of its secretive habits. On those days in late May when a careful census was taken, between 20 and 60 Least Bitterns were flushed, and it was obvious that the total number in the area must have been more than 200 birds, probably as many as 300.

The Least Bittern was unquestionably the most abundant nesting species of the heron tribe. June censuses indicated that between 40 and 90 pairs nested yearly. The censuses also indicated that there was a steady diminution of nesting numbers throughout the survey, caused by continual shrinkage of marsh and swamp acreage. The species was essentially a cattail marsh-nesting bird, and most of the nests were in a cattail association. The remainder were in plant associations which contained considerable amounts of coarse grasses and rushes. Nest building began as early as May 9 and apparently those individuals intending to nest began building shortly after arrival and while transients were passing through. The maximum amount of nest construction was done in late May and very early June. More than 50 nests in various stages of construction and use were observed, and all except a few were made of living and dead plants of the various species of the genera *Typha*, *Carex*, and *Scirpus*. Most of the nests were between 6 inches and 2 feet above the water or ground. Two nests were found as high as 3½ feet above the ground, 1 in a buttonbush, the other in a willow tree. Twenty-three nests with eggs were examined, of which 4 contained 3 eggs each, 9 contained 4 eggs each, 7 contained 5 eggs each, and 3 contained 6 eggs each. Dates for eggs in the nest ranged from May 18 to July 10. Six nests were observed, and with only 2 exceptions an egg a day was laid in each until the sets were completed. Young out of the nest were observed from June 10 to late July.

An increase in numbers and the presence of the birds in localities where they did not nest were generally noted in early August. The maximum abundance of southbound transients occurred in the last half of August and the first week of September. The last birds were seen between September 14 and 29. During the fall migration the species was more difficult to observe than it was in spring because of its more secretive manner and the great abundance of marsh vegetation, and as a consequence no accurate estimation of total numbers present per day was obtained. Whenever a census was taken, 5 to 25 birds were flushed, but it was very evident that an unknown percentage of birds was not flushed and was not recorded. It seems probable that as many individuals per day were present during this migration as there were in spring.

While hunting bird nests on June 9, 1928, on Onion Island, I heard a series of harsh bird cries. Upon investigation, a Least Bittern was found perched on a cattail stalk about 1 foot above the water, scolding most vociferously at a 4-pound snapping turtle (*Chelydra serpentina*). The turtle was swallowing another Least Bittern, the feet and tail of which still protruded from the turtle's mouth. The captured bird may have been caught while feeding near the water's surface.

According to former market hunters and old sportsmen, the Eastern Least Bittern was a most numerous transient and summering species between 1860 and 1900. Thereafter a decrease became apparent, and this continued until the investigation. It is evident from the accounts that a principal reason for decrease was the continual shrinkage of marsh and swamp acreage. In discussing the abundance of the bird, Jones (1903: 53) wrote: "At the Licking Reservoir [Buckeye Lake] it was the most numerous of the swamp haunting birds." This statement may have been true when Jones visited this area at the beginning of the present century, but it was not true during my investigation, as then the Redwing and Prairie Marsh Wren outnumbered this bittern.

Cygnus columbianus (Ord)

Whistling Swan

Very rare spring and rather rare fall transient.

Earliest date of arrival:	March 15, 1933	October 30, 1930
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	March 29, 1933	November 24, 1928

It is claimed by former market hunters and sportsmen that between 1865 and 1920 the Whistling Swan was an irregular spring and regular fall transient, and that most of the spring birds were seen in March and the fall birds in November. Occasionally a hunter succeeded in shooting 1 of these much-prized waterfowl.

The Whistling Swan was recorded twice in spring and 7 times in fall: On March 15, 1933, 2 were on the water near Journal Island, and on March 29, 1933, 1 flew northward, high above the western end of the lake. On November 2, 1927, I saw a flock of 40 as they came from the north and alighted upon the water near Journal Island. Later that day 3 of them swam so close to the blind I was occupying, that I could distinctly see the yellow loreal spots on their heads. On November 5, 1927, I saw a flock of 28; on November 24, 1928, 3 were flying high over the lake; in 1929 I saw 20 on November 2, 5 on November 9, and 2 on November 23; on October 30, 1930, 7 were flying over the east end of the lake.

During the investigation many sportsmen told me of seeing large "white brant," which they insisted were a species of goose. Upon a few occasions

I pointed out swans to sportsmen, who even after I had outlined the distinctive characters of the species, still believed them to be geese. From the reports of these men concerning "white brant without black wing tips" and from my own observations, I conclude that the Whistling Swan was an irregular spring and regular fall transient.

**Cygnus buccinator* Richardson
Trumpeter Swan

A probable former transient.

There is 1 possible record for this swan. Field (1903: 134) wrote: "Uncommon spring and fall migrant. One record of three at the Licking Reservoir [Buckeye Lake], March 28, 1903." By 1903 the Trumpeter Swan had become a rare transient east of the Mississippi River. Field did not state the circumstances under which the species was identified, nor whether the observer was qualified to distinguish between this species and the very similar Whistling Swan. Field likewise failed to record the Whistling Swan, a species which unquestionably occurred as a transient at this period.

Considerable confusion exists concerning the Trumpeter Swan in Ohio, because the average pioneer, market hunter, and sportsman were unable to distinguish between it and the Whistling Swan. The Trumpeter Swan did occur, however, for the Cincinnati Society of Natural History has 2 mounted specimens, taken on the Ohio River at Cincinnati. One of these, Catalogue No. 411, is a female, with an undated label which states that Max Wocher was the collector. It is probably the bird referred to by Wheaton (1882: 516): "Mr. Langdon records one specimen taken and three seen on the Ohio River, near Cincinnati, in December, 1876, and informs me the captured specimen is preserved by M. Wocher, Esq."

Further evidence of the probable occurrence in Ohio of the Trumpeter Swan is obtained from the caves, mounds, and garbage heaps of mound builders and later Indians, for in some of these places the bones of this species have been found. I conclude that the Trumpeter Swan was probably a transient in the Buckeye Lake area in early historic time, though not in recent years.

Branta canadensis canadensis (Linnaeus)
Common Canada Goose

Fairly common spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(February 22, 1926)	September 24, 1929
Median date of arrival:	March 4	October 23
Median date of departure:	April 1	November 19
Latest date of departure:	April 12, 1924	(November 27, 1926)

Market hunters and old sportsmen who hunted in the area between

1860 and 1921 have stated that the Common Canada Goose was a regular spring and fall transient, that the birds were usually seen or heard flying in flocks overhead or found individually and in small groups of 2 to 30 birds upon the water, and that at rare intervals when adverse weather conditions prevailed there were from 100 to 1000 geese present upon the land and water. During these unusual circumstances as many as 60 geese were killed in a migration, but in the average migration less than 10 were shot. The men also said that occasionally small groups attempted to winter. Schaff (1905: 101) stated that "wild geese came and went with the seasons, wintering, when our people first came to Ohio [1829 or 1830], on the Scioto [River] and at the Reservoir [Buckeye Lake]."

During the investigation the time of arrival and departure of the Canada Goose in spring and fall was of surprising regularity. The first transient flock made its appearance each spring between February 22 and March 10, and the last flock was noted between March 25 and April 12. The height of migration took place during the middle third of March. In spring many more geese were usually heard or seen flying over the lake than were found upon the waters or land. The flocks usually consisted of between 5 and 40 individuals. The largest spring flight recorded took place on March 12, 1933, when 86 geese were seen upon the water at once, and hundreds passed over during the day.

The earliest southbound flock passed high overhead on the evening of September 24, 1929, an extremely early date. During the other 11 years the first geese were recorded between October 14 and 30. The period of greatest abundance was between October 28 and November 7, and the main flight for any year lasted 6 days or less. The last fall birds were noted between November 10 and 27. The number seen and heard during a fall fluctuated greatly from one year to another and was obviously correlated with weather conditions, especially fog. Whenever fog occurred as the main flight was in progress, geese were recorded in large numbers, but when the weather was calm few were noted. (See "Fall goose migration," pp. 95-96.) During the winters of 1928-29 and 1929-30 flocks of 11 and 8 geese respectively, were seen at infrequent intervals during late December, January, and February.

The geese fed principally in the wheat fields at night, eating the sprouted grains and growing wheat. No damage was done to wheat except on the morning following the great goose flight of October 21, 1925, when a 20-acre field of winter wheat was seriously damaged by having been trampled and uprooted. On the 2 occasions when observations were made of a goose feeding upon the lake, the birds were eating yearling gizzard shad. The stomach of the bird collected November 27, 1926, contained 1 shad $3\frac{1}{2}$ inches in total length and some gravel.

**Branta hutchinsi* (Richardson)
Richardson's Goose³

Possibly a casual transient.

The single record for the area has been published by Dawson (1903: 581), Jones (1903: 50), and Field (1903: 134). Dawson, who referred to the species as Hutchin's Goose (*Branta canadensis hutchinsi*), wrote:

The only recent authentic instance of its occurrence in this state is that of an adult female which was winged and captured upon the Licking Reservoir [Buckeye Lake]. Mr. William Harlow kept the bird four years, and allowed it latterly the freedom of the place, except during the migrating season. I measured the bird in the summer of 1903 and found that it came well within the requirements of Hutchin's Goose.

Since the skin was not preserved, and as Dawson's (p. 580) measurements of bill, wing, and tarsus are larger than the measurements of the species as defined by Taverner (1931: 37), Richardson's Goose is only tentatively placed on the list of the birds of Buckeye Lake.

**Branta bernicla* (Linnaeus)
Brant

In Dawson's *Birds of Ohio* (1903: 644) there is this doubtful record:

On May 30th, 1902, Professor Lynds Jones and I came upon a bird in the Licking Reservoir [Buckeye Lake] which we had every reason to believe was a Brant, but whether of this species [*Branta bernicla*]⁴ or the next (*Branta bernicla glaucogastra*) it is impossible to say.

Field (1903: 134) recorded what obviously was the same individual as "*Branta bernicla*." Curiously, Jones (1903: 266) does not mention this sight record, which tends to indicate that he did not consider it worth publishing.

Among the sportsmen of Buckeye Lake the word "brant" is a frequently used term; it is applied by the majority to such varied species as Double-crested Cormorant, Loon, Whistling Swan, and Canada, Snow, and Blue geese. Among the more discriminating only the immature Snow and Blue geese are called "brant."

**Chen hyperborea* (Pallas)
Lesser Snow Goose

Rare fall transient.

Earliest date of arrival:	.....	October 18, 1923
Median date of arrival:	.....	October 23
Median date of departure:	.....	November 20
Latest date of departure:	.....	December 28, 1929

³ I have followed Taverner's (1931) revision.

⁴ It is doubtful which form Dawson had in mind. From his use of *Branta bernicla* and *B. bernicla glaucogastra* it is supposed that he considered this bird to be either *B. bernicla bernicla* or *B. bernicla hrota* [= *B. bernicla glaucogastra*]. The only form of brant recorded for Ohio is *B. bernicla hrota*, the form expected to occur.

The "white brant with black wing tips" was recorded during 9 autumns of the investigation, and obviously it was a regular fall transient. The majority of the birds noted were flying southward high overhead and usually as individuals or small groups associating with larger flocks of Canada Geese. Occasionally an individual or small group of as many as 9 alighted on the water or land, generally during a heavy fog. At least 1 bird was shot during the period.

There was no authentic late winter or early spring record of occurrence, though the species was recorded elsewhere in central Ohio. According to former market hunters and old sportsmen this goose was a rather regular fall transient and rare winter visitant and spring transient between 1860 and 1921.

Considerable confusion has existed among ornithologists concerning the status and relative abundance in Ohio of the Greater Snow Goose and the Lesser Snow Goose. Bent (1925: 164-78) has recently shown that with few exceptions the Greater Snow Goose (*Chen hyperborea atlantica*) occurs in the United States only along the Atlantic coast. The few available Ohio specimens of Snow Geese that I have examined were Lesser Snow Geese. I therefore assume that the birds seen in the Buckeye Lake area were of this species.

Chen caerulescens (Linnaeus)

Blue Goose

Rare or uncommon spring and fall transient.

Earliest date of arrival:	March 16, 1929	October 24, 1929
Median date of arrival:	.....	October 23
Median date of departure:	.....	November 20
Latest date of departure:	April 2, 1932	December 4, 1923

The past records of the Blue Goose in Ohio definitely indicate that it was a much more numerous transient through the state than was the Snow Goose. Most Blue Geese, however, were recorded from the western half of Ohio and relatively few were seen in the eastern half in the Appalachian foothills, at whose base Buckeye Lake lies. During the investigation the Blue Goose was only slightly more numerous and no more regular in occurrence than was the Snow Goose. The few spring transients seen during the larger flights of Canada Geese were either associating with them or were by themselves. Never more than 2 were seen in a day.

The Blue Goose was a more regular transient in fall than it was in spring, but even in fall it was not recorded yearly. Most southbound birds were seen in late October and early November and in flocks of Canada Geese. The majority were flying overhead and seldom more than 6 were noted in a day. The largest flock known to alight was seen feeding in a wheat field southwest of the lake by William Harlow during the last week

of October, 1924. This flock consisted of about 50 individuals, of which a few were "baldpate brant" (adult Blue Geese) and the remainder "black-breasted brant" (immature Blue Geese).

According to market hunters and sportsmen the "baldpate brant" and "black-breasted brant" were rather regular fall and irregular spring transients in the 1860 to 1921 period. These men considered the immature and adult Blue Geese as different species. The specimen collected near Liebs Island, April 2, 1932, was a male in incomplete adult plumage. Its stomach contained remains of 2 gizzard shad, and some gravel.

Anas platyrhynchos platyrhynchos Linnaeus
Common Mallard

Very common spring and fall transient, uncommon winter visitant, very rare summer visitant and resident.

Earliest date of arrival:	(February 7, 1925)	(September 9, 1933)
Median date of arrival:	February 25	October 10
Median date of departure:	April 12	December 19
Latest date of departure:	(April 25, 1931)	(December 28, 1929)

Former market hunters and sportsmen have stated that the much-prized Common Mallard or "green-head" was an abundant transient, an uncommon winter visitant, a summer resident, and a nesting bird throughout the 1860 to 1890 period. It was much hunted, and a brace of fat birds sold for \$.35 to \$1.00. Hunters reported that the species was less abundant between 1890 and 1921, and some reported a drastic decrease in numbers of transients and nesting birds.

The first large group came between February 7 and 20 of each year, and the first large migration took place soon after February 20. In warm years there were consistently large flights in late February; in other years these flights did not begin until March. The maximum numbers for spring occurred between March 1 and March 18. By April 1 migration was decidedly on the wane. The last transients left between April 8 and 25. During the largest spring flights 200 to 1200 birds could be recorded daily, and it was obvious that at such times there were several thousands in the area during a day.

Throughout 5 summers 1 to 4 obviously nonbreeding individuals were seen. In these summers there also were a few pairs which were suspected of nesting, and a record of a successful nesting was obtained. A pair was repeatedly noted during the spring of 1929 in a pond choked with yellow water lily (De Weese's Pond), and on June 15 a female and 6 small young were seen there.

The first fall arrivals appeared between September 9 and October 16, and by October 21 migration had begun. The large flights, usually begun during the last week of October, continued until between November 25 and

December 15. The autumn migration usually ended abruptly with the first hard freeze of late November or December. In the larger flights between 200 and 1500 individuals were recorded in a day, and as many as an estimated 1000 birds were seen upon the water at a time. During the "big freeze" of some years a truly great flight occurred. On such days large numbers came to and left the rapidly freezing lake, and it was evident that several thousands visited the area during a day.

In early December it became obvious that a dense flock, known as a "raft," of future winter residents was being formed. The "raft" usually remained, when undisturbed, in the wide expanse of open water between Sellars Point and Journal Island. By late December the Common Mallards and Black Ducks had established a winter routine of remaining together upon the water or ice throughout the day and of visiting their feeding grounds in the fields north and west of the lake at night. The birds were very regular in leaving the lake each evening about sundown and in returning again at or a little before daybreak. The number in the wintering flocks fluctuated during each winter and from one year to another. Whenever conditions were extremely unfavorable, as when a deep snow or sleet covered the food supply in the fields, the birds were few in number or entirely absent. Under favorable conditions from 30 to 800 were present.

The species fed largely upon gizzard shad, especially in fall. Upon many occasions I have seen birds gorging themselves upon this readily available food. Stomachs of 5 Mallards contained: 1, 3 shad; 1, 8 shad; 1, 1 shad; 1, 3 shad, spiders, aquatic insect larvae, a few small mollusks, duckweed, some hornwort, and corn; and 1, gravel (Pirnie, 1935: 153-54, Table 10).

Anas rubripes Brewster
Black Duck

Very common spring and fall transient, uncommon or common winter resident, very rare summer visitant.

Earliest date of arrival:	(January 29, 1932)	(September 10, 1933)
Median date of arrival:	February 13	October 20
Median date of departure:	April 12	December 18
Latest date of departure:	(April 21, 1928)	(December 23, 1933)

The history of the Black Duck in the area, as indicated by reports of market hunters and sportsmen, and by my records, is fascinating. This duck seems to have increased in numbers during the 1860 to 1934 period, in contrast to the almost universal decrease shown by most species.

The former market hunters and the sportsmen were united in their opinion that from 1860 to 1885 the "black mallard" or "Jackie" was a decidedly uncommon duck and that few were shot for sport or the market. About 1885 the species slowly began an increase which continued until 1915. Opinions were divided concerning the continuance of this trend after 1915;

some thought that the increase continued and others that the numbers remained stationary. All agreed that the "black mallard" became a most numerous and conspicuous species several years before 1915.

I found the Black Duck among the most numerous of the transient ducks and usually the most numerous winter visitant; after 1925 it was the most numerous large duck. Hundreds of records indicate that the bird did not decrease in numbers, but evidently increased slightly between 1922 and 1934. The reasons for its ability to increase, or at least to hold its own, are not known; most ducks declined in numbers. It may be that (1) since this duck's breeding range is in northeastern North America its natural reproduction has not been seriously affected by man or by recent climatic conditions, as have the western prairie-slough-breeding species; (2) it has extended its nesting range and migrations westward, and this extension has progressed as the population pressure from other duck species has lessened; (3) it can take care of itself better in areas populated by people than can any other sporting duck—its ability to keep out of shotgun range is remarkable;⁵ (4) when the less cautious duck species were more abundant, the wilder and relatively scarce Black Duck was not as conspicuous as it has become in recent years; the apparent increase in Black Duck numbers may have been in part relative, rather than absolute.

During the investigation the first large group of invaders appeared between January 29 and February 18. The first large migration occurred between February 10 and March 2, and was primarily dependent upon the breaking up of the ice and upon general weather conditions. The height of the spring migration took place during late February and early March. By March 18 of most years a pronounced decrease had occurred, and by March 25 migration was almost over. A few flocks could be seen during the last of March and the first days of April, but by April 9 only a few individuals remained. The large flights contained between 400 and 2500 individuals, and it was evident that on such days there were many thousands in the area or passing over.

Obviously nonbreeding individuals and crippled birds were seen in 3 summers. There was no indication of the species' nesting. After the investigation, on April 30, 1936, the late E. V. Prior of Newark found a nest with 5 eggs, in the small marsh on Liebs Island. On May 3, this nest contained 9 eggs. Prior visited the nest on May 24 and found the bird incubating; on June 1 he found that all except 1 egg had hatched. This is the only nesting record.

The first fall arrival made its appearance between September 10 and October 25, and the first large flights occurred by the last few days of

⁵ At least twice as many of the supposedly wily Common Mallards were shot during each fall hunting season, even though the Black Duck was more numerous.

October or the first few days of November. Large flights continued throughout November and often during most of December. They usually ended abruptly with the first "big freeze," when many thousands of Black Ducks visited and passed over the area each day. During the usual "big flights" between 400 and 2500 individuals were daily recorded.

In early December the winter "raft" began to form (see under Common Mallard). The number of wintering Black Ducks depended largely upon weather and food conditions and fluctuated from a few birds to as many as 1800; however, with few exceptions the Black Duck was always more numerous than was the Common Mallard.

No species of puddle or sea duck ate gizzard shad with such seeming avidity as did the Black Duck. During the fall hunting season, when the birds were almost constantly frightened from the marshes and were repeatedly chased from the fields by the many sportsmen hunting rabbits and pheasants, the readily available gizzard shad of the open waters of the lake were eaten in great quantities. It was interesting to see a large flock of hungry transients alight and begin picking up and swallowing the benumbed and recently killed shad. At such times a bird swallowed as many as 10 shad in 3 minutes. Nine stomachs of Black Ducks, taken from October to late April, were examined. Seven stomachs contained 1 to 11 shad each; 1 (April 21, 1932) contained several small mollusks, dragonfly larvae, and stolons of a species of *Potamogeton*; and 1 was empty except for gravel.

The status of the 2 supposed subspecies of Black Ducks in the area remains unsolved, for to have definitely determined their status would have necessitated the collecting or trapping of a very large number. Observations indicated: (1) The majority of winter birds whose legs were plainly seen as they stood on land or ice or were exposed above the water's surface as the birds tipped up to feed had bright coral red legs. (2) The bills of winter birds were every perceptible shade of yellow and yellow-green. (3) Nine of 11 late fall and early winter birds, examined in the hand, had coral red legs, yellow to yellow-green bills, and agreed in size and plumage (especially the streaking on the throat) with the current descriptions of the subspecies *rubripes*. (4) The remaining 2 (1 male, 1 female) had olive green legs, bills shading toward olive green and plumage similar to the subspecies *tristis* (= *obscura*) as outlined by Brewster (1902: 184-85). (5) Seventeen of 20 early fall birds, examined in the hand, had the legs olive green to dull reddish brown, and the bills were never bright yellow but tended toward olive green. (6) The remaining 3 had coral red legs and bills distinctly yellowish (2 males, 1 female). (7) All late spring, summer, and very early fall birds observed in the field, and 2 late spring birds examined in the hand, had olive green to dull reddish brown legs, and the bills were more or less olive green. (8) Birds with bright reddish legs and heavy

weight were the "big winter" or "red-legged Jackie" of the sportsmen; these were referable to *Anas rubripes rubripes*. (9) Birds with olive green or dark brownish legs were the "little green-legged Jackie" of the sportsmen; these were referable to *Anas rubripes tristis*. (10) In total yearly population the red-legged variety seemed much more numerous. (11) I suspect that the "little green-leg" (*Anas rubripes tristis* of current lists) may be the younger stage or summer plumage and coloring of the "red-legged Jackie" (*Anas rubripes rubripes*), and because of this suspicion the Black Duck is listed to species only.

Anas acuta tzitzihoa Vieillot

American Pintail

Common spring and fall transient, rare winter visitant.

Earliest date of arrival:	(January 31, 1931)	September 9, 1930
Median date of arrival:	February 24	October 3
Median date of departure:	April 16	December 5
Latest date of departure:	April 28, 1881	(December 15, 1927)

The American Pintail, according to men who persistently hunted the bird between 1860 and 1920, was a very abundant spring and fall transient until 1895, after which its numbers decreased slightly. The decline was particularly apparent in fall. During the heyday of market hunting the species was killed in large numbers, usually from blinds on the lake or beside pools and ponds in the fields. Because of the fine flavor of its flesh, its goodly size, and attractive appearance, the bird brought almost as high a price as did the Common Mallard. The "pin head" as it was called, was a favorite with sportsmen, for it was more easily decoyed to "wooden blocks" and live decoys than were most puddle ducks, especially in spring.

During the investigation this graceful bird came with the first great wave of duck migration. If the late winter was mild this flight occurred in the first half of February, and migration was heavy during the latter half of that month and through most of March. If the late winter was cold, the first flight did not appear until the latter half of February, and the spring migration was restricted chiefly to March. During some late Februarys and throughout each March, 40 or more of the birds were daily seen, and during large flights, which took place primarily in mid-March, between 400 and 1100 could be noted in a day. A sharp decrease in numbers usually took place during the last few days of March, and by April 1 the species was poorly represented. The last transients were noted between April 2 and 22. The species was found over the entire lake and its marshes and was a numerous inhabitant of "sky ponds" and overflow ponds. Occasionally, it fed throughout the daylight hours upon grass in wet meadows, as did its close associate, the Baldpate.

The first American Pintails of fall usually arrived during the first 10 days of October, though in a few years the first arrivals appeared in September. Maximum abundance was during the last days of October and throughout November, and the last transients were noted in the first half of December. The fall numbers never equaled the spring abundance, for in autumn less than 75 birds were usually recorded in a day, the number was often less than 20, and only during the largest flights were 100 to 400 individuals seen. In fall many more were observed migrating over the area than alighting in it, and the few which did alight seldom remained for more than a few hours. The intensive fall hunting in marshes and on land made conditions very unfavorable, and food, except shad, was obviously scarce in the deeper and more open waters of the lake. This puddle duck ate shad rather sparingly, and few were observed gorging themselves. Stomachs of 2 were examined, one collected February 22, 1926, the other in early November of 1932. The February bird was collected in a "sky pond" north of the lake and its stomach contained a shad and several small mollusks. Apparently the duck had recently fed on the lake or adjacent waters, for there were no gizzard shad in the rain water puddle where the bird was collected. The fall bird was taken on the lake; its stomach contained 2 shad, 2 inches long, and a few plant stolons.

During most of the winters 1 to 20 of these birds associated with flocks of Black Ducks and Common Mallards. During warm periods between mid-December and mid-February when pools and ponds in fields were free from ice, few or no ducks alighted in them, even though they appeared as suitable as in spring, when the waters contained many birds.

**Anas crecca crecca* Linnaeus
European Teal

Accidental visitor.

For an hour on the afternoon of March 6, 1932, I observed a European Teal, in male plumage, that was swimming and feeding in the water of a partly frozen bay of Maple swamp. The bird remained near a group of 6 male Green-winged Teals and a female teal which I took to be a Green-wing. When the birds were about 120 feet distant, I noted, with the aid of 8× Zeiss binoculars, in the European Teal a white streak along each side of the back and the total absence of the white crescent on the side of the breast in front of the wing, and the total absence of the white streak and presence of the white crescent before the wing in the male Green-winged Teals. In the European Teal the vermiculations on the breast, sides, and flanks were noticeably coarser, and the ground color was a darker gray than it was in the Green-wing Teal males.

The Green-wings remained in a more or less compact flock. The European Teal usually remained several feet away, obviously because of the actions of the others. Whenever this solitary bird attempted to join the flock it was vigorously driven away (Trautman, 1932*b*: 345).

The only previous record in Ohio is that of a bird collected by the late W. F. Henninger (Walker, 1931: 63).

Anas crecca carolinensis Gmelin
Green-winged Teal

Uncommon spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(February 26, 1927)	September 9, 1930
Median date of arrival:	March 2	September 28
Median date of departure:	April 14	December 2
Latest date of departure:	April 18, 1925	(December 15, 1927)

It is claimed by the older men that between 1860 and 1920 the Green-winged Teal always occurred in moderate numbers each spring and fall. Apparently, this little duck was not considered as fine a game bird as was the more abundant Blue-winged Teal, nor was its flesh considered as of equal quality. The species sold readily in the market. Accounts differ as to whether it decreased in abundance during the 1860 to 1920 period. A few sportsmen called this little duck a "snee."

The spring migration of the Green-winged Teal was characterized by a marked consistency in time of arrival and departure and in abundance. The first northbound transients arrived between February 26 and March 6, and the first flights were in the first week of March. The period of maximum abundance was during the last 3 weeks of March and was usually restricted to March 12 to 18. Migration was obviously on the wane by April 1, and the last transients were recorded between April 12 and 18. In the period of greatest abundance from 5 to 50 individuals were usually seen in a day, occasionally 75 were seen, and on April 10, 1925, 105 birds were recorded.

The fall migration was less consistent as regards time of arrival and departure, and abundance than was the spring movement. The first transients appeared between September 9 and October 10, usually during the last week of September or first week of October. The species was regularly recorded from October 15 to November 15, and was occasionally seen as late as December 1. The last transients, noted between November 15 and December 15, left when the lake froze over. At the peak of migration from 5 to 40 individuals could be daily seen, and in the largest flights between 60 and 85 were recorded in a day.

One to 7 Green-winged Teals were usually present throughout an entire winter. These birds spent the day upon the lake with flocks of Black Ducks and Common Mallards and flew with them at night to feed in the cornfields.

The stomachs of 4 Green-wings, taken during the hunting season in October and November when the birds were harassed by sportsmen, were examined. Three stomachs contained from 1 to 3 shad each, traces of a great number of spiders and insects, and a few small univalves and bivalves. The fourth contained spiders and insects. This dainty little bird was not an habitual fish eater, and apparently it fed upon fish only when other food was not readily available. During hazy, quiet Indian summer afternoons little groups of Green-wings could be seen swimming rapidly in one direction and then another, picking up spiders which had floated over the lake on their gossamer threads and dropped upon the water. Occasionally a Green-wing saw a spider drifting above the water and reached upward and caught it. While these little groups of ducks were busily engaged in feeding on spiders they gave the impression of greatly enjoying themselves. At such times the females occasionally stopped feeding to give diminutive little quacks, which sounded surprisingly loud in the stillness of the fall afternoons and early evenings.

Anas discors Linnaeus

Blue-winged Teal

Uncommon spring and fall transient, rare summer visitant, casual winter visitant.

Earliest date of arrival:	(March 15, 1930)	(August 6, 1932)
Median date of arrival:	March 19	August 15
Median date of departure:	May 14	October 29
Latest date of departure:	(May 25, 1929)	(November 12, 1923)

The former market hunters and sportsmen of the 1860 to 1890 period have unanimously stated that the Blue-winged Teal was the most numerous transient puddle duck. They have also stated that the men who hunted in the area from 1830 to 1860 told them that during that period the species had likewise been most abundant. Apparently conditions were extremely favorable from the time of the completion of the reservoirs until at least 1880. Fall conditions were said to have been especially favorable when the lowering of the lake level through use of water for canal purposes exposed an enormous food supply and seemingly made other factors very propitious. The men claimed that many thousands of birds were present during April, September, and October of each year, and, that until 1880 a hunter could kill as many as 100 in a day, when the water level was low, while sitting upon a stump in the reservoir and shooting into the closely packed flocks as they flew past, or alighted among the decoys. Until 1880 hundreds of these birds were annually sent to the markets.

A decrease in numbers became apparent about 1885, and this has continued. A few men believed that no other duck species had been so greatly reduced in abundance during the 1860 to 1920 period. Reasons for this

decrease seem apparent. The food and cover about the lake became scarce, and the food and cover north and west of the lake has continued to decrease in amount as the ponds and swamps have been drained. Furthermore, the species has greatly decreased in numbers over its entire range, and much of its breeding range has been destroyed. The species was a more numerous transient between 1922 and 1925 than it was between 1929 and 1934.

The first spring arrivals appeared between March 15 and 22, usually after the last of the heavy winter ice had disappeared. The first flights began in late March and continued throughout most of April. The period of maximum abundance was in the first 2 weeks of April. A definite decrease in numbers occurred about May 1, and the last transients were seen between May 9 and 25. Throughout late March and most of April from 10 to 160 could be daily recorded. During larger flights as many as 220 were seen in a day, and the flocks contained as many as 40 individuals. The species was unquestionably more numerous than my records indicated, for these small birds did not inhabit open waters as did most ducks, but remained in marshes and weedy ponds, where they were difficult to find. Because of this inconspicuousness I assume that a smaller percentage of the total number present was daily recorded than of any other duck species, except perhaps the Wood Duck and the Shoveller.

One to 12 Blue-wings were seen from late May to early August during 7 summers. Most of these birds were immature or nonbreeding individuals, though occasional pairs of seemingly mated birds were noted. No actual nesting evidence was obtained. William Harlow insisted that the duck formerly nested in the area, and that in the late spring of 1885 or 1886 his dogs flushed a female from her nest and 7 eggs in a lowland meadow at the western end of the lake. It seems probable that the species nested when the marshes were more extensive and conditions were more favorable.

The first southbound transients were observed between August 6 and 20, and by August 27 migration was well under way. Occasionally distinct flights occurred in late August, when as many as 40 individuals were noted in a day. The peak of migration took place during September and the first 10 days of October, and then the species was almost as numerous as in spring. At this season all except a few were in the larger marshes, particularly in the game refuges.

There was 1 wintering record. During the exceptionally warm 1931-32 winter L. L. Ludwig and I noted a male on several days between early December and mid-March.

During the greater part of their migrations, most of the Blue-winged Teals were in marshes and inland swamps and ponds, where gizzard shad were absent or largely unavailable, and where there was little opportunity to feed upon fish. In the hunting season, when many birds were forced to

remain on the open waters where other food was apparently scarce, they fed on fish. Eight stomachs were examined; 6 from birds collected in the fall hunting season, and 2 from birds taken in April. Each of 4 stomachs of fall birds and 1 stomach of a spring bird contained 1 to 4 shad, many spiders, other aquatic and land insects or their larvae, duckweeds, and bits of other aquatic vegetation; the stomach of another fall bird contained many small mollusks and a crayfish 1½ inches long. The remaining 3 stomachs contained spiders, insects, and vegetation.

Anas cyanoptera cyanoptera Vieillot
Cinnamon Teal

Accidental visitor.

The single record of the Cinnamon Teal is apparently the only authentic one of its occurrence in Ohio. Davie (1898: 82), in first recording its capture, stated:

On the 4th of April, 1895, a fine male of this species was killed, together with a number of ducks, at the Licking County Reservoir [Buckeye Lake], by William Harlow. On the 6th, I skinned and mounted this specimen and it is now one of the rare Ohio birds in my collection.

References to this bird are found in the publications of Field (1903: 133), Jones (1903: 215), and Dawson (1903: 594).

I have discussed this specimen with Harlow, who told me that he first noticed this striking bird in a flock of Blue-winged Teals as they approached the blind he was using on Onion Island. As the birds flew over his decoys, he shot the Cinnamon Teal and several Blue-wings. Realizing that he had obtained an unusual specimen, he took it to Mr. Davie. Later Harlow saw the mounted bird upon many occasions.

When a large part of the Oliver Davie bird collection was obtained by Ohio State Museum there was in it a mounted Cinnamon Teal in male plumage which contained no date of collection nor other data. Harlow's description of the posture of his mounted bird fitted the mounted teal in the Davie collection. When he saw this bird he unhesitatingly declared it to be the Cinnamon Teal he shot in 1895. I assume that this mount from the Davie collection is the Buckeye Lake specimen.

Spatula clypeata (Linnaeus)
Shoveller

Uncommon spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(March 5, 1927)	September 4, 1879
Median date of arrival:	March 10	October 10
Median date of departure:	April 28	November 10
Latest date of departure:	May 20, 1931	(November 30, 1933)

It is the opinion of former market hunters and sportsmen that the "spoonbill" was a rather numerous spring and fall transient between 1860 and 1900. Apparently few were shot for food, as there was little market for this odd bird, and even the sportsmen seemed to dislike it. A steady decrease in annual numbers was noted after 1900, which continued until the beginning of the investigation. With the decrease in the daily kill of most duck species between 1900 and 1921, the estimation of the worth of the Shoveller rose, until by 1920 the species was considered a prize, and its flesh was greatly esteemed.

During the investigation the first spring transients did not usually appear until the winter ice had left the lake and moderate weather prevailed. In warmer years the first arrivals were noted between March 5 and 10, otherwise it was not until March 18 to 24 that the first were found. Maximum spring abundance, when there were 5 to 25 birds, occurred during the last week of March and the first half of April. A decrease in numbers took place about April 20, and after April 28 only an occasional bird was seen. In the largest waterfowl flights between 30 and 75 were seen. The largest number ever recorded was on April 3, 1928, when 103 individuals were noted. As with the Blue-winged Teal, this species was principally a bird of marshes, swamps, and ponds, where it usually remained well hidden. Because of its inconspicuousness the actual abundance was probably greater than the records indicate.

The fall migration was poorly defined, for the bird was never recorded upon more than 8 days of any fall, and in 3 autumns none was noted. It was usually found alone or in flocks of less than 10, and only upon a few days were there as many as 25. The majority were found between October 15 and November 10.

The only wintering record of the Shoveller was made during the unusually warm 1931-32 winter, when 33 individuals, mostly in various stages of male plumage, were to be found in the shallow water about Onion Island.

The stomach of a bird collected on Cranberry Island, on November 11, 1933, was filled with approximately 1200 lesser duckweed plants (*Lemna minor*), 8 greater duckweed plants (*Spirodela polyrhiza*), 121 seeds of the dotted smartweed (*Persicaria punctata*), 9 seeds of another species of smartweed (*Persicaria* sp.), 3 seeds of hornwort (*Ceratophyllum demersum*), 1 small piece of the carapace of a crayfish, and a few grams of gravel. Stomachs of 2 birds taken from the open water near Journal Island, on November 30, 1933, were empty except for a few dozen seeds each of hornwort and some gravel. Upon a few occasions during the hunting season, when the birds were forced out in the open waters, they were observed feeding upon gizzard shad.

Chaulelasmus streperus (Linnaeus)

Gadwall

Uncommon spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(February 28, 1931)	October 8, 1929
Median date of arrival:	March 8	October 22
Median date of departure:	May 6	November 28
Latest date of departure:	May 16, 1926	(December 29, 1923)

It is the opinion of older hunters that the Gadwall was a numerous transient between 1860 and 1885, that thereafter it began rapidly to diminish in numbers, and that by 1915 it had become uncommon. The more observant men stated that the Gadwall was more readily decoyed to "wooden blocks" than was any other puddle duck species and that it was the only puddle duck which frequently allowed the hunter to approach within shotgun range as it sat upon open water. Because of this tameness or stupidity a rather large proportion of these ducks were killed. The bird was justly called the "fool mallard."

During the investigation the first spring arrivals appeared between February 28 and March 11. One to 20 individuals were generally present from March 14 to April 10. During larger flights 20 to 60 were seen, and the largest number ever noted, 82 birds, was observed on March 20, 1932. The average daily numbers began to decline during the last half of April, and the last transients were noted between May 1 and 16.

The fall migration was less well defined. The first arrivals were noted between October 8 and November 1, the majority during the first 3 weeks of November, and the last transients between November 25 and December 29. Usually less than 10 birds were recorded in a day, and 42 individuals was the largest number ever noted. An occasional Gadwall was usually found in the wintering flocks of Black Ducks and Common Mallards.

The stomachs of 2 Gadwalls, collected December 29, 1923, and October 30, 1931, each contained 4 gizzard shad 3 inches long, and some gravel.

An interesting courting flight of this species was observed many times, usually on warm April evenings. The female, quacking loudly, was at first pursued high in the air by 2 or more males. After a few minutes of such pursuit a male, by a sudden burst of speed, passed directly above and in front of the female, where he set his wings and coasted, with spread tail and arched neck, in obvious display. As his speed decreased he forced the female to pass around him, after which he, or one of the other males repeated the same performance. These tactics continued until the birds appeared exhausted. During some performances the wings of the male and female struck together, causing a note that was sometimes as sharp and loud as a rifle shot. The most astonishing feature of the courtship flight was the great speed attained.

Mareca penelope (Linnaeus)
European Widgeon

Very rare spring transient and winter visitant.

The first recorded occurrence of this species in the Buckeye Lake area, as well as in Ohio, was on March 29, 1902, when Peter Hayden, of Columbus, captured a male. It has been mounted and is in the museum of Denison University (Field, 1903: 133; Jones, 1903: 215; and Dawson, 1903: 588). Field recorded a male taken at the lake on April 1, 1902 (Jones, 1903: 215).

It was not until April 15, 1924, that another was recorded in the area. On that day Edward S. Thomas observed a male at the western end of the lake. The next record was made on April 13, 1929, when at intervals over a 4-hour period I observed a fine male at the western end of the lake. During my observations the bird repeatedly attempted to join a flock of 9 male and 5 female Baldpates whenever they were upon the water, but each time it was repulsed by one or more of the Baldpates. These males were extremely pugnacious toward the bird, especially when it swam rapidly toward a female Baldpate as if to begin courting. Whenever the flock was in flight the European Widgeon joined the group and flew with them until they alighted, after which he was promptly chased away. The bird had a peculiar and distinctive rolling note unlike the Baldpate notes.

On April 4, 1931, near Onion Island, I again heard this distinctive rolling note. Closely examining with field glasses a flock of Baldpates as they circled preparatory to alighting I saw the unmistakable, brilliant reddish chestnut head of a male European Widgeon. The head seemed much more conspicuous than were the heads of the male Baldpates.

All 5 records were of males in very distinctive plumage. I assume that females also visited the area but were not noted because of their similarity to female Baldpates. No widgeons were observed in fall, probably because of inability to find the few males that were sufficiently distinctive in coloration. On December 30, 1938, and January 3, 1939, Lawrence E. Hicks observed a male near Liebs Island. It was in a flock of several hundred wintering waterfowl, including 12 Baldpates.

Male widgeons have been recorded at infrequent intervals elsewhere in central Ohio. I believe that if a thorough investigation of ducks in central Ohio was made each spring, it would result in the recording of 1 or more of these birds. A male was collected on April 16, 1926, at O'Shaughnessy Reservoir, Delaware County, by Roscoe W. Franks (Geist, 1928: 6).

Mareca americana (Gmelin)
Baldpate

Common spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(February 22, 1927)	September 6, 1930
Median date of arrival:	March 4	October 8
Median date of departure:	April 28	November 23
Latest date of departure:	May 17, 1930	(December 6, 1931)

Hunters in this area between 1860 and 1920 have stated that the Baldpate was a very numerous transient, especially in spring, and that it was shot in considerable numbers for market and for sport. A few men claimed that the species has decreased in numbers since 1895.

The first northbound transients yearly arrived between February 22 and March 12. In the average year the first large flocks appeared during the first week of March, in warm seasons in late February, and in the coldest years not until almost mid-March. The spring height of abundance occurred during the last half of March and first 12 days of April, when 25 to 100 could usually be recorded daily. In the big flights between 400 and 950 birds were tallied. A decided decline became apparent about April 12, and by April 20 this duck was usually uncommon. The last transients were noted between April 22 and May 17. Throughout spring the Baldpate inhabited the entire lake and marshes, and was present in many overflow puddles and "sky ponds." Occasionally flocks of these handsome birds could be seen walking about a wet meadow, eating grass in much the same manner as do domesticated geese.

The Baldpate was less numerous in fall than it was in spring. Seldom more than 60 birds were recorded in a day and never more than 350. The first fall birds usually arrived during the first 2 weeks of October, and the peak of migration took place between October 15 and November 15. The greatest numbers were seen during the last 8 days of October and the first 4 of November. The fall birds apparently had little desire to remain for any length of time, as intensive hunting on land and marsh forced them to the open waters of the lake where the only available food in quantities was the gizzard shad. The Baldpate was seemingly less fond of fish than were most puddle duck species, and few were seen to swallow shad. Stomachs of 2 Baldpates, taken in early November, 1931, were entirely empty except for a little gravel.

An individual or a small flock was occasionally noted during several winters, and a flock of 9 to 12 birds remained at the eastern end of the lake throughout each of two winters (1931-32 and 1932-33). These birds were almost invariably found in a small portion of the lake, about a foot in depth, which contained a dense growth of submerged aquatics. During colder periods the flock kept a small hole open in the otherwise frozen lake, and even when a thaw occurred and much of the lake was open, the flock seldom left this favored weed bed. Apparently there was an especially attractive food supply in this small area.

Aix sponsa (Linnaeus)

Wood Duck

Uncommon spring and fall transient and summer resident, casual in winter.

Earliest date of arrival:	(February 28, 1932)	.....
Median date of arrival:	March 20	(August 23)
Median date of departure:	(April 22)	October 24
Latest date of departure:	.....	(November 11, 1931)

Former market hunters and sportsmen found the Wood Duck an abundant transient and common summer resident between 1850 and 1890. The species was said to have been so numerous during summer that a profitable business was made of hunting fledglings and flightless adults in the flapper stage. The concentration of nesting birds was said to have been the result of the great number of nesting sites in the standing and dead trees which thickly dotted the greater part of the "Old Reservoir." Between 1890 and 1900 the numbers of Wood Ducks began to decrease sharply; this continued until about 1914, when the legislature of Ohio passed an act prohibiting the shooting of Wood Ducks for sport. This act has been in force ever since. With complete protection the species slowly began to increase in abundance, although by 1922 it was still an uncommon transient and summer resident. The reason for its failure to regain its former abundance after the hunting drain had been removed is obvious. From 1890 to 1922 there was a steady decrease in the number of available nesting sites. This situation prevails throughout the bird's nesting range. Had the hunting drain not been removed in 1914 the species probably would have been exceedingly rare or entirely extirpated from the area.

Between 1922 and 1934 the Wood Duck was an uncommon transient that showed no marked change in abundance during the period. It was always present by March 28, and from then until April 15 it was more numerous than at any other period of spring. During the height of abundance between 3 and 40 individuals could be seen in a day.

Between 1922 and 1925 there were 8 to 12 pairs annually nesting, from 1926 to 1930 the nesting number was between 3 and 9 pairs, and from 1931 to 1933 there were always less than 4 pairs nesting. This decline in nesting abundance seemed to be caused by a decrease in the number of nesting sites. On July 13, 1929, I found a female and 5 almost grown ducklings in Little Buckeye refuge; on August 9, 1930, I saw an adult and 5 young that were well able to fly, in Honey Creek refuge; and on July 12, 1931, L. L. Ludwig and I saw 6 half-grown young in Little Buckeye refuge.

Southbound transients began arriving shortly after mid-August. By late August the species had become rather numerous, and until late September it was more numerous than at any other period; 10 to 70 individuals could be daily noted. The number of birds began to decrease in early October, and by mid-October only an occasional individual or flock could be observed. Throughout its sojourn, and particularly in the fall, the species remained principally in the game refuges, where conditions were more favorable than elsewhere. There is 1 wintering record. In the unusually warm winter of 1931-32, a male was seen at various times in Little Buckeye game refuge and swamp during the entire winter (see pp. 122-24).

Twice in late October a Wood Duck was seen feeding upon yearling

gizzard shad. Apparently its food was primarily vegetable matter and small invertebrate animals.

Nyroca americana (Eyton)

Redhead

Rather common spring and fall transient, rare winter visitant.

Earliest date of arrival:	(February 8, 1931)	October 17, 1925
Median date of arrival:	February 27	October 31
Median date of departure:	April 10	December 3
Latest date of departure:	April 16, 1927	(December 11, 1926)

Former market hunters and sportsmen stated that from 1860 to 1900 the Redhead was an abundant spring and very common fall transient, and that during each migration large numbers were killed for market or for sport. The bird was easily decoyed to live or wooden decoys, especially in spring, and was therefore considered an excellent game bird. Its flesh was of fine quality, and the birds were always in demand for market consumption. Before 1875 the market hunter usually received \$.25 for a brace of Redheads, but after that date plump birds usually sold for between \$.25 and \$.50 each.

Shortly after 1900, according to market hunters and sportsmen, there began a noticeable decrease in the abundance of Redheads which continued until 1920, and fewer were killed. In 1914 spring shooting of waterfowl was first abolished, and the annual kill of Redheads was reduced by more than half. The laws regulating the sale of ducks became increasingly restrictive, until in 1919 their sale was prohibited entirely.

The Redhead was a common transient until 1928, and 200 to 700 birds could be noted each day during the height of the spring migration in early March and in the fall migration in November. In 1929 there was a sharp reduction in both spring and fall numbers. By 1933 this once common species had become uncommon. The number of Redheads seen in a day in these later years was always below 300, and usually was less than 40.

Only a few Redheads were killed each fall of the investigation, for, besides the reduced number of transients, the species was not so effectively hunted with the aid of decoys as it formerly had been. Three to 24 individuals remained throughout the warmer winters.

The Redhead consumed large quantities of fish, particularly gizzard shad, especially during the fall. Upon several occasions I have observed a flock of 5 to 15 Redheads alight upon the lake from migration and begin to feed upon the benumbed or dead shad that were near the surface of the water. At such times a bird ate as many as 6 shad in 2 minutes. Stomachs of 5 Redheads were examined; each stomach contained 1 to 9 shad, and 1 stomach also contained a few aquatic insect larvae. The alimentary tract of the bird which had eaten 9 shad was so full that it was first necessary for me to re-

move 2 shad from the bird's throat before I could insert cotton in it and thus keep the bird from drooling and ruining its plumage.

Nyroca collaris (Donovan)
Ring-necked Duck

Common spring and fall transient, rare winter visitant.

Earliest date of arrival:	(February 11, 1923)	(October 15, 1927)
Median date of arrival:	March 2	October 20
Median date of departure:	May 10	November 28
Latest date of departure:	(June 3, 1928)	(December 4, 1926)

The market hunters and sportsmen who knew the characters separating the species of "bluebills" stated that the Ring-necked Duck or "marsh blue-bill" was very numerous between 1860 and 1890. Its numbers then declined until 1910, after which no decrease was noted. Throughout these years the species was always less numerous than was the Lesser Scaup.

Between 1922 and 1928 the Ring-necked Duck could be termed "very common"; at the peak of migrations it was not unusual to record 300 individuals in a day, and sometimes as many as 1000 were present. In these years the Ring-necked Duck was generally less numerous than was the Lesser Scaup, and the yearly ratio between the species was about 3 Ring-necked Ducks to 10 Lesser Scaups. From 1929 to 1933 there were somewhat fewer Ring-necked Ducks, but the decrease in the number of Lesser Scaups during this period was even more marked, and by 1934 the ratio between the two had become almost equal. The Ring-necked Duck could then be termed only "common."

Its spring migration coincided with that of the Lesser Scaup, and the largest flights for each species occurred simultaneously. As with those of the Lesser Scaup, March flocks of Ring-necked Ducks consisted chiefly of well-marked males, early April flocks were one-half well-marked males and one-half females and immature males, and late April and May flocks were chiefly females and poorly plumaged males. The fall migration and the largest flights also coincided with those of the Lesser Scaup. During warmer winters an occasional individual or small flock of Ring-necked Ducks was noted for periods of one to ten days; only in the extremely warm winter of 1931-32 did the species remain, and 2 to 15 individuals were recorded every day.

Relatively few sportsmen realized that the Ring-necked Duck and the Lesser Scaup were distinct species. Curiously, many considered the female or poorly plumaged male Ring-necked Ducks as young Lesser Scaups and ignored the marked differences between the high-plumaged males. Some sportsmen considered the females to be female Redheads, an easily understandable mistake when the gray speculum and general color pattern are considered. Other sportsmen mistook some female Redheads for Greater Scaups because they were heavier than regular "bluebills."

As with many other sea ducks, the Ring-necked Duck feasted upon gizzard shad whenever it was available. Six stomachs, of birds taken in fall, winter, and spring, contained 2 to 7 shad each.

Nyroca valisimeria (Wilson)

Canvas-back

Uncommon spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(February 11, 1923)	October 26, 1929
Median date of arrival:	March 2	November 2
Median date of departure:	April 10	December 8
Latest date of departure:	April 25, 1931	(December 15, 1927)

The reports of former market hunters and sportsmen indicated that the Canvas-back was a regular and numerous spring and fall transient between 1860 and 1900, which usually flocked and was closely associated with the more abundant Redhead. According to the hunters the Canvas-back decreased in numbers between 1900 and 1922.

During my study this fine waterfowl was always an uncommon spring and fall transient. Between 1922 and 1928 the yearly numbers appeared to be very constant, but in the following years there seemed to be a fluctuation in annual numbers and possibly a decrease. The spring migration took place chiefly in early March, the fall migration in November, and during those periods 2 to 40 Canvas-backs could be expected daily. At no time was the species very numerous upon the lake, and never more than 154 individuals (March 10, 1928) were recorded in a day. During November flights many flocks of Canvas-backs sometimes migrated across the area. The flocks were of less than 60 birds, except for one flock of approximately 300 and another of almost 400 individuals. Those Canvas-backs which alighted seldom remained in flocks entirely of their own species, but usually merged with larger flocks of Redheads, Lesser Scaups, and Ring-necked Ducks.

A few Canvas-backs were found in milder winters; they sometimes remained for weeks in some small open hole in the ice-covered lake. The species seemed very fond of young gizzard shad and captured them in large numbers. These fish formed the greater part of their food. The stomach of a female, collected November 28, 1925, contained the remains of 9 shad which averaged $3\frac{1}{2}$ inches in length.

**Nyroca marila nearctica* (Stejneger)

Greater Scaup Duck

Very rare visitant.

Much confusion has existed among market hunters and sportsmen concerning the status of the Greater and Lesser Scaup ducks in the area. The majority believed that from one-half to three-fourths of the scaups were

Greater Scaup or "big bluebill." A few men considered only the fatter and heavier "bluebills" to be of this species. The confusion in regard to the 2 species was not confined to wildfowlers, for opinions of many ornithologists acquainted with Ohio birds differed greatly. Wheaton (1882: 530) considered the Greater Scaup a "not uncommon spring and fall migrant in the interior of the State." Jones (1903: 42) reported in both his and Dawson's (1903: 604) *Birds of Ohio* that at least one-fourth of all scaups found in Ohio were Greater Scaups. Field (1903: 133) considered the species to be an uncommon spring and fall transient in the area.

For a few years after 1922 I believed that the Greater Scaup was not uncommon during early spring and late fall duck migrations. My conclusions were based on sight identifications, and highly colored spring males with greenish heads and whitish flanks were considered Greater Scaups. It was not until a few were collected that I realized the mistake. Since these early years I have examined and measured 214 scaups from the area, all of which were unquestionably Lesser Scaups. Almost all were collected during the legal hunting season, either by sportsmen or myself (Trautman, 1931b: 257).

Despite the fact that no Greater Scaups were collected I am firmly of the opinion that the species did occasionally visit the lake (Trautman, 1935a: 202). Upon 4 occasions I studied, under favorable conditions, scaups which undoubtedly must have been of this species. During the phenomenal waterfowl flight of November 2, 1927, I observed for more than an hour a fine-plumaged male and female (or young male) which I consider to be of this species. On December 1, 1927, I saw a flock of 3 males and 2 females (or immature males) which gave every indication of being Greater Scaups, and on November 16, 1929, I found 4 males which were particularly well-marked birds. On February 4, 1933, Harry Fabert and I observed in a flock of wintering waterfowl, 4 males which we identified as Greater Scaups. Each bird was clearly characterized by (1) greater size than that of the Lesser Scaups; (2) a squarish-shaped head, comparatively larger than that of the Lesser Scaup; (3) an extremely thick neck, which together with the squarish head is distinctive; and (4) the extent of the whitish area on the upper surface of the wings, which in flight definitely continued from the white speculum outward across the base of the primaries. In recent years, at Houghton Lake, Michigan, I have repeatedly identified Greater Scaups at considerable distances and later checked my identifications by collecting the birds.

From these studies of scaups at Buckeye Lake and elsewhere I conclude that (1) the Greater Scaup was a very rare and irregular visitant; (2) since there has been no notable decrease in abundance in recent historic time the Greater Scaup should not have been much more numerous between 1751 and 1922 than it was later.

In an article (Trautman, 1928b: 78) on ducks at Buckeye Lake I included

the Greater Scaup as a species in whose stomach gizzard shad had been found. The bird which I thought was a Greater Scaup has upon recent examination of the skin (collected October 31, 1925), proved to be a Lesser Scaup. This record of a Greater Scaup is erroneous.

Nyroca affinis (Eyton)
Lesser Scaup Duck

Very common spring and fall transient, rather rare winter and summer visitant.

Earliest date of arrival:	(February 11, 1923)	(September 24, 1929)
Median date of arrival:	March 1	October 14
Median date of departure:	May 28	December 3
Latest date of departure:	(June 9, 1928)	(December 15, 1928)

The reports of former market hunters and older sportsmen indicated that between 1860 and 1915 the Lesser Scaup was one of the most abundant duck species that visited the area and was the most sought for and most often taken. The bird was readily decoyed to wooden decoys or "blocks," especially in spring, and this made it a favorite. The species was not readily frightened as were the large puddle ducks or the Redhead and the Canvasback, for the "little bluebill" would repeatedly return to, "or swing around," the decoys after having been fired upon. The bird was of the most economic importance as a market product between 1860 and 1890; between 1890 and 1915 hunting for the market became of less significance to the community, and sport hunting and the revenue derived from it became increasingly important. At this time the area became well known throughout Ohio for its excellent "bluebill shooting," and annually drew many hunters from central Ohio. In talking over the "good old spring shoots" with some of these men one could not help catching some of their enthusiasm as they recounted experiences in shooting "bluebills" which "dropped in among the decoys as fast as did the snow flakes."

The numerical status of the Lesser Scaup drastically changed during the 12-year investigation. For the first 6 years the species was the most abundant duck species and was taken in fairly large numbers during each fall hunting season. In 1929 a sharp decrease in numbers occurred, which continued until 1934, when the Lesser Scaup was surpassed in abundance by the Black Duck and Common Mallard and equaled by the Pintail and American Merganser.

The first spring transients arrived by March 5, and the first large flocks were present by the middle of the month. From then until early May the species was very numerous, and, especially before 1928, it was not unusual to note an estimated 1000 individuals upon the water at one time. The March flocks contained more well-marked males than females or males in changing plumage; early April flocks were rather evenly divided between these classes; and in late April and thereafter the flocks contained many

more females and immature males than well-marked males. In early May a sharp decrease in numbers occurred, and by mid-May the species had become uncommon. In the majority of years a few nonbreeding birds of both sexes remained. Some summering individuals became so tame as to approach within 3 feet of one to eat bread or other food offered.

The first fall transients usually appeared in October, and the first large flocks arrived by the middle of the month. From mid-October until the first hard freeze in late November or early December the bird was usually present in large numbers. This was particularly true between 1922 and 1928, when it was not unusual to note an estimated 1000 individuals on the water at one time. The greatest flight occurred during the huge waterfowl migration of November 2, 1927. On that day large flocks of these waterfowl came to and went from the lake in an almost continuous procession, and several times that day I noted approximately 2400 birds on the water. The total number in the area surely consisted of many thousands.

During warmer winters when a considerable amount of open water was present, a few individuals or small flocks remained throughout the season. Like other sea ducks, this species fed heavily upon young gizzard shad, especially in fall. Of 96 stomachs examined, 49 contained shad only, 19 contained shad, mollusks, crayfish, insects, or aquatic vegetation, 3 contained mollusks and crayfish, 2 contained mollusks, duckweeds, and bits of hornwort, and 23 were empty except for gravel.

Bucephala clangula americana (Bonaparte)

American Golden-eye

Common spring transient, rare or uncommon fall transient and winter visitant.

Earliest date of arrival:	.....	November 11, 1933
Median date of arrival:	(February 15)	November 28
Median date of departure:	April 10	(December 18)
Latest date of departure:	April 23, 1929	.....

Market hunters and sportsmen of the period between 1860 and 1920 are of the opinion that the American Golden-eye was a common transient and uncommon winter visitant and was more numerous in late February and early March than at any other season. The species was said to have never reached the abundance of such sea ducks as the Redhead, Lesser Scaup, or Ring-necked Duck, nor was it taken in such large numbers for food and sport.

Between 1922 and 1934 the number of American Golden-eyes recorded annually remained constant. The species was one of the first of the ducks to begin its spring migration. In the average winter the first large flight began in mid-February or shortly thereafter, in the coldest winters the flight began in early March, and in the warmest winters distinct flights took place in early February. These early transients usually arrived when the lake, canal, and streams were largely ice covered, and only a few open holes were

present. The main flight took place in late February if the season tended to be warm, or in the first half of March if the weather had been unseasonably cold. During this spring height, when the birds were at their greatest abundance for the year, it was not unusual to record as many as 100 individuals in a day, and in the largest flights as many as 400 were recorded. The numbers dwindled during the third or fourth week of March, and by April 4 only a few remained.

This sea duck, generally the last of the duck transients to appear in fall, arrived even later than the hardy American Merganser. In the average autumn the species did not arrive until the last week of November, and during the 2 warmest autumns it was not recorded until late December; only once was it rather numerous as early as November. In fall the species was usually uncommon; about 25 were recorded in a day. Because of the relatively few transients, their wariness, and the lateness of their arrival,⁶ very few were shot.

The size of the wintering population varied considerably and depended upon the amount of open water. During winters or parts of winters when there was considerable open water the species was fairly numerous, and 5 to 35 individuals could be daily recorded. In cold winters the bird was absent. Generally at the first indication of a warm period following a severe cold wave, the American Golden-eyes came to the lake in search of open water. If there was no open water they left, but if a hole or lead was present they alighted and began to feed.

Thirteen stomachs of the birds were examined, of which 8 contained 1 to 4 gizzard shad each, the remainder contained crayfish and an occasional mollusk. It was apparent that in the area this sea duck was not primarily a fish-eating species, but it resorted to fish when other food was not readily available. If the birds were frequently disturbed and were not permitted much time to feed, as in the hunting season, they ate dead and dying shad. If left undisturbed the species almost invariably segregated about the submerged and stony "Middle Bank" or along the stony "North Bank" to hunt for crayfish. All sizes of crayfish were caught and brought to the surface. The small and medium-sized crayfish were readily swallowed, the larger ones were eventually rejected, but only after numerous attempts to swallow them had failed (Pirnie, 1935: 158).

**Bucephala islandica* (Gmelin)

Barrow's Golden-eye

A duck observed on March 16, 1923, and considered to be Barrow's Golden-eye was reported by E. S. Thomas (1923: 116). This bird was an

⁶ During the years 1930 to 1933 the hunting season closed before December 1, and, as few arrived before that date, the species had almost complete protection from hunting.

immature male American Golden-eye, the plumage of which superficially resembled that of Barrow's Golden-eye. A correction of the report appears in the *Wilson Bulletin* (Thomas, 1938: 202).

I have examined more than 50 specimens of the American Golden-eye in various plumages; among them were 2 young males, which, like the bird reported by Thomas, showed some purplish gloss on head, had the white spot at the base of the bill imperfectly outlined and higher than wide, and lacked the large amount of white on the shoulders and scapulars. Since 1923 I have elsewhere observed similar color patterns on young male American Golden-eyes both in the field and in museums.

Confusion of the young and adult male plumages doubtlessly accounts for the prevailing belief among sportsmen of the area that two distinct species of Golden-eye occur during migration, as well as for Field's (1903: 133) report that Barrow's Golden-eye was a "rather uncommon spring and fall migrant. Found at Licking Reservoir [Buckeye Lake]."

Barrow's Golden-eye almost certainly has not been recorded at Buckeye Lake. The species is now considered as of casual occurrence in Ohio.

Bucephala albeola (Linnaeus)

Buffle-head

Uncommon spring and fall transient, rare winter visitant.

Earliest date of arrival:	(March 1, 1930)	November 1, 1926
Median date of arrival:	March 5	November 8
Median date of departure:	April 23	December 8
Latest date of departure:	May 18, 1929	(January 1, 1932)

The "butter-ball" was reported to have been a common transient between 1860 and 1900. After 1900 its numbers were said to have steadily decreased, and by 1922 it had become an uncommon transient. This duck was much sought by market hunters and sportsmen. Because it was readily decoyed to wooden "blocks" a rather large proportion of the birds were shot.

Usually less than 15 Buffle-heads were noted in a day, and the largest number ever recorded was 65. There was a slight indication that the species decreased in abundance during the investigation. The first spring transients were always seen in the first 2 weeks of March, and the peak of migration took place between March 20 and April 15. Except for occasional stragglers, the species disappeared about April 20.

The first arrivals in autumn regularly appeared between November 1 and 14, and the peak of migration was during the last 2 weeks of November. Fall departure depended chiefly upon the weather, but usually occurred in December. A few birds remained until the lake became ice-covered for the first time. Whenever the water was exceptionally low, making accessible a large food supply, the species remained late in fall. A few individuals stayed throughout the 2 warmest winters.

The little "butter-ball" was a persistent fisheater, and these little ducks went through what appeared to be painful contortions in their efforts to swallow yearling gizzard shad that were 3 or 4 inches long. Seven stomachs were examined, 6 were from birds collected in November and December, and 1 from a bird taken on April 23, 1929. Six stomachs, including the stomach of the spring bird, contained 1 to 3 gizzard shad, and a few mollusks, insects, or crayfish. The seventh, from a bird taken November 20, 1926, was empty.

Clangula hyemalis (Linnaeus)

Old-squaw

Rare spring and fall transient, very rare winter visitant.

Earliest date of arrival:	.....	(November 22, 1928)
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	(April 23, 1922)	.....

According to market hunters and sportsmen the Old-squaw was usually a rather uncommon transient and rare winter visitant during the 50 years previous to 1922. At rare intervals large flights were said to have occurred. My friend the late Joseph F. Hays told me that the last large visitation took place during March and April of 1912. Then several hundred Old-squaws were present, and at least 50 birds were shot over decoys. For some unexplainable reason, the species in this area acquired the name of "Florida Long-tail" and "Florida Sprig," and the name Old-squaw was seldom heard. Wheaton (1882: 534) appears to be the first to record the species for Buckeye Lake: "Chas. S. Orton secured a female in breeding plumage at Licking Reservoir the following April [1878]." The duck was also recorded by Field (1903: 134), who stated that in Licking County the birds were "rather uncommon spring and fall migrant[s]. . . . They occur principally on the Licking Reservoir."

From 1922 to 1934 never more than 11 Old-squaws (April 23, 1922) were seen in a day. During migrations the species was most often noted during the very last of November, early December, and March. Temporary visitants were seen during every winter month.

The stomach of a bird collected along the "North Bank" near Sellars Point, February 28, 1925, contained 3 gizzard shad and 1 small crayfish; the stomach of another, collected near Liebs Island in an open hole on the ice-covered lake, January 1, 1927, contained 2 shad and 1 small crayfish.

**Somateria mollissima dresseri* Sharpe

American Eider

Casual visitant.

There is possibly an authentic record of the occurrence of the American

Eider, first mentioned by Davie (1898: 93): "A female specimen of this species in my collection was taken November 11, 1895, at the Licking Reservoir [Buckeye Lake] by William Harlow." Later Jones (1903: 46) and Dawson (1903: 614) mentioned its capture. Harlow told me that he shot the bird while hunting over decoys in the "Old Reservoir" near the "Middle Bank" (Map 1; No. 18).

Apparently this specimen, which was mounted, has been destroyed or lost for many years. The loss is unfortunate, because of the possibility that Davie's identification may have been incorrect; it may have been a female of the less rare King Eider.

Somateria spectabilis (Linnaeus)

King Eider

Casual visitant.

There is 1 record of the occurrence of the King Eider. Early on the morning of December 2, 1926, a hunter in a rowboat saw 3 ducks upon the water at the western end of the lake near Summerland Beach. He shot one of them, and finding it to be an eider and therefore a protected species, he gave it to a conservation officer who took it to L. L. Ludwig, game protector. Ludwig mounted the bird and later presented it to Ohio State Museum. Its stomach contained 3 yearling gizzard shad, a few grains of corn, and gravel.

Melanitta fusca deglandi (Bonaparte)

White-winged Scoter

Very rare spring transient, regular though rare or uncommon fall transient.

Earliest date of arrival:	February 28, 1925	October 18, 1923
Median date of arrival:	.....	October 25
Median date of departure:	.....	November 10
Latest date of departure:	April 17, 1932	December 22, 1924

There are 2 records of the occurrence of this scoter prior to 1922. The first was published by Wheaton (1882: 538): "An immature bird was taken at the Licking Reservoir [Buckeye Lake] in December, 1876, in company with the last species [American Scoter]." The second record is represented by a skin, taken March 10, 1881, and now in Ohio State Museum.

During the investigation the White-winged Scoter was recorded only twice in spring: on February 28, 1925, I saw 2 birds on the partly ice-covered lake near Sellars Point and on April 17, 1932, Charles F. Walker noted 2 birds on the lake near the same point. The species was a regular fall transient, and a few individuals could be annually recorded on at least 1 day between October 25 and November 10. The bird was usually rather rare, for generally less than 5 were recorded in a day, though once 21 were seen. All except a few were immatures or females.

This scoter and the Ruddy Duck appeared oftener on mornings following clear, frosty nights than on nights which were cloudy and stormy, and both were usually amazingly stupid when first arriving. Immature birds were particularly stupid, for they permitted hunters to row a boat well within shotgun range before attempting to fly away; occasionally an individual or group remained on the water after having been fired upon and after some of their companions had been killed or wounded. Because of this behavior a large proportion alighting upon the lake were killed. The young birds were much prized by the experienced sportsmen for the fine flavor of their flesh.

Few sportsmen or market hunters who hunted in this area prior to 1922 have any recollection of seeing White-winged Scoters, and the few who saw or killed this species remember doing so only upon a few occasions. This scarcity of birds before 1922 seems odd, as there appears to be no reason why the species should have been less numerous than it is at present.

Stomachs of 9 October and November birds have been examined. Four had 1 to 12 gizzard shad each; 3, shad and 1 to 6 mollusks (*Physa*); 1, a few mollusks; and 1, no food. All contained a surprisingly large amount of gravel (called "ballast" by sportsmen)—more than 70 pieces in each stomach. The bits of gravel ranged from 0.5 to 3.0 mm. in diameter.

**Melanitta perspicillata* (Linnaeus)

Surf Scoter

Very rare spring and fall transient.

Earliest date of arrival:	.....	October 24, 1925
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	April 28, 1917	November 13, 1928

The first record of the Surf Scoter in the area was published by Jones (1917: 166):

Buckeye Lake, Licking County, has furnished Ohio with several rare records of birds. Mr. Ed. S. Thomas of Columbus found two Surf Scoters *Oidemia perspicillata* there in company with Scaup Ducks, on April 28, 1917. It has been supposed that this scoter would be found on Lake Erie at some time, but this artificial body of water seems to have furnished a greater attraction.

Thomas told me that on the day he saw these scoters he was accompanied by several members of the Columbus Audubon Society and that everyone had an excellent opportunity to observe and to study the birds, one of which was a male in well-defined spring plumage.

On October 24, 1925, I found 2 Surf Scoters, apparently immatures or females, at the western end of the lake, and during the huge waterfowl migration of November 2, 1927, I found 3 immatures. When first seen they

were near Sellars Point, but later in the day I found them as far east as Little Buckeye swamp. Early in the afternoon of November 13, 1928, Robert B. Foster and I saw a well-marked female near Sellars Point. Hoping to secure the bird as a specimen we pursued it—vainly—during most of the afternoon. This duck was the rarest of the 3 scoters recorded; it probably has been rare throughout historic time. Apparently the species is the rarest of these 3 scoters elsewhere in Ohio.

Oidemia nigra americana Swainson

American Scoter

Very rare spring and fall transient.

Earliest date of arrival:	March 18, 1928	October 28, 1933
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	April 23, 1929	December —, 1876

There are 8 records: (1) Wheaton (1882: 538) lists the capture of a young male in December, 1876. It was preserved by Theodore Jasper. (2) Thomas M. Earl mounted 2 specimens taken November 3, 1921. One is now in Ohio State Museum. (3) On November 28, 1924, Robert M. Geist and Charles F. Walker saw 4 American Scoters near Journal Island. One was a male in adult plumage, with the yellow-orange knob at the base of the culmen well developed. (4) While on the "Middle Bank" in a duck blind, I observed a male for the greater part of the afternoon of October 30, 1926. (5) I noted a male and 2 females on March 18, 1928, on the water near Sellars Point. (6) On April 23, 1929, as I drove an automobile north of the Lakeside Woods, an American Scoter flew in front of the machine and alighted in a small pond beside the road. The bird, a young female, was collected. Its stomach contained the remains of 52 mollusks (*Physa*), a small gizzard shad, and gravel. (7) Edward L. Wickliff and I saw 2 on April 5, 1930, on the water between Liebs and Onion islands. (8) On the afternoon of October 28, 1933, I found 2 near Journal Island.

The American Scoter has probably been an irregular transient throughout the historic period. The 6 birds found during the investigation were at or near the western end of the lake, where the greatest expanse of water was located.

Oxyura jamaicensis rubida (Wilson)

Ruddy Duck

Fairly common spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(March 10, 1928)	September 18, 1929
Median date of arrival:	March 16	October 12
Median date of departure:	April 27	December 13
Latest date of departure:	May 18, 1928	(December 30, 1923)

According to the market hunters and the sportsmen, the Ruddy Duck migrated through the area in large numbers between 1860 and 1900. After 1900 there began a noticeable decline in numbers, which continued until 1922. Before 1900 the species was little sought by market hunter or sportsmen, for it sold for only a few pennies in the market, and the sportsmen disliked it because it was not easily decoyed. About 1900 the public began to realize the superior table quality of this small duck, and the demand for it began to increase until its price equaled and sometimes exceeded that of the Common Mallard, Redhead, and Canvas-back. This demand resulted in a great increase in the annual kill. In the latter period hunters began the effective practice of rowing a boat toward the birds and of shooting them as they rose into the air.

Between 1922 and 1928 the species was usually a common transient, especially in fall, and during the height of migrations several flocks of from 3 to 12 could be recorded daily. After 1928 the species became a decidedly uncommon transient.

The period of spring migration was usually less than $1\frac{1}{2}$ months in duration. The first arrival did not generally appear before mid-March, and the last bird had usually left by late April. The height of the movement was in early April. The first fall arrivals came about mid-October, and the first definite flights occurred shortly thereafter and continued until the first hard freeze of late November or December.

The Ruddy Duck was in many respects a most peculiar and individualistic waterfowl. For instance, the largest fall migrations did not occur during the great waterfowl flights, but usually took place on and immediately following clear, frosty nights, when few duck species were migrating in large numbers.⁷ Unlike most duck species, the Ruddy Duck did not habitually flock with other ducks, but usually remained in small flocks of its own kind. Large groups of the birds were seldom seen. The largest flock ever noted, consisting of 178 individuals, came from the north on the calm afternoon of November 22, 1928, and alighted upon the water near Journal Island where it formed a "raft" and remained until disturbed by sportsmen. This little duck was generally an amazingly stupid animal; it repeatedly allowed hunters to row a boat well within shotgun range before attempting to dive or fly away. As a consequence, entire flocks of as many as 10 were killed in a few moments. A few old birds, if sufficiently frightened, became more wary. Because of its stupidity and the persistence with which it was hunted, a much higher percentage of fall transients were killed between 1922 and 1931⁸ than of any other duck except the White-winged Scoter.

⁷ Because of the habit of appearing on mornings following frosty nights the bird was called the "little frost duck" or "little frost sprig-tail" by many sportsmen.

⁸ In 1932 and 1933 the Ruddy Duck was protected by law.

Throughout all of the winter of 1931-32, except a part of March, 2 individuals remained in the water which separated Liebs and Onion islands.

Sixty-eight stomachs were examined. Of these, 24 contained a few to many mollusks, principally of the genera *Physa* and *Sphaerium*, traces to large quantities of aquatic insects, and, in addition, 14 contained duckweed (*Lemnaceae*) and hornwort. Two stomachs contained traces of a gizzard shad. Forty-two stomachs contained only gravel. It was a surprise to discover that this duck did not habitually eat fish. It apparently refused to eat the readily available shad, even when its stomach was entirely empty and it must have been hungry. The species was observed upon several occasions to pick up and "mouth" shad, yet no bird was ever observed to swallow one. Ruddies dabbled and picked up duckweeds, aquatic insects, and spiders from the surface of the water; many came up from a dive holding bits of leafy aquatic vegetation or plant stolons, which they subsequently swallowed; and a few were seen to eat small crayfish.

Lophodytes cucullatus (Linnaeus)

Hooded Merganser

Fairly common spring transient, common fall transient, rare summer and winter visitant.

Earliest date of arrival:	(February 8, 1931)	(October 24, 1925)
Median date of arrival:	February 28	October 31
Median date of departure:	April 2	December 15
Latest date of departure:	(April 16, 1927)	(December 30, 1923)

The Hooded Merganser was said by market hunters and sportsmen to have been a common transient from 1860 to 1922. As its flesh was not very palatable, the bird was little molested. The species is said to have occasionally nested in the area before 1900, and adults and fledglings were found by hunters who were in search of the flapper and fledgling Wood Ducks.

In spring throughout the investigation the Hooded Merganser was essentially a March duck. The peak of migration usually took place between March 10 and 27, when 3 to 30 individuals could be seen. The greatest number ever recorded on a spring day (March 23, 1928) was 72.

The first fall arrivals appeared during the last week of October or first 10 days of November, and by mid-November the species was always present and usually rather numerous. The migration peak generally occurred between November 17 and December 10. The numbers varied much from fall to fall. During some autumns never more than 20 were seen in a day, during others from 200 to 300 birds could be noted daily. The bird was usually most numerous when the water level was low, thereby exposing or making available a large quantity of food. An exception prevailed during late November of 1932, for then the water level was above normal and at least 100 mergansers were present.

In 3 years of the investigation a few highly plumaged males remained throughout the summer. They were thought to breed but no actual nesting evidence was observed. Besides these highly plumaged males there were other males, in less brilliant plumage, and a few females. A few remained throughout the warmer winters. The species ate many fish, especially the young gizzard shad. Four stomachs, from birds taken during the fall hunting season, were examined. Two contained shad and small mollusks, and 1 also contained a bit of hornwort; 1 contained 6 shad; and 1 was empty except for gravel.

Mergus merganser americanus Cassin
American Merganser

Uncommon fall transient and winter visitant, common spring transient.

Earliest date of arrival:	(February 6, 1927)	(November 2, 1928)
Median date of arrival:	February 15	November 25
Median date of departure:	April 1	December 15
Latest date of departure:	(April 30, 1933)	(December 22, 1922)

Market hunters and sportsmen stated that this species was a common transient and winter resident from 1860 to 1920, and that its numbers were very constant. It had no market value because of its unpalatable flesh.

The numerical status of this fish duck showed no change between 1922 and 1934. It was among the last of the ducks to arrive in fall; the first migrants did not usually appear before the last 2 weeks in November, and the species was often rare until early December. In mid-December it was daily present and remained until the entire lake froze over. Like the Black Duck and Common Mallard it was a characteristic winter waterfowl, but its wintering numbers fluctuated considerably in relation to the amount of ice. Whenever the lake or the streams became completely ice-covered, it left because it was not adapted to feeding in grain fields at night as were the puddle ducks. During the coldest periods of some winters the species sometimes disappeared for a few days, but upon the first indication of a moderation in the weather a few reappeared, flying low over the lake looking for leads and open holes. In fall and winter the species was uncommon, and, except for a few days of each year, less than 60 individuals a day were recorded.

This species was among the first of the waterfowl to begin its northward movement. In warm winters the first large flights appeared in early February; in the average winter they occurred in the last week of that month; and in the coldest winters the first flights began in early March. The height of migration took place during the general breaking up of the ice, which in the normal year was during late February or the first 2 weeks of March. A decrease in numbers took place between March 15 and 25, and by April 1 the species had usually disappeared. At the height of spring abundance this

fish duck was more numerous than at any other period and 50 to 200 individuals a day were not unusual. The largest flight occurred on March 20, 21, and 22, 1924, when there were an estimated 2000, 1000, and 1000 individuals. There was only one summering record, a male which was repeatedly noted throughout late spring and summer of 1925.

Few American Mergansers were killed by sportsmen between 1922 and 1934, for in addition to its natural wariness, its flesh is unpalatable, and it appears late in the fall.⁹

Five stomachs have been examined: 4 contained 2 to 11 gizzard shad, and 1 contained 3 shad and a 2-inch yellow perch. Hundreds of observations were made of this merganser feeding upon the readily available young shad. The bird was of little economic importance, since this important forage fish seemed well able to maintain its numbers. Had the shad not been present in great numbers the merganser might have fed upon the young of important game fish, such as the white crappie, bluegill, and largemouthed bass.

Mergus serrator Linnaeus
Red-breasted Merganser

Common spring and fall transient, very rare winter and summer visitant.

Earliest date of arrival:	(March 18, 1928)	(October 26, 1929)
Median date of arrival:	March 28	November 2
Median date of departure:	June 3	December 3
Latest date of departure:	(June 16, 1928)	(January 1, 1932)

The Red-breasted Merganser was not well known to market hunters and sportsmen of the 1860 to 1921 era, and only a few of these men distinguished between this species and the American Merganser. The few who were able to identify the 2 species stated that the Red-breasted Merganser was a fairly common April and November transient. As with the American Merganser, this species was little valued because of its rank flesh, and consequently was seldom molested.

The Red-breasted Merganser was one of the latest of the duck species to arrive and to depart in spring. The bird seldom appeared before the last few days of March, and it was April before it became common. By late April it was always numerous, and so remained until mid-May, after which it decreased in numbers. During some years a few flocks did not depart until the last of May, after all other duck transients had left. At the height of abundance 20 to 200 individuals were daily recorded.

The first Red-breasted Mergansers of autumn made their appearance in late October or early November, the full peak of migration occurred between November 10 and 30, and, on the average, the species was more numerous

⁹ Before 1930 all intensive fall duck hunting was done before the American Merganser appeared, and after 1930 the fall hunting season ended before the species arrived. During these later years it was virtually a protected species.

than it was in spring. Sometimes there were large flights, with as many as 500 individuals. There was 1 summering record—a bird seen throughout the summer of 1929. This individual could fly well, but its plumage was very bedraggled. A crippled individual succeeded in remaining alive during the abnormally warm winter of 1931–32.

Eaton (1910: 180) and Fargo (1932b: 6) have interestingly described a method of fishing employed by this species. It is one which I have frequently witnessed. A typical example occurred on November 20, 1932. While I was observing birds from Sellars Point, a flock of approximately 50 Red-breasted Mergansers alighted near by on the water and, with a widely extended front, swam rapidly and noisily forward. After swimming a short distance the birds began diving into a large school of gizzard shad and succeeded in driving the benumbed fish to the surface, where they could be readily captured and eaten. Presently several Herring Gulls and Ring-billed Gulls were attracted by the splashing and general commotion, and soon they were fluttering above the mergansers and the fish or dipping downward to capture fish. About 10 minutes later a flock of 9 Black Ducks also began to eat the fish. The performance lasted about 20 minutes and was rather spectacular. The normally wary and sedate Black Ducks were especially ludicrous as they frantically chased the shad that were appearing all about them.

The stomachs of 14 Red-breasted Mergansers were examined. Eleven contained from 1 to 9 shad each, and 3 were empty except for gravel.

Cathartes aura septentrionalis Wied
Turkey Vulture

Common spring and fall transient, common in summer.

Earliest date of arrival:	February 8, 1927	.....
Median date of arrival:	March 3	(September 15)
Median date of departure:	(April 25)	November 15
Latest date of departure:	.....	December 22, 1931

The first Turkey Vultures of spring were always noted by March 8. Shortly after mid-March the species became common, and from then until mid-April between 15 and 50 individuals could be seen daily. After mid-April there were between 5 and 20 birds daily until mid-September. During those springs when an abundance of carrion was present the species was much more numerous than usual. In March and April, 1929, there were many dead sheep in the fields north of the lake, and individuals and small groups of vultures drifted northward across the lake from the direction of the Sugar Grove region¹⁰ to feed upon them. About 5:30 P.M. a general exodus took place, and as many as 50 birds could be noted slowly flapping southward in a straight course across the lake.

¹⁰ The Turkey Vulture nests in large numbers on the sandstone ledges of the Sugar Grove region.

Most of the individuals seen during late spring and summer did not nest in the area, but came there to feed. The scarcity of nesting pairs was probably caused by a lack of suitable nesting sites. Evidence of 3 nestings was obtained. Throughout the spring of 1928, I noted 2 pairs in the Hill Woods, which seemed to be nesting near by, and on June 30 I found an adult feeding 2 well-grown young, about 30 feet above the ground on a limb of a dead tree. The tree had a cavity in the bole, near the limb where the young were perched, and I assume that the cavity contained the nest. On the same day another young fledgling was found upon a limb near a cavity in another tree in the same woodland. On July 12, 1931, in the Big Woods north of Sellars Point I saw an adult vulture come out of a hole in a large, hollow snag. Climbing up to the hole, which was about 20 feet above the ground, I found a young vulture that was almost large enough to leave the nest.

The southward migration of the Turkey Vulture became evident about September 15, and by October 1 it was well under way. Its peak occurred during the first 3 weeks of October, and throughout the daylight hours of that period from 1 to 15 vultures could be almost always seen, circling about and drifting slowly to the southward. It was evident that during the largest migrations there were more than 100 individuals, and possibly as many as 400, passing southward over the area in a day. During the last week of October a decrease in numbers was usually noted. Except for an occasional straggler, migration was over by November 10. On December 24, 1939, members of the Wheaton Club saw 1 at the eastern end of the lake.

The Turkey Vulture was recorded during every winter month except January. An occasional, unrecorded visitor was probably present in January during one or more years, since throughout the investigation the species usually wintered in the Sugar Grove region, only 20 miles to the south. It was surely a nesting species and transient in the Buckeye Lake area throughout historic time, and formerly may have been more numerous, when nesting sites were more plentiful.

**Coragyps atratus atratus* (Meyer)

Black Vulture

Very rare visitant.

On the early evening of April 13, 1929, I saw a Black Vulture and a small group of Turkey Vultures flying southward over the lake. Both species had probably been attracted to the area from their haunts in the Sugar Grove region by a number of dead sheep in the fields north of the lake.

The Black Vulture, like the Turkey Vulture, must sometimes of necessity wander far afield in search of food. As a few of the species were nesting residents in the Sugar Grove region, individuals probably wandered rather frequently into the Buckeye Lake area in search of food.

**Accipiter gentilis atricapillus* (Wilson)
Eastern Goshawk

Very rare winter visitant.

Earliest date of arrival:	.....	November 29, 1924
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	March 14, 1925	.....

Three Eastern Goshawks, all in immature plumage, were recorded. On November 29, 1924, Charles F. Walker and I saw a very large Eastern Goshawk flying over Little Buckeye swamp. From that day until March 14, 1925, various members of the Wheaton Club saw this individual upon a total of 16 days. Throughout its sojourn the bird seemingly remained in and about Little Buckeye and Honey Creek swamps, where food was abundant. The hawk must have fed upon the Bob-white, for by spring the coveys in these swamps were unusually depleted. Upon several occasions evidence was found that Bob-whites had been eaten by a hawk.

On February 7, 1926, while I was near Sellars Point whistling the "Screech Owl" call to attract birds, an Eastern Goshawk came gliding from behind a cottage and alighted in a near-by tree. The bird perched less than 35 feet from me, and it was possible to identify it.

An Eastern Goshawk was seen 11 times in or near Jack's Neck Woods between December 22, 1927, and March 18, 1928. Probably because of this hawk's activities a covey of Bob-whites that originally contained 14 individuals was reduced to 6. On March 18, 1928, I saw the hawk capture a Bob-white. When I noticed the hawk it was standing upon a fence post, which it presently left, to fly and glide alternately toward a large tangle of blackberry bushes. Upon reaching the tangle the hawk flew into it with incredible speed and dexterity and captured a Bob-white from the covey of 7 which had been feeding there. Upon reaching the tangle I found 6 Bob-whites huddled together on the ground beneath a dense clump of bushes; they were so frightened that they refused to leave their cover, even though I came within 3 feet and touched 2 of them with a stick.

Had this hawk appeared regularly and in considerable numbers in the area, it might have had a destructive effect upon the game crop and upon poultry. Because of its irregular occurrence and small number, the species was of little or no economic importance. It therefore seemed futile for the state government, public organizations, and private individuals to spend much time and money in efforts to extirpate this predator.

Accipiter striatus velox (Wilson)
Sharp-shinned Hawk

Rare spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(February 22, 1927)	September 2, 1930
Median date of arrival:	March 15	September 20
Median date of departure:	April 10	November 10
Latest date of departure:	May 18, 1928	(December 7, 1930)

The Sharp-shinned Hawk was always a rare transient, for never more than 2 individuals were recorded in a day nor more than 12 in a year. Most of the spring transients were noted during the last few days of March and first days of April. In spring the bird was usually found about the brushy edges of larger woodlands. In fall it was most often recorded in late September or early October, generally in the larger bushes or trees about the shores and islands of the lake. Cranberry Island seemed a favored haunt; the hawk was undoubtedly attracted to the island by the small land birds and shore birds which congregated there during early fall.

The bird was a very rare winter visitant; never more than 1 was observed to remain throughout that season. Wintering birds were usually in the Big Woods or in one of the hilly woodlands in the eastern half of the area. No evidence was obtained of the bird nesting during the investigation, though it was found nesting in the Sugar Grove region (Hicks, 1928: 51).

The few older residents of the area capable of correctly identifying the Sharp-shinned Hawk have told me that from about 1880 to 1910 they saw several of these birds each spring and fall, that there were occasional, well-marked flights during late March or late September, and that an occasional pair nested in the area each year. In 1882 Wheaton (1882: 420) considered the bird a "common resident in Northern, less common in Middle and Southern Ohio," and 20 years later Field (1903: 136) wrote that it was a "tolerably common permanent resident" in Licking County.

The stomach of a specimen collected on Cranberry Island, November 11, 1931, contained the partial remains of a Swamp Sparrow.

Accipiter cooperii (Bonaparte)

Cooper's Hawk

Rather common spring and fall transient and winter resident, uncommon summer resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(March 1)	(October 1)
Median date of departure:	(April 20)	(November 30)
Latest date of departure:	.....	.....

The former market hunters and older sportsmen stated that the Cooper's Hawk declined in numbers between 1860 and 1921. These men declared that the species was formerly a well-represented nesting and wintering bird, and that distinct flights occurred each spring and fall until as late as 1900. From the study of conditions during early historic time it appears that this woodland-nesting species should have been a numerous nesting bird; because of the great concentration of Passenger Pigeons and other land birds, it should have been numerous in migrations and winter.

During the investigation the Cooper's Hawk showed a continued decrease in nesting numbers. Between 1922 and 1924 there were at least 18 pairs annually nesting; by 1927 the yearly number had been reduced to 14 or

fewer; and by 1933 there remained only 4 nesting pairs. In nesting abundance the Cooper's Hawk was outnumbered only by the Sparrow Hawk, and was equaled by the Red-shouldered Hawk. At least 26 nests were found, but only 6 were closely examined. All were in large trees, generally ash, white elm, sugar maple, beech, or oak. The nests, which were usually at the junction of 2 or more of the principal forks of a tree and from 30 to 70 feet above the ground, were rather compact structures of small branches and twigs, and some contained a lining of leaves, corn husks, or bits of corn cob. Nests were constructed, or old ones repaired, in April or May, and the sets of eggs were completed from late April to late May. Of the 6 nests examined, 5 contained 4 eggs each, and 1 contained 6 eggs. The young, only a few days out of the nest, were seen during late June and July.

A nest and 4 eggs, found on May 5, 1928, was obtained for the Ohio State Museum. This nest was about 55 feet above the ground in a white ash tree in a hilly beech-maple woodland south of the lake. While I was removing the nest and eggs, the parents, especially the male, became very bold and repeatedly struck at me. The male succeeded in taking my hat from my head. He carried the hat in his talons for about a dozen feet before allowing it to fall to the ground. As a rule the species was very bold in defense of the nest, and if I gave the "Screech Owl" call in the vicinity of a nest I was usually attacked or scolded vigorously. In 1922 the species appeared to be almost as numerous in summer as it was in winter, and the daily population for each season seemed to be between 30 and 50 birds. This population density, about 1 bird per square mile, was greater than for most parts of central Ohio, and apparently was the combined result of available nesting sites, cover, and abundance of food. By 1934 the wintering population was definitely greater than was the summering one, despite reduction of the winter population to between 10 and 30 individuals. Throughout the investigation the species was most numerous during migrations, which occurred in March and early April, and October and November. Migrations were poorly defined and were noted only upon a few days of each year.

The stomachs of 10 Cooper's Hawks were examined by Arthur Stupka¹¹ or myself, with the following results: 6 were empty; 1 of these was of the male shot May 5, 1928, while defending its nest, in Walnut Township, Fairfield County; the other 5 were of birds trapped in Little Buckeye game refuge, Thorn Township, Perry County, during January and February, 1932; 1, of a female, shot January 24, 1931, in Union Township, Licking County, was gorged with the flesh, toes, tarsi, and part of the shoulder girdle of a Domestic Pigeon (*Columba livia livia*); 1, from a hawk trapped January 12, 1932, in Union Township, Licking County, contained traces of a small

¹¹ Mr. Stupka was temporarily employed by the Ohio Division of Conservation during a portion of 1931 and 1932, to study stomach contents of hawks and owls trapped or shot throughout the state.

unidentifiable bird (not a domestic or game bird); 1, from a hawk trapped February 8, 1932, in Union Township, Licking County, contained the remains of a white-footed mouse and traces of a small unidentifiable bird (not a domestic or game bird); and 1, from a hawk trapped February 19, 1932, in Union Township, Licking County, contained the remains of a red squirrel.

The Cooper's Hawk fed to a large extent upon the most readily available birds the size of the Bob-white or smaller. During spring and summer the hawk was seen to capture small land birds only, particularly fledglings of such abundant birds as the Eastern Redwing, which because of their choice of perch and the persistence of their call exposed themselves to ready capture. During summer the secretive game birds such as the Bob-white seemed little molested. In winter, when land birds were few, the Bob-white apparently became a principal article of food, and particularly whenever it became weakened by lack of food or cover.

As the Bob-white formed a part of the food of the Cooper's Hawk, and as I was particularly interested in the life history of the Bob-white, I spent much time investigating the relationship of these species. I conclude that the Cooper's Hawk was the principal bird predator of the Bob-white in the area. The hawk captured few Bob-whites, either old or young, in spring, summer, and autumn, because of the abundance of the more readily obtained nongame birds. The hawk preyed, sometimes to a considerable extent, upon Bob-white during winter, particularly when this game bird was very numerous, was weakened by disease or hunger, or when sufficient cover was lacking. At no time during the period was the Cooper's Hawk so abundant as to be a principal factor in the decrease of the Bob-white brood stock. It is possible that the capture of weakened or diseased Bob-whites may have been neutral or beneficial to the species, since removal of weakened birds may have left more food for the stronger survivors, and removal of diseased birds may have prevented the spreading of disease. Attempts to extirpate the Cooper's Hawk from the area should cease until it is established that such action is necessary and desirable.

Buteo jamaicensis borealis (Gmelin)

Eastern Red-tailed Hawk

Fairly common spring and fall transient and winter visitant.

Earliest date of arrival:	.....	September 17, 1930
Median date of arrival:	(February 25)	October 12
Median date of departure:	April 5	(November 20)
Latest date of departure:	April 30, 1933	.....

A study of conditions in the past leaves no doubt that the Red-tailed Hawk was present throughout early historic time. Wheaton (1882: 427) wrote that it was a common resident in central Ohio, and Field (1903: 136)

stated that it was a "common permanent resident" in Licking County. Market hunters, sportsmen, and old residents have told me that between 1860 and 1910 it was numerous throughout each year, and that as late as 1910 they noted it nesting in the hilly, beech-maple woodlands south and east of the lake. Apparently the bird ceased to be a nesting species between 1910 and 1922. During the investigation this splendid hawk was not seen between May 1 and mid-September.

Migrations took place primarily in March and late October and early November. These movements were poorly defined, and a distinct influx of transients was noted only during a few days of each migration. At no time did a large migration take place, for never more than 12 were recorded in a day and only occasionally were more than 6 noted. The winter population usually consisted of 4 to 20 individuals.

Because of marked peculiarities in color or color pattern some wintering individuals could be readily recognized. It was found that most of these recognizable birds maintained definite wintering territories, which, with few exceptions, were 2 square miles or less in extent. Once a given territory was established the bird left only when forced to do so by unfavorable conditions, such as when snow covered the food supply. If forced to leave the bird often re-established itself in the old territory as soon as conditions became favorable. Sometimes, however, there was a gradual shifting of territory in a given direction as winter progressed, so that by spring the bird was as much as 2 miles from its original establishment. A Red-tailed Hawk with a well-established territory often attempted to chase from its territory any large hawk, especially when the invader attempted to alight.

Stomachs of 3 birds were examined by Stupka or myself: 1, of a male, shot November 30, 1929, in Union Township, Licking County, contained the remains of 4 meadow mice; 1, of a large, immature female, shot February 22, 1930, in Lakeside Woods, Walnut Township, Fairfield County, contained 2 short-tailed shrews, 1 least shrew, and 2 meadow mice; and 1, of an individual trapped January 16, 1932, contained 1 meadow mouse and 1 crayfish.

Individuals were observed eating or carrying food upon 16 occasions. On 14 occasions the food was a small rodent; twice it was chicken which had been thrown into a field by a farmer.

Buteo lineatus lineatus (Gmelin)

Northern Red-shouldered Hawk

Fairly common spring and fall transient and summer resident, rare or absent in winter.

Earliest date of arrival:	(January 14, 1928)	.....
Median date of arrival:	February 15	(October 20)
Median date of departure:	(March 20)	November 15
Latest date of departure:	.....	(December 22, 1927)

Apparently the Red-shouldered Hawk was a common transient and nesting species in early historic time, for the few old men who could correctly identify this "chicken hawk" have told me that it was a conspicuous nesting species as early as 1870. Wheaton (1882: 428) recorded the bird as nesting commonly in all parts of Ohio, and Field (1903: 137) stated that it was a "common permanent resident" in Licking County.

In this investigation the Red-shouldered Hawk was the only *Buteo* to nest in the area or to be found regularly throughout late spring, summer, or early fall. As with the Cooper's Hawk, its annual nesting numbers steadily decreased. From 1922 to 1924 all large wooded areas contained 1 to 4 nesting pairs, and the total number averaged slightly more than 22 pairs a year. From 1927 to 1929 the yearly number had been reduced to about 14; and in 1933 there were only 4 nesting pairs.

About 30 nests were located during the investigation, and many of these were used for several successive years. Most of the nests were situated in lowland woods of the elm-ash-soft maple type, and only occasionally was one found in the hilly, beech-hard maple woodlands. The trees selected for nesting sites were usually elm, ash, hard or soft maple, oak, or beech. The nesting trees were often large in size, and with no large branches less than 30 feet from the ground. The nests were built in the forks of 2 or more of the larger branches and were generally between 40 and 75 feet above the ground. Medium-sized twigs were used in the construction, and the nests were lined with smaller twigs, leaves, bits of corn husks, and shreds of bark. Of six nests with eggs, 5 contained 3 eggs each, and 1 had 4 eggs. The earliest set was completed March 30, and the last on May 2. The first young left the nest in late May, and the last young left in early July.

On April 19, 1928, a nest and 3 eggs were collected. This nest was in the principal fork of a green ash tree in the Lakeside Woods and was about 40 feet above the ground. It was made of twigs and lined with a few leaves and contained 3 eggs and a large corn cob. The cob was not part of the nest proper, but was lying with the eggs. The female, a bird in immature plumage, was collected as she left the nest and while her mate, a splendid creature in adult plumage, hovered near by. Upon the discharge of the gun the male momentarily flew away, but quickly returned to make a spirited defense of his nest as I climbed the tree. The pair was especially interesting because one was in immature plumage and the other in striking adult plumage. Usually both sexes of a pair were either in adult plumage or in immature plumage.

The Red-shouldered Hawk left during late December, January, and early February, when snow lay deep upon the ground. During the warmest winters 1 to 4 individuals remained. The first arrivals of the year appeared in late February, the spring migration took place chiefly in early March,

and by March 10 almost all of the pairs were in their nesting territories. At this season the male was particularly bold and conspicuous as he soared above his territory or perched in a tree, announcing by his wild, free scream that he had established nesting territory. The habit of conspicuously announcing his presence was often his undoing, especially during the latter years of the investigation when the so-called "vermin campaigns" had become popular, and the "chicken hawk" was considered a great prize. The poorly defined fall movement took place in late October and early November.

The Red-shouldered Hawk was chiefly an inhabitant of lowlands, for it nested most numerous in swampy woodlands, and most of its hunting was done there. When hunting, the species was usually rather inconspicuous, for it did not soar as much as did the Red-tailed Hawk, but flew at a low elevation from one perch to another. It was decidedly conspicuous, however, when hunting the breeding bullfrogs during late May and early June. Then these hawks perched in the tops of large trees, or in small trees and large shrubs whose branches seemed hardly strong enough to support their weight, and looked for the singing frogs. When a frog was sighted the slow-moving hawk flew directly over it, paused momentarily, and then dropped upon its prey in a seemingly awkward fashion.

Two stomachs were examined: 1, of a female, shot on April 19, 1928, while leaving her nest, in the Lakeside Woods, Fairfield County, contained a 15-inch garter snake and 1 meadow mouse; 1, of an adult male, trapped January 29, 1931, contained 2 mouse hair pellets, 1 of which included the skull of a meadow mouse.

On at least 50 occasions individuals were observed carrying or eating food, which in more than 40 instances was some cold-blooded vertebrate, such as a toad, frog, or snake; on 10 occasions it consisted of mice or shrews.

At the close of the investigation the Red-shouldered Hawk was nearing extirpation as a nesting species, and it was evident that in a few years the bird would cease nesting in the area if not given the protection it deserved.

Buteo platypterus platypterus (Vieillot)

Broad-winged Hawk

Very rare spring and fall transient.

Earliest date of arrival:	April 12, 1930	September 5, 1929
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	May 29, 1931	September 8, 1928

The Broad-winged Hawk was recorded 7 times in spring: On April 24, 28 and May 8, 1925, 1 on each day in the same section of the Jack's Neck Woods (all 3 records probably were of the same individual); on April 26, 1927, 2 birds, 1 in the Lakeside Woods and 1 in the Big Woods; on April

30, 1929, 1 in Jack's Neck Woods; on April 12, 1930, 1 seen soaring over the lake near Journal Island; on May 29, 1931, 1 collected in Jack's Neck Woods. The latter was apparently a nonbreeding, immature female; its undeveloped ovary was only 3 mm. long. The stomach contained remains of a fledgling Eastern Robin.

The species was seen twice in fall: On September 8, 1928, 1 near the Lakeside Woods; on September 5, 1929, 1 flying over the lake near Cranberry Island.

The Broad-winged Hawk was probably not as rare as the few records indicate. The species was extremely retiring in its habits, and unlike most hawks of the genus *Buteo* did little soaring. Those under observation remained quietly perched in some heavily foliated tree or else unobtrusively hunted through the woodlands by alternately perching and flying from one tree to another.

Apparently none of the men who hunted in the area for many years previous to 1922 knew the species. The early ornithologists gave little information concerning its status, for they confused this species with other hawks, as can be seen by referring to Wheaton (1882: 429-30), Jones (1903: 94), and Dawson (1903: 410). The Broad-winged Hawk has been recorded as nesting in many counties of eastern Ohio and may have nested in the Buckeye Lake area at some period in historic time (Hicks, 1935: 145).

**Buteo lagopus s.-johannis* (Gmelin)

American Rough-legged Hawk

Rare or uncommon spring and fall transient and winter visitant.

Earliest date of arrival:	.....	October 21, 1923
Median date of arrival:	.....	(November 20)
Median date of departure:	(February 28)	.....
Latest date of departure:	March 21, 1931	.....

The American Rough-legged Hawk was a late fall arrival. It was noted only once in October (21, 1923), was first noted in November during 9 years, and in 2 years was not observed until December was well advanced. The poorly defined fall migration usually took place in very late November or December.

The species was generally present throughout late December, January, and February, though ordinarily fewer than 5 individuals were seen in a day. A marked exception occurred between January 15 and February 3, 1930, for then as many as 25 (January 25, 1930) were noted in the fallow, lowland meadows northwest of Sellars Point.

In the warmest winters evidence of a northward movement became apparent as early as the latter part of January, and in the average or colder winters the movement became evident during the first 3 weeks of February. The spring movement was more pronounced than was the fall one.

Both the extreme light and dark phases of plumage were noted as well as many intermediate color combinations. In 11 years the lighter birds outnumbered the darker ones, but in the winter of 1929-30, when there was a large concentration, dark birds were greatly in the majority. On January 25, 1930, there were recorded 6 typically black-phased individuals, 18 intermediates tending toward the dark phase, and 1 in the light phase.

Because of the great variation in color and color pattern the majority of the birds could be recognized. Many were found to have a definite wintering territory of 2 square miles or less in extent in which they usually remained throughout a winter. With few exceptions the territories were in lowland fields and meadows or in the broader valleys between the hills. The lowlands supported a large rodent population. The birds hunted by flying or soaring at a moderate height over fields, meadows, and pastures. By hunting over open situations and feeding upon small rodents, this hawk was more of a food competitor with the Sparrow Hawk than with either the Red-tailed or Red-shouldered hawks.

The American Rough-legged Hawk was observed with food upon 34 occasions. The food always consisted of small rodents except once when it was a chicken, which had been thrown, dead, into the field. Because of its preference for meadows and fields I suspect that the bird was rather uncommon or rare during early historic time. Wheaton (1882: 431) wrote that it was a rather rare winter visitant in central Ohio, and Field (1903: 136-37) failed to record the bird for Licking County.

* *Aquila chrysaëtos canadensis* (Linnaeus)

Golden Eagle

Casual visitant.

While rowing a boat on the western half of Buckeye Lake, December 8, 1928, I saw an immature Golden Eagle in a tree on Journal Island. When I was within 30 yards of the bird I began to observe it with field glasses. It remained quietly upon its perch, with no apparent uneasiness because of my presence. After 5 minutes it became restless, frequently turning its head. A few seconds later the bird left the perch and flew to the center of the lake, where it began stooping after a female Common Mallard on the water. The eagle stooped repeatedly, but each time the quarry dived and escaped. After many futile attempts the eagle gave up the chase. While the eagle was perched I could plainly see its feathered tarsi, and, in flight, the white basal portion of the tail and the light area under the wing near the base of the primaries, indicative of an immature Golden Eagle, were plainly visible.

The apparent tameness of this eagle seems characteristic of the species in Ohio. I have noted this tameness or stupidity in 2 other immatures seen elsewhere in the state, and other observers have likewise noted a lack of

wariness. In December, 1926, a farmer in western Ohio showed me a mounted immature Golden Eagle, which he had shot on his barn. The farmer stated that he fired 8 times before he succeeded in hitting the eagle, and that he was less than 50 feet away and visible to it. Its unwariness is also evidenced by the fact that, despite its rarity in Ohio, I know of at least 7 specimens that were killed between 1922 and 1933. All were immatures.

**Haliaeetus leucocephalus washingtoniensis* (Audubon)

Northern Bald Eagle

Rare or very uncommon spring and fall transient and winter visitant.

Earliest date of arrival:	.....	September 6, 1930
Median date of arrival:	(February 15)	(October 20)
Median date of departure:	February 28	.....
Latest date of departure:	March 4, 1931	.....

Never more than 4 Northern Bald Eagles were seen in an autumn migration, and in 5 autumns none was noted. Most of the fall transients appeared in very late October or November. There was at least 1 seen between December 15 and February 10 of each winter, and occasionally 1 to 4 remained throughout that season. The spring migration took place chiefly in the latter half of February. The species was noted more frequently than at any other season, but never more than 6 (February 16, 1930) were seen in a day.

The majority were observed in the immediate vicinity of the lake, and the remainder in the larger woodlands. The individuals in the vicinity of the lake hunted persistently for food that was upon the waters or perched in the top of a tree or upon the ice, watching the gulls. As soon as a gull found a dead fish or other offal the eagle left its perch to rob the gull of its food. The eagles also flew above the ice-covered lake, looking for fish frozen in the surface of the ice, and when one was found, the eagle scratched it out of the ice. It was a curious sight to see the huge bird industriously scratching the ice to obtain a fish.

Upon 2 occasions 3 to 6 eagles were observed playing with a stick. Such a habit appears to be not well known, and therefore a brief description of an observation is given. While standing on Sellars Point on the rather warm, sunny afternoon of February 15, 1930, I watched 6 of these great hawks playing with a stick. The birds were grouped about an open hole in the ice-covered lake and were approximately 250 yards south of the Point. The stick was about 18 inches long and $1\frac{1}{2}$ inches in diameter. A bird, followed by 2 or 3 of the others, took the stick and began to ascend in great spirals until it attained a height so great that it could be seen by the naked eye only with difficulty. Thereupon the bird dropped the stick; the others stooped and attempted to catch it with their talons before it hit the ice. The bird catching the stick began to ascend again, screaming all the while, and

followed by the others. The game of dropping and recovering the stick continued for more than 10 minutes, after which the birds came down and stood upon the ice about the open hole. During the downward plunges, these usually heavy, awkward hawks appeared surprisingly swift and graceful.

According to market hunters and sportsmen the Northern Bald Eagle was a regular transient and winter resident between 1860 and 1921; during the first half of this period it was said to have been a summer resident. Wheaton (1882: 436) was of the opinion that the species summered, for in 1882 he wrote: "I have seen it in October, at the Licking County Reservoir [Buckeye Lake], and have been informed, that it remains through the summer and probably breeds there."

Circus cyaneus hudsonius (Linnaeus)

Marsh Hawk

Common spring and fall transient and winter visitant, rare summer resident.

Earliest date of arrival:	.....	(October 11, 1928)
Median date of arrival:	(January 25)	October 16
Median date of departure:	March 28	(December 15)
Latest date of departure:	(April 14, 1929)	.....

The former market hunters and sportsmen stated that the Marsh Hawk was a rather common nesting species and common transient and winter visitant throughout the 1860 to 1921 period. Even as late as 1926 conditions were still rather favorable, especially for transients and winter visitants, and until that year as many as 50 were frequently recorded in a day. During 1927 a downward trend in numbers began which was given added impetus in 1930, when dredging in the lowlands north and west of the lake destroyed much habitat of the species and reduced its food supply.

The Marsh Hawk was most numerous during migrations, chiefly in late October and November and in late February and March. During migrations from 8 to 50 individuals could be recorded daily. The hawk was usually rather common in winter, especially before 1926, and between 2 and 45 birds could be daily noted.

The species nested annually. The first nest located, on June 3, 1928, was in the swampy meadow across the road and west of the Lakeside Woods; it contained 4 eggs broken by some animal a few hours before I discovered it. I found another nest with 4 eggs in the same meadow on June 16, 1929, in the central part of a clump of swamp rosebushes. On June 26 I collected this nest; the eggs contained embryos in various stages of development. One embryo would have hatched in a few days. Upon several days of late April and early May, 1930, I found a pair of Marsh Hawks in this meadow, going through their spectacular courtship flight—"looping the

loop," twisting and turning, and crying "cac-cac-cac." On May 17, I found their nest and 3 eggs at the base of a clump of rosebushes, and on May 21 found 5 eggs, which proved to be the complement. This nest was destroyed a few days later. In 1930, 3 additional pairs nested in the area; 2 in low meadows north of the Big Woods, and 1 in Little Buckeye swamp. On August 9 the latter pair was seen accompanied by 2 young. Each year from 1931 to 1933 a pair nested in the low meadows north of the Big Woods, but none nested in the swampy meadow near the Lakeside Woods, because in 1930, after dredging operations, the meadow was converted into a cornfield.

The Marsh Hawk was recorded capturing, carrying, or eating food upon 41 occasions, and with 1 exception the food consisted of a mouse, shrew, frog, snake, or crayfish. Once, on June 16, 1928, an adult Meadowlark was taken by a male Marsh Hawk. When I first saw the hawk he had the lark in his talons and was flying toward his mate in the swampy meadow west of the Lakeside Woods. As the male came over the nest he dropped the lark, and at the same instant the female rose vertically from the nest into the air for about 10 feet, turned upon her back, and caught the falling bird in her talons. After catching the lark the female alighted about 50 yards from her nest, pulled out a few of the largest wing and tail feathers, and tore the bird apart and ate it. The time taken to eat the lark was 3 minutes and 10 seconds, and the hawk was away from her nest for less than 5 minutes.

On August 23, 1930, a Marsh Hawk flew past me with a prairie rattlesnake in its talons. The snake was about 20 inches long and seemingly not dead, for its rattling could be plainly heard. The stomach of a bird collected December 11, 1925, contained 2 meadow mice.

Pandion haliaëtus carolinensis (Gmelin)

Osprey

Uncommon spring and fall transient, very rare summer visitant.

Earliest date of arrival:	March 28, 1925	(August 31, 1931)
Median date of arrival:	April 5	September 4
Median date of departure:	(May 16)	October 14
Latest date of departure:	.....	October 30, 1926

In first recording the Osprey, Wheaton (1882: 432) wrote: "I have observed it at the Licking Reservoir [Buckeye Lake], in the vicinity of which it doubtless breeds, . . ." In 1903 Field (1903: 137) recorded that it "breeds at the Licking Reservoir" and that it was a "rather uncommon summer resident [Licking County] from April to October." These statements agree with accounts of former market hunters and sportsmen that the Osprey nested in the area from 1860 to about 1905, and that between 1860 and 1921 it was a regular spring and fall transient.

The Osprey was regularly noted in April and early May, and in September and early October. The species was never numerous, for even during

the height of migration seldom more than 3, and never more than 8, were noted in a day. An occasional bird, probably nonbreeding, was seen during several summers. No evidence was obtained indicating that it nested in the area.

In spring the Osprey was found chiefly in the vicinity of the larger marshes of the eastern half of the lake. An occasional bird was noted along streams, especially when these were exceptionally clear and low. The "fish hawk" fed principally upon spawning carp, in the marshes; gizzard shad, mostly taken in the more open waters of the lake; and suckers (*Moxostoma* and *Catostomus*) in the streams.

In fall all except a few of the birds remained in the vicinity of the larger marshes, where the vegetated, clearer waters enabled them to see their prey, which consisted of carp, gizzard shad, goldfish, an occasional bluegill, and small largemouthed bass. The rather rare goldfish was frequently caught, probably because of the conspicuousness of its bright gold or red as it swam in clear water against a background of green aquatic vegetation.

During an hour's observation on June 15, 1924, I saw an Osprey catch and eat 4 gizzard shad, which averaged 7 inches in length, and a 7-inch white bass, that had previously been thrown away by a fisherman and was in a dying condition when taken by the Osprey. A bird collected April 13, 1929, was taken beside a small stream that enters the lake south of Journal Island; its stomach contained the remains of a 12-inch golden sucker.

**Falco peregrinus anatum* Bonaparte

Duck Hawk

Very rare spring and fall transient.

Earliest date of arrival:	February 26, 1928	September 17, 1930
Median date of arrival:	March 1	October 1
Median date of departure:	April 4	October 30
Latest date of departure:	May 16, 1926	December 26, 1930

The 1 to 3 Duck Hawks annually recorded were usually seen during the large March and October duck and shore bird flights. Although these hawks have been recorded as wintering on other large bodies of water in Ohio, none was seen about Buckeye Lake. Apparently the bird has been uncommon in the area since at least 1870, for the former market hunters and sportsmen were not aware of its presence.

This hawk was observed to capture and eat its prey upon 2 occasions: on October 7, 1927, a Killdeer; on March 30, 1929, an English Sparrow. During the last 6 years of investigation, state and public organizations and individuals expended considerable effort to kill this species whenever possible. The desire to extirpate the Duck Hawk is unwarranted, for the few present obviously did not affect the birdlife of the area.

**Falco columbarius columbarius* Linnaeus
Eastern Pigeon Hawk

Rare transient and very rare winter visitant.

Earliest date of arrival:	(February 23, 1930)	September 5, 1929
Median date of arrival:	.....	September 15
Median date of departure:	.....	October 20
Latest date of departure:	May 20, 1933	(December 13, 1927)

During March and April and in late September and October 1 to 5 Eastern Pigeon Hawks were annually recorded, usually during the larger flights of small land birds and shore birds. Apparently the hawks accompanied these flights. The species was seemingly less numerous in spring than it was in fall, when this falcon had a decided preference for Cranberry Island; from its vicinity more than half of the fall individuals were recorded. It usually contained large numbers of small land birds and shore birds. The 1 winter record is of an individual seen in a tall tree near Crane Pond, February 7, 1926.

This hawk was apparently a rather rare transient during the 60 years prior to 1922. The old residents were unacquainted with it. In 1882 Wheaton (1882: 425) recorded it as "far from common in the vicinity of Columbus [central Ohio region]," and as a "not common spring and fall migrant in March, April, September, October, and November in most portions of the State."

On September 29, 1928, I observed for several minutes a fine-plumaged adult which sat unconcernedly in a low alder bush on Cranberry Island, while 2 Kingfishers flew excitedly around and around it, constantly uttering their harsh, rattling notes. At the same time a host of smaller birds chirped and scolded from the security of the denser bushes. Such indignation on the part of the Kingfishers and smaller birds was very amusing.

Falco sparverius sparverius Linnaeus
Eastern Sparrow Hawk

Common resident, very common spring and fall transient.

Earliest date of arrival:	.....	.....
Median date of arrival:	(March 8)	(November 2)
Median date of departure:	(April 4)	(December 3)
Latest date of departure:	.....	.....

This fascinating little falcon was present during every day of the investigation. It was most numerous during migrations, which took place largely in March and November. A day's automobile trip over the roads of the area during migrations resulted in recording between 30 and 50 individuals. In winter on an automobile trip over the same roads 12 to 40 birds were recorded, but in summer only 12 to 22 birds would be recorded in a day.

During every season all except a few of these hawks remained in the

more open fields, meadows, and thickets. There was a tendency to congregate in lowlands, apparently because of the greater abundance of small rodents, snakes, frogs, and large insects. The species seemingly avoided overgrazed uplands and large woodlands. The latter were especially avoided during the nesting season.

The numerical status during migrations and in winter showed no change, but a decrease in nesting abundance was noted. Censuses indicated that between 1922 and 1925 there were from 20 to 35 pairs annually nesting, and that from 1931 to 1933 the number had been reduced to between 10 and 20 pairs. The change was seemingly caused by the continued removal of the large, solitary, and partly dead trees, which were the principal nesting sites.

Pairs of courting birds were first seen about their nesting sites in late February, and mated pairs could be found in the vicinity of their nests from late February until late June. By their actions the birds readily betrayed the location of their usually inaccessible nests, which almost invariably were more than 20 feet above the ground and in a decayed part of a dead or partly dead tree. Four nests were examined; these contained 3, 4, 4, and 5 eggs or young each. The earliest nest with eggs was found April 3 (4 eggs), the latest May 25 (4 eggs). Young in the nest were noted from May 3 to July 4, and fledglings out of the nest from June 1 to July 15. Whenever I attempted to examine a nest the owners boldly defended it. On May 7, 1928, I climbed a large bur oak stub to examine a nest containing 5 young. The owners attempted to frighten me by repeatedly swooping at my head from a height of about 100 feet, each time missing it by a few inches. While swooping downward the birds loudly screamed "killi-killi-killi."

Wintering birds usually permitted one to drive an automobile sufficiently close so that their plumage peculiarities could be noted. It was observed that most wintering individuals had a well-defined territory, which was generally not more than three-quarters of a square mile in extent. The territory was left only because of adverse conditions, such as a deep snow that covered the food. Cold weather without snow seemingly did not affect the bird. Sometimes 2 birds, almost invariably a male and female, occupied the same territory. Their joint territory was about 1 square mile in extent. The same observational perches, such as telephone poles, fence posts, trees, or straw stacks were used throughout an entire winter, and apparently exceptionally fine observational perches were used year after year. The boundaries of most territories also were very nearly the same size and shape year after year.

Many dozens of observations were made of Eastern Sparrow Hawks capturing or carrying prey. In all except 3 instances the prey was a mouse,

shrew, snake, frog, toad, crayfish, or large insect. Once a hawk took a Song Sparrow, and twice an English Sparrow. The stomach of a female collected along the canal south of Millersport on May 28, 1928, contained traces of several large beetles; the stomach of a male, collected north of the lake on December 7, 1929, contained remains of an English Sparrow, 8 black field crickets, and 4 spiders.

Because of the few prairie-like openings and the general ecological conditions in early historic time, I assume that this hawk was not as abundant as it was later, when open fields, meadows, and thickets became numerous. If this is true, this is the only hawk which has benefited by the presence of man. This falcon has also been fortunate in that relatively few hunters believe it their duty to kill it whenever possible.

**Bonasa umbellus umbellus* (Linnaeus)

Eastern Ruffed Grouse

Formerly a common resident, extirpated several years ago.

The Ruffed Grouse was surely a numerous species throughout early historic time. The original forests, with their cover and abundance of berries and other foods, presented a favorable environment. Later, when the forests were replaced by brushlands and clearings, conditions should have become more favorable, and it seems probable that the grouse then became more numerous than it had been at the advent of the white man.

Former market hunters, old sportsmen, and farmers stated that the species was very numerous between 1860 and 1870, that it decreased sharply in abundance between 1875 and 1885, and that by 1890 it had become rare or absent. Stephen Holtzberry said that he shot the last bird he saw in an autumn of the late 1880's. William Harlow claimed that each fall he hunted grouse in upland woods and brushy fields south and east of the lake until they disappeared in 1900.

During the investigation the area appeared unsuited for grouse, and none was seen; however, it is conceivable that unobserved stragglers may have wandered in from other portions of Perry, Licking, and Fairfield counties, where a few still existed. At the time of this study, the beloved "pa'trtridge" had become only a fond memory in the minds of older men, and the species and name meant nothing to the younger generation of sportsmen.

Perdix perdix perdix (Linnaeus)

European Partridge

Rather rare resident.

The European Partridge (often called the Hungarian Partridge) was first introduced in the area and immediately adjacent region in 1915. The

introduction, made by the former Ohio Fish and Game Department (now Ohio Division of Conservation), was not successful, probably because of the type of soil on which the birds were liberated. In a study of the distribution of this species in Ohio, made between 1928 and 1933 by members of the Bureau of Scientific Research of the Ohio Division of Conservation, it was definitely shown that introductions were successful only in light, sandy soils, such as occur in the postglacial lake beds of western and northwestern Ohio and were always unsuccessful in heavy, viscous, till clays of glaciated western Ohio, or residual, viscous clays of the sandstone-shale region of unglaciated, hilly, eastern Ohio. The clays, when wet, form into balls on the feet of the partridges and eventually become so large as to prevent the birds from walking or flying.

Realizing the environmental needs of this bird Edward L. Wickliff and I, on February 5, 1930, as an experiment, liberated 15 pairs on the Charles Brown farm, in the Bloody Run swamp, which is a part of old postglacial Lake Licking and which had light, nonviscous soils. The introduction was successful, illustrating the ability of the bird to establish itself where viscous clays are absent. Since this introduction, young and adults have been repeatedly found in the approximate 600 acres of suitable postglacial lake bed, and unless extirpated by hunting, extreme weather conditions, or a series of unsuccessful nesting seasons, a small colony might successfully remain indefinitely. If the birds wander during rainy weather into adjacent country that has heavy clays, they will probably perish.

Since 1930 males have been heard crowing in the early mornings of late May and until mid-July of each year. The first young were noted July 16, 1930, when I found 2 adults with 5 half-grown young dusting themselves in the road near the locality where the adults had been liberated. The bands which had been placed on the leg of each adult before liberation were plainly seen. Between 1931 and 1933 adults with young have been reported during each nesting season. In hunting seasons a few birds have been reported shot or seen, and in 1932 the adult bearing band number 642 was shot on the Kiner farm. The bird was approximately one-eighth of a mile from the spot where it had been liberated 33½ months before.

Colinus virginianus virginianus (Linnaeus)

Eastern Bob-white

Normally a very common resident.

When Christopher Gist visited the "Great Swamp" in January, 1751, the Bob-white must have been comparatively rare; it may even have been entirely absent from this area of lakes, partially wooded swamps, wet prairies, and forests. Except for the borders of wet prairies, there apparently was no suitable habitat. With the coming of settlers around 1800, the hilly

forest land about Thornport and along the national road began to be cleared for farming. Since the soil was rich and agricultural methods crude, this recently cleared land produced an abundant weed crop, so that if this species was present in the vicinity at the time of clearing, it should have begun almost immediately to increase in numbers.

By 1875 the bird was said to have been very numerous. At that time approximately half of the area was in brushlands and fields, and these contained an abundant weed crop and sufficient cover to produce a most favorable environment. The annual number of birds remained very high until 1900, in spite of a heavy yearly drain imposed upon them by hunters. From 1900 to 1912 the bird rapidly decreased in abundance, probably because of increased hunting, a series of unfavorable winters, a dwindling food supply, and the removal of much of the former cover.

Between 1912 and 1916 Ohio permitted no hunting of the Bob-white, though it was in the "game bird" class. On March 7, 1917, the state legislature passed an act placing the quail in the nongame bird (songbird) class, and the act has continued in force. With the removal of the hunting drain and probably aided by other favorable conditions the bird again became more abundant. The severe winter of 1917-18 caused a heavy mortality, and it was not until 1920 that the bird was considered "common" again.

Throughout the investigation the Bob-white was very common; it was found in greatest abundance in the fertile fields of corn and other grains, in the brushy pastures that lie to the north and west of the lake, and about the more extensive and fertile lowlands that border the lake on the south and east. It was present in fewer numbers in the hilly fields to the south and east which still produced a fair crop of grain and weed seeds and were adjacent to the emergency cover of the beech-maple woodlands. The yearly population fluctuated considerably, in spite of protection from hunting.

The principal adverse factor was severity of weather in winter (Trautman, Bills, and Wickliff, 1939: 99-101). The sleet storms that visited this area, especially during late February and early March, covered the birds' food supply and sometimes their feathers with a coating of ice. Whenever one of these storms lasted for a few days many of the birds died. Heavy rains which flooded the lowlands during the breeding season also killed many of the young. There was some evidence that disease occasionally lessened the Bob-white numbers. In the late summer and early fall of 1930 there was a severe drought and a decided decrease in the number of birds, especially in the young of the year. Evidence from a few very emaciated dead birds seemed to indicate a bacteriological disease as the cause. A steady, though comparatively slight, drain on the population occurred through the destruction of nests by the mowing of fields and roadsides and through capture by such animals as cats and Cooper's Hawks.

In spite of all these factors there were at times many birds. A preliminary survey of the Bob-white, which I made in many counties of Ohio in the winter of 1931-32, indicated that the Buckeye Lake area averaged 1 bird per 4 acres; the Little Buckeye game refuge and adjacent lowland fields, 1 bird per 2 acres; and the state of Ohio, 1 bird per 8 acres. Their abundance in the more favorable situations was demonstrated after a heavy snowstorm on December 18, 1933, when, without the aid of a dog, I flushed 115 Bob-whites in the Bloody Run swamp in less than 2 hours.

The maintenance of such abundance depends to a great extent upon the future use of farmlands. If general draining is carried on, if the fields continue to decline in fertility, if agriculture becomes more intensive and the weed crop less prolific, and if the winter food supply and cover shrink in the pastures, roadsides, and woodlands, then the Bob-whites will be fewer. These factors have been observed to reduce the number of Bob-whites in many localities in central Ohio.

The winter coveys tended to disperse in late March and early April. By May 1 most of the birds were paired, and from then until July the males whistled conspicuously from salient perches. Two nests with eggs were found. One, on May 25, 1929, contained 16 eggs; the other, on June 15, 1929, 20 eggs. The first young were seen in mid-June, and thereafter until mid-July young were frequently encountered. The last date for young less than a week old was August 25, 1930. On that day E. L. Wickliff, Joe Howland, and I found a Bob-white, in male plumage, with 10 young in the Bloody Run swamp. The female was not seen. Occasionally during July and August small groups of 2 to 7 males were found, probably unmated birds or those which had left the female and young. The regular coveys of adults and young became a conspicuous part of the bird fauna from the advent of cold weather until the breaking up of the coveys in the following spring.

Phasianus colchicus torquatus Gmelin
Ring-necked Pheasant

Common resident.

The first Ring-necked Pheasants seem to have been introduced shortly after the beginning of the twentieth century.¹² Because of the abundance of food and cover and the generally favorable environment, particularly in the lowlands, the species had become well established by 1912; it was sufficiently numerous by 1918 to be of considerable importance as a game bird, and by 1922 it had become the dominant upland game bird of the area.

During the investigation it was not only very numerous but was one of

¹² The first large numbers of the Ring-necked Pheasant were released in Ohio during the last decade of the nineteenth century, principally in the northwestern part of the state.

the few game birds to augment its annual numbers, in spite of the ever larger toll of males taken each hunting season. Surveys made throughout Ohio during the years 1928 to 1933, by the Bureau of Scientific Research of the Ohio Division of Conservation, indicated that the lowlands of the Buckeye Lake area contained more pheasants per acre than did the average acre in Ohio, and that they contained considerably more birds than did the hilly sections adjacent on the east and south.

The pheasant seemed to be comparatively free from natural enemies and was not greatly affected by parasites and diseases. It was well able to survive cold winters and sleet and snow, provided corn or other food was available. One of the unfavorable factors was the destruction or desertion of many nests and eggs because of the disturbance created by the mowing of fields of grain and forage crops and the mowing of roadsides at the time the females were incubating eggs.

The first indication of the approaching nesting season was an increased amount of crowing of the cocks in early March. This reached its height during late April and early May, when every day several males could be seen frequently crowing and flapping their wings from some slight rise in a field or pasture. Less crowing was apparent in mid-May, but it had not altogether ceased by late July. Eleven nests, containing 10 to 19 eggs, were observed. The earliest nest with a complete set of eggs (14) was found on May 5, and the latest nest with eggs (10) was found on July 20. The earliest date of hatching was May 15 (12 chicks and 2 chipped eggs), and the latest hatching date was July 22 (9 young).

On June 3, 1928, a hen with 12 small chicks was discovered in the meadow west of the Lakeside Woods. Several chicks were captured, and it was found that each was infested with dozens of bird lice (*Mallophaga*). The crop and stomach of a chick was found to be completely filled with green, hairless caterpillars about 1 inch long, and 1 adult firefly.

This gaudy stranger has been a welcome addition to the game bird fauna. To the younger sportsmen it was *the* upland game bird. Older sportsmen were less enthusiastic, and still longed for and fondly remembered the "old days" of woodcock, quail, and "pa'tridge" hunting.

**Meleagris gallopavo silvestris* Vieillot

Eastern Turkey

Formerly a common resident, extirpated during the last century.

All evidence indicates that this noble game bird was a numerous resident at the advent of the white man and throughout early historic time. The open, hilly beech-oak-hard maple forests with their abundance of mast and

other food undoubtedly were a favorable habitat, as were the lowland swamp forests with their abundance of nuts, berries, and protective cover. Until its flooding in 1828 the usually impassable "Great Swamp" was said to have been a haven for the birds.

An early pioneer, James Smith (1870: 21), mentioned that he had hunted the birds in 1755. The Reverend Timothy Howe (Schaff, 1905: 150-51), in describing a circular hunt which took place in the area and adjacent county between 1823 and 1825, related that "from early in the march turkeys were seen flying over the lines like flocks of pigeons," and that in the hunt "sixty or seventy turkeys" were killed. Schaff (1905: 96) stated that turkeys were present in Bloody Run swamp as late as 1853 or 1854. Simson (1912: 19) wrote: "Thomas Minthorn. . . a pioneer in the Big Swamp killed Deer in the woods where now exists Buckeye Lake. From his cabin door he shot wild turkeys while they were in the act of robbing his newly planted corn patch."

A few old men told me that their elders had said that because of the dense cover and the large amount of food the species remained in the area after its disappearance elsewhere in central Ohio. The last Eastern Turkeys were seen sometime between 1853 and 1870. Stephen Holtzberry stated that about 1865 his father shot a hen turkey from a flock of 5, as the birds were roosting on Rabbit Island.

**Grus canadensis tabida* (Peters)

Sandhill Crane

Casual transient.

The only record of the Sandhill Crane was made on the afternoon of October 9, 1926, when I saw a flock of 5, 1 apparently adult, flying high in the air in a southwesterly direction and over Sellars Point. Upon arriving above the lake the flock began to descend and to circle as if looking for a place to alight, and at the same time the various members uttered their long, croaking cry. After circling the western part of the lake several times the birds ascended and continued in a southwesterly direction.

Because it is impossible to distinguish between the Sandhill Crane and the Little Brown Crane (*Grus canadensis pratensis*) in the field it cannot be positively stated to which subspecies these birds belonged. Inasmuch as this area lies considerably east of the normal migration route of the Little Brown Crane and in the migration route and former breeding range of the Sandhill Crane, it can rather safely be assumed that these transients belonged to the latter subspecies. It is possible that the Sandhill Crane nested in the area within historic time in the wet prairies and cranberry-sphagnum-poison sumac bogs of the "Great Swamp."

Rallus elegans elegans Audubon

King Rail

Common summer resident.

Earliest date of arrival:	April 7, 1929	.....
Median date of arrival:	(April 16)	.....
Median date of departure:	.....	(September 28)
Latest date of departure:	.....	October 12, 1926

The first King Rails of spring arrived each year a few days before or during mid-April, and by early May the normal summer numbers had been attained. During no spring, late summer, or fall was there any apparent increase in numbers because of transients. This species was the most numerous nesting rail. In the dusk of spring evenings the reiterated "umph-umph-umph" note could be heard coming from the swamps and marshes, and often the birds, presumably the males, could be seen uttering their calls. It was interesting to watch them as they stood in some small opening in the marsh or swamp, or under a rosebush or a blackberry bush, and emphasized each "umph" with a grotesque jerk of the head. While they were emitting the notes the birds were remarkably tame, allowing one to approach within a few feet.

Censuses indicated that there were more than 50 pairs nesting annually between 1922 and 1930. Thereafter the yearly nesting number was 45 pairs or less. This change resulted chiefly from the effectual draining of the swamplands north and east of the lake. Nineteen nests with completed sets of eggs were observed. Cattail marshes, buttonbush swamps, wet prairies containing coarse grasses, sedges, and bulrushes, edges of marshy pools in swamp forests, and wild rose and blackberry tangles in swampy meadows (Pl. XIV) provided some of the rather diverse habitats in which the nests were situated. Many were built directly upon the ground, but some of those in the cattail marshes floated upon water that was as much as 2 feet deep. The nests were made of cattails, rushes, sedges, or coarse grasses, and usually of the most readily available material.

The 19 nests with eggs averaged 10.4 eggs per set and contained 6 to 14 eggs per set. These nests were noted chiefly in late May, but the dates varied from May 10 to June 26. In 2 nests the last egg laid was only half the size of a normal King Rail's egg, and contained no yolk. The incubating birds were exceedingly tame, and some permitted me to stroke their backs as they sat upon the nests. One particularly tame bird repeatedly allowed me to lift it from the nest, examine the eggs, and replace it upon the nest again. A male incubating bird was collected June 9, 1928. The first young were found in late May, and from then until early August newly hatched young were frequently encountered. The young were accompanied by one or both of the adults.

The late Earl McPeak informed me that on the evening of June 11, 1929, he saw an adult King Rail uncover, break, and eat 5 eggs of the painted turtle. At 1:00 P.M. of the preceding day he had watched the turtle lay the eggs in a hole she had previously dug; she had then covered them with earth.

Apparently the King Rail was a common summer resident throughout historic time. With all other species of marsh-nesting birds, it will continue to decrease in nesting abundance as more and more marshes and swamps are drained.

Rallus limicola limicola Vieillot
Virginia Rail

Uncommon spring and fall transient, rather rare summer resident.

Earliest date of arrival:	March 30, 1929	.....
Median date of arrival:	April 13	(September 1)
Median date of departure:	(May 15)	October 25
Latest date of departure:	.....	November 3, 1928

The first Virginia Rails of spring appeared between March 30 and April 17, and often the first arrival was noted upon the same day as was the first King Rail. Unlike the King Rail, the Virginia Rail had a definite spring migration, the height of which took place from April 20 to May 10. The last apparent transients were noted between May 12 and 25. During the larger flights between 5 and 16 were noted in a day, and it was then evident that at least 100 individuals were present.

Never more than 5 pairs were recorded during a nesting season. All nesting birds were in the wettest and most extensive cattail marshes about the lake. None was found in the inland swamps and swales, and consequently the species was not as numerous as was the King Rail. Six nests with eggs were found; these contained 6 to 9 eggs each, and averaged 7.9 eggs per nest. The first completed set of eggs was found on May 8, the last on June 15. The first contained 7 eggs; the last 6 eggs. Young, hatching or only a few days old, were recorded from May 18 to June 15.

The hatching of 3 sets of eggs was observed. The young were amazingly precocious; they could readily swim, run, jump, and dive under water within a few minutes after hatching. The late James S. Hine and I on the morning of June 9, 1928, collected a nest and 6 eggs and the incubating bird, a male, on Onion Island. Upon examining the eggs later in the day we found that the supposedly fresh eggs had hatched and that the young were scrambling about in the cotton of the egg container. I hurriedly took the young back to Onion Island and, after chasing the brooding adult away, placed them in another Virginia Rail's nest, which held a newly hatched chick and 8 eggs. I retreated to a point where I could watch the returning adult. It was amusing to see the excited bird return to the over-

flowing nest and find the many eggs and young. The bird resumed incubating immediately and remained at the nest until all except 1 infertile egg had hatched. A few days later the bird with its large family of 14 young was seen walking along the edge of a small pool.

Both the King Rail and the Virginia Rail collected from nests were males. When the nests were approached and the eggs and adult were collected, another rail scolded from the security of the cattails and sedges. Had either rail species been more numerous, more incubating individuals would have been collected, and it would have been possible to determine if, or when, the female incubated.

The first obviously southbound transients were seen during the last week of August or the first week in September, and the peak of migration took place during the last half of September and the first half of October. During this migration fewer individuals were recorded a day than in spring, probably because the quiet habits of the birds in autumn and the profuse vegetation made them less conspicuous. It is possible that the Virginia Rail was more numerous as a nesting species in early historic time and in mid-historic time after the building of reservoirs and the re-establishment of large cattail marshes than it was in later years after the marshes had begun to dwindle in size.

Porzana carolina (Linnaeus)

Sora

Common spring and fall transient, rare summer resident.

Earliest date of arrival:	March 25, 1928	.....
Median date of arrival:	April 12	(September 1)
Median date of departure:	(May 25)	October 25
Latest date of departure:	.....	November 5, 1927

The Sora was said by market hunters and sportsmen to have been very numerous during migrations and fairly numerous as a summer resident between 1860 and 1910. During this period many birds were annually shot and were used in the making of potpie. After 1910 a decrease took place in the transient and summer numbers, because of the shrinking of the marshes. Field (1903: 135) stated that this rail was a "common summer resident from April to November [in Licking County], and that it nested at Licking Reservoir [Buckeye Lake]."

The Sora was usually the first rail species recorded in the spring. Like the Virginia Rail it had a marked spring migration, but one of longer duration, since it lasted from early April to late May. The species was likewise more numerous, for during periods of greatest abundance as many as 18 individuals were noted in a day. The fall migration in September and October was very marked, and despite the dense vegetation as many as 30 birds were recorded in a day (Pl. XV).

This rail was a rare summer resident, and in 3 summers no breeding birds were found. The first of the two nestings recorded was noted on June 9, 1928, when I found an adult accompanied by at least 8 young in the cattails on Onion Island; the other record was on June 30, 1928, when I found an adult and 7 young in the cattail swamp in the Little Buckeye game refuge. There is 1 nesting record previous to the survey. On May 26, 1912, Edward S. Thomas found a nest and 10 eggs in the cattails which bordered the canal north of Sellars Point. The eggs were hatching.

**Coturnicops noveboracensis noveboracensis* (Gmelin)

Yellow Rail

Presumably a very rare spring and fall transient.

The first of the 3 records for this species was made on April 9, 1927. At that time I flushed a bird from the sedges that bordered a part of Lewiston Island. The second bird, seen on May 5, 1928, was flushed from beside a sedge-bordered pool on the western edge of the Lakeside Woods. The third bird was noted on the evening of September 29, 1928, on the edge of Cranberry Island. I was sitting quietly in a boat when I first saw this individual. Although I was not more than 10 feet from the bird it was apparently undisturbed by my presence. Later a very slight movement caused it to retreat quickly into the bur marigolds (*Bidens* sp.). In each instance further attempts to flush or to observe these elusive creatures met with failure.

From my experiences with these individuals and studies of the Yellow Rail elsewhere in Ohio and southern Michigan, I am convinced that it is only by the merest chance that an observer unaccompanied by a trained dog ever sees this bird. With a trained dog the chances of flushing a bird are greatly increased. As I did not use a dog it is possible that this most secretive species was a more regular transient and occurred in larger numbers than the records indicate.

**Laterallus jamaicensis stoddardi* (Coale)

Black Rail

Presumably a very rare transient or summer resident.

On June 10, 1923, Arthur R. Harper, Robert B. Gordon, Roscoe W. Franks, and J. Stanley Douglass found an adult in a sweet-flag patch in a short-grass pasture beside Little Buckeye game refuge. Because the bird refused to fly after it had been flushed, a path was cut through the sweet-flag patch, and while one of the party was stationed so as to have a view of the path, the others crawled through the sweet flag and forced the bird to cross the path. After the bird had been chased back and forth many times

and its characteristic markings had been carefully noted, it flushed and alighted some distance away. The startled bird uttered at frequent intervals a sharp, rapidly repeated note.

Whether this evasive species occurred more frequently than the record indicates is not known. The bird was seen upon 2 occasions elsewhere in central Ohio, on April 1, 1927, and on April 22, 1927 (Walker: 1928b: 13).

Gallinula chloropus cachinnans Bangs
Florida Gallinule

Uncommon spring and fall transient, rare or uncommon summer resident.

Earliest date of arrival:	April 10, 1925	.....
Median date of arrival:	April 14	(September 1)
Median date of departure:	(May 10)	October 8
Latest date of departure:	.....	October 22, 1933

Market hunters and sportsmen have stated that the Florida Gallinule was a very numerous transient and uncommon summer resident between 1860 and 1910. Dawson (1903: 455) considered it numerous during some years: "In 1902, they [Florida Gallinules] were common at the Licking Reservoir [Buckeye Lake], while in 1903, with the water a foot or so higher, none were to be found." Jones (1903: 62) visited Buckeye Lake during the same year, and he "found it in considerable numbers." Field (1903: 135) mentioned that the species nested there. According to sportsmen, the bird began to decrease in abundance about 1910, when the marshes shrank in size and number.

During the survey the species was an uncommon spring and fall transient; it appeared each year in the greatest numbers during late April, early May, and the latter half of September, when from 3 to 12 individuals could be seen daily. The number present seemed to be governed by the water level of the lake, especially during nesting seasons. In the late spring and summer of 1929, when the cattail marshes were flooded and the bases of the cattails were well covered with water, at least 12 pairs nested about the lake, and during late June and July, broods of 4, 6, 6, and 11 young were noted upon several evenings. The next year the water level was very low in late spring and summer, most of the marshes were dry, and no young or adults were found.

More than 25 used or empty nests were noted during the survey, and all except 2 were constructed entirely of cattail leaves and stalks. In the 2 exceptions the bases of the nests were made of cattails, and the linings of leaves and stalks of *Scirpus* and *Carex*. The nests floated upon water 1½ to 4 feet deep, though they were anchored to growing vegetation. There were no nests in the interior of the cattail marshes, and all nests were within 12 feet of open water. Three nests containing eggs were found in Honey Creek marsh. The nest found on June 9, 1935, held 7 eggs; of the nests

found on June 29, 1929, one contained 9 eggs and the other 11 eggs. The eggs in the nests found in 1929 were in the process of hatching. Small young have been noted from June 7 to mid-August.

Fulica americana americana Gmelin
American Coot

Very common spring and fall transient, rare summer resident and winter visitant.

Earliest date of arrival:	(February 13, 1932)	(September 9, 1930)
Median date of arrival:	March 12	September 15
Median date of departure:	May 25	December 8
Latest date of departure:	(June 12, 1928)	(December 11, 1927)

The American Coot has probably been a numerous transient throughout historic time. The oldest residents agree that it was an abundant transient from 1860 to 1910; after 1910 the yearly numbers seemed to decrease, and after 1915 the decline became pronounced. Despite the reduction, this species was unquestionably one of the most numerous and conspicuous waterfowl to migrate through the area between 1922 and 1934. The first spring birds usually arrived before March 15, and by March 20 the species had become rather numerous. The peak of migration occurred during late March, April, and early May, when between 200 and 1500 individuals could be seen daily. By late May all except an occasional straggler had disappeared. The birds were very tame and confiding in spring; they swam within a dozen feet of people in boats, and flapped away in their customary, awkward fashion only when closely pressed.

The first transients of the southward migration appeared in early or mid-September, and by late September the species was rather numerous. The period of greatest abundance was in October and the first 20 days of November, and then as many as 1800 individuals were recorded in a day. A decided decrease occurred during the first severe cold period of late November or December, and thereafter the species was uncommon or rare until its final disappearance.

The oldest residents stated that the species nested in small numbers each summer between 1860 to 1915. If this is true, the bird probably nested throughout most of historic time. Field (1903: 35) wrote that a few probably nested at the lake, but Jones (1903: 62) stated that none was found. Two pairs of birds were seen in Honey Creek marsh throughout the summer of 1929, and on July 13, 2 adults and 6 small young were discovered. A second nesting record was obtained August 9, 1930, when an adult and 7 nearly grown young were found at the eastern end of the lake near Thornport.

Between 150 and 180 coots were found throughout most of the exceptionally warm winter of 1931-32. They were in the waters between Liebs and Onion islands (see pp. 119-20).

The bird was seldom molested by market hunters, for it had no market value, and as long as ducks were plentiful this stupid and abundant bird was seldom killed by sportsmen. It was considered almost worthless as food. About 1900, when ducks had become scarce, sportsmen began to hunt it. The birds were shot either as they settled among or flew over the decoys, or during recent years, while they sat on the water or attempted to fly from it.¹³ Between 1900 and 1922 there was a steady growth of interest in shooting these birds. During the investigation the coot was the dominant game bird and more of these birds were shot each fall than of all other waterfowl species combined. Before the game refuges were established at the eastern end of the lake in 1925, coots had no sanctuary and were harassed throughout each hunting day; often the kill per day exceeded 70 per cent of the number present at the beginning of the day's hunt. After the establishment of refuges a surprisingly large proportion of hunted coots at the eastern half of the lake at some period of the day flew into one of these havens and found protection. Once a bird entered a refuge it seldom returned to the hunted area.

With the change in public opinion as to the sporting qualities of the coot, there occurred a change regarding its edible qualities. Before 1900 it was considered almost worthless as food, but during the survey the quality of its flesh was considered as equaling or surpassing that of the Lesser Scaup.

Squatarola squatarola (Linnaeus)
Black-bellied Plover

Rather rare spring and fall transient.

Earliest date of arrival:	May 16, 1929	August 23, 1925
Median date of arrival:	.....	September 10
Median date of departure:	.....	October 10
Latest date of departure:	May 24, 1926	October 22, 1927

In spring the Black-bellied Plover was found in May, and in small numbers at infrequent intervals. The largest number recorded on any spring day (May 18, 1929) was 6. At that season it inhabited overflow puddles and "sky ponds" of recently plowed fields. The species was a more regular transient in the southward migration, and each autumn more than 5 individuals were recorded. The largest number recorded for a day (September 14, 1924) was 21. The peak of migration occurred in late September. As with the Golden Plover, the southbound individuals were rather solitary in their habits and tended to scatter widely over the peat islands, mud flats, and puddles, rather than to remain in flocks. In fall none was noted in fields.

Apparently the Black-bellied Plover was an uncommon transient

¹³ This latter method of hunting Coots has been well described by Dawson (1903: 456-57).

throughout historic time. Market hunters and sportsmen stated that they saw the species infrequently between 1860 and 1921. In 1882 Wheaton (1882: 456) indicated that it was seldom seen in central Ohio.

Pluvialis dominica dominica (Müller)

American Golden Plover

Very rare spring and uncommon fall transient.

Earliest date of arrival:	April 4, 1931	September 3, 1928
Median date of arrival:	.....	September 11
Median date of departure:	.....	October 14
Latest date of departure:	April 30, 1929	October 23, 1927

The American Golden Plover was an abundant transient between 1860 and 1890. Large numbers were killed for market. Wheaton (1882: 457) wrote that in Ohio it was "usually abundant in spring, common in fall." A tremendous decrease was noted between 1890 and 1900, and from 1900 to 1921 the species was so reduced in abundance that it was observed only infrequently. Jones (1903: 79) stated: "From common or even abundant during the spring migration up to the time Dr. Wheaton's work closed, this plover has become hardly more than casual in most sections of the state."

Golden Plovers were recorded 3 times in spring during the investigation. On April 30, 1930, I saw 2 beside a small puddle at the western end of the lake; on April 4, 1931, I saw a group of 58 around a flooded onion field in Bloody Run swamp; and on April 28, 1934, Lawrence E. Hicks saw 22 birds in a wet field near the lake. Throughout the investigation the species was also a rare spring transient in the remaining eastern half of Ohio, but in the prairie-like sections of the western half of the state it was a fairly regular transient and often occurred in large flocks.

This plover was a regular late summer and early fall transient. Most of the birds were seen on the mud flats and peat islands of the lake, and the remainder about temporary puddles present in fields immediately after severe rainstorms. One to 10 transients were generally recorded in a day. These southbound birds did not usually flock as did spring birds, but scattered widely over the peat islands, mud flats, and puddles. Only once was a large flock noted; on October 12, 1929, I saw a group of 52 flying over Cranberry Island.

The number of birds recorded each year slightly increased as the investigation progressed, which may indicate that since given federal protection the species is increasing in abundance.

Charadrius hiaticula semipalmatus Bonaparte

Semipalmated Plover

Uncommon spring and fall transient.

Earliest date of arrival:	May 8, 1931	July 30, 1930
Median date of arrival:	May 11	August 12
Median date of departure:	May 27	October 10
Latest date of departure:	May 29, 1931	October 29, 1933

The Semipalmated Plover was noted whenever an intensive survey was made in May, and I conclude that the species was present in at least small numbers each spring. The number fluctuated from spring to spring, chiefly in connection with the presence or absence of temporary "sky ponds" in fields. When suitable ponds were present, and especially if situated upon recently plowed ground, from 10 to 25 individuals could be recorded daily between May 12 and 25. Because of the high water level of the lake in spring, there were seldom any suitable feeding areas, and the bird was rarely found about the lake during that season.

The Semipalmated Plover was a regular transient during late summer and fall and usually occurred in larger numbers than were present in spring. During the southward movement there were always feeding and resting places on peat islands, mud flats, and shores of the lake. All fall birds were seen there, except an occasional individual or small group that was found about a temporary puddle in the fields. From 1 to 30 were recorded each day during the last 2 weeks of August and first 3 weeks of September, and 1 to 10 individuals could usually be seen during the last week of September and the first week of October.

As with other small shore birds, this species was remarkably tame in fall, especially after 1928, when the hunting of most shore-bird species was prohibited. Many plovers fed unconcernedly on mud flats or peat islands within 10 feet of fishermen in boats. As long as the fishermen remained seated or in a crouching position the birds were not alarmed, even though the fishermen moved, jerked their fishing rods about, or talked loudly. If a fisherman stood up in the boat, the birds flew away immediately. This was likewise true of other shore-bird species. On 2 occasions when I whistled to attract the attention of passing shore birds, one of these dainty plovers was decoyed and alighted upon the gunwale of my boat. The bird remained for a few minutes, running back and forth.

Charadrius melodus Ord
Piping Plover

Very rare transient.

On September 20, 1929, Robert M. Geist and Charles F. Walker found a Piping Plover on a peat island at the eastern end of Cranberry Island. On September 15, 1937, Gene Rea and Dale Jenkins saw one near Cranberry Island, and the next day Lawrence E. Hicks (1938: 141) collected it.

Wheaton (1860: 377) collected specimens in central Ohio, at the Scioto River in 1856, and recorded (1882: 469) the species as a "not common migrant" in interior Ohio. This species has been recorded in central Ohio at least 5 times between 1929 and 1937. It has probably been a rather regular transient throughout historic time.

Charadrius vociferus vociferus Linnaeus

Killdeer

Very common spring and fall transient, common summer resident, and very rare winter resident.

Earliest date of arrival:	(February 20, 1929)	.....
Median date of arrival:	February 28	(July 20)
Median date of departure:	(April 10)	November 26
Latest date of departure:	.....	(December 18, 1932)

The first Killdeers of spring always arrived in the latter part of February or early March with the first huge wave of spring migration, and by March 10 the species had usually become very numerous. At the peak of migration, between March 15 and April 10, 100 to 225 birds could be recorded daily. Throughout spring Killdeers were scattered widely over the area, with segregations about overflow puddles, "sky ponds," wet fields, along the streams and canal, and about the shores and islands of the lake.

Censuses indicated that each year 15 to 40 pairs nested in the area. Almost all pairs nested in a well-defined and readily recognizable habitat: the short-grass meadows, pastures, and grain fields situated upon the gentle, gravelly, and well-drained slopes of glacial moraines. Twenty nests with eggs were observed. The earliest nest with eggs was found April 15, and the last on July 2. Sixteen nests contained 4 eggs each; 4 nests contained 3 eggs each—these were found after June 4. Young, accompanied by parents, were noted from April 25 to July 28.

Throughout late spring and until July 4 most of the birds were in family groups. About mid-July the groups merged into flocks and left the gravelly slopes to congregate about wet fields, meadows, streams, pools, shores, and islands of the lake. By the last week of July the process was complete; some flocks contained as many as 100 individuals.

Evidence of southbound transients were noted during late July, and the movement was well under way by early August. The period of greatest abundance was throughout late August and September, when between 200 and 1500 Killdeers could be daily noted. At this time the dryness of the fields made conditions rather unfavorable; however, many mud flats and peat islands about the lake were exposed, and it was in such places that the species congregated. The number found during a southward flight seemed directly correlated with the number of mud flats and peat islands present. The Killdeer was a most vociferous creature during all seasons, but in these late summer concentrations it seemed unduly noisy.

A decline in numbers became evident in early October, and after mid-October this trend was very noticeable. By December 1 only an occasional straggler ran about over the frozen ground. Occasionally birds were noted in winter, and 2 remained throughout the warm winter of 1931-32, on the

north shore of Crane Pond, in an area approximately 200 feet long by 20 feet wide.

I have several times noted a peculiar habit of this species. Whenever I rowed a boat toward a group of Killdeers, all except 1 flew away. If the remaining bird was upon land it slowly settled downward until pressed closely to the ground; while in such a position it would allow me to approach within a few feet of it before flying away. If the bird was standing in shallow water it slowly crouched down until only a part of its head was above the water's surface. Such submerged birds would almost allow one to catch them.

All evidence indicates that the Killdeer was a regular transient and nesting species in at least small numbers throughout historic time. Between 1860 and 1910 the bird was hunted for food and sport.

Bartramia longicauda (Bechstein)

Bartram's Curlew¹⁴

Fairly common spring transient, uncommon summer resident, common fall transient.

Earliest date of arrival:	March 30, 1929	(July 4, 1931)
Median date of arrival:	April 3	July 12
Median date of departure:	(May 1)	September 10
Latest date of departure:	.....	September 18, 1929

In 1882 Wheaton (1882: 490) wrote: "Bartram's Sandpiper or the Field Plover, . . . is an abundant migrant and common summer resident" in Ohio. This agrees with statements of market hunters and sportsmen of the Buckeye Lake area, for they claimed that before 1890 this curlew was a most numerous transient during April and sometimes in August. During migrations it inhabited plowed and grassy fields, and large numbers were shot for the market and for sport. About 1890 it began to decrease in numbers. The trend became more pronounced each year until about 1915. Thereafter until 1921 the species was said to have maintained its numbers or increased in abundance.

The spring migration of this curlew took place principally during the last 3 weeks of April, when 4 to 24 individuals could be daily recorded. From its arrival until early summer the lovely, ethereal whistle of this shore bird could be often heard. Censuses indicated that between 10 to 14 pairs nested yearly. About two-thirds of these pairs nested in the open and well-drained, though not hilly, pastures and fields of forage crops and grain that lay south and east of the lake. The remaining third were in the better-drained fields and pastures on the gently sloping glacial moraines to the

¹⁴ Lowe (1927: 127-30) has pointed out that the genus *Bartramia* is closely allied to the curlews. J. Van Tyne told me that Outram Bangs, with his usual acumen, recognized the Upland Plover as a curlew, and that Bangs mentioned this to him as early as 1922. Since the name Upland Plover is a misnomer I suggest the name Bartram's Curlew be used.

north and west. Five nests were found, each with 4 eggs. The nests were in slight depressions in the ground, were composed of grasses, and were well hidden in growing forage crops or in grain. The earliest nest was found on May 4, and the latest one June 10. Some nests with eggs were completed much earlier than May 4, for young out of the nest were noted as early as May 7. The latest small young for any year were seen on June 17.

The first southbound transients were usually heard in mid-July, and by late July the southward movement was well under way. The peak of migration occurred in August, when a few birds could be nightly heard; during the larger flights dozens and occasionally hundreds were heard passing overhead in a southerly direction. A small proportion of the southbound birds also migrated during late evenings and very early mornings. Few fall transients passing over the area alighted in it, and those which did usually frequented the sloping pastures and the wheat, oats, and hay stubble fields. They did not resort to the mud flats and peat islands as did other shore-bird species.

These graceful creatures had a prolonged and melodious whistle, which, given from the top of a post or telephone pole, or while on the wing and high in the air, was one of the most beautiful bird notes of spring and summer. The highly characteristic soaring and fluttering flight of courting birds in spring, and later of the family group, was very attractive, especially during the dusk of clear, quiet summer evenings when the birds soared at exceptionally great heights. The "puttie-putt-putt" notes of the southbound transients during warm summer nights and early, misty mornings were as appealing and pleasant as the prolonged whistle of the spring birds.

**Numenius phaeopus hudsonicus* Latham
Hudsonian Curlew

Very rare spring transient.

The Hudsonian Curlew was recorded twice during the survey. On May 26, 1928, James S. Hine and I observed one for 10 minutes, as it flew over the lake near Cranberry Island. This individual made several attempts to alight on the island, but was frightened each time by fishermen in boats. By imitating the call note of the Black-bellied Plover, we repeatedly decoyed the curlew to within 30 yards of us. Then the dark loreal and postocular stripes were plainly visible.

E. L. Dakan and I observed one, on May 21, 1933, as it fed in a large overflow puddle in Bloody Run swamp. The dark loreal and postocular stripes of this individual were also plainly visible.

The status of the Hudsonian Curlew in the area before 1922 is unknown. A few sportsmen have stated that they shot curlews in former years, but were unable to state which species. From the statements of persons who

studied the bird fauna of Ohio between 1920 and 1935, it is obvious that the Hudsonian Curlew was the large curlew most frequently seen in that period. It is therefore possible that it occurred in the area at irregular intervals throughout historic time.

**Numenius americanus americanus* Bechstein

Long-billed Curlew

Casual transient.

The first published record of the Long-billed Curlew is by Wheaton (1882: 492), who stated: "I have seen specimens captured at the Licking Reservoir [Buckeye Lake]." It is not clear from the description of the 3 species of curlews whether he knew the salient characters separating the Long-bill from the other species, and hence there is some doubt as to the validity of his testimony. The second record is by Field (1903: 136): "A rare migrant. One record of seven at the Licking Reservoir, May 31, 1902."

The Long-billed Curlew was not found during the survey, but it was recorded once in central Ohio. On May 22, 1926, Robert M. Geist, Charles F. Walker, and I observed an individual at O'Shaughnessy Reservoir, Delaware County. The cheeks of this bird were plain and buffy, and lacked the dark loreal and postocular stripes of the Hudsonian Curlew, and the bill was much longer than any we have seen on the latter species (Trautman, 1928c: 43).

Limosa fedoa (Linnaeus)

Marbled Godwit

Very rare or casual visitant.

The presence of the Marbled Godwit is attested by a bird, collected October 8, 1881. The specimen was preserved as a bird skin by Theodore Jasper, and is now in the Ohio State Museum.

Wheaton (1882: 480) considered the species as a "not common spring and fall migrant" in central Ohio in 1882. Between 1922 and 1934 it was recorded once from central Ohio, when on September 13, 1925, Charles F. Walker found 5 individuals at O'Shaughnessy Reservoir, Delaware County (Trautman, 1928c: 43).

Tringa melanoleuca (Gmelin)

Greater Yellow-legs

Uncommon spring and fall transient.

Earliest date of arrival:	March 24, 1928	July 12, 1924
Median date of arrival:	March 30	August 2
Median date of departure:	May 15	October 23
Latest date of departure:	May 21, 1933	December 4, 1925

In 9 spring seasons during the investigation this shore bird was uncommon. At the height of its abundance, which occurred in April, 4 to 20 birds a day were found. In the 3 remaining years the species was more numerous. In April, 1928, there were many overflow puddles and "sky ponds" in the plowed and grassy fields north and west of the lake, and 40 to 80 individuals could be seen daily.

The first arrivals of the southward flight always appeared during mid-July or a few days later, and there were a few from then until mid-August. The height of the movement took place during the last half of August and first half of September. This movement was poorly defined, and the species was not constantly present. Seldom more than 10 individuals were noted in a day. In this flight the bird chiefly frequented mud flats and peat islands about the lake, and only upon a relatively few occasions, as when fall rains formed temporary ponds, were individuals noted in fields not adjacent to the shores of the lake.

Fall observations upon the feeding habits of the Greater Yellow-legs indicated that it generally fed in water 2 to 4 inches in depth and habitually captured small fish. Very small gizzard shad were most often eaten, probably because of their availability and abundance. Tadpoles and large dragonfly larvae were frequently eaten, and twice a bird was seen to eat a very small frog.

Reports of market hunters and sportsmen indicated that between 1860 and 1910 rather large numbers were shot for the market or for sport, and that the species was very numerous. These men stated that the bird was often more numerous in the southward flight than in spring, when the lowered waters of the reservoirs exposed a vast amount of feeding territory. Wheaton (1882: 484) considered it "more numerous in fall than in the spring."

Tringa flavipes (Gmelin)

Lesser Yellow-legs

Common spring and fall transient.

Earliest date of arrival:	March 26, 1927	July 12, 1931
Median date of arrival:	April 8	July 16
Median date of departure:	May 25	October 10
Latest date of departure:	May 29, 1931	November 29, 1923

During the investigation the first Lesser Yellow-leg made its spring appearance in late March or the first half of April. The height of abundance occurred during the last 2 weeks of April and first 2 weeks of May. About May 15 the species became rare and disappeared entirely during the latter half of the month. It was very evident that spring numbers were largely governed by the presence or absence of overflow puddles and "sky ponds" in lowland fields. If such waters were few only 4 to 15 Lesser

Yellow-legs were seen in a day, but if numerous between 50 and 200 were daily noted. The greatest number recorded in a day (April 26, 1928) was an estimated 400.

The first southbound arrival appeared during mid-July, and migration was definitely under way by August 1. The largest concentrations occurred in August and very early September. By mid-September the flight was definitely on the wane, and only occasional individuals or small groups were noted after October 1. This movement was almost twice as long as the spring migration, and 5 to 100 individuals were usually seen in a day.

The Lesser Yellow-legs was four times as numerous as the Greater Yellow-legs during migrations. The peak of migration of the Lesser Yellow-legs occurred about 2 weeks later in spring and about 3 weeks earlier in fall than that of the Greater Yellow-legs. The Lesser Yellow-legs hunted for food chiefly over moist ground or in water less than 2 inches in depth, rather than in deeper water as did the Greater Yellow-legs. The food of the Lesser Yellow-legs consisted principally of insects and other small invertebrates, rather than of larger animals, and only once was a Lesser Yellow-leg observed to catch and eat a fish.

Reports of market hunters and sportsmen indicated that between 1860 and 1900 the Lesser Yellow-legs was very abundant, was shot in considerable numbers for food and sport, and was more numerous in the southward flight than it was in spring.

Tringa solitaria solitaria Wilson
Eastern Solitary Sandpiper

Fairly common spring and fall transient, very rare June visitant.

Earliest date of arrival:	April 18, 1925	(July 13, 1929)
Median date of arrival:	April 25	August 1
Median date of departure:	May 20	October 3
Latest date of departure:	(May 29, 1931)	October 13, 1928

The first spring arrivals made their appearance during the latter half of April, and by May 1 the bird was always present in small numbers. During this migration it was most numerous in the first half of May. About mid-May a decrease in numbers was noted, and by May 20 all except an occasional straggler had departed. At the height of abundance between 5 and 25 individuals could be daily noted. The total number recorded each year varied little. Unlike the more gregarious sandpipers, this bird fed about the narrow shore margins of lake, streams, and canals, and about small woodland pools. Each spring there was always some suitable feeding habitat.

The first southbound arrivals made their appearance during mid-July, and by late July migration was definitely begun. The height of the movement usually took place during August and early September, particularly the first half of August, and then between 5 and 25 individuals could be

daily recorded. A decrease occurred in mid-September, and the species disappeared in early October. During this migration the temporary woodland pools were dry, as usually were the ponds in the fields, and this sandpiper was restricted to the larger stream courses and the mud flats and peat islands of the lake.

In 4 years an individual or pair was noted throughout late May, June, and July. From the courting behavior of 2 pairs the impression was obtained that the birds might be nesting; however, there was no positive evidence. Wheaton (1882: 486) thought that the species nested in central Ohio, as he "once found the young in care of their parents," in central Ohio.

The species has probably been a regular transient throughout historic time. It was never abundant between 1860 and 1921, according to the few older residents who knew the bird, and few were shot for sport or for the market.

Actitis macularia (Linnaeus)
Spotted Sandpiper

Common spring and fall transient, uncommon summer resident.

Earliest date of arrival:	April 14, 1923	.....
Median date of arrival:	April 19	(August 8)
Median date of departure:	(May 26)	October 12
Latest date of departure:	.....	October 22, 1927

The Spotted Sandpiper was a common spring transient whose numbers varied little from year to year. There were always some favorable feeding grounds about the shores of the lake and the banks of the streams. The first arrival was always present by April 25, and the height of abundance occurred during the last few days of April and the first half of May, when 10 to 25 individuals could be daily recorded.

Between 5 and 8 pairs nested each season, chiefly along the shores of the lake and the islands. The shores of Liebs Island and Maple swamp seemed particularly favored. The remaining pairs nested along the banks of streams or ditches. Three nests with eggs were found. They were more than 15 feet from the water's edge in slight depressions in gravelly soil and were sparsely lined with bits of grass. The first nest was found on May 15, 1925, and contained 4 eggs; the second on May 29, 1931, contained 3 eggs; and the third on July 13, 1929, had 4 eggs.¹⁵ Small young out of the nest were seen from late May to late July.

Evidence of the southward migration was apparent by mid-August, and the height of the movement took place during the latter half of that month

¹⁵ No incubating birds were collected, but I have taken 3 incubating birds from their nests elsewhere in Ohio, once in Delaware County and twice in Ottawa County. All 3 were males.

and the first 2 weeks of September. A sharp decrease in numbers was noted in the latter part of September or early October, and by October 12 only an occasional straggler remained. The number of transients varied little from one fall to another, and 10 to 60 individuals could be daily seen.

The older residents stated that the Spotted Sandpiper was a much more numerous summer resident between 1880 and 1921 than it has been since, and that after 1890 there was a rather consistent lessening in annual nesting abundance. The principal cause of the decrease was the occupation of the nesting habitats by cottages and the constantly extending stone and concrete retaining walls about the shores of the lake. Removal of the partly exposed stumps from the lake also eliminated excellent feeding places. During my visits to Buckeye Lake between 1909 and 1918, the little "teeter-tail" seemed a much more numerous summer resident than it was during the investigation; between 1907 and 1920 I noted a drastic decline in its nesting abundance at Indian Lake, Logan County, Ohio. The changes were correlated with the destruction of nesting and feeding habitats by real-estate developments.

During the southward movement the species scattered widely in feeding and was to be found about the shores of the lake and islands and along the banks of streams. Each evening at dusk, singly or in small companies, the birds gathered to roost on the peat islands near Cranberry Island. The number roosting upon an island usually varied from 5 to 20 birds; upon a few occasions as many as 40 were observed roosting together. Some remained in the area for a considerable length of time, and I have repeatedly noted marked individuals returning to roost on the same spot each night for periods of about 2 weeks.

On several occasions "spotties" were noted feeding upon small flies (Diptera) that were hovering, cloudlike, in the air a few inches above small plants or the ground. When feeding upon these flies the birds ran nimbly about and snatched insects from the air, or hopped high into the air to catch them. A group of these nervous, teetering birds jumping up and down capturing insects was a ludicrous sight.

**Catoptrophorus semipalmatus inornatus* (Brewster)

Western Willet

Very rare transient.

There are 2 records of this rare Ohio bird in the area. On September 10, 1924, Charles F. Walker noted 1 as it fed on a peat island in the vicinity of Cranberry Island. He noted presumably the same individual at this locality on September 18.

Willetts taken by me at Sandusky Bay, Ohio, on May 29, 1924, and September 7, 1925 (Geist, 1928: 7), and at Lake St. Marys, Ohio, on May 13,

1933 (Hicks, 1934: 402) are of the subspecies *inornatus*. This is the only subspecies that has been collected in Ohio, and therefore I assume that the bird or birds noted by Walker were of this form.

Arenaria interpres morinella (Linnaeus)

Ruddy Turnstone

Very rare spring and fall transient.

Earliest date of arrival:	May 6, 1912	September 14, 1924
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	May 29, 1929	October 8, 1929

The records for this species in spring: on May 6, 1912, Edward S. Thomas saw 1; May 21, 1924, Robert M. Geist, Charles F. Walker, and I collected 1 at Luray Puddle; a few days later, May 24, Edward S. Thomas, John S. Thomas, and I saw 3 at the same place; on May 28, 1 was found there by me; on May 25, 1926, I noted 1 at a small pond north of Sellars Point; on May 29, 1929, E. V. Prior found 1 near Little Buckeye game refuge; and on May 21, 1933, E. L. Dakan and I observed 1 beside a large overflow pond in Bloody Run swamp.

Late summer and early fall records: on September 18, 23, and 24, 1924, I noted a bird, seemingly the same individual, on the peat islands near Cranberry Island; on September 17, 1929, I collected 1 from the peat islands; and on October 8, 1929, I collected 1 there.

The fall Ruddy Turnstones spent much time feeding about bases of snags and rotten stumps on the peat islands, deftly flipping with their bills bits of peat and rotten wood so as to obtain the food that lay beneath.

Unlike most shore-bird species, the Ruddy Turnstone was more often observed in spring than it was in fall. The greater abundance in spring was also noted elsewhere in central Ohio during the investigation and was particularly evident at the western end of Lake Erie, where it was not unusual to record 200 of the birds on a late May or early June day; by late summer or early fall seldom more than 35 were noted in a day.

Market hunters and sportsmen who hunted intensively in the Buckeye Lake area between 1860 and 1921 did not find this gaudy and conspicuous bird, and it was not recorded for central Ohio by Wheaton, Davie, Jones, Dawson, Field, and other ornithologists.

Limnodromus griseus griseus (Gmelin)

Eastern Dowitcher

Very rare spring and fall transient.

Earliest date of arrival:	May 2, 1925	August 22, 1929
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	May 19, 1934	October 23, 1926

The Eastern Dowitcher was recorded upon 3 occasions in spring: on May 2, 1924, Charles F. Walker, George R. Schoedinger, Jr., and Monford P. Miles found 1 beside a pool near the south shore of the lake; on May 18, 1934, E. V. Prior, of Newark, noted 1 at Liebs Island; and on the next day Prior saw the same bird again.

There are 5 records in the southward migration: on September 10, 1925, Walker recorded 1; on October 23, 1926, Robert B. Gordon saw 1; on August 22, 1929, I collected 1; on August 24, 1930, I noted 1; and on September 23, 1930, Walker found a flock of 9. All of these birds were on peat islands in the vicinity of Cranberry Island.

It is strange that the species was not recorded oftener and more regularly in fall, for then conditions about the peat islands appeared to be favorable. Furthermore, Wheaton Club records between 1922 and 1927 indicated that the species was a rather regular fall transient in central Ohio. It is also surprising that this shore bird was not recorded in July at Buckeye Lake or central Ohio in general, for Louis and Bernard Campbell and I have repeatedly seen the birds in July in the western Lake Erie district, and the Campbell brothers reported that occasionally the greatest numbers for the year occurred in that month.

On August 12, 1936, Walker found 1 on a peat island near Cranberry Island. This date is earlier than any other date for the species during the investigation. On October 4, 1936, on a mud flat adjacent to Liebs Island, Edward S. and John S. Thomas saw 3 dowitchers which they regarded as Long-billed Dowitchers (*Limnodromus griseus scolopaceus*). The bills of these birds were extremely long, only one-half an inch shorter than the bill of a Wilson's Snipe with which the dowitchers were associating.

It appears probable that the Long-billed Dowitcher occurs in Ohio oftener than was previously supposed. Since 1934, the Campbell brothers have upon several occasions observed or collected this subspecies in the western Lake Erie district (Campbell and Campbell, 1935: 81).

Capella delicata (Ord)

Wilson's Snipe

Common spring and uncommon fall transient, very rare winter visitant.

Earliest date of arrival:	(March 17, 1928)	July 21, 1928
Median date of arrival:	March 20	August 2
Median date of departure:	May 14	November 8
Latest date of departure:	May 21, 1931	(December 27, 1931)

Former market hunters and sportsmen stated that from 1860 to 1910 the Wilson's Snipe was a very common semiannual transient. This game species was much sought. Its greatest spring abundance was said to have been during late March and early April, when hundreds were to be found

daily about the wet grassy meadows north and west of the lake and about the marshes of the lake itself. In the large spring flights hunters shot as many as 30 to 60 snipe a day. In these early years the southward migration took place chiefly in late August, September, and early October. Most of the transients were found about the huge mud flats and peat islands exposed by the lowered waters of the reservoirs. The fall numbers were said to have been somewhat less than were those of spring, and in this migration bags of 30 birds a day were considered excellent.

During the survey the species usually was a common spring transient during late March and early April; however, its daily and yearly numbers fluctuated markedly. These fluctuations seemed to have been caused by the absence or presence of shallow, grassy puddles and wet, grassy fields, since it was only when such puddles were numerous and conditions in the fields favorable that the birds were very common. Between 75 and 125 could then be flushed in a day.

The species was rather uncommon during its southward movement, seemingly because of a lack of suitable feeding habitat. At this season, wet grassy fields with soft ground that could be probed were absent or few, and the birds were forced to feed about the shores of the lake. Much shore-bird territory about the lake was unsuited to the snipe, for many mud flats contained a soil too firm for probing or lacked sufficient vegetative cover. Greatest abundance during this movement occurred in late August, September, and early October, when 5 to 55 individuals could be seen in a day. On many days during the extremely warm winter of 1931-32 a snipe was found upon Liebs Island. In November, 1924, upon several occasions I saw a bird coming to roost in a cattail marsh near Journal Island. It came about sundown and always roosted upon the same bare square foot of earth that was surrounded by cattails.

I have been told that between 1880 and 1900 the species was heard winnowing above the marshes in late spring, and that the birds were present throughout the summer. It is possible that this species did nest when the marshes and bogs were extensive and conditions were more favorable than they have been in recent years. During the survey the species still nested in northeastern Ohio (Hicks, 1935: 152).

Philohela minor (Gmelin)

American Woodcock

Formerly a very common transient and summer resident; from 1922 to 1934 an uncommon transient and summer resident.

Earliest date of arrival:	February 19, 1932	.....
Median date of arrival:	(March 15)	.....
Median date of departure:	.....	(October 30)
Latest date of departure:	.....	November 18, 1928

The species was probably present as a summer resident and transient between 1755 and 1860, but it should have been less abundant than it was later after much forest had been replaced by brushy slashings and undrained fields. From 1860 to 1900, according to hunters and sportsmen, it was one of the most numerous and important of the game birds to nest or migrate through the area. Wheaton (1882: 468) wrote that the bird was a "very common summer resident" throughout central Ohio. The area was a favorite and well-known resort for summer woodcock shooting by both sportsman and market hunter. Apparently during July and August bags of 20 to 50 birds a day were not unusual. These statements of abundance can be readily believed, for the area then consisted chiefly of swampy lowland woods and wet brushy fields.

From 1900 to 1921 there was a drastic reduction in transient and nesting numbers. This decline was principally caused by the destruction of the habitat. The swamps and lowlands were drained by ditching and tiling, brushy fields were converted into dry grain fields and open pastures, and the water table was lowered through agricultural practices. Overshooting, the chief cause for the lessening numbers of many game birds, apparently was not a principal factor in the status of the species. I believed that had the bird received complete protection from hunting throughout historic time, it would not have been much more numerous than it has been during recent years, when its feeding and nesting habitats were rapidly disappearing. By 1922 there was only a small remnant of the former extensive feeding coverts and nesting habitats, and each succeeding year found these reduced in size and number. Nesting censuses made between 1922 and 1927 indicated that between 40 and 60 pairs annually nested, but between 1930 and 1933 the number had decreased to less than 30 pairs, possibly as few as 15.

The species was usually present by March 15 of each year. From late in the month until early May the spectacular and lovely courtship flight was in full progress. Extreme dates for courtship flights were from February 28 to May 10. On March 3, 1930, I collected a male woodcock while it was in courtship flight, believing that the bird might be a female. No nest and eggs were found in the area during the study, but elsewhere in central Ohio, complete sets of 4 eggs were noted from mid-March to late May. Young birds, accompanied by an adult, were found in the area twice; on June 26, 1927, J. Stanley Douglass found an adult and 3 small young in the Lakeside Woods, and on May 15, 1930, I found an adult and 4 large young in the western half of the Big Woods. Elsewhere in central Ohio young have been noted from early April to mid-July.

The southward movement apparently occurred in late August and September, but unlike that of former years, it involved only a few birds. If

drainage projects and intensive agricultural practices continue, it will be only a relatively short time before this once characteristic and important game bird will have ceased to nest in the area.

Calidris canutus rufus (Wilson)
American Knot

Casual transient.

The only record of the American Knot was first mentioned by Wheaton (1882: 478) and later by Jones (1903: 68). Wheaton wrote: "Mr. Ed. Savage, of this city [Columbus], captured a fine male, of a pair in full breeding plumage, at the Licking Reservoir [Buckeye Lake], May 27, 1878." The bird was mounted and is now in Ohio State Museum. The species is a very rare transient in central Ohio and elsewhere in the inland portion of the state. Only at Lake Erie and Sandusky Bay does the bird occur regularly in Ohio.

Crocethia alba (Pallas)
Sanderling

Very rare spring transient, rare or uncommon fall transient.

Earliest date of arrival:	May 10, 1924	August 24, 1930
Median date of arrival:	.....	September 1
Median date of departure:	.....	October 10
Latest date of departure:	.....	November 7, 1925

Between 1922 and 1934 the Sanderling was recorded only once in spring. On May 10, 1924, F. Dale Pontius found 1 near the Little Buckeye game refuge. In a few other sections of Ohio, notably along Lake Erie, the bird was much more numerous in spring.

The species was noted at Buckeye Lake more frequently in the southward migration, and was recorded upon 1 to 13 days during 7 years. The bird was usually found singly, or in groups of 6 individuals or less. It was a very late transient for a shore bird, and all except a few birds were seen in September or October. Field (1903: 135) noted the late occurrence of southbound birds: "It may be usually found in small numbers at the Licking Reservoir [Buckeye Lake] during September and October." I assume that the bird has been a rather irregular transient throughout historic time.

From a blind, on the afternoon of October 31, 1925, I noted a peculiar performance by 2 Sanderlings. When first seen, these whitish birds were feeding upon a dark mud flat on which they were very conspicuous. While they were busily engaged in feeding, a large Cooper's Hawk flew overhead. Upon seeing the hawk, the Sanderlings ran quickly into a small patch of snow near by, that was about half an inch deep and stood there motionless for several minutes after the hawk had disappeared. Against the snow

the white birds could be seen only with great difficulty. Upon leaving the snow the birds again resumed their feeding, but at frequent intervals during the next hour they returned to stand in it. That the birds actually ran into the snow when frightened by the hawk in order to be less conspicuous, is difficult to believe.

Ereunetes pusillus (Linnaeus)
Semipalmated Sandpiper

Common spring and fall transient, rare summer visitant.

Earliest date of arrival:	May 6, 1931	(July 25, 1931)
Median date of arrival:	May 12	July 29
Median date of departure:	May 31	October 15
Latest date of departure:	(June 9, 1928)	October 31, 1924

This species occurred at approximately the same periods of the year and in the same situations as did its close associate the Least Sandpiper, and the larger flocks of small "peeps" usually contained members of both forms. My records indicate some slight average differences between the species: The average dates of spring arrival and fall departure of the Semipalmated Sandpiper were a few days later than those of the Least Sandpiper. The average daily and total yearly numbers of the Semipalmated Sandpiper were approximately one-fourth larger than those of the Least Sandpiper. The Semipalmated Sandpiper fed more frequently in water, and preferred wetter situations than did the Least Sandpiper.

Like the Least Sandpiper, the Semipalmated Sandpiper was very tame and unsuspecting. It probably was a regular transient throughout historic time.

Ereunetes maurii Cabanis
Western Sandpiper

Rather rare late summer and early fall transient.

Earliest date of arrival:	.....	August 9, 1930
Median date of arrival:	.....	August 15
Median date of departure:	.....	September 12
Latest date of departure:	.....	October 3, 1929

Little is known concerning the numerical status of the Western Sandpiper during historic time because of its similarity in form and coloration to the Semipalmated Sandpiper. It is only with better-marked birds, especially long-billed females, that the fall-plumaged Western Sandpiper can be definitely identified in the field.

The Western Sandpiper was probably a regular late summer and early fall transient that usually occurred singly or in groups of less than 5 individuals. The largest number recorded in a day was 12 birds, on September 4, 1929. The species was generally found on the peat islands and mud flats of the lake and was seldom found about an inland pool. It often

appeared in company with Semipalmated and Least sandpipers. Nearly all Western Sandpipers were recorded during the last half of August and first 10 days of September.

The following characters were used to identify this species in autumn plumage in the field: It habitually fed in deeper water than did the Semipalmated and Least sandpipers and more frequently immersed the entire head. The flight note was coarser than any notes of the Semipalmated Sandpiper, and it bore resemblance to one of the more querulous notes of the Least Sandpiper. The dusky legs of the Western Sandpiper had a greenish cast in certain lights, instead of always being black as were those of the Semipalmated Sandpiper or the yellowish green of the legs of the Least Sandpiper. The forehead was more whitish than it was in the other species. There usually was some chestnut-red on the feathers of back, shoulders, wings, and tertials. The color was most intense in specimens whose postnuptial molt had not been completed. It was lacking or less intense in fall Semipalmated and Least sandpipers.

Nichols' (Bent, 1927: 261) description of the differences in shape of the bills of the Western and the Semipalmated sandpipers was found accurate. The bill of the Western Sandpiper appears heavy at the base and is slightly curved downward at the tip; the bill of the Semipalmated Sandpiper is lighter at the base, straighter, and usually more slender at the tip. Since the bills of the male Western Sandpiper and female Semipalmated Sandpiper averaged approximately the same in length, the greater length of bill of the Western Sandpiper was a good field character only in the females and longest billed males. Length of bill was a satisfactory character for birds whose sex was known.

Five specimens were collected: September 12, 1925; August 24, 1928; September 4, 1929; August 26, 1933 (2).

Erolia minutilla (Vieillot)

Least Sandpiper

Common spring and fall transient, rare summer visitant.

Earliest date of arrival:	April 30, 1929	(July 11, 1925)
Median date of arrival:	May 7	July 28
Median date of departure:	May 31	October 10
Latest date of departure:	(June 9, 1928)	October 28, 1927

During both migrations the daily and seasonal numbers of this dainty little "peep" seemed largely governed by the amount of surface water. Whenever a large number of overflow puddles or "sky ponds" were present in the fields during the last 3 weeks of May or large expanses of mud flats and many peat islands were exposed in late summer or early fall, as many as 70 birds could be recorded in a day; otherwise less than 10 individuals were daily noted. A few have been found throughout June and early July.

It was frequently impossible to ascertain whether the June birds were late spring or early fall transients, or summering, nonbreeding individuals.

This "peep" and its close associate, the Semipalmated Sandpiper, were among the tamest of birds. Both species often allowed fishermen in rowboats to approach within a few feet of them as they fed about the peat islands. Occasionally a few became so tame as to allow me to approach sufficiently close to splash them with water. Apparently the birds enjoyed the baths, for when splashed they would droop their wings, ruffle their feathers and "cheep" contentedly; however, if I threw too large a quantity of water on them they would hurriedly shake their feathers and run complainingly away, only to return presently for more.

Erolia fuscicollis (Vieillot)

White-rumped Sandpiper

Rare spring and fall transient.

Earliest date of arrival:	May 12, 1924	July 12, 1924
Median date of arrival:	May 14	August 20
Median date of departure:	May 22	September 27
Latest date of departure:	May 25, 1924	October 28, 1922

This species was generally a rare spring transient throughout Ohio. Whenever overflow puddles and "sky ponds" were plentifully scattered over the lowlands during the middle third of May, 1 to 15 individuals were recorded. The species was unrecorded when such waters were absent, for the shores of the lake seemed wholly unsuited for it.

Most of the White-rumped Sandpipers in the southward migration were noted in late August and early September. In this migration they appeared as often as in spring, and as many as 15 were observed in a season. The largest number seen in a day was 8 (September 6, 1930). In their southbound journey the species seemed restricted almost entirely to mud flats and peat islands, and the largest numbers were found when the greatest amount of lake bottom was exposed. Market hunters and sportsmen did not recognize this species, and its numerical status before 1922 is unknown.

Erolia bairdii (Coues)

Baird's Sandpiper

Very rare spring transient, rather rare fall transient.

Earliest date of arrival:	May 18, 1929	August 15, 1924
Median date of arrival:	.....	August 17
Median date of departure:	.....	September 16
Latest date of departure:	May 20, 1931	September 23, 1930

Baird's Sandpiper was recorded twice in spring. On May 18, 1929, I saw one with a flock of 4 White-rumped Sandpipers that were feeding along the muddy shores of the partially drained Crane Pond; on May 20, 1931, I

found another in company with 5 White-rumped Sandpipers that were feeding in a small "sky pond" north of the lake. The scarcity of spring transients of this species seems characteristic of Ohio, for during the period few were found elsewhere in the state.

Baird's Sandpiper was recorded at Buckeye Lake oftener in the southward migration than it was in spring, though even then it was not noted every year. Most birds were seen during the last week of August and the first week of September, and never more than 3 were recorded in a day. All south-bound transients were found about the exposed mud flats and peat islands.

In comparing this species with its close associate, the White-rumped Sandpiper, it was found that Baird's Sandpiper was much less frequently recorded in spring, and less frequently and in smaller numbers in late summer and early fall; Baird's Sandpiper habitually remained on the drier, higher parts of the islands and shores of the lake or margins of the ponds and did not feed to any extent in water; the White-rumped Sandpiper habitually fed in water or probed about the wettest portions of the shores.

Erolia melanotos (Vieillot)

Pectoral Sandpiper

Common spring and fall transient.

Earliest date of arrival:	March 18, 1930	July 22, 1933
Median date of arrival:	March 26	August 7
Median date of departure:	May 7	October 29
Latest date of departure:	May 16, 1929	November 30, 1923

During the investigation the Pectoral Sandpiper was usually found to attain the height of its spring abundance in April, when there were the greatest number of overflow puddles, "sky ponds," and water-soaked, grassy meadows. Unlike many shore birds this sandpiper resorted in small numbers to the narrow, shore margins and marshes of the lake and islands if other feeding areas were absent. During spring 50 to 100 birds were often noted in a day, and occasionally as many as 400 were recorded. The birds remained in flocks of from 4 to 200 birds; the flocks averaged about 30 individuals each. When in motion in the air, the birds banked and turned with the utmost precision, and their movements were executed as though the flock was a unit rather than a group of individuals. Unity of flock motion in spring Pectoral Sandpipers was also noted in groups running over the ground or through shallow water.

The species appeared on its southward journey in late July or early August, and, until mid-October, 1 to 150 individuals could be daily recorded. The largest concentrations were present in September. Throughout the movement most of the birds were, of necessity, restricted to the shores, peat islands, and mud flats of the lake, and to overflow puddles or "sky ponds."

The abundance of fall birds was controlled by the amount of feeding territory available. The spirit of flock unity, very noticeable in spring, was almost absent in fall. The birds fed singly or in small groups, and when flushed flew more or less independently.

The Pectoral Sandpiper seemingly varied more in size than did most shore-bird species, especially in fall. In the hand, size and weight differences were quite apparent. Five birds in the Museum of Zoology, University of Michigan, taken in southern Michigan, range in weight from 52.5 grams (female, August 29, 1937) to 114.0 grams (male, July 28, 1935). In the field some Pectoral Sandpipers appeared to be only as large as Baird's Sandpiper, and others approached the Eastern Dowitcher in size. The size difference added to the difficulty in correctly identifying these shore birds.

Between 1860 and 1910, and especially before 1900, the species was shot in considerable numbers during both migrations. It was classed as a "grass snipe," and sold in the market for about a penny apiece.

Erolia alpina sakhalina (Vieillot)

Red-backed Sandpiper

Uncommon or common spring and fall transient.

Earliest date of arrival:	May 18, 1929	September 24, 1929
Median date of arrival:	May 20	September 28
Median date of departure:	May 27	November 4
Latest date of departure:	May 29, 1931	November 28, 1925

During the survey the Red-backed Sandpiper was a rather uncommon late May transient. There were generally few suitable feeding grounds, for the temporary field pools of early spring had disappeared, and the narrow margined shores of the lake and banks of streams were unsuitable. The species was common upon the few occasions when pools were present in the fields, and at such times flocks of as many as 41 individuals (May 23, 1928) were noted in a day. The species must have normally migrated across Ohio in rather large numbers in spring; it probably stopped to feed and rest whenever there was opportunity.

In the southward movement the Red-backed Sandpiper was generally the last of the shore birds to appear, and one of the last to depart. The first fall arrivals were noted between September 24 and October 3, the maximum numbers occurred in October, and the last transients departed during November. The species was a regular autumn transient, and 3 to 40 individuals could be usually seen each day; upon a few occasions as many as 60 birds were recorded. During its fall sojourn the species was chiefly confined to mud flats, peat islands, and shores of the lake.

Apparently this sandpiper has been a regular transient throughout historic time. Wheaton (1882: 478) wrote that "the Red-back was rare in

spring and rather common in the fall in the interior of the State" and that "the number of specimens which are sometimes brought from the vicinity of Shadeville [Franklin County] and the Licking Reservoir [Buckeye Lake] induce me to believe that it not infrequently occurs in considerable flocks." The species was considered a game bird before 1900, and sold readily in the market.

The late fall of 1925 provided opportunity to study a few reactions of this sandpiper and a few other bird species. The water level of the lake was so low that the usually submerged portion of the "Middle Bank," was exposed for an average of 10 feet in width for approximately half a mile. On this bank a duck blind had been sunk flush with the stony ground, and small rocks were piled about the edge further to conceal the hunter. To facilitate observations small holes had been left between the rocks. During October the bank was frequented by a group of Red-backed and Pectoral sandpipers, Sanderlings, Lesser Yellow-legs, and a few Snow Buntings. These birds fed together as they slowly walked upwind past the blind. As I peered out at them through the holes in the rocks, passing birds noticed my eye. Upon seeing the eye the Red-backed Sandpipers cautiously advanced to within 2 feet, tucked their heads tightly against their bodies in a most meditative fashion, and after twittering softly a few times remained silent and motionless. The Pectoral Sandpipers after a few moments of twittering and standing rather quietly, moved onward and gradually resumed feeding. The Sanderlings ran rapidly back and forth, twittering and showing the utmost curiosity. Occasionally a Sanderling stopped running, stretched its neck to the utmost, and jerked its head in much the same manner as does the Ruffed Grouse when its curiosity is aroused. One Sanderling always flipped its tail upward as does a Sora, and in a manner very unlike a shore bird. The Lesser Yellow-legs backed rapidly away until they stood belly deep in water, and while there constantly jerked their bodies in customary Yellow-leg fashion, shrilly crying "kew-kew-kew." The Snow Buntings crouched against the earth or between the stones and remained motionless for minutes at a time. Upon several occasions I attracted the attention of the birds by wriggling a stick back and forth between the rocks. Upon seeing the moving stick the shore birds became much excited, began twittering loudly and backing away, and shortly thereafter flew away. The Snow Buntings flew up the instant the stick was moved.

Micropalama himantopus (Bonaparte)

Stilt Sandpiper

Rather rare fall transient.

Earliest date of arrival:	.....	July 17, 1928
Median date of arrival:	.....	August 8
Median date of departure:	.....	September 16
Latest date of departure:	.....	October 4, 1924

It was not until the fall of 1924 that the Stilt Sandpiper was first recorded for the Buckeye Lake area. Thereafter 1 to 60 individuals were recorded during each southward migration. Most of the birds were seen in late August and early September. The species usually occurred singly or in small flocks of as many as 8 birds. Upon 2 occasions, September 9 and 10, 1933, flocks of 21 and 20 individuals respectively were noted.

The Stilt Sandpiper was usually found about the many peat islands that annually appeared in the vicinity of Cranberry Island. Whenever the late summer and early fall water level was extremely low, the bird was likewise found on the exposed mud flats which then bordered the entire lake. It was seen upon a few occasions in overflow puddles or temporary "sky ponds" present in the lowland fields to the north of the lake after heavy rains.

Most transients were in various stages of juvenal and winter plumages, and only a few adults in July retained much spring coloration. Retention of this coloration was especially marked in 2 individuals which Charles F. Walker and I observed feeding in a "sky pond" near the Lakeside Woods, on July 21, 1928, and in 1 which I collected near Cranberry Island on July 30, 1930.

Wheaton (1882: 471) failed to find the bird in central Ohio and recorded it only "on the authority of Mr. R. K. Winslow, who informed me that specimens had been taken on Lake Erie, where it was very rare." Field (1903) did not list the species for Licking County. Dawson (1903: 503) stated that for Ohio there were "several light [sight] records, enough perhaps to constitute a valid claim." Jones (1903: 68) gave two records, neither of which is for central Ohio. I assume, however, that the bird was a regular transient throughout the historic past and was not frequently recorded because ornithologists confused it with the more abundant Lesser Yellow-legs.

Tryngites subruficollis (Vieillot)

Buff-breasted Sandpiper

Very rare fall transient.

Earliest date of arrival:	.....	September 18, 1929
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	.....	September 29, 1928

On September 29, 1928, while rowing a boat among the recently exposed peat islands at the eastern end of Cranberry Island, I heard and immediately recognized the characteristic note of the Buff-breasted Sandpiper. After a long search I found the bird feeding quietly among the bur marigolds on one of the drier and larger peat islands. During most of my observations of it this sandpiper leisurely fed in the vegetation, usually

keeping well hidden and avoiding the water as much as possible. Occasionally it stopped feeding to lift its head high above the flowering bur marigolds and, while standing motionless, peered about for many seconds at a time.¹⁶ No bird which I saw during my observations has left me with so lasting and pleasing an impression as has the dainty Buff-colored Sandpiper.

The only other record of this species is of an individual which I heard and saw as it flew over the lake on the early morning of September 18, 1929, in company with a Bartram's Curlew.

Philomachus pugnax (Linnaeus)

Ruff

Accidental visitant.

The first of the 2 Ruffs recorded for Ohio was taken in the Buckeye Lake area. Its capture was first recorded by Wheaton (1877: 83):

Dr. Theodore Jasper, of this city, obtained, November 10, 1872, at the Licking Reservoir, thirty miles east of Columbus, a Wader which remained unidentified until recently. I was of the opinion that it would prove to be either *Philomachus pugnax*, or a non-descript. On communicating my views to Mr. H. W. Henshaw of Washington, he kindly offered to compare the specimen with others in the National Museum. He writes that the bird, which was a male (probably young), is positively identical with specimens of that species in the collection of the National Museums.

Wheaton (1882: 489) later published this record again, and it is also mentioned by Davie (1898: 148), Dawson (1903: 526), and Jones (1903: 217). The skin of this specimen is preserved in the Ohio State Museum.

Phalaropus fulicarius (Linnaeus)

Red Phalarope

Very rare transient.

The first individual was noted on November 2, 1929, by Charles F. Walker and me near Sellars Point. When first seen by us it was flying across the lake, and it soon alighted upon the water. As we approached the bird, it was shot by a hunter and left upon the water. We found it greatly mutilated by a heavy charge of duck shot; but despite mutilation the skin was satisfactorily preserved. The stomach contained remnants of beetles and duckweeds (Trautman and Walker, 1930: 249-50).

I collected a second bird as it swam about on the open waters of the lake near Liebs Island, on October 28, 1933.

Apparently, the Red Phalarope is not as rare a fall transient in central Ohio as was formerly supposed, since between 1927 and 1933, 3 specimens were collected. The records indicate that it is a fall rather than a late summer straggler (Trautman, 1935b: 321-22).

¹⁶ The habit of feeding in short vegetation away from water and of stopping to lift the head and peer about, much in the manner of Bartram's Curlew, has also been observed in other Buff-breasted Sandpipers elsewhere in Ohio.

**Steganopus tricolor* Vieillot

Wilson's Phalarope

Very rare transient.

Wilson's Phalarope is one of several species of birds which has undoubtedly occurred at rare intervals in the area during the past century and a half. It was not recorded, however, until after the close of the investigation. An individual was seen on May 10, 1934, by the late E. V. Prior of Newark, Ohio; it was noted on May 12 by Misses Anna and Minnie Brueggemann and Miss Elizabeth Bragunier of Columbus; and it was last seen on May 13 by 7 other persons. On these 3 days the bird was found swimming and wading about in the shallow waters near the wooden bridge which connects Liebs Island with the mainland.

Lobipes lobatus (Linnaeus)

Northern Phalarope

Very rare transient.

The Northern Phalarope has been recorded once. On September 10, 1933, I collected a specimen on a small peat island south of Cranberry Island. The bird had been associating with a small group of Stilts and Pectoral Sandpipers (Trautman, 1935b: 322). The species has probably been present at irregular intervals throughout historic time.

Stercorarius parasiticus (Linnaeus)

Parasitic Jaeger

Casual late summer and fall visitor.

There is 1 authentic record of the Parasitic Jaeger. On September 2, 1919, an immature male was taken at the east end of the lake in Perry County. The specimen, mounted by Thomas M. Earl and now in the possession of A. T. Wehrle of Newark, Ohio, is in intermediate coloration between the light and dark phases.

There is one possible sight record. On the afternoon of October 16, 1926, I observed for more than an hour a dark-colored, large, immature jaeger as it flew about the western end of the lake. The bird was extremely active, occupying itself chiefly by pursuing Common Terns and forcing them to disgorge gizzard shad. Robbing the terns of their food seemed unnecessary, for there were thousands of dead and dying yearling shad floating upon the water's surface, which could have been picked up by the jaeger with less effort. Apparently the jaeger enjoyed chasing birds, for once a flock of 8 Blue-winged Teals came in sight about a mile away. Upon seeing the ducks the jaeger started in pursuit, and in an incredibly

short time had overtaken them. As it dove for the ducks they scattered widely. After chasing several ducks for a few moments each the pursuer returned to harass the terns again. This jaeger seemed larger and heavier than any Parasitic Jaeger I had ever seen in life, and the possibility exists that it was a Pomarine Jaeger (*Stercorarius pomarinus*).

Stercorarius longicaudus Vieillot
Long-tailed Jaeger

Accidental visitor.

On September 5, 1928, Charles F. Walker and I collected an immature, male Long-tailed Jaeger as it sat upon the water near Cranberry Island. The bird was greatly emaciated and, with its stomach contents of 4 three-inch gizzard shad, weighed only 4.8 ounces. The specimen apparently constitutes the first definite record for the species within the boundaries of Ohio (Trautman and Walker, 1930a: 242).

The plumage of this jaeger is somewhat at variance with that of juvenal birds described by Bent (1921: 24) and with that of more than 20 Long-tailed Jaegers with which it has been compared. The upper parts are dark, varying from chaetura drab to chaetura black (Ridgway, 1912), and the feathers of back, rump, and wing coverts are edged with light cinnamon-drab. The throat and the breast are fuscous, with the feathers of the throat streaked with light gray. The belly is fuscous and mottled with lighter grays; the flanks and the under tail coverts are fuscous and boldly barred with light cinnamons and light grays. The tarsi, the inner half of the webbing, and the toes were blue in life, and the outer half of the webbing and the toes were black. This color description agrees rather well with the dark-phased juvenal plumage of August birds as described by Bent (1921: 24); however, the two central tail feathers of this specimen extend 18 mm. beyond the others instead of being "hardly noticeable" as in juvenal plumaged birds described by Bent. These long tail feathers suggest a bird of two years, but the coloration of the plumage seems much too dark. In small size, blue color of tarsi, and color of the shafts of the outer primaries, the specimen is definitely a Long-tailed Jaeger. The wing is 275 mm. long; the total length of the exposed culmen is 26.1 mm.; and the width of the bill, measured at the first upper feathering, is 9.2 mm. The first 2 shafts of the outer primaries are white, the remaining ones are notably darker. The size and ratios of ulna, radius, and humerus, considered diagnostic characters for the separation of Long-tailed and Parasitic jaegers by Willet and Howard (1934: 158-60), have not been used, as the bones were destroyed when the bird was skinned. My identification of this specimen has been verified by H. C. Oberholser and J. Van Tyne.

Larus delawarensis Ord
Ring-billed Gull

Common spring and fall transient, rare or uncommon winter visitant.

Earliest date of arrival:	(February 6, 1927)	September 2, 1930
Median date of arrival:	February 24	October 15
Median date of departure:	May 16	December 8
Latest date of departure:	May 21, 1930	(December 15, 1927)

The history of the Ring-billed Gull in Ohio is confusing. Wheaton (1882: 549) acknowledged the presence of the bird in central Ohio, but considered it less common than about Lake Erie, and he wrote: "C. J. Orton obtained specimens from a considerable flock, in April, 1874, at the Licking Reservoir [Buckeye Lake]." In the opening years of the twentieth century Jones (1903: 29) and Dawson (1903: 552) failed to find the species in the state. On March 25, 1906, Thomas M. Earl obtained a specimen at Buckeye Lake for mounting (now in the Ohio Wesleyan University collection), and he secured another on October 10. The species was numerous throughout the period of investigation. This evidence suggests that the bird markedly decreased in numbers between 1882 and 1900, and thereafter increased. It seems probable that the species was present throughout the 1882 to 1922 period but was overlooked by ornithologists.

During the investigation the first Ring-billed Gulls of fall were recorded between September 2 and October 20, usually between October 6 and 18. The bird was generally present in small numbers by October 25, and maximum numbers occurred in late October, November, and the first week of December. Usually 1 to 12 birds could be recorded daily, and during larger flights between 15 and 75 were noted each day. In comparison with the Herring Gull in fall the species was slightly less numerous, appeared a week earlier, and reached the height of its abundance earlier in the season.

The Ring-billed Gull was a less regular winter visitant than was the Herring Gull, and only occasionally could an individual or small group be seen. The largest number ever recorded in this season was a group of 11 which remained throughout the exceptionally warm 1931-32 winter.

The first arrivals of spring always appeared during the last 3 weeks of February. The species remained rather uncommon until about mid-March. The maximum spring numbers occurred between March 15 and April 12, when a decrease in numbers became apparent; from May 1 until May 21 only an occasional straggler was recorded. Usually 2 to 30 birds were seen in a day at the peak of the spring migration, and in the larger flights between 40 and 115 were observed. In spring also the species was usually less numerous than was the Herring Gull, and the height of abundance was about 2 weeks later. It is strange that no nonbreeding, summering birds were recorded, for these gulls summered on other large bodies of water in Ohio.

The species ate great quantities of dead and dying yearling shad, and transients were most numerous only during periods of greatest fish mortality. The stomach of a specimen collected May 10, 1930, contained 1 small shad and a yellow perch 5 inches long.

Larus argentatus smithsonianus Coues

Herring Gull

Common spring and fall transient, uncommon winter visitor.

Earliest date of arrival:	(February 8, 1930)	October 11, 1922
Median date of arrival:	February 23	October 22
Median date of departure:	May 12	December 11
Latest date of departure:	June 6, 1925	(December 29, 1928)

The first Herring Gulls of fall appeared shortly after the middle of October, and by early November from 3 to 15 individuals could be noted daily. At the peak of migration, from early November to mid-December, 2 to 115 birds were recorded daily. Fall abundance depended chiefly upon the food supply, for these gulls were most numerous only when the low water level of the lake or a sharp decline in water temperature had killed a large number of gizzard shad. The birds left as soon as the ice formed over the entire lake, though whenever the practice was made of throwing garbage upon the ice, a few remained throughout the winter. Upon rare occasions during warm winters the birds became numerous for short periods. During a week of springlike weather, January 10 to 17, 1930, a flock of approximately 100 was daily noted. On January 18, 1930, the temperature dropped by late afternoon to 1° F. The birds became very restless, and by midafternoon it was evident that they were preparing to leave. This they did at dusk (see pp. 100-103).

The species was usually numerous by late February. The peak of the spring migration was attained in March, when 15 to 75 individuals a day were not unusual; as many as an estimated 200 could be noted during the largest flights. A steady decrease in daily numbers occurred throughout April, and by early May only a few remained. The only June record is of a bird which appeared during a severe thunder storm on June 6, 1925. It is odd that during the investigation no nonbreeding, summering birds were recorded. Such birds were noted in many localities elsewhere in Ohio. According to old sportsmen, the "big sea gull" was a regular and numerous transient and uncommon winter visitant throughout the 1860 to 1920 period.

**Larus marinus* Linnaeus

Great Black-backed Gull

Very rare or casual visitor.

The one record of the Great Black-backed Gull is of an immature, seen by Harry Fabert and myself on November 19, 1933. During the hour we

observed the bird it remained a few hundred yards north of Journal Island in the vicinity of an open hole in the ice-covered lake. This extremely pugnacious immature chased every Herring or Ring-billed gull which attempted to alight within a hundred yards of its station upon the ice, and twice it succeeded in forcing Herring Gulls to surrender gizzard shad which they had previously found lying upon the ice.

The characteristics of the immature Black-backed Gull were noted: the great size, the dusky and dark mottled back, much darker than the back of a Herring or Ring-billed gull; the whitish head, neck, and underparts; and the huge bill and head (Trautman, 1935b: 322).

**Larus leucopterus* Vieillot
Iceland Gull

Accidental visitant.

While on Liebs Island, December 26, 1937, Roscoe Franks, Walter Tucker, Harry Fabert, and I saw what we believe was an Iceland Gull. This individual flew within 100 feet of us. It was intermediate in size between the Herring Gulls and a Ring-billed Gull which were present, and its bill was about the size of that of the Ring-billed Gull and was notably smaller than the Herring Gulls' bills. The basal two-thirds of the bill was light, the distal third dusky; the body feathers were grayish white, mottled with buffy and light brown; the head and neck were whiter than the body feathers, and definitely streaked with buffy; the tail and under tail coverts were boldly barred and mottled with brown and gray; there was no black terminal band on the tail, as there is in the immature Ring-billed Gull; and the wings were white, except for the buffy tipping of the primaries. The tipping was most noticeable on the innermost primaries. On January 1, 1938, Gene Rea and I again observed the bird, this time it associated with 12 Herring and 7 Ring-billed gulls. It was found that the Iceland Gull, although distinctly smaller than the Herring Gulls, had the broad wings of that species and was, therefore, strikingly different from the narrower-winged Ring-billed Gulls.

The Glaucous Gull (*Larus hyperboreus*) is apparently a more frequent visitor in Ohio than is the Iceland Gull; however, the bird we saw, because of its small body size and small bill could not have been a Glaucous Gull. The possibility exists that it was a Kumlien's Gull (*Larus kumlieni*), but this seems improbable, for it lacked the dark band across the distal half of the outer primaries which is usually pronounced in specimens with whitish primaries. It could hardly have been a partial albino Ring-billed Gull because of its broad wings and distinctive body shape (Wheaton Club, 1938: 48).

Larus pipixcan Wagler
Franklin's Gull

Casual visitant.

The only record of Franklin's Gull was made by Jones (1907: 20):

I found the specimen in the taxidermy shop of Mr. Thomas M. Earl of Columbus. . . . A hunter had brought it into his shop to be mounted but left it there. It was shot at the Licking Reservoir [Buckeye Lake] on October 15, 1906. The hunter stated that there was another bird of the same kind with it. [See also Campbell, 1939: 78-79.]

I examined this specimen, an adult in early winter plumage, at Oberlin College on September 24, 1938. The dark feathers of the head are chiefly confined to the crown, lores, occiput, and sides of head; the tail is white, except for the central pair of rectrices which are grayish; the wing pattern is that on a bird over a year old. The specimen is mounted upon a base of the distinctive type used by Earl.

Larus philadelphia (Ord)
Bonaparte's Gull

Common spring and fall transient, rare summer and very rare winter visitant.

Earliest date of arrival:	(March 25, 1931)	(September 3, 1927)
Median date of arrival:	April 1	September 15
Median date of departure:	May 9	November 28
Latest date of departure:	(May 27, 1928)	(December 15, 1927)

With few exceptions during the study the first Bonaparte Gulls of spring were noted about April 1. There were usually few of them until April 10, after which an increase was noted. By April 15 the numbers had materially increased, and from then until May 1, between 25 and 300 could be recorded daily. A decided decrease was usually noted shortly after May 1, and by the last of that month only a few stragglers were to be found. Throughout spring the species was more confiding than were the larger gulls. Some became so tame as to fly within a few feet of a boat, to retrieve from the water the dead minnows, bread, or bits of meat that the fishermen threw to them.

The species was uncommon or absent during June and July, and it was not until mid-August that it could be found regularly and in fair numbers. Occasional flocks of 15 to 50 were present throughout September, October, and the first half of November. The peak of migration occurred in November and early December. In fall the species was much less numerous than it was in spring; some days it was absent, and when present never more than 70 individuals were observed in a day. Three individuals remained about the western end of the lake throughout the exceptionally warm winter of 1931-32.

Rissa tridactyla tridactyla (Linnaeus)
Atlantic Kittiwake

Casual straggler.

From the shelter of a duck blind during a violent rainstorm on November 7, 1925, I noticed an unusual gull. To attract the bird I strewed pieces of a partly decomposed channel catfish near the blind. This successfully decoyed the gull and allowed me to observe and collect it. The stomach of this immature female contained, beside pieces of catfish, 3 three-inch gizzard shad. This appears to be the only record of the capture of this species in Ohio, although Jones (1903: 224) in a hypothetical list mentions 2 sight records for the northern part of the state (Trautman, 1926: 228).

It is interesting to note that for 5 days previous to the capture of this bird, strong northeasterly gales had been sweeping the North Atlantic off the coast of Newfoundland, and traveling southwestward across the country.

Xema sabini (J. Sabine)
Sabine's Gull

Casual visitor.

On the afternoon of October 9, 1926, while rowing a boat in the vicinity of Sellars Point, my attention was attracted to 2 birds sleeping upon the water. Rowing toward them I readily identified one as a Common Tern, but it was not until the other flew that I recognized the forked tail, exquisite color pattern, and form of Sabine's Gull. This record seems to furnish the most southerly locality for the occurrence of the species on the American continent east of the Mississippi River (Hine, 1927: 241). The stomach of this immature male contained 4 three-inch gizzard shad.

Chlidonias nigra surinamensis (Gmelin)
Black Tern

Common or very common late spring transient, uncommon summer visitant and fall transient.

Earliest date of arrival:	April 26, 1925	.....
Median date of arrival:	May 4	(August 1)
Median date of departure:	(June 7)	September 11
Latest date of departure:	.....	September 25, 1928

All except a few of the northward migrating Black Terns noted during the investigation were late spring transients, and although an occasional individual or flock was found in late April or early May, it was not until late May or early June that the species was numerous and the peak of the vernal migration was reached. On the average migration day between 10 and 50 birds were noted, and during the period of maximum abundance from 300 to 700 were recorded in a day. Small groups of apparently non-breeding individuals were present throughout late June and early July.

The first definite southward flights were usually noted in late July or early August, and in mid-August the peak of migration was reached. At this season usually less than 60 and never more than 120 individuals were recorded in a day. A sharp decrease in the average daily numbers occurred about September 7, and after September 10 only an occasional straggler or small group was seen.

The Black Tern was found in fair numbers over the open waters of the lake and about the larger overflow ponds in the fields to the north and west. The largest numbers, however, were found about the marshy and shallow margins of the lake, and particularly about the marshes at the eastern half. Many field observations indicated that insects rather than fish formed the bulk of its food, and only occasionally were individuals seen to capture or pursue fish. The fish sought was almost invariably the gregarious and surface-swimming gizzard shad of very small size.

**Hydroprogne tschegrava tschegrava* (Lepechin)

Caspian Tern

Rare or uncommon spring and fall transient and summer visitant.

Earliest date of arrival:	April 20, 1929	(August 7, 1932)
Median date of arrival:	May 15	August 20
Median date of departure:	(June 2)	September 10
Latest date of departure:	.....	October 18, 1923

The Caspian Tern was noted upon 7 to 26 days of each year, and between 12 and 205 individuals were annually recorded. The largest number observed in a day (May 28, 1924) was a flock of 16. Most of the spring records were grouped about the last week of May. The fall records centered about September 1, when there usually occurred a small, definite flight. The few sportsmen who knew this bird stated that they had seen it at irregular intervals between 1890 and 1921. It is assumed that the species was a rather regular transient and summer visitant throughout historic time. The only record published, of May 31, 1902, is given by Jones (1903: 31) and Field (1903: 132).

Sterna hirundo hirundo Linnaeus

Common Tern

Common spring and fall transient, uncommon summer visitant.

Earliest date of arrival:	April 18, 1931	.....
Median date of arrival:	May 4	(September 1)
Median date of departure:	(June 7)	October 18
Latest date of departure:	.....	November 8, 1924

The first Common Terns of spring generally arrived on or a few days before May 5. From then until the end of the first week in June they could be recorded daily. Most frequently the daily number was between 10 and

15, though during the largest flights of late May and early June as many as 600 individuals were seen in a day.

A few birds were frequently observed between June 8 and August 15. Shortly after mid-August a slight increase in numbers could be noted, and by September 1 the fall migration had begun. The peak of migration took place in late September, when the recording of 100 birds a day was not unusual and as many as 300 were noted in a day. It is strange that none were seen after November 8, for the species was often present in large numbers in the Sandusky Bay and Maumee Bay regions of Lake Erie until mid-December. Possibly these late transients do not stop in inland Ohio after leaving Lake Erie.

During migrations and in summer the Common Tern was most numerous about the larger, open waters of the western half of the lake, and only occasionally did a small group hunt about the marshes at the extreme eastern end. As indicated by stomach analysis and field observations, the gizzard shad was the staple food of this tern.

Sterna forsteri forsteri Nuttall
Forster's Tern

Very rare fall transient.

Earliest date of arrival:	.....	August 17, 1932
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	.....	November 2, 1927

I first noted this bird on the afternoon of October 20, 1923, when 2 immatures were found on some snags near the submerged Middle Bank. During a huge flight of waterfowl on November 2, 1927, I found 1 within a few yards of where the first 2 were seen (Trautman, 1928a: 200). On August 17, 1932, Lee S. Roach and I found 2 adults and 3 immatures sitting upon posts which marked the submerged portion of the Middle Bank, near Sellars Point (Trautman, 1933: 234-36). On each occasion the birds were first recognized by their characteristic note. The stomachs of specimens collected on November 2 and August 17 each contained a 3-inch gizzard shad.

Formerly, this species was considered to be very rare in Ohio. Recent investigations have shown it to be of rather regular occurrence in the western Lake Erie district (Campbell and Trautman, 1936: 213-14).

**Sterna albifrons antillarum* (Lesson)
Least Tern

Casual visitor.

On May 28, 1924, Charles F. Walker noted 5 Least Terns, at various times of the day, as they flew about over the water near Cranberry Island

in company with Common and Black terns. He had ample opportunity to note the distinctive characters of the Least Terns and to compare them with the other tern species present. This species has been collected in Ohio upon a few occasions. A recent collection was made in Lucas County, on September 16, 1934, by Louis W. Campbell (1935: 87).

Zenaidura macroura carolinensis (Linnaeus)

Eastern Mourning Dove

Common or very common spring and fall transient, common summer resident, uncommon winter visitant.

Earliest date of arrival:	.....	.....
Median date of arrival:	(February 25)	(September 1)
Median date of departure:	(April 10)	(November 20)
Latest date of departure:	.....	.....

Because of the large amounts of corn, small grains, weed seeds, berries, and other food present during most seasons, the Eastern Mourning Dove was apparently more abundant in this area than in any other section of like size in east central Ohio. The first large spring flights began in late February and continued through March, and the last transients left by the middle of April. On the average spring day from 15 to 100 birds were recorded, and at the time of the largest flights between 200 and 600 were observed. It was evident during these large flights that there were several thousand in the area each day.

The species was rather constant in numbers throughout the investigation. Censuses indicated that between 70 and 130 pairs nested annually. The yearly nesting number was somewhat difficult to obtain because of the long nesting period and the unknown number of nestings for each pair. The recorded period for eggs in the nest extended from February 28 (1931) to October 20 (1930). Of 41 nests with eggs, 34 were noted between April 25 and July 20. All nests contained 2 eggs at some time during the incubation period, though in several instances an egg was later found on the ground. Young recently out of the nest were seen during all months except December and February. The only January record is that of 2 nearly grown young accompanied by an adult; the birds were seen seeking shelter under a bridge during a sleet storm on January 25, 1930. On that day the temperature was about 20° F. A month previous the weather had been unseasonably warm, a factor which probably was chiefly responsible for this winter nesting.

Throughout early summer Eastern Mourning Doves were seen singly or in small groups. Flocking began in early August and continued until early spring. The fall migration period extended from mid-September to early November. Then, as well as in the late August and early September segregations, the species was very numerous, and several hundred or occasionally

several thousand individuals were present in a day. In September, flocks of these birds could be seen going to or from Cranberry Island, where there were great quantities of cranberries, poison sumac, and other berries. These conspicuous flocks were sometimes mistaken for those of Passenger Pigeons, and so reported in newspapers.

At least a few Eastern Mourning Doves were seen every winter, and in the warmer winters, flocks of as many as 182 birds were recorded. Sometimes during sleet storms the tails of the birds froze to perches, such as corn shocks, tree branches, or wires, and when they flew away they literally left their tails behind them. Flocks in which most or all of the birds were tailless or had partly grown tails were often noted following severe sleet storms. During a sleet storm on January 25, 1930, I saw a flock of 11 Eastern Mourning Doves upon the top rail of a board fence. They flushed at my approach, but their tails remained frozen to the rail. The birds had little difficulty in freeing themselves, for the tail feathers, and other feathers, are easily removed from this species. It was a curious sight to see the birds extricate themselves and fly away tailless, and still more curious to see the 11 tails frozen to the fence.

It is possible that the Eastern Mourning Dove was more numerous during this investigation than at any other period of the historic past. Environmental conditions were more favorable than in early historic time, when the area was largely wooded and when there was possible food competition with the Passenger Pigeon. Hundreds of the birds were shot annually, until they were protected from hunters in 1922.

Ectopistes migratorius (Linnaeus)

Passenger Pigeon

Formerly abundant, now extinct.

The history of the Passenger Pigeon in the Buckeye Lake area vividly demonstrates the vast upheaval in animal and plant ecology produced by the invasion of the white man. The numerical status of no other bird recorded for the area has been more drastically affected. Immensely abundant in the early nineteenth century the species became extinct in the early part of the next century.

Part of my information on this bird was obtained through conversations with former market hunters and sportsmen, and, principally, with William Harlow and Stephen Holtzberry. The remaining information was taken from the publications of Wheaton and Schaff. The writings of both men appear reliable. The paucity of literature concerning this species is remarkable. Seemingly, most writers felt that so numerous a bird was not worth writing about.

The Bloody Run or Pigeon Roost swamp, in the northwest corner of the area, was until 1865 a roost and nesting site for a huge number of Passenger Pigeons;¹⁷ however, it apparently did not contain as many birds as did the great roosts and nestings recorded by Wilson and Audubon in Kentucky or in northern Michigan.

Concerning the number of birds in the swamp and their flights, Schaff (1905: 103-5) wrote:

Once they darkened the sky. Millions [?] of them flew over Etna Township [Licking County] as they travelled to and from their feeding ground to their roost in the Bloody Run swamp. . . . The pigeons set toward the roost about an hour before sundown, often lighting in the intermediate timber for a while, and then passed on in a broad stream as far as the eye could reach. After arriving at the swamp they circled round and round till dark, when they settled down, covering every limb and twig.

Wheaton (1882: 441) stated:

Until about 1855, Pigeons were extremely abundant in Central Ohio, having at and before this time a roost and breeding place near Kirkersville, Licking County [Bloody Run swamp]. Then for weeks at a time, they might be observed flying over this city [Columbus, which lies 30 miles west of the swamp] and around its suburbs. In the morning soon after sunrise until 9 o'clock or after, their flight was westward, from the roost. In the afternoon, from four o'clock till sundown they were returning. During these periods, they were never out of sight, and often dozens of flocks were in view at once. These flocks were not of large size, but may be estimated to consist of from five hundred to fifty thousand birds, and it was their daily habit to leave their roost in search of food, in this manner. Whether those leaving in the morning invariably returned the same evening, or how far their journeys extended is not known.

Schaff (1905: 106) wrote concerning their flights to the feeding ground:

The pigeons left the swamp about daylight in vast columns several miles in length, and would fly to their various feeding grounds, distant from one to two hundred miles. Those going west, after clearing the swamp, moved up Bloody Run, and, obliquing to the left, followed the woods that reached in almost unbroken stretches along the south line of the township to the bank of Black Lick [Creek], south of Reynoldsburgh; or they would cross the [National] Pike about a mile east of Kirkersville and follow the creek which was lined with timber. They flew well up above the tops of the trees.

Undoubtedly, this was the flight which passed over Columbus, and of which Wheaton wrote.

The Bloody Run swamp during the nesting of the Passenger Pigeons, was said to have been largely a willow-poison sumac bog, with soft maple, swamp ash, and white elm in the central, drier, and higher portions. It was in these trees that the main body of birds nested and roosted. The last nesting, according to Schaff (1905: 107), was about 1845 or 1846. Wheaton (1882: 441) related that the birds nested in the swamp until "about 1855." Harlow and Holtzberry stated that the last nesting was between 1850 and 1860. Concerning the nests Schaff (1905: 107) said:

¹⁷ Whether this roost extended into the swamp area now occupied by Buckeye Lake is not known.

The nests were constructed of small twigs laid up loosely and very carelessly, apparently; and yet I used to see the remains of some of them, eleven or twelve years after they were made.

The food of the Passenger Pigeons consisted chiefly of beech and acorn masts and grain, though grasshoppers and other large insects were eaten when available. Their feeding was described by Wheaton (1882: 441):

They fed both in beech and oak woods and cornfields. When feeding upon acorns they were rather quietly dispersed among the branches of the trees, but beech nuts were generally collected from the ground.

Schaff (1905: 107) goes into greater detail concerning their method of feeding in beech woods:

They fed all through the beech woods, and it was most interesting to see them feeding. If they were approaching, there would be the appearance of a blue wave four or five feet high rolling toward you, produced by the pigeons in the rear flying to the front. When startled while feeding, their sudden rise would sound like rumbling thunder.

According to Harlow, Holtzberry, and others, netting the birds was the most profitable means of securing them. This method appears to have been extensively used between 1820 and 1865. It was said not to have been unusual to capture 36 birds in a cast of the net, and several hundred were sometimes caught at a single cast. Schaff (1905: 105), in describing a trip to the swamp he and others took after dark for the purpose of getting pigeons, related another method of capturing birds:

We entered from the north side, about opposite the big island.¹⁸ The party was equipped with single-barrel shot-guns and old percussion muskets, with the barrels cut to shot-gun lengths. We all went in together, but not more than a few rods, when the men began to shoot. The birds would rise in throngs, with thundering noise, but would soon come back, for there were hunters, apparently, all along the margins of the swamp, and the firing was like that of a closely engaged skirmish line. When the pigeons returned they would light all over and around us, and no aim was necessary, or possible, for that matter. We carried away two large three-bushel bags full by nine o'clock, and doubtless did not get one half of what we killed. The owls and minks that infested the swamp lived on what we left. By ten o'clock the firing ceased, and the poor creatures could then find peace for the rest of the night.

Another method of capturing these birds is also described by Schaff (1905: 106):

Captain James Stone . . . told me that when he was a boy [sometime between 1815 and 1835] they killed all they wanted by waving back and forth a long, slender pole, heeled in the ground near the edge of the swamp, as the birds came in to the roost. At that time they flew directly into the swamp, and did not circle over it, as in my day, up out of range of shotguns.

A drastic decrease in the number of Passenger Pigeons became apparent about 1860, and by 1875 virtually all of them had disappeared. Henry

¹⁸ The hummock of elm-ash-maple previously described.

Minthorn wrote to Joseph Simpson (1912: 75) that "the sudden disappearance of the pigeon occurred in the spring of 1868 or 1869." Harlow attempted to net Passenger Pigeons in the swamp as late as 1873, but because the birds were so wild that they would not go into the nets he was forced to shoot them. After 1873 netting was no longer profitable. Harlow killed his last one in the swamp in September, 1879.

The Passenger Pigeon was formerly an immensely abundant species, and one well suited to forest conditions. It was most gregarious, nesting and roosting in colonies and flying or feeding in large groups. These gregarious habits made the bird very vulnerable throughout the entire year, but particularly during the nesting season. Obviously the nests of a conspicuous, colonizing species could be destroyed in greater numbers than could those of a solitary species whose nests were inconspicuous and widely scattered. It was likewise easier and took less time to kill or capture birds that occurred in conspicuous and enormous flocks, than it was to obtain the same number of a less gregarious species. The Mourning Dove, unlike the Passenger Pigeon, was not immensely abundant in early historic time, was not principally a forest bird, did not nest in colonies, did not flock during the nesting period, and did not occur in enormous groups. The result has been the extinction of the forest-inhabiting, very gregarious and formerly abundant Passenger Pigeon, and the maintenance in fair numbers throughout historic time of the woodland-, brush-, and field-inhabiting Mourning Dove.

Coccyzus americanus americanus (Linnaeus)

Yellow-billed Cuckoo

Common spring and fall transient and summer resident.

Earliest date of arrival:	May 6, 1922	.....
Median date of arrival:	May 12	(August 10)
Median date of departure:	(June 5)	October 3
Latest date of departure:	.....	October 13, 1929

The Yellow-billed Cuckoo was one of the last of the summer residents to arrive in spring. Usually it was not recorded until May 8 to 16, and once the first arrival was not noted until May 18. After its first appearance its numbers slowly increased until the end of May or the first few days of June, at which time the spring height of abundance was reached. The maximum spring numbers were seemingly little higher than were the nesting numbers. During those few years when a spring concentration was noted, between 10 and 18 individuals were recorded in a day.

The principal nesting territory of the 30 to 45 pairs that annually nested was in the brushy borders of woodlands, in thickets, and along the brushy shores of the lake and the banks of the streams and the canal. Occasionally, a pair was found nesting in a brushy fence row near an

orchard. Eight nests were examined: 2 contained 3 eggs each; 3, 4 eggs or young each; 1, 5 eggs and 1 Cowbird egg; and 2, 6 young each. The earliest nest with eggs (4) was found on June 27 (1930), and the first fledglings out of the nest were seen on July 13. The species apparently nested very late.

On September 4, 1926, Robert B. Gordon recorded young birds in the nest, and on September 20, 1929, a farmer found a nest with 3 eggs. On September 25, 1929, I visited this nest and found 3 small young. These remained in the nest until October 3.

In early August the species began to leave the uplands, farms, and woodlands to congregate along the brushy banks of streams and the shores of the lake. Then the species seemed more conspicuous and numerous than at any other period of the year, and as many as 12 individuals were sometimes found along a small section of stream or shore. The southward movement occurred chiefly in late August and the first 3 weeks of September. It seems probable that this brush- and thicket-inhabiting species nested more numerous in the area during late historic time than it did formerly, when the land was principally forested.

The stomach of a bird collected on June 16, 1928, was half filled with the blackish hairs of caterpillars.

Coccyzus erythrophthalmus (Wilson)

Black-billed Cuckoo

Common spring and uncommon fall transient, rare summer resident.

Earliest date of arrival:	May 10, 1930	(August 24, 1928)
Median date of arrival:	May 16	September 3
Median date of departure:	May 30	September 28
Latest date of departure:	(June 15, 1928)	October 9, 1927

Like the Yellow-billed Cuckoo, this species was one of the last birds to arrive in the spring. The peak of migration was usually between May 18 and 26, when as many as 9 individuals were recorded in a day.

Only once was evidence obtained of a successful nesting. On June 15, 1929, I found a singing male in the brushy woods beside Honey Creek marsh; I also saw and heard the bird singing upon several days during July. Its nest was not located, but on August 8 an adult was seen in this woods feeding 2 young, only recently out of the nest. A pair was noted in this same woods on August 6, 1932. The birds were carrying food, but their nest and young were not located. It is rather odd that no other nestings of this species were noted in the area, for during the investigation it was found nesting not uncommonly in several localities only a few miles distant.

The species was uncommon or rare during the southward migration in September, and seldom more than 2 were seen in a day.

Tyto alba pratincola (Bonaparte)

Barn Owl

Common resident.

The Barn Owl was probably rare or absent during early and mid-historic times, for the forested conditions were obviously not suited to this inhabitant of less-forested country. Wheaton (1882: 406) considered the species to be very rare in central Ohio. After 1882, with the clearing of the country and general forest removal, the species increased greatly in numbers, so that since 1910, according to old sportsmen, the "monkey-faced owl" has been well known.

The Barn Owl was rather inconspicuous except just at dusk, when it could be seen flying over the fields and lake. The species was distributed over the entire area, though apparently it was slightly more numerous in lowlands, where there was an abundance of small rodents. Seven nesting sites and several roosts were examined. These were used year after year. Of the nests 4 were in cavities of large and more or less isolated trees, 2 were in trees that were in small woodlots of the "grove" type, and 1 was in the attic of a deserted school house, a half mile north of Sellars Point.

The eggs and young found in the school house in 1928 and 1929 were closely observed. The "nest" found in the school house on May 8, 1928, contained 6 eggs, 1 of which was chipped. The eggs were on the plaster and lath between the rafters in the attic. No attempt at building a nest had been made. On May 26, 4 eggs had hatched and the other 2 had disappeared; the 4 young ranged from the size of a Sora to that of a King Rail. On June 10 the wing feathers of the largest young were almost full grown, and by July 7 this bird had lost all trace of down and was able to fly well. On July 7 the smallest bird still had considerable down clinging to its feathers, especially on the back and head. On this day Edward S. Thomas and I took pictures of the young owls and banded them. The birds became very disturbed during the procedure; they spread their wings, and hung their heads until they almost touched the floor; then while slowly moving their heads from side to side, the birds hissed in a most solemn fashion. We have noticed this behavior in other young Barn Owls and also in young Black and Turkey vultures.

Reports were received from 2 of the banded Barn Owls. One was killed several hundred miles southwest of the area by A. Walker, at Springfield, Kentucky, on April 6, 1930. The other was found dead more than 120 miles northeast of the area by D. Deltour, at Barberton, Ohio, on November 9, 1931. The apparent scattering of young birds may be a reason why in no instance were more than 2 Barn Owls seen about a roost or nesting site after the young had begun to fly, and why the number of nesting pairs remained

constant. In fact, the Barn Owl appeared to be one of the most strictly sedentary birds of the area. What appeared to be pairs of adults were found continuously in the vicinity of their nesting sites or roosts month after month.

Between January, 1930, and June, 1932, Arthur Stupka conducted a most enlightening investigation of the contents of thousands of Barn Owl pellets. The pellets were collected from roosting and nesting sites in various localities in Ohio, and included pellets from the attic of the schoolhouse where the owls nested in 1928 and 1929. The pellets from the schoolhouse contained 5137 skulls, of which 5082 were mammal skulls and 55 were bird skulls. Stupka's identifications of mammal skulls were verified by James S. Hine. The bird skulls were identified by members of the Food Habits Research Division of the United States Biological Survey.

MAMMAL SKULLS (5082)	NUMBER
<i>Microtus pennsylvanicus pennsylvanicus</i> (eastern meadow mouse)	4128
<i>Peromyscus leucopus noveboracensis</i> (white-footed mouse)	389
<i>Pitymys pinetorum scalopsoides</i> (pine vole)	35
<i>Mus musculus</i> (house mouse)	33
<i>Zapus hudsonius hudsonius</i> (meadow jumping mouse)	8
<i>Synaptomys cooperi cooperi</i> (Cooper lemming-vole)	6
Unidentified mouse skulls	46
<i>Rattus norvegicus</i> (brown rat)	58
<i>Blarina brevicauda talpoides</i> (short-tailed shrew)	289
<i>Cryptotis parva</i> (least shrew)	29
<i>Myotis lucifugus lucifugus</i> (little brown bat)	53
<i>Eptesicus fuscus fuscus</i> (large brown bat)	3
<i>Mustela vison allegheniensis</i> (least weasel)	2
<i>Scalopus aquaticus machrinus</i> (prairie mole)	2
<i>Sylvilagus floridanus mearnsii</i> (cottontail)	1
BIRD SKULLS (55)	
<i>Agelaius phoeniceus phoeniceus</i> (Eastern Red-wing)	14
<i>Sturnella magna magna</i> (Eastern Meadowlark)	10
<i>Melospiza melodia euphonia</i> (Allegheny Song Sparrow)	9
<i>Passer domesticus domesticus</i> (English Sparrow)	8
<i>Colinus virginianus virginianus</i> (Eastern Bob-white)	4
<i>Rallus</i> sp. (Rail)	2
<i>Molothrus ater ater</i> (Eastern Cowbird)	2
<i>Colaptes auratus luteus</i> (Northern Flicker)	1
<i>Dolichonyx oryzivorus</i> (Bobolink)	1
<i>Junco hyemalis hyemalis</i> (Slate-colored Junco)	1
<i>Zonotrichia leucophrys</i> or <i>Z. albicollis</i> (White-crowned or White-throated Sparrow)	1
Other unidentified passerine birds	2

Otus asio naevius (Gmelin)

Eastern Screech Owl

Common resident.

Statements by hunters and farmers who were well acquainted with the Screech Owl indicate that before 1900 this species was decidedly uncommon

in the area and that with the removal of most of the forests and the decrease in numbers, or extirpation, of Barred and Horned owls, the Screech Owl became increasingly numerous. These statements agree with my studies. There were several instances of the disappearance of Barred Owls from a recently cutover woodlot, and the marked increase within 1 or 2 years of the number of Screech Owls. Sutton (1928: 137) stated that the Screech Owl is rare in those areas of the Pymatuning Swamp region of Pennsylvania where Barred Owls are present. Sutton also stated that the larger owl preys upon the smaller one.

Throughout spring, summer, and fall the Screech Owls were found in pairs about most of the small groves, orchards, and edges of the larger wood patches which contained no Barred Owls. Pairs were also found about rows of cottages along the lake shore and in the villages. In winter there apparently was a tendency for birds to concentrate in the smaller, more open wood patches. At that season, especially at daybreak or dusk, I could evoke an answer to my imitation of the Screech Owl whistle from as many as 8 birds in an area of 5 to 15 acres. The same number of owls in the same woodlot could be "whistled up" repeatedly throughout most of the winter; apparently the birds shift little during that season.

At least 20 pairs were known to nest annually between 1925 and 1933; however, the actual number nesting was probably greater than that. Most of the nests were in small hollows of trees, often apple trees, posts, stumps, or telephone poles and were most frequently 3 to 20 feet above the ground. Two nests were in small holes under the eaves of cottages. Three nests with young were examined. On May 19, 1928, 3 small young were found in a nest 3 feet above the ground in a hollow stump by the canal at Millersport; on June 5, 1929, 4 half-grown young were seen in a nest 11 feet above the ground in a hollow willow tree on the bank near Sellars Point; and on June 25, 1929, 3 young were noted in a horizontal stovepipe about 12 feet above the ground in the wall of the Lakeside Hotel. Young recently out of the nest were seen from May 15 to July 6. While the young were in the nest the parents were most pugnacious and often attacked persons who came near their nest. The adults which nested in the stovepipe were particularly pugnacious and repeatedly knocked hats from the heads of those who came within 15 feet of their nesting site.

One of the parents of the 3 young found May 19, 1928, was a gray-phased bird; the other was red-phased. The gray-phased birds decidedly outnumbered the red-phased ones.

The stomach of a fledgling taken May 19, 1928, contained remains of several large June bugs (*Scarabacidae*). The skull of a meadow mouse was in the stomach of an adult collected August 20, 1929.

Bubo virginianus virginianus (Gmelin)
Great Horned Owl

Formerly a common resident, rare or absent between 1921 and 1934.

Older farmers and hunters agreed that the Great Horned Owl was a common resident from 1860 to 1900 and uncommon thereafter. Reports from elsewhere in central Ohio also indicate that the bird was numerous before 1900. In 1882 Wheaton (1882: 407) stated that it was a "common resident" throughout the state. It can be assumed that this inhabitant of heavily forested regions was numerous throughout early and mid-historic time.

At the beginning of the investigation the remnant forests had been so reduced in size that the number of Great Horned Owls had dwindled to 1 pair, which was always to be found in the "Big Woods" north of the lake. On May 12, 1928, John S. Thomas and I found this pair, accompanied by 2 young. The larger of the young was approximately two-thirds the size of the smaller adult and was sparingly covered with down. The smaller young was half the size of the smaller adult and was almost entirely covered with down. One or more members of this family were noted in the "Big Woods" until the fall of 1928, when all disappeared. Whether they left because of recent extensive cutting of timber or were killed in a "vermin drive" is not known. No Great Horned Owls were seen after 1928 in the area, though an occasional wintering bird was reported from larger woodlands a few miles distant.

Nyctea nyctea (Linnaeus)
Snowy Owl

Occasional rare winter visitant.

I have secured little accurate data concerning this species in the area before 1921. William Harlow informed me that in a winter "about 30 years ago" (probably the invasion of 1901-2) he saw more than 50 individuals. Carleton Sharer, a resident at the lake, showed me a mounted Snowy Owl which was taken about the end of November, 1916, at the east end of Bloody Run swamp, south of Luray. Several of these birds were reported in or immediately outside of the area during the Snowy Owl invasion into Ohio in the winter of 1926-27. In that invasion a bird was seen upon several days of late December in a field near Millersport by F. L. Thompson and others.

Strix varia varia Barton
Northern Barred Owl

Common resident.

Former market hunters and farmers who lived in the area between 1860 and 1920 indicated that until 1880 or a few years thereafter the Northern Barred Owl was an extremely rare resident and was much less numerous than was the Horned Owl. After 1890 an increase became apparent, and by 1910 the Barred Owl was more numerous than was the Horned Owl. In 1922 and until 1925 there were 1 to 3 pairs of Northern Barred Owls in each large woodland, and during that period I yearly recorded a total of 16 pairs. The number of pairs decreased after 1925, and in 1933 I found only 6 pairs. This decrease was probably the result of the shrinking of woodland acreage and increased persecution by man.

The Northern Barred Owl was rather secretive. Occasionally, an individual or pair could be heard calling during cloudy afternoons and nights in fall or very early spring, and sometimes the birds were flushed from some leafy tree or cavity in a tree, or observed as they were mobbed by crows. It was only during late May and June, immediately after the young had left the nest, when adults and young sat together in some woodland tree, that the species was conspicuous. The adults were very bold and vociferous while defending their young. Nesting counts were made principally during late spring, and at that time as many as 5 pairs of adults with 2 to 4 young each have been recorded in a day.

One nest with eggs was recorded. On March 17, 1927, James S. Hine and Roscoe W. Franks collected a set of 4 eggs from a nesting cavity 30 feet above the ground in a slippery elm tree in Jack's Neck Woods.

The stomach of a large fledgling, collected June 3, 1928, contained the decapitated remains of an adult red squirrel. Upon 2 occasions I saw an adult Northern Barred Owl capture a red squirrel and pull off and swallow its head. As red squirrels are somewhat crepuscular and chatter at daybreak and twilight, these birds probably capture many of them. Often at twilight when I was whistling to attract Screech Owls a Barred Owl flew at my head or alighted in a near-by tree. Once when a Screech Owl answered my call a Barred Owl captured it, flew to an adjacent tree, pulled off and ate the head, and carried the body away in its talons.

The change in the numerical status of the Horned, Barred, Barn, and Screech owls between 1860 and 1933 well illustrates the effects of the white man's invasion. In 1880, when large tracts of forest and swamp still remained, the Horned Owl was well known, while the Northern Barred, Barn, and Screech owls were virtually unknown. As forest and swamp acreages were reduced in amount the Horned Owl decreased in numbers and the Barred Owl began to thrive. With still further reduction in forests and swamps and the extension of fields, thickets, open woodlots, and orchards the Horned Owl was extirpated, the Barred Owl became less numerous and was threatened with extirpation (some reduction was doubt-

less caused by persecution), and the Screech Owl and the Barn Owl became dominant.

Asio wilsonianus (Lesson)
Long-eared Owl

Very rare winter visitor.

The only published statement concerning this species in the area was made by Field (1903: 137): "Probably breeds near the east end of the Licking Reservoir [Buckeye Lake] where it is most often found." Since 1903 conditions have so changed about the eastern end of the lake that this section is unfavorable for the nesting of the species.

During the investigation 1 record was obtained. On January 28, 1932, L. L. Ludwig caught a female in a pole trap in Little Buckeye game refuge. I preserved its skin, which is now in Ohio State Museum. The stomach of the bird contained the skulls and partial remains of a Cooper lemming-vole and a meadow mouse.

Asio flammeus flammeus (Pontoppidan)
Short-eared Owl

Usually a rare spring and fall transient and winter resident, very rare summer resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(March 10)	(November 1)
Median date of departure:	(April 10)	(November 30)
Latest date of departure:	.....	.....

Reports concerning the abundance of the Short-eared Owl prior to 1922 indicate that the species fluctuated greatly in yearly numbers. Occasionally no birds were seen throughout a year, but in the colder periods of other years as many as 50 were observed daily. Sportsmen have told me that, when hunting rabbits, quails, or ducks in November and March of some years before 1910, they encountered as many as 75 Short-eared Owls in a day. Dawson (1903: 377) gave some indication of their numbers: "Mr. I. A. Field of Grandville tells me that he has seen as many as fifty in the air at once over the cattail swamps of the Licking Reservoir [Buckeye Lake]."

Short-eared Owls were noted upon 1 to 19 occasions during 10 years of the 12-year investigation. No birds were reported in 1927 and 1933. The greatest number recorded for a day was 9 (on March 22, 1924). The records indicate that the spring migration occurred chiefly in March and the southward movement in November.

In 1903 Field (1903: 137) suggested that the bird "probably breeds about the Licking Reservoir." There appears to be only 1 nesting record. On May 26, 1928, I found a pair in the swampy meadow immediately west of the Lakeside Woods. Attempts to find the nest were unsuccessful. From

the actions of the pair it was obvious that they had a nest in the meadow, for while I was searching for it both birds continuously flew around me and incessantly uttered their soft, deep-throated cries. On June 30 I found 2 fledglings accompanied by a parent. The smaller young still retained considerable down.

The stomach of a male, collected June 2, 1928, was empty; the stomach of a female, taken January 1, 1930, contained the skulls and partial remains of 5 meadow mice.

The Short-eared Owl customarily roosted throughout the day in high grass, sedge swales, and lowland meadows. During the fall hunting season many of these birds were shot by rabbit and pheasant hunters, who thought that the owls were "chicken hawks."

**Cryptoglaux acadica acadica* (Gmelin)

Saw-whet Owl

Very rare.

The 1 record of the Saw-whet Owl was made by Dawson. He (1903: 381) found a "family group" of 4 birds on the banks of Licking Reservoir (Buckeye Lake), on June 19 (1902 or 1903). During the investigation none were seen, and I conclude that the bird was very rare or absent.

Antrostomus vociferus vociferus (Wilson)

Eastern Whippoorwill

Uncommon spring transient, very rare summer resident and fall transient.

Earliest date of arrival:	April 20, 1923	(September 4, 1923)
Median date of arrival:	April 27	.....
Median date of departure:	May 20	.....
Latest date of departure:	(May 25, 1929)	September 24, 1930

Many of the older residents said that when they were young (i.e., as early as 1850) this species was a common spring and summer woodland bird and that its voice on moonlight spring and early summer nights was one of the most familiar notes of their childhood. They had enjoyed this loud-voiced bird and had missed it in recent years. A farmer and his wife, who lived at the east of the lake, recalled that they had heard an occasional individual during the spring and summer seasons between 1915 and 1921. From these accounts it was obvious that this nesting species was numerous when the forests and larger woodlands still remained, but that with the removal of the forests the bird had gradually disappeared.

Between 1922 and 1934 the spring migrating Eastern Whippoorwill were often seen during the last few days of April and the first half of May. They were always rare in spring and never more than 3 were noted in a day. The bird was usually absent during the summer and very rare in the southward migration. There was 1 nesting record. A bird was heard singing on

several moonlight nights in May and June, 1929, in the Hill Woods, north-east of the lake. On June 15 I flushed an adult and 2 three-fourths grown young in this woodland.

This once numerous nesting species, which obviously was appreciated and not wilfully persecuted by man, has become almost extirpated from the area, because of the almost total destruction of its nesting habitat.

Chordeiles minor minor (Forster)

Eastern Nighthawk

Common spring and very common fall transient, rare summer resident.

Earliest date of arrival:	April 30, 1929	.....
Median date of arrival:	May 4	(July 15)
Median date of departure:	(June 2)	October 1
Latest date of departure:	.....	October 6, 1928

The peak of the spring migration of the Eastern Nighthawk occurred in the latter half of May, when between 5 and 15 birds were usually noted daily. During the larger flights as many as 25 a day were seen. The spring migration was virtually over by early June and only the 5 to 10 nesting pairs remained. These were found about the villages of Buckeye Lake, Millersport, Kirkersville, Thornport, and Thornville, where they presumably nested upon the flat, gravel-covered roofs of buildings.

A small, definite increase in daily numbers became evident in late June or early July, and by the first of August as many as 30 birds have been recorded in a day. The increase in numbers continued steadily during August until the last week, at which time the fall migration was at its peak. Then and throughout the first week of September it was not unusual to note from 100 to 300 birds a day, and occasionally, many hundreds and possibly several thousands daily passed through the area. A sharp decline in numbers occurred about September 11, and after September 15 only an occasional straggler was seen.

Approximately 45 Eastern Nighthawks were observed sitting lengthwise upon branches of trees. With few exceptions these trees were black walnut or honey locust. Both of these trees have mottled gray bark and are similar in coloration to the bird's plumage. When an Eastern Nighthawk sat upon the limb of such a tree, though not hidden by foliage, it could be recognized only after the most careful scrutiny.

Chaetura pelagica (Linnaeus)

Chimney Swift

Common or very common spring and fall transient, rather common summer resident.

Earliest date of arrival:	April 7, 1928	.....
Median date of arrival:	April 14	(July 25)
Median date of departure:	(May 25)	October 8
Latest date of departure:	.....	October 12, 1929

During each spring the Chimney Swift had become conspicuous and fairly numerous by April 23. At that time 10 to 50 individuals could be noted in a day. Until the middle of May the species was at the peak of its spring migration, and the daily numbers were rather constant but not large, since seldom more than 100 individuals were recorded in a day. By June 1 only the summering number, between 20 and 50 pairs, remained.

Throughout the nesting season pairs or groups of three Chimney Swifts could be seen flying in and out of chimneys. On June 3, 1928, I found a nest and 3 eggs in the chimney of a deserted farmhouse at the northeast end of the lake. On June 10 this nest contained 5 eggs, and on June 23 the young had hatched. Another nest, found in the same chimney on June 15, 1929, contained 3 eggs.

The birds usually began to flock by July 15, and their numbers gradually increased until by September 1 the peak of the fall migration was reached. In September daily flights of 150 to 300 birds were not infrequently recorded. A sharp decrease in numbers usually occurred about October 1, and by October 5 only a few stragglers remained. The greatest number recorded on any day was an estimated 500 birds, on October 3, 1929.

Interesting behavior of this species was witnessed on the showery afternoon of September 29, 1928. On the north shore opposite Cranberry Island was an old, dead, hollow oak tree, which had the top broken off. A group of approximately 250 Chimney Swifts were flying and feeding in the vicinity. Whenever it began to rain, the birds flocked in the form of a huge inverted and revolving cone with the apex immediately above the hollow top of the tree. Presently the individuals at the apex of the cone dropped into the hollow, after which the remaining birds quickly tumbled in after them. When the shower was over they came out again, singly and in small groups, to fly about and feed until the next rain, when they again sought shelter in the same manner.

Archilochus colubris (Linnaeus)

Ruby-throated Hummingbird

Fairly common spring and common fall transient, uncommon summer resident.

Earliest date of arrival:	April 24, 1925	.....
Median date of arrival:	May 5	(August 10)
Median date of departure:	(May 25)	September 22
Latest date of departure:	.....	October 1, 1925

During the investigation 1 to 5 Ruby-throated Hummingbirds were recorded daily after May 10 and until May 25. In spring the birds were scattered rather evenly over the area, and they could be expected wherever there were many flowering plants.

The species was rather inconspicuous and uncommon during the nesting season. Seldom more than 2 pairs were noted in a day, and it is doubtful

whether more than 20 pairs nested in any year. On June 16, 1928, I found a nest with 2 eggs on a branch of a small slippery elm which was beside the South Branch of Licking River, north of the village of Buckeye Lake. This nest was about 10 feet above the stream. On June 15 of the next year, I found another nest containing 2 eggs on the same branch of this elm and 10 inches from the preceding year's nest, the remnants of which were still visible. On May 29, 1931, I discovered a female working on a half-finished nest 15 feet above the ground on a horizontal branch of a beech tree. This bird greatly objected to my presence, and each time it flew from or to the nest it first flew directly at my head. When only a few inches away it altered its course and circled around my head a few times in an angry fashion before resuming work. The nest was composed largely of soft plant down faced with lichens and bound together with spider web. On June 11 this nest contained 2 eggs; the young had left the nest by July 1.

Four old nests were noted in winter: 1 was 5 feet above the ground in a climbing rosebush beside a cottage; 1 was 6 feet above the ground in an elm sapling, and hung over the South Branch of Licking River; the remaining 2 were on branches of smooth alder, which overhung the waters of the lake.

The fall movement, which began in early August, was at its peak from August 20 to about September 7, and by September 15 only a few stragglers remained. The species was more numerous than it was in spring, and the recording of 15 birds a day was not unusual. At this season the birds were found most frequently about dense vegetation in the vicinity of the lake and in the lowlands to the north.

An unusual migration was noted on the early morning of September 1, 1931. While rowing a boat from Sellars Point to Cranberry Island, a distance of about 3 miles, I noted 32 Ruby-throated Hummingbirds at various intervals along the route. All were flying southward across the lake. The large numbers of individuals that evidently were migrating that morning can only be realized when one remembers that so small a bird can be seen only a short distance and that this flight extended over a 3-mile front for a period of more than 2 hours.

Megasceryle alcyon alcyon (Linnaeus)

Eastern Belted Kingfisher

Common spring and fall transient, uncommon summer resident, rare winter resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(March 23)	.....
Median date of departure:	(May 10)	(November 16)
Latest date of departure:	.....	.....

The first migrating Eastern Belted Kingfishers of spring were always noted in the last half of March. If, upon their arrival, the lake was ice-

covered or the waters turbid, the birds were chiefly found along the clearer waters of the canal and the creeks. Throughout April and May between 2 and 7 birds could be noted daily. The species was uncommon about the lake in June and was occasionally absent except for 1 or 2 nesting pairs at the eastern end. Most of the 8 to 15 pairs were to be found nesting in the higher banks of the canal, along the South Fork of Licking River, and along Honey and other creeks entering the lake from the south.

Because of the inaccessibility of the nests, data upon them are scanty. On July 4, 1926, Lawrence E. Hicks found a nest with 6 eggs in a clay bank east of Maple swamp. On June 16, 1928, I noted a pair of birds along the South Fork of Licking River. They were going in and out of a hole 1 foot from the top of a 25-foot clay bank. On July 14 I noted 4 fledglings sitting on a branch near the mouth of this nesting hole. I observed a pair flying in and out of a hole in a small clay bank at the extreme eastern end of the lake on June 25 and 26, 1932, and a week later I saw their 6 young perched in near-by trees.

An increase in daily numbers about the lake became evident in early July and continued until late August. The greatest daily numbers for the year, 10 to 20 birds a day, were recorded from late August to late September. There was a gradual decrease in abundance during October, and by November 10 only an occasional straggler remained. In late summer and fall the species fed principally upon the large schools of young, surface-swimming gizzard shad.

During warmer winters, such as that of 1931-32, 1 to 3 birds remained. These individuals frequented the lake until it became largely ice-covered, when they retreated to the open waters of the creeks.

Colaptes auratus luteus Bangs

Northern Flicker

Common resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(March 20)	(September 28)
Median date of departure:	(May 2)	(November 10)
Latest date of departure:	.....	.....

The number of Northern Flickers annually wintering varied considerably. Throughout some winters more than 100 were daily present; during others seldom more than 5 birds were noted. In warmer periods of a winter the birds sometimes became very numerous; with the advent of colder weather all except a few disappeared. During the coldest weather the birds flocked in the larger woodlands near supplies of beech nuts, berries, corn, and other grains. In the winter of 1927-28, a large group wintered in Jack's Neck Woods, flying from there to Cranberry Island, where they fed on poison sumac and poison ivy berries. On January 14, 1928, I counted

104 Northern Flickers flying in a straggling group from this woods to Cranberry Island, and it is probable that the number of birds wintering in the woods was much larger. Field (1903: 138) stated: "Sometimes a few, favored by plenty of food, remain over winter."

The spring migration began in late March and was at its peak during April; the last flocks of obvious transients disappeared in early May. The fall migration was first noted in late September, was most pronounced in October, and ended in early or mid-November. During migrations from 10 to 90 individuals were daily recorded. Several hundred birds were probably present upon some days.

During summer the nesting birds were well scattered over the land area, though they tended to concentrate about the more open woodlots where there were many dead or partly dead trees. At this season these rather noisy birds were not so readily seen as in the leafless winter, and the species sometimes seemed less numerous in summer than it was. The nesting population, between 40 and 90 pairs, remained rather constant. Eighteen nests were found: 3 contained 5 eggs or young each; 3, 6 eggs each; 3, 4 eggs or young each; 5, 5 eggs or young each; 3, 6 eggs or young each; and 1, 7 young. Dates for eggs in the nest ranged from May 11 to June 9; young in the nest were found from May 25 to July 4; and young recently out of the nest were seen from June 2 to July 20. The nests were located in cavities of dead and living trees, fence posts, telephone poles, and similar objects and were between 2 and 60 feet above the ground. Until 1900 the Northern Flicker was considered a game bird and was often used in the making of potpies.

**Ceophloeus pileatus* (Linnaeus)

Pileated Woodpecker

Casual visitor.

Wheaton (1882: 394) wrote that "about 40 years since," the Pileated Woodpecker was a common bird in all parts of Ohio. Schaff (1905: 96-97), in recording the more conspicuous and better-known birds of Bloody Run swamp, stated:

Another bird long since disappeared that, like the Wild Turkey, loved the freedom of the wilderness; this was the log-cock or pileated woodpecker, a most interesting, beautiful, and naturally very wild bird. His family was not large, rarely more than two were ever seen together, and when the woods began to go he, like a true frontiersman, left also. But while he was there he was never idle for a moment, and his chattering could be heard at intervals from daylight till dark. One of his amusements was to mount up to the top of some lofty elm, or ash, or sycamore, that had a hollow, dead limb, and then break the silence by hammering on it with his powerful bill. The last one I saw was dangling from the hand of Isaac Winter, who had shot him in the woods, north of where Hunter's Run crosses the Pike. [This brook is some 4 miles west of the western edge of the area here reported upon.]

Older residents said that the species was numerous and well known during the middle third of the nineteenth century. Curiously, it was then considered a game bird, and the young were eaten. This woodpecker apparently became extirpated from the area as a breeding species between 1880 and 1900.

The species was recorded once in recent years. On July 3, 1932, while in a boat at the eastern end of the lake, I heard its distinctive call notes. A few moments later, the bird flew from a wooded ravine and crossed the lake to the woods at the mouth of Honey Creek. There it remained for several minutes, which gave me opportunity to observe it carefully. This individual may have come from the more wooded sections to the south, east, or northeast, where the species is still present and where it may be slowly increasing in numbers.

Van Tyne and I have compared 3 recently collected specimens in the Ohio State Museum. These were taken less than 25 miles east of Buckeye Lake; they are fairly typical *C. p. pileatus*.

Centurus carolinus (Linnaeus)

Red-bellied Woodpecker

Fairly common resident.

The daily numbers of Red-bellied Woodpeckers fluctuated little during any year of the investigation; however, as in many other localities in Ohio, this fine woodpecker definitely lessened in numbers. The decrease was seemingly caused by a continued shrinkage of the forest acreage. Since the bird is principally a forest inhabitant it probably was a numerous resident during early and mid-historic times. According to the few old residents who knew this species it was numerous between 1880 and 1921.

An occasional recognizable pair was noted in the same woodland for a year or more, and the species seemed one of the most sedentary to be found in the area. Occasionally, a pair temporarily deserted, during extreme wintry weather, such exposed localities as the rows of trees along the north shore of the lake or a small woodlot and retreated into denser woodland. There was no evidence of semiannual migrations and little difference in total numbers of winter and summer birds. In the average day's field trip 2 to 15 birds were recorded. Nesting censuses indicated that during the early years of the investigation between 50 and 70 pairs annually nested, and in the later years from 40 to 55 pairs.

There was 1 record of a nest with eggs. This nest, found in the Lakeside Woods on April 30, 1929, was about 35 feet above the ground in a dead branch of a living silver maple tree and contained 4 eggs. The nesting cavity had evidently been excavated that year. Revisiting this nest on May 4, I found the eggs hatching. On the same day and in the same woods I

found 3 newly hatched young in a nest which was also in the cavity of a dead limb of a living silver maple tree, but was only about 18 feet above the ground. A nest found extremely early, April 15, 1924, contained 4 small young. The nest was in a dead swamp white oak in the Hill Woods, and the cavity containing the nest was in a small branch that was fully 45 feet above the ground. Fledglings, obviously cut of the nest only a few days or less, were observed from May 15 to August 14.

Melanerpes erythrocephalus erythrocephalus (Linnaeus)

Red-headed Woodpecker

Common spring and fall transient and summer resident; absent, rare, or uncommon in winter.

Earliest date of arrival:	.....	.....
Median date of arrival:	(April 28)	(September 1)
Median date of departure:	(May 22)	(October 15)
Latest date of departure:	.....	.....

During each year it was late April or early May before the first transient Red-headed Woodpeckers of spring arrived. The maximum spring numbers occurred between May 8 and 22, and in some years these numbers seemed no larger than those of the summer nesting population. The south-bound transients were first observed about September 1, and the fall movement was principally in September. Nearly all of the birds that did not attempt to winter had left by October 10.

Between 5 and 20 birds were noted during the average summer field trip, and the total summer population was estimated to be between 30 and 50 pairs. No variation in nesting abundance was noted during the investigation. Throughout the summer the bird was principally an inhabitant of small open groves, scattered trees, and edges of woodlands, particularly those woodlands where the trees were mostly oak, elm, maple, and hickory. Because of the open situations it inhabited and its striking colors the bird was rather conspicuous. It was apparently very fond of flycatching over streams and roads, and over the latter many individuals were annually killed by automobiles.

More than 20 occupied nesting cavities were noted. Only 3 contained eggs, and these were 3 to 9 feet above the ground in telephone poles. The first nest, noted May 26, 1928, contained 4 eggs; the next on May 21, 1930, contained 5 eggs; and the last on June 12, 1932, contained 5 eggs. Six nests containing 4 or 5 young each were noted between June 10 and July 5. Of these nests 2 were in holes in telephone poles, 3 in dead trees, and 1 in a cavity of a living tree; all were less than 15 feet above the ground. Young recently out of the nest were seen from mid-June to mid-August.

A nest with 4 small young was found on June 30, 1928, in a cavity of a dead tree, in Little Buckeye refuge. This nest was approximately 20 feet

above the ground. Two feet above the opening and 1 foot below, and on the same side of the tree, were the openings of 2 Starling nests, which also contained young. The close proximity of these 3 nests caused considerable confusion, much noise, and many fights between the Starlings and the Red-headed Woodpeckers; but all 3 pairs raised their broods. In this instance the Red-headed Woodpecker competed successfully with the Starling.

The species was a most irregular winter resident. There were no birds in 1926-27 and 1927-28 and an estimated total of 90 individuals in 1930-31. The number that wintered depended chiefly upon the abundance and availability of corn and mast. In 1925-26 the principal food of the wintering birds was beech mast; in 1928-29, pin oak mast (*Quercus palustris*); in 1929-30, chiefly corn. About 50 individuals remained in the Lakeside Woods throughout the winter of 1929-30, getting most of their food from a neighboring cornfield to the east. These birds spent a large part of every day noisily and busily engaged in carrying corn, a grain at a time, to trees in the woods, where it was tucked into the bark and crevices of tree trunks and limbs. Each Red-headed Woodpecker appeared to have 1 to 4 rough-barked trees for its storehouse. Whenever another alighted in a storehouse tree, it was invariably driven away, though not without much chattering and darting about by both birds. On 2 occasions a red squirrel was seen busily engaged in removing corn grains while a most irate and vociferous bird helplessly fluttered about and watched the robbing of its granary. During the winter season most of the birds remained in the larger woodlands, and only left them for short periods to search for food.

As the Red-headed Woodpecker is a bird of open groves it is probable that the species has increased in nesting abundance during the past 100 years.

Sphyrapicus varius varius (Linnaeus)

Yellow-bellied Sapsucker

Fairly common spring and rare fall transient, very rare winter visitant.

Earliest date of arrival:	(March 24, 1928)	September 13, 1925
Median date of arrival:	March 27	.....
Median date of departure:	May 10	.....
Latest date of departure:	May 18, 1928	(November 26, 1925)

The first Yellow-bellied Sapsuckers of spring made their appearance during late March, when as many as 4 were recorded during a day. Throughout April from 3 to 15 birds could be recorded daily. A decrease in daily numbers then occurred, and after May 8 only an occasional straggler remained.

The bird was rare or absent during the fall migration. Never more than 3 (September 24, 1930) were noted in a day nor more than 8 in the season, and in 5 fall migrations the species was not recorded. The south-

bound transients were most frequently found in the denser, larger woodlands. An occasional bird was found about some orchard or row of trees. There was 1 winter record. On January 26, 1932, I found a male in a woodlot near Hebron. It is probable that the Yellow-bellied Sapsucker was more numerous during migrations before 1900 than it has been since.

Dryobates villosus villosus (Linnaeus)

Eastern Hairy Woodpecker

Uncommon resident.

There was a remarkable consistency in the number of Eastern Hairy Woodpeckers noted each year, and there appeared to be little difference in the total number during any part of any season. The birds remained in the area throughout the year, and seemingly there was no large winter replacement. There was, however, a tendency for those pairs inhabiting small woodlots in the warmer seasons to move into larger, denser woodlands during extremely cold weather. Usually 1 to 8 birds were seen on every field trip, and the total population was estimated at between 45 and 80 pairs. Most individuals were found in the largest wooded areas, and the remainder were in the smaller woodlands. The bird was absent as a regular resident and nesting species in the smallest and most grovelike of woodlots. Nothing definite was learned concerning its numerical status before 1922; but, since the species is essentially a forest inhabitant, it probably was present in fair numbers in early and mid-historic times and has probably been decreasing in abundance because of forest removal.

The beginning of the nesting season was made evident during late February and early March by an increased amount of calling and of hammering upon resonant trees. Excavation of nesting sites began in mid-March and reached its height in early April. To locate the nests was rather difficult, for unlike most birds which nest in tree cavities, this species could not be flushed from its nest by pounding on the base of the tree with a hammer or log. To flush the incubating bird it was necessary to climb the tree suspected of containing a nest and reach into the nesting cavity with the hand or a stick. As the species generally nested more than 25 feet above the ground in a dead, partially rotten tree, hunting for Hairy Woodpeckers' nests was a laborious task. Two nests were examined. The first nest, with 5 eggs, was found April 21, 1932, in Jack's Neck Woods in a living silver maple tree and was 35 feet above the ground. The other nest, found on May 7, 1920, contained 4 half-grown young. It was about 60 feet above the ground in a dead sugar maple tree in a woods at the eastern end of the lake. From May 7 to June 11 adults were seen carrying food into nesting cavities, and the cheeping of the young was heard. Young fledglings out of the nest were seen from May 22 to July 10. With one exception there

were 3 to 5 fledglings in the family groups. An unusually large family group of 7 was seen on June 3, 1928.

Dryobates pubescens medianus (Swainson)

Northern Downy Woodpecker

Common in spring, fall, and winter, fairly common in summer.

Unlike the Eastern Hairy Woodpecker, the Northern Downy Woodpecker did not remain constant in numbers throughout each season. During the average field trip in summer 8 or fewer birds were recorded. In other seasons usually more than 8 and occasionally as many as 45 were noted. The species was much more readily observed in the leafless winter than it was in summer, and some difference in seasonal numbers may be attributed to this factor.

The Northern Downy Woodpecker inhabited not only remnant forests but also small woodlands, woodlots, orchards, and solitary rows of trees. Its feeding range was seemingly much less limited than was that of the Hairy Woodpecker, for it did not confine itself to the trunks and larger limbs of large trees, but also hunted food among the smaller branches and twigs and in saplings and in the brush of thickets. In winter it likewise fed to a considerable extent in cornfields, pecking out insects in cornstalks and the larger weed stalks. This greater range of nesting and feeding habitat was a principal reason why it was more abundant than was the Hairy Woodpecker. The total number of both species recorded by me during the 12 years, was 2021 Downy Woodpeckers and 747 Hairy Woodpeckers—2.7 to 1. The ratio changed with the seasons, for in summer it was about 2 Downy Woodpeckers to 1 Hairy Woodpecker and between mid-October and mid-April it was almost 4 to 1.

In several years a distinct flight of Northern Downy Woodpeckers was observed in the latter part of March and the first half of April and in late October and early November. During a severe cold period in winter a decided increase in numbers was noted, indicating an influx from outside the area, and in a few periods the number present was seemingly doubled.

The first indications of the approaching nesting season were seen in late February, when the pairs began following each other about and persistently bowing to each other and calling. The first excavating of nests began in mid-March, was at its height in mid-April, and ended in late May. One nesting was followed from the time of excavating until the young left. Excavation of the nest was first noted on May 6, 1931, when a female was seen digging in a dead branch of a white elm tree. The cavity was about 12 feet from the ground. On May 8 the nest was completed and on May 20 contained the complement of 5 eggs. On May 29, 4 young were found,

which seemed to be between 2 and 3 days old. On June 13 the young were out of the nest and clinging to branches of near-by trees.

Twelve other nests were found, all containing young: two contained 3 young each; 4, 4 young each; and 6, 5 young each. The earliest date for young in the nest was May 22; the latest, June 26. The first fledglings out of the nest were seen on June 2; the last, about July 28. All nests were in cavities of fence posts, in limbs of dead trees, or in snags and were from 2 to 15 feet about the ground. The species nested lower in trees than did the Eastern Hairy Woodpecker, and somewhat later in the year.

Since the Northern Downy Woodpecker is chiefly an inhabitant of scattered, small trees and small woodlands it may have become more numerous in recent years.

Tyrannus tyrannus (Linnaeus)

Eastern Kingbird

Fairly common spring transient and summer resident, common fall transient.

Earliest date of arrival:	April 25, 1925	.....
Median date of arrival:	May 1	(August 2)
Median date of departure:	(May 30)	September 15
Latest date of departure:	.....	September 24, 1930

In 3 years of the investigation the first Eastern Kingbirds of spring were noted between April 25 and 30, and in the remaining 9 years between May 1 and 6. Between May 8 and 14 a few could be daily recorded. By May 15 the bird had become as numerous as it was during the nesting season in June and early July, and then from 4 to 10 birds could usually be daily noted. The period of maximum spring abundance occurred during late May, when as many as 22 birds were recorded in a day.

June censuses indicated that between 15 and 35 pairs annually nested. The majority nested in fields and meadows near the lake—the species had a marked preference for the vicinity of water. Nest building began in late May and was at its height in early June. The earliest completed nest, with 1 egg, was found on June 2 (1928) and contained its complement of 3 eggs on June 5. The latest nest with eggs (3) was found on July 17 (1932). Six nests with eggs were noted. Of these, 4 contained 3 eggs each, and 2 contained 4 eggs each. Between June 20 and July 12, 4 nests, each containing 3 fledglings, were seen. Fledglings out of the nest and accompanied by parents were noted between July 10 and August 15. Nine nests were built upon the horizontal branches of small trees, and 1 was on the top of a fence post. All nests were 2 to 12 feet above the ground. Edward S. Thomas found a nest with 4 eggs, on June 5, 1916; this is the only record before 1922.

The southward migration began in the first week of August. The height of the movement normally took place between August 15 and 25. A

sharp decrease in daily numbers occurred about September 1, and by September 12 only an occasional straggler was noted. During this southward movement the Eastern Kingbird was much more numerous than at any other period. As many as 80 individuals were seen in a day, and as many as 60 (August 22, 1929) were recorded about Cranberry Island alone. The southbound birds congregated about the immediate vicinity of the lake and did much of their feeding over the water. As the birds flew, in a surprisingly swallow-like fashion, flycatching over the water, they did considerable singing, if their aerial twittering can be called such, particularly during the cooler parts of mornings and evenings. Occasionally, as many as 6 birds flew over the lake, twittering or singing. These flights seldom lasted more than 2 minutes.

On the evening of June 25, 1932, I watched an individual sallying from its perch to catch large insects over the water. After several flights it attempted to pick food from the water's surface. When the bird was within a few inches of the water, a big largemouthed bass rose to the surface and snapped at it. The bird was knocked into the water, but it quickly righted itself and flew away, screaming loudly.

Myiarchus crinitus boreus Bangs
Northern Crested Flycatcher

Fairly common spring and fall transient and summer resident.

Earliest date of arrival:	April 26, 1925	.....
Median date of arrival:	April 30	(August 20)
Median date of departure:	(May 20)	September 22
Latest date of departure:	.....	September 29, 1928

The spring migration of the Northern Crested Flycatcher took place almost entirely within the month of May, and on the average day between 3 and 8 birds were recorded. During periods of maximum spring abundance, usually between May 8 and 18, from 8 to 19 individuals could be daily recorded. The southward migration began shortly after mid-August, and its height occurred between August 25 and September 12. The last birds were noted between September 18 and 29. The species was very secretive during this migration and seldom more than 8 individuals were noted in a day. As a transient and nesting species the Crested Flycatcher was pre-eminently a woodland inhabitant. The few birds not found in woodlands were seen in large orchards or along rows of large trees.

The records indicate that there were 20 to 45 pairs annually nesting in the larger woodlands, and that because of forest shrinkage the species was less numerous during the closing years of the investigation. Two nests were observed. On June 10, 1928, I found a nest and 5 eggs in an apple tree, at the edge of Honey Creek marsh. The nest was about 12 feet above the ground and in a large cavity, which it almost filled. The nest was made

of a quantity of coarse grass, some twigs, and a snake skin. On May 19, 1928, along the canal south of Millersport, I observed a bird carrying coarse grasses to a nesting cavity in a dead limb of an old oak tree. This nest was at least 55 feet above the ground. On June 21, I found 3 fledglings in the immediate vicinity of this nest.

The species unquestionably was a regular transient and nesting species throughout the historic past. It seems probable that more pairs annually nested in early and mid-historic times when the area was largely forested.

Sayornis phoebe (Latham)

Eastern Phoebe

Very common spring and fall transient and common summer resident.

Earliest date of arrival:	(February 23, 1930)	.....
Median date of arrival:	March 17	(September 2)
Median date of departure:	(May 2)	October 15
Latest date of departure:	.....	(October 27, 1928)

The Eastern Phoebe was the first flycatcher to arrive in spring. A few individuals were always present by March 20, and by the last of that month as many as 30 could be seen daily. The peak of migration took place during the first half of April, and then as many as 60 birds were recorded in a day. Thereafter, the numbers decreased and by May 5 only the summer residents remained.

From the many pairs and more than 125 nests observed, it appears that between 90 and 210 pairs nested annually. Almost all of the many culverts and bridges contained 1 or more nests. A few pairs nested on the joists beneath cottages and underneath the roofs of porches and buildings. Every nest was attached to or upon a man-made structure. Recently completed nests were noted from March 28 to May 30, the majority before April 18. Complements of 3 or 4 eggs were recorded from April 8 (1928, 4 eggs) until June 20. Most of the nests of the early part of the season contained 4 eggs, and later nests usually contained 3 eggs. The earliest date for fledglings out of the nest was May 7 (1929), and the last fledglings were noted in early July.

The species began to desert the vicinity of the nesting sites and to concentrate about woodlands during late July, and by late August few remained about the bridges and culverts. The fall migration took place chiefly during September and the first week of October. All except stragglers had left by October 10. Throughout fall the species was at least as numerous as it was in spring; however, because of their comparatively quiet manners fewer individuals were daily recorded during this movement. On December 26, 1938, an Eastern Phoebe was found at the southeastern end of the lake (Wheaton Club, 1939: 31).

It is probable that before 1800 few of this species were present during the breeding season. The bird was present in mid-historic time, for Schaff (1905:99) mentioned that when he was a boy, between 1840 and 1858, the "little pewee . . . used to build under the bridges of the National Road [the road which forms the northern boundary of the area]."

Empidonax flaviventris (W. M. Baird and S. F. Baird)
Yellow-bellied Flycatcher

Rare or uncommon spring and fall transient.

Earliest date of arrival:	May 6, 1924	August 11, 1931
Median date of arrival:	May 14	August 28
Median date of departure:	May 25	September 25
Latest date of departure:	May 28, 1924	October 6, 1929

The Yellow-bellied Flycatcher regularly occurred in small numbers in spring. At the peak of spring migration, between May 16 and 24, seldom more than 3 individuals were seen in a day and never more than 10 (May 19, 1928). The birds principally inhabited the densest lowland woods, where they were found perching upon small saplings beside woodland pools, and periodically sallying out to catch the swarming mosquitoes, midges, and gnats. They were rare in the higher and drier beech woods to the south and east.

The southward migration was poorly defined, and seldom more than 2 birds were noted in a day. Apparently the majority migrated through the area in the first 3 weeks of September, and, as in spring, most of the birds were found in the denser portions of lowland woods and about the, by then, dry woodland pools. It is possible that the Yellow-bellied Flycatcher was more numerous in the southward movement than the few records indicate, since some birds were probably overlooked, because of similarity in size and coloration to the more numerous Acadian, Alder, and Least flycatchers.

Empidonax virescens (Vieillot)
Acadian Flycatcher

Fairly common spring and fall transient and uncommon summer resident.

Earliest date of arrival:	May 5, 1923	.....
Median date of arrival:	May 10	(August 28)
Median date of departure:	(May 30)	September 26
Latest date of departure:	.....	October 7, 1928

This late transient was never noted before May 5, and in 2 years it was not recorded until mid-May. A few days after its first appearance the species usually reached its greatest spring numbers, and then as many as 20 individuals could be recorded in a day. A decrease became apparent about May 26, and by May 28 all except an occasional transient had left.

The Acadian Flycatcher nested only in woodlands containing large trees, and in such woodlands appeared to be principally restricted to the beech-

sugar maple association, which occurred chiefly in upland woods south and east of the lake. The bird was most numerous there and was present in swamp forests only where beech and sugar maple were well represented. Never more than 25 nesting pairs were present during any year. The 1 nest with eggs, found June 16, 1928, was about 12 feet above the ground on a horizontal fork of a low limb of a beech tree. It contained 3 eggs. The only nest with young was found on June 19, 1932. This nest, which contained 3 half-grown young, was about 15 feet above the ground on a limb of a sugar maple sapling in a wooded ravine at the east end of the lake. Fledglings recently out of the nest were noted from June 25 (1930) to August 11 (1931).

The southward migration occurred principally in September, and was at its peak during the first 10 days of that month. Only a few individuals could be noted after September 18. Since this is a woodland-nesting species it probably was much more numerous before 1900 than it has been since.

Empidonax trailli trailli (Audubon)
Alder Flycatcher

Very common summer resident.

Earliest date of arrival:	May 5, 1928	.....
Median date of arrival:	May 9	(August 10)
Median date of departure:	(June 1)	September 11
Latest date of departure:	.....	October 7, 1928

The rather inconspicuous Alder Flycatcher was one of the most characteristic nesting species of the area. It became very numerous shortly after its arrival in the first half of May, and so remained until late August. The little information on spring and fall transients indicated that the vernal migration took place principally in the last two-thirds of May, and the autumnal movement in the last two-thirds of August.

The species nested almost everywhere about the lake, swamps, lowlands, and creeks where swampy and brushy conditions prevailed. For nesting sites it seemingly preferred brush, 3 to 18 feet high, composed of such trees as small willows, alders, buttonbush, and dogwood. It also nested rather numerously in brush that consisted largely of elm, silver maple, and honey locust saplings. An occasional pair nested in the more extensive cattail marshes, placing the nest in a solitary buttonbush, alder, or red osier dogwood. Few nested in the drier, brushy fields, such as was the favored habitat of the Field Sparrow, and no nests were found in the interior of large, upland woodlands. The nests were cup-shaped and very similar to those of the Yellow Warbler, except that they lacked the soft, cotton-like inner lining. Nests were found 8 inches above the ground and 16 feet above it; the usual distance was between 2 and 12 feet. In winter these conspicuous, well-made nests gave added testimony to the bird's abundance.

The earliest nest with the complement of eggs (4) was recorded on June 3 (1930); the latest (4 eggs), on July 12 (1928). The majority of nests with eggs were found about mid-June. Of 16 nests with eggs or young, 3 contained 3 eggs or young each; 5, 3 eggs or young of this species and 1 or 2 eggs or young of the Cowbird; 3, 4 eggs or young each; 2, 4 eggs or young each and 1 egg or young of the Cowbird; 1, 2 young each; 2, 2 young each of this species and 1 Cowbird young. Fledglings recently out of the nest were noted from June 14 to August 12.

Because of the abundance of the bird it was impossible to obtain an accurate estimate of the hundreds of annual nesting pairs. Some conception of abundance was obtained from a nesting census which totaled 218 singing males. The census was taken on June 12, 1928, along 1 mile of lake shore about Little Buckeye game refuge. The slowly drawled "sweet-cheeuu" note of this species was one of the most familiar bird songs of the lowlands, and was only less common than the ubiquitous and noisy clatter of the Redwings. The amount of singing began to decrease materially in late July, and by early August the males had become rather silent and inconspicuous. The number that could be recorded daily had diminished greatly by mid-August, and by early September only a few remained.

There was considerable evidence that this species decreased slightly in nesting numbers between 1922 and 1934. This change was seemingly caused by continued draining of swamps and by brush removal about lake shores and elsewhere. In several instances the draining of a swamp destroyed the nesting habitat of as many as 40 pairs. If draining and brush removal continue the species will undoubtedly further decrease in nesting abundance. Little evidence was obtained of the number of pairs nesting between 1900 and 1922, but since more brushy and swampy area was then present it is assumed that the species was probably more numerous than it was during the investigation. In early historic time before extensive forest removal the species was probably less numerous.

The Alder and Acadian flycatchers exemplify well the manner in which closely related species can inhabit the same general locality, and because of different nesting habitats, avoid competition with each other. The Acadian Flycatcher was confined during the nesting season to the larger and drier woodlands and the Alder Flycatcher to swampy and brushy areas. An example of the differences in their nesting environment is found in their behavior along the canal south of Millersport. At this locality the canal cuts through a large morainal deposit, and the tops of the banks are 30 to 50 feet above the water's surface. Each year a few Alder Flycatchers nested along the canal bank in small trees or bushes near the water's edge and fed over its surface and up the sides of the banks for a distance of no more than 25 feet. The Acadian Flycatcher nested and fed in and about

the tall trees on the upper third of the bank. Though pairs of the 2 species nested as close as 100 feet from each other, there was virtually no territorial competition between them.

Empidonax minimus (W. M. Baird and S. F. Baird)
Least Flycatcher

Common spring and fall transient.

Earliest date of arrival:	April 30, 1926	August 24, 1928
Median date of arrival:	May 1	September 1
Median date of departure:	May 24	September 25
Latest date of departure:	May 27, 1928	October 7, 1928

The peak of spring migration of the Least Flycatcher took place during the second and third weeks of May, when as many as 50 individuals were recorded in a day. The spring birds tenanted brushy fence rows, thickets, and dense, mature forests, but displayed a slight preference for moderately tall, second-growth timber containing considerable brushy ground cover.

The peak of the southward migration generally occurred between September 10 and 20 and was apparently only a few days in duration. As many as 25 birds were then identified in a day, but the number seen was probably much larger. Individuals of the 4 species of the flycatcher genus *Empidonax* were extremely difficult to separate in the field in autumn, because of plumage and size similarity, and it was only under excellent light conditions or when a bird uttered its characteristic note that it could be satisfactorily identified.

Myiochanes virens (Linnaeus)
Eastern Wood Pewee

Common spring and fall transient and summer resident.

Earliest date of arrival:	April 23, 1929	.....
Median date of arrival:	May 8	(August 25)
Median date of departure:	(June 1)	September 28
Latest date of departure:	.....	October 7, 1928

The Eastern Wood Pewee was recorded once in April, and in the remaining 11 years was first noted between May 1 and 16. In most years a few could be seen by May 10, and by May 18 the species was usually common. The peak of migration was between May 20 and 28, and then as many as 20 birds were observed in a day. A sharp decrease in numbers occurred in very late May, and by June 3 only summer residents were noted.

The species nested principally in the larger remnant forests, less frequently in smaller woodlands which still contained large trees, and occasionally in rows of large trees, such as lined the North Bank. Nesting pairs were never noted in small, second-growth timber, the taller trees of which averaged less than 30 feet in height. In a survey of nesting territory in

June, 1928, 34 singing males were recorded. There were probably never more than 50 pairs nesting during any year of the investigation. A nest was found on June 16, 1926, by Robert B. Gordon; another was found on June 21, 1927, by Charles F. Walker. Both nests were between 30 and 50 feet above the ground and could not be reached. Young recently out of the nest have been recorded from June 20 to August 5.

During spring and early summer the plaintive song of the Wood Pewee was almost unnoticed amid the general bird chorus. In late July after most of the bird species had ceased to sing, its persistent voice became conspicuous. By August its note had become one of the dominant bird songs, and was especially noticeable during quiet, late evenings and early mornings. The southward migration occurred chiefly in the first half of September, and then as many as 20 nonsinging birds could be noted in a day. Few were seen after September 20.

The Eastern Wood Pewee is pre-eminently a forest inhabitant, and it is probable that this flycatcher was more abundant as a nesting species when the area was largely forested than it has been in late historic time when only remnant forests and small woodlands remain.

Nuttallornis borealis cooperi (Nuttall)
Eastern Olive-sided Flycatcher

Very rare spring and fall transient.

Earliest date of arrival:	May 15, 1930	September 3, 1931
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	June 9, 1928	September 24, 1930

At least 1 Eastern Olive-sided Flycatcher was noted each spring; the greatest total number for any spring (1928) was 6. All except a few north-bound transients were seen between May 20 and June 1. The species was very rare during the southward migration, which occurred chiefly in early September, and never more than 2 were recorded in a day nor more than 3 in an entire season (1928). In both migrations the birds were usually found perched on the uppermost dead twigs of tall trees, from which they could sally out to capture food. These trees were usually in lowland forests and at or near the edge of a clearing or field.

The stomachs of 2 birds collected on May 21, 1930, contained remains of several honeybees and large June bugs.

Otocoris alpestris hoyti Bishop
Hoyt's Horned Lark

Very rare winter visitor.

Earliest date of arrival:	.....	December 29, 1928
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	March 17, 1928	.....

Hoyt's Horned Lark was by far the rarest of the 3 subspecies of larks recorded for the area. The few typical birds observed were associated with flocks of *Otocoris a. alpestris*. Usually less than 5 well-marked Hoyt's Horned Larks were observed during a winter, and normally only 1 or 2 were noted in a day. An exception occurred on December 29, 1928, when 5 well-marked individuals, 2 of which were collected, were observed in a flock of an estimated 100 larks. As stated on page 300, 10 per cent of a flock of mostly Northern Horned Larks were Hoyt's Horned Lark or intergrades between the 2 races (Walker and Trautman, 1936: 154).

Upon a few occasions in late winter and spring I heard the Hoyt's Horned Lark sing. The song differed from the songs of the other 2 races, in being outstandingly brief and harsh. Such short, harsh songs were to be expected from a bird so far from its breeding range, and it is possible that its song in this area was only a poor representation of the full-voiced songs delivered on the breeding grounds.

Otocoris alpestris alpestris (Linnaeus)

Northern Horned Lark

Common spring and fall transient and winter resident.

Earliest date of arrival:	.....	October 11, 1928
Median date of arrival:	(February 10)	October 25
Median date of departure:	March 16	(December 12)
Latest date of departure:	March 29, 1930	.....

Specimens were collected on January 19, 1928, December 29, 1928 (3), and January 25, 1930.

The first fall arrivals of the Northern Horned Lark appeared during the last two-thirds of October. By early November the species was usually common, and flocks containing as many as 100 individuals were noted, and as many as 350 of these birds were recorded in a day. In several years a decrease in numbers was observed in early December, indicating that some transients had left. During other years there appeared to be a gradual increase in daily total number throughout December, and in 2 years the increase continued until a peak was reached in mid-February. The largest number ever recorded in a day was an estimated 2000 individuals which composed several flocks that Harold S. Peters and I found along a 3-mile stretch of road immediately south of the lake, on February 14, 1929.

The northward migration became evident about mid-February, reached its height during late February, and was over by March 10, except for a few belated stragglers. Singing of the males in spring flocks was not unusual, and by careful analysis the songs of this northern subspecies were rather readily distinguished from those of the Prairie and Hoyt's horned larks. The song of the Northern Horned Lark was never as full and well developed as was the song of the Prairie Horned Lark. This was to be expected, for the northern bird was far from its nesting grounds and could

not be expected to have so finished a song. The northern subspecies never sang from a perch, as did the Prairie Horned Lark, but both sang while on the wing or on the ground, usually when associating with a flock composed entirely or largely of their own races.

The first fall transients were most often found on the exposed sand and mud bars and islands of the lake until the first hard freeze. During late fall, winter, and early spring the 3 races of horned larks were found principally in well-drained uplands, most often in those fields and pastures where the Prairie Horned Lark nested and remained in summer. Since such land lay mostly south and east of the lake, the birds were much more numerous there. Occasional flocks were found in the higher fields north and west of the lake. The birds never fed in lowland fields, except when the ground was solidly frozen and food only abundant there. Cold weather apparently did not materially affect the winter numbers, but amount of food and depth of snow did. Few birds were seen during the deep snows, except in those fields where manure had been thrown upon the snow.

After some collecting and much studying of the coloration and habits of the 3 races of horned larks in the field it was found possible under favorable light condition to identify accurately well-marked examples of any of these subspecies in life. Intergrades between 2 (or more?) subspecies could not be identified in the field; they were usually very uncommon and formed only a small proportion of an entire flock. The intergrades were always in flocks composed principally of Northern Horned Larks and never appeared in the fall or early spring flocks of Prairie Horned Larks.

Of 4 birds collected on December 29, 1928, and now in Ohio State Museum, 2 are referable to *O. a. hoyti* (Nos. 3077-88), 1 is *O. a. alpestris* (3073), and 1 (3061) appears to be an intergrade between *O. a. alpestris* and *a. hoyti*. These birds were collected from a flock of an estimated 100 individuals, of which at least 90 per cent appeared to be typical *O. a. alpestris*; the remaining were *a. hoyti* and intergrades between the 2 (Walker and Trautman, 1936: 154).

Otocoris alpestris praticola Henshaw
Prairie Horned Lark

Common spring and fall transient, fairly common summer resident, rare or absent in winter.

Earliest date of arrival:	(February 8, 1930)	.....
Median date of arrival:	February 15	(September 22)
Median date of departure:	(March 24)	November 27
Latest date of departure:	.....	(December 15, 1923)

Specimens were collected on February 22, 1928, February 14, 1929 (2), November 30, 1929 (5), January 18, 1930 (2), January 14, 1933.

The Prairie Horned Lark was one of the first nesting species, not strictly resident, to make its spring appearance. The first invasion, con-

sisting of between 15 and 500 individuals in flocks of 5 to 30 each, usually appeared during the first warm period in February, or early March if the weather was unseasonably cold. Within a few days after arrival these flocks disintegrated or passed on, and after that few or no flocks were seen. With the disappearance of the flocks the males began jealously guarding their territories.

During the normal year the majority of resting pairs were on their nesting territories by February 22. Once a male had selected his territory he would not usually desert it because of adverse weather conditions, and if his favorite singing station upon a clod of earth became deeply covered with snow, he resorted to other stations upon fence posts or wires. Cold weather and snow likewise did not affect his defense of his territory, and some of the most determined fights against invaders occurred when the temperature was near zero and the snow was so deep that the combatants occasionally disappeared in it while fighting.

The nest was hard to find, despite the fact that it was built in almost bare fields. No nests were found in this area, but those found elsewhere in Ohio indicated that the first sets of eggs were completed during the latter half of March. Several groups of fledglings, recently out of the nest and still fed by their parents, were noted in the area from April 20 (1929) until June 2 (1928). It was estimated that between 40 and 60 pairs nested annually, principally in the well-drained, upland fields and pastures to the south and east of the lake.

Family groups and small flocks of 10 to 12 individuals were noted throughout summer, dusting themselves in the dirt or gravel roads and feeding and flying about the closely cropped pastures and stubble fields. The fall migration became evident in late September and lasted until late November, and in this movement flocks containing as many as 30 birds were occasionally seen. Unlike a few other sections of Ohio, this area did not regularly harbor the Prairie Horned Lark throughout the winter, and only upon 2 occasions, January 18, 1930 (15 birds) and January 14, 1933 (5 birds), were individuals found in this midseason. During migrations the Prairie and Northern horned larks usually remained separated from each other, even though flocks of both subspecies or flocks of the Northern and pairs of the Prairie horned larks were simultaneously inhabiting the same fields (Walker and Trautman, 1936: 152).

Iridoprocne bicolor (Vieillot)

Tree Swallow

Common spring and fall transient, uncommon summer resident.

Earliest date of arrival:	March 29, 1933	.....
Median date of arrival:	April 2	(July 29)
Median date of departure:	(May 19)	October 10
Latest date of departure:	.....	November 3, 1925

The Tree Swallow was always present by April 8, and by April 20 was usually common and so remained until late May. At the peak of migration, between May 5 and 20, 100 to 200 individuals were to be noted in a day.

A marked increase in daily numbers noted in late July continued throughout the first half of August. During the latter half of August and early September the maximum numbers of the southward movement occurred, and then as many as 100 were seen in a day. After September 15 there usually was a sharp decline in numbers, though occasional groups of as many as 75 birds were noted as late as October 5. A few were generally seen during late October and after cold weather had occurred. Small groups or a few individuals were noted flying over the water during snowstorms, twittering cheerfully, and apparently suffering no ill effects from the weather.

The Tree Swallow is an outstanding example of a nesting species which has greatly decreased in numbers. It was surely present before the white man's invasion and until the building of the Licking Reservoir. With the building of the reservoir (1825) and the flooding and killing of timber, there occurred a tremendous increase in the number of nesting sites and a probable increase of nesting birds. The older residents are agreed that by 1860 this swallow was most abundant, and that its nesting numbers remained very high until about 1900. I remember, as a small boy in 1907, that I saw large numbers nesting. The numbers of nesting pairs had sharply decreased by 1910, chiefly because of the decay or removal of stumps and dead trees, which were the nesting sites. By 1922 only a small fraction of the original great mass of stumps and dead trees remained, and at that time less than 100 pairs nested annually. The decline in nesting pairs has continued, coincident with the lessening number of suitable nesting sites. By 1933 only 1 or 2 pairs were found nesting about Liebs, Onion, and Cranberry islands, several pairs each were at Little Buckeye game refuge and the marsh at the mouth of Honey Creek, and a few scattered pairs were about the east end of the lake and Maple Swamp. It is highly probable that this graceful bird will in the not distant future become extirpated as a nesting species, because of lack of nesting sites. The bird does not nest in bird boxes as it is said to have done elsewhere. Rather recently the Starling has become a competitor for the few remaining nesting sites.

Approximately 25 nests were observed, about half of which were in holes first made by Carolina Chickadees in stumps, trees, and posts. The trees were chiefly dead willows; apparently the rotted wood of this tree could be readily excavated. The remaining nests were in old woodpecker holes, principally those made by Downy Woodpeckers. Of 6 nests examined, 4 contained 4 eggs or young each; 1, 3 eggs; and 1, 6 eggs. Eggs

were noted from May 15 (1932) to June 9 (1928). Young in the nest were noted from June 10 (1928) to July 16 (1924, half grown).

Riparia riparia riparia (Linnaeus)

Bank Swallow

Common spring and fall transient, very rare summer resident.

Earliest date of arrival:	April 13, 1929	(July 12, 1931)
Median date of arrival:	April 18	July 15
Median date of departure:	May 24	September 5
Latest date of departure:	(June 2, 1928)	September 29, 1928

Each year 3 to 30 Bank Swallows could be daily noted during the last 8 days of April. The species did not become common until May 1 or slightly thereafter, and from then until mid-May as many as 200 (May 18, 1929) individuals could be seen in a day. A sharp decrease in daily numbers occurred about May 20, and by the last week of the month only a few belated stragglers remained.

The first southbound transients usually made their appearance in mid-July, and from then on the numbers tended gradually to increase. The greatest daily numbers were recorded between August 15 and September 1, when as many as 200 individuals were noted in a day. Within a few days of September 1, a chilly, rainy day usually occurred, and the abundant, flying insects temporarily disappeared. The swallows left simultaneously with the disappearance of the insects, and from then on few birds were noted, despite the return of warmer weather and the reappearance of vast numbers of insects. Apparently there were no large numbers of transients from the north after the chilly day to take the place of the group which had been there during August.

There was 1 nesting record. Two pairs nested in holes in the side of a gravel and sand bank beside the South Fork of Wicking River, immediately north of the village of Buckeye Lake. I first noted these birds on June 16, 1929, at which time the adults were seen flying in and out of their nesting holes. On June 26 I heard the cheeping of young in the nests, and on July 13 I saw 3 young being fed by their parents in the vicinity of the nesting cavities.

Stelgidopteryx ruficollis serripennis (Audubon)

Rough-winged Swallow

Common spring and fall transient, uncommon summer resident.

Earliest date of arrival:	April 7, 1929	.....
Median date of arrival:	April 13	(June 30)
Median date of departure:	(May 20)	August 5
Latest date of departure:	.....	August 22, 1929

The first arrivals in spring came in the middle third of April, and from April 20 to about May 15 the species was common. Its daily numbers then

rapidly shrank, and by May 28 all transients had apparently left. The daily numbers in spring were usually less than 100, though during the larger flights as many as 350 were noted.

Each year between 1922 and 1934, 1 to 6 (1928) small nesting colonies were recorded. These usually consisted of 2 to 12 pairs, and were located in the gravel, clay, and sand banks beside streams and in banks of gravel pits. The birds nested rather early; hole digging appeared to be at its height about May 20, and by May 25 most of the nesting cavities were completed. Usually the nests were placed well above the early summer flood crest, but occasionally a few were too low and were flooded. Such flooding was noted on June 21, 1928, when exceptionally heavy rains raised the waters of the lake and overflow stream sufficiently to flood a low bank immediately north of the wasteweir in which were 3 nests. Young recently out of the nest and still fed by their parents were noted from June 16 to July 20.

The Rough-winged Swallow was probably the earliest regular nesting species to leave on its southward journey. Marked migrations were noted by July 1, and by the middle of that month the movement was at its height. A decided decrease in daily numbers was noted during the last week of July, and by August 5 only an occasional straggler or small group could be seen. Rough-winged Swallows were reported by various persons as rather numerous during August, but examination indicated that they had mistaken the rather similarly colored young Tree Swallows for this species. During the southward migration the daily numbers were lower than in spring, and seldom more than 75 birds were noted in a day.

Hirundo rustica erythrogaster Boddaert

Barn Swallow

Common spring and fall transient and summer resident.

Earliest date of arrival:	April 2, 1932	.....
Median date of arrival:	April 9	(August 8)
Median date of departure:	(May 21)	October 12
Latest date of departure:	.....	October 29, 1931

Each year a few Barn Swallows were noted between April 2 and 14, and by April 22 the species was common. The peak of the migration took place between May 1 and 12. Then 100 to 200 birds per day were not infrequently noted, and upon a few spring days as many as 300 were seen. A decrease became apparent about May 16 and by the last week of May few or no transients remained.

The first spring arrivals usually flew about over the lake, and later in the season the greatest concentration of transients occurred there also. By April 18 a few could be seen flying about the barns where the species nested, and by mid-May the entire nesting population appeared to be present about

barns. A large proportion of the many barns contained colonies of 3 to 12 pairs. The data indicated that there were at least 300 pairs present each year and possibly as many as 450. Most of the nests were placed on rafters or joists inside of barns, though occasional nests were found attached to both the inside and outside walls of barns and other buildings. In 1923, 2 pairs attached their nests to joists of the wooden bridge on the National Road, which then spanned the South Branch of Licking River. Nest building began in mid-May, and nests with the complement of 4 to 6 eggs were noted from May 19 (1928) to July 13 (1929). The majority of the pairs were incubating eggs during late May and early June. The first young in the nest were noted May 26 (1928), and the last July 21 (1928). Fledglings out of the nest were observed from June 10 until early August.

A drifting of birds from barns to the lake and ponds began in late June, and by mid-July the southward migration had apparently begun. The species was very numerous throughout August and September. As many as 500 birds were recorded in a day at the height of the movement in late August and in the first few days of September. A few stragglers were always found in early October.

Because of its nesting habits this swallow probably was considerably less numerous before 1800 than it has been since. Before 1800 the only nesting sites seemingly at all suitable were large hollow trees near the edges of swamps and in forest openings.

Petrochelidon albifrons albifrons (Rafinesque)

Northern Cliff Swallow

Rare, uncommon, or common spring and fall transient, very rare summer resident.

Earliest date of arrival:	April 25, 1931	(July 12, 1931)
Median date of arrival:	May 7	August 8
Median date of departure:	May 25	August 30
Latest date of departure:	(June 9, 1928)	October 10, 1925

The numbers of Northern Cliff Swallow transients in spring fluctuated markedly. All except a few were seen in May. In the average spring a total of less than 8 birds was seen, and in all except 1 season a total of between 8 and 180 was recorded. The exception occurred on May 24-25, 1924, when at least 200 individuals were noted on each day.

The poorly defined southward movement, in which never more than 20 individuals were recorded in a day, apparently began in late July, reached its height between August 10 and 20, and usually ended about mid-September. The migrational data agree with other data taken elsewhere in Ohio. The only October record was of 3 birds seen by me on October 10.

There was 1 nesting record. On June 15, 1923, I noted 2 Cliff Swallows flying about De Weese's Pond, and the next day I found their nest with 4 young. It was attached to the side and under the eaves of a small unpainted

shed made of rough lumber. It was within 300 yards of the pond in the center of a large field and was several hundred yards from human habitation and its attendant colony of English Sparrows.

The older residents have told me that from 1860 to 1905 the "eve swallow" nested annually and that it was found nesting in colonies of from a few to 50 pairs, under eaves of barns and other outbuildings. The cause of the drastic change in nesting status is not known, but I suspect that the increase in numbers of English Sparrows and the recent practice of building barns of smooth lumber and of painting them, have been responsible. It is regrettable that this fine swallow has ceased to nest regularly in the area.

Progne subis subis (Linnaeus)

Purple Martin

Common or very common spring and fall transient, common summer resident.

Earliest date of arrival:	March 15, 1930	.....
Median date of arrival:	March 27	(July 28)
Median date of departure:	(May 20)	September 23
Latest date of departure:	.....	October 27, 1928

The first spring arrivals were annually noted in the latter half of March. The species usually became common between April 3 and 7, and the peak of migration occurred in late April and the first 10 days of May. During the spring height between 200 and 800 were noted in a day. A decrease in transient numbers became apparent in mid-May, and by late May only nesting birds remained.

Each year there were 6 or more large nesting colonies of 15 to 20 pairs, and many smaller ones, and it was estimated that at least 250 pairs annually nested. With no exceptions, all nested in martin houses, and the houses nearest the lake were generally occupied first. Each year the houses nearest water contained more nesting pairs than did those farther removed. Nest building began during late May and continued throughout early June. The first completed set of eggs (4) was noted June 6 (1925), and nests with 3 to 6 eggs were found from then until July 2 (1932). Young in the nest were seen and heard from mid-June to early August. Young out of the nest, on top of the houses and accompanied by parents, were noted from early July to August 20.

On June 18, 1928, near the village of Buckeye Lake, a storm of tornado proportions blew down and considerably damaged a large martin house which contained 16 nests. The house, though almost wrecked, was placed upon the top of a high pole shortly after the storm had ceased, and 3 days later 4 pairs of Martins, seemingly birds which had been nesting in the house previous to the storm, began to build nests in it.

Slight evidence of a southward migration was noted in mid-July, but by the last of that month the movement had become pronounced. The daily numbers recorded during August and early September were large, and at

the peak of migration, in the latter half of August, as many as 1000 individuals were recorded in a day. It was most impressive to watch a huge flock congregating at evening into a more or less compact flock, which circled around and around preparatory to roosting. The birds roosted chiefly in dead trees, and later in the season upon various amusement structures in Buckeye Lake Park, such as the "loop the loop" and "circle swing." Upon a few occasions a large, compact, and circular flock of several hundred transients was seen coming to or leaving the lake. These flocks apparently came during all periods of the day. One group of over 150 birds came in the early afternoon of September 29 (1928) and left at dark—a rather curious performance for these supposedly day migrants.

An albino Martin roosted each night with several hundred normally colored birds, on top of the "circle swing" at Buckeye Lake Park, during the last 2 weeks of August, 1929.

Cyanocitta cristata bromia Oberholser

Northern Blue Jay

Averaged fairly common throughout the year.

Earliest date of arrival:	.....	.....
Median date of arrival:	(March 4)	(October 18)
Median date of departure:	(April 10)	(December 5)
Latest date of departure:	.....	.....

The number of Northern Blue Jays fluctuated considerably from season to season and from year to year. The greatest fluctuation occurred in the winter months. In some winters 25 to 50 individuals could be seen daily, and in others the species was rare or absent. The number of wintering birds depended largely upon the amount of corn left in the fields and the amount of beech and acorn mast in the woodlands. The 1930-31 winter followed a phenomenally dry summer and fall, and little of the small corn crop was left in the fields, and the mast crop was very poor. During that winter no birds were recorded in January, and only 1 bird was seen in February (on the twenty-eighth).

When there were large numbers of wintering Northern Blue Jays it was difficult to note any evidence of a spring migration, but when wintering birds were rare the spring migration, which occurred principally in late March, was rather pronounced. Because of the rather low summer numbers it was always possible to note the beginning of the fall migration, which took place largely in November. During both migrations as many as 50 individuals could be recorded in a day, though the number usually was between 8 and 25.

The nesting and summer numbers averaged the lowest for any season and were the most constant. It was estimated that 40 to 65 pairs nested annually. Because of their rather secretive habits, seldom more than 8 individuals were noted in a day, and the nesting numbers seemed much lower

than they actually were. These birds were very noisy during fall, winter, and early spring, but in the nesting season, when most bird species were most conspicuous and assertive, they were quiet and secretive. They continued to be fairly quiet and inconspicuous until early August, when they again became vociferous.

Most of these birds nested in the woodlands and scattered trees of the better-drained sections and were rather scarce in the wettest swamp forests. A nest was found on April 16, 1915,¹⁹ and another, with 5 eggs, was discovered on May 14 (1929). I found the second nest 35 feet above the ground in a white willow (*Salix alba*) on Liebs Island. Incubation of eggs was well advanced. Young jays in 6 nests were noted from May 21 (1930) to June 16 (1929), and fledglings out of the nest were seen from late June to late July.

On June 18, 1928, a severe storm destroyed a number of cottages and uprooted trees along the North Bank from the wasteweir to Buckeye Lake Park. Immediately after the storm 2 dead and badly battered jays were found among the wreckage.

Corvus corax europhilus Oberholser
Southern Raven

It is unfortunate that there seemingly is no published record of the Southern Raven in the Buckeye Lake area. The species undoubtedly was present during early historic time; it was recorded (Wheaton, 1882: 363) as having occurred in all portions of Ohio. The "Great Swamp" portion of the Buckeye Lake area must have been a favorable habitat.

The Southern Raven's disappearance from the area probably was early in the nineteenth century. Wheaton (1882: 363) stated that it "had disappeared as a regular visitor from all parts [of Ohio], excepting the northern portions of the State where it is now rare." Schaff (1905) does not include it among the more spectacular birds he found there as a boy between 1840 and 1858. The last record of its occurrence in central Ohio was that of a specimen taken September 3, 1879, near Marysville, Union County (Wheaton, 1882: 364).

Corvus corone brachyrhynchos Brehm
Eastern Crow

Common or very common spring and fall transient, common winter visitant and summer resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(February 18)	(October 20)
Median date of departure:	(April 3)	(November 28)
Latest date of departure:	.....	.....

¹⁹ Recorded by Edward S. Thomas before the investigation was begun; the number of eggs is unknown.

As with many other so-called resident species, the number of Eastern Crows fluctuated considerably from season to season and from year to year. Winter numbers appeared to vary the most. When the ground was snow-covered for several weeks the species was rather uncommon; when there was little snow and plenty of corn or other food available the bird was much more numerous, and as many as 800 individuals were noted daily. There were no large winter roosts in the area—the birds chiefly roosted in small groups in the remnant forests and in the high brush of Bloody Run swamp, or went outside the area to the large crow roosts of central Ohio. Between 1929 and 1932 there was an enormous winter roost east of Reynoldsburg (Licking County), within 12 miles of the eastern edge of the Buckeye Lake area. Crows went from the lake to this roost nightly at sundown. It was curious that there were no large winter roosts in the area during the investigation, since conditions were favorable. The older residents stated that between 1880 and 1922 there were several large roosts, and during January and February, 1935, a roost of an estimated 6,500 birds was established in a thicket in Bloody Run swamp.

In warm winters the largest flights were in the last half of February; in cold winters they were chiefly in late March. The Eastern Crow was a very numerous spring transient, and occasionally several thousands were noted in a day. The spring flights were not as large as those elsewhere in central Ohio, for apparently Buckeye Lake was not in the path of the larger flyways. The flights did not compare, for instance, with those in the Scioto River bottom lands south of Columbus.

The annual nesting numbers, between 100 and 200 pairs, were rather stable. The birds nested in all large remnant forests and woodlands and in most of the groves. Occasional pairs also nested in solitary trees in fields. Nests were located in many kinds of large trees, but beech, elm, and honey locust were most often used. Some nests, usually those in thorny honey locusts, were as low as 8 feet from the ground; others were as high as 70 feet. The construction of the nests varied greatly; some carelessly made ones were unlined, whereas others were elaborate and compact and had a thick lining of rabbit fur or horse or cattle hair.

Many dozen nests were noted and more than 40 were examined. The earliest date for a complete set of eggs was March 31 (1929, 5 eggs); the latest, June 15 (1929, 4 eggs). The majority of nests with eggs were found in late April and early May. There were 4 to 8 eggs in the sets, usually 4 or 5. Young in the nest were noted from April 19 (1928) to June 30 (1928), and fledglings recently out of the nest were seen from May 17 (1930) to mid-July.

The migration in fall was much less spectacular than it was in spring. Usually, less than 500 birds were daily recorded in autumn and only on a

few days, generally in November, were more than an estimated 1000 noted. Statements made by old residents indicated that the species had greatly increased in transient and wintering numbers since 1860.

**Penthestes atricapillus atricapillus* (Linnaeus)
Black-capped Chickadee

Formerly a resident and winter visitant.

Wheaton (1882: 222-23) in commenting on the Black-capped Chickadee stated: "Not common winter visitor in Central and Southern Ohio. Twenty-five years ago [1850] the Black-capped Titmouse was as abundant in Central Ohio as the Tufted [Titmouse]. Since that time it has become quite rare, and a winter visitor only in the vicinity of Columbus. In some seasons none are seen." Apparently, the species was still present, in winter at least, in central Ohio in 1902, for Dawson (1903: 249) wrote: "The two forms [Black-capped and Carolina chickadees] were found last winter, near the Licking Reservoir [Buckeye Lake], mingling freely in a large winter troop, while *P. carolinensis* alone was found breeding there the following season."

During the investigation the Black-capped Chickadee was not noted, though much time was spent, especially in winter, looking for it. Two reasons for its disappearance present themselves: (1) a gradual northward trend of the species, and (2) an environmental change from a forested area to one of farms and woodlands, which favored invasion and establishment of the southern species. The Black-capped Chickadee was still present within 50 miles to the north and east of Buckeye Lake.

Penthestes carolinensis carolinensis (Audubon)
Carolina Chickadee

Common summer resident, very common winter visitant.

Concerning the Carolina Chickadee in Ohio, and particularly of the central portion, Wheaton (1882: 223) wrote: "Not common summer resident. Breeds. Arrives about the middle of April, apparently departs for the south soon after the breeding season." Its status, especially as regards winter, had changed by 1902, for Dawson (1903: 249) said that he found both this species and the Black-capped Chickadee in the area "last winter" and that the "following season" only the Carolina Chickadee was found nesting there. By 1922 this form only was present. If the statements of early ornithologists are true, then during the past 40 years the Carolina Chickadee has become a resident in the area and has entirely replaced the Black-capped Chickadee.

The Carolina Chickadee was very numerous in winter. There obviously were several hundreds present, and between 10 and 120 individuals were

daily recorded. Wintering birds were found in greatest numbers in woodlands containing much undergrowth. A rather large proportion were in heavily grazed woodlands without undergrowth, in brushy thickets, in orchards, along brushy fence rows, and in adjacent weedy fields. During severe storms individuals in open situations, such as along fence rows, temporarily retreated into denser woodlands.

The first indications of the approaching nesting season became evident during the latter half of February, when an increased amount of singing was noted. At the same time pairs began to drift from the loose winter companies in the larger woodlands to their resting sites. Digging and cleaning out of nesting cavities was at its maximum in late March and early April. The dead wood of many trees was used for nesting sites. The various species of willows were seemingly preferred, apparently because the rotten inner wood could be readily removed. Holes, originally made by woodpeckers, in stumps, fence posts, and telephone poles, were also used as nesting sites. The nests were between 2 and 15 feet above the ground and were largely made of dried grass blades and usually lined with rabbit fur or the soft, inner bark of such plants as the swamp milkweed (*Asclepias incarnata*). The first completed nest was found April 16 (1927) in Lakeside Woods; it contained its complement of 6 eggs on April 28. The last date for a nest with eggs was June 5 (1922, 4 eggs). The first nest with young was noted May 2 (1925); the last, June 24 (1927); and young recently out of the nest were noted from May 15 (1930) to July 22 (1933). The complement of eggs from 14 nests ranged from 4 to 9 eggs a nest. At least 125 pairs of these birds nested annually.

After the nesting season, in August, the species became scattered and inconspicuous, and fewer were seen and heard in that month than when they were restricted to woodlands and thickets. By late September the birds again became conspicuous and vociferous and began to gather in loose groups or companies of 6 to 20. An increase in numbers became apparent in early December. What percentage of nesting birds left in winter is not known. All did not leave, for upon several occasions individuals or pairs, recognizable by some peculiarity of color pattern or voice, were recorded from the same locality throughout periods of a year or more.

Todd and Sutton (1936: 69-70) have recently given the subspecific name *extimus* to the Carolina Chickadee north of New Jersey and Missouri. Examination of the series in the Museum of Zoology indicates that there are only two eastern races of this species, but topotypical material from South Carolina is not available to show whether the name *carolinensis* belongs to the northern or southern race. The describers of *extimus* implied that they did not compare topotypical material, and until such is examined it seems advisable to retain *impiger* for the Florida bird and *carolinensis* for the

northern form, especially since Bangs (1903: 2) has stated that South Carolina birds belong to the northern form.

Baeolophus bicolor (Linnaeus)

Tufted Titmouse

Common throughout the year, most numerous in winter.

As with the Carolina Chickadee the Tufted Titmouse was definitely more numerous in winter than at any other season. The winter birds were found principally in the larger, denser woodlands, and in fewer numbers in smaller woodlots, orchards, brushy thickets, and along fence rows and solitary rows of trees. During the coldest weather the species left the more open situations for denser woodlands and there, in companies of 10 to 30 individuals, became one of the more conspicuous and noisy of winter birds. At this season from 10 to 75 birds were recorded daily, and undoubtedly several hundreds were present.

The nesting habits were in many respects similar to those of the Carolina Chickadee. The approaching nesting season was first indicated by an increased amount of singing during the latter half of February; and the cleaning out of old nesting sites and the excavating of new began in mid-March and continued until mid-April. There were some slight nesting differences: the Tufted Titmouse nested in larger trees and taller snags and occupied woodpecker holes more frequently than did the Carolina Chickadee; it did not nest in the smallest of the brushy thickets and open, small woodlots, and the nests averaged higher above the ground, usually 5 to 40 feet instead of 2 to 15 feet.

Titmice, mostly females, were seen from mid-April to mid-May carrying dead leaves, feathers, dried grass, rabbit fur, and horse and cattle hair to the nesting cavities. The first complement of eggs was noted April 21 (1928, 6 eggs), and the last June 10 (1928, 4 eggs); the first young in the nest were observed May 11 (1929, 3 young), and the last June 16 (1928, 3 young); fledglings recently out of the nest were seen from May 18 (1929) to June 28 (1924). There were from 3 to 7 eggs or young in each of 11 nests. On the average day's field trip from 5 to 15 pairs were usually recorded, and it was estimated that more than 100 pairs nested annually. The family group remained together until late August, and occasional groups remained together until early winter, after which they merged into the large companies of titmice and chickadees. By early December the majority were again in dense woodlands, and from the greatly increased numbers it was evident that an influx of birds had occurred.

Titmice in winter to a large extent ate cultivated grains, seeds, and mast, usually flying out of the woodlands into neighboring fields to feed. Upon several occasions an individual was seen to tear a *Samia cecropia* cocoon

from a limb or twig of a tree, and, with the cocoon held firmly between its toes and a branch, pick a hole through the silky fibers and pupa wall to eat the contents.

The species was recorded by Wheaton (1882: 221) as abundant throughout central Ohio. It is probable that the bird regularly nested in the area during the historic past.

Sitta carolinensis carolinensis Latham
White-breasted Nuthatch

Common throughout the year.

The White-breasted Nuthatch was another common nesting species which was more numerous in winter than in summer. It could be found with the Carolina Chickadee and the Tufted Titmouse throughout the winter in all large woodlands and in many small woodlots, open groves, thickets, and trees along fences, about farmhouses, and along shores of the lake and streams. Its wintering numbers appeared to fluctuate more than did those of the other 2 species. In some winters the White-breasted Nuthatch was almost as numerous as either of these species, in others it was less than half as numerous. Usually 5 to 25 were recorded in a winter day, but 60 were once noted. Throughout the colder season there usually were present more than 100 individuals and at times there were possibly more than 400.

The White-breasted Nuthatch was among the first of the small land birds to display courtship behavior. The males began their simple, persistent "tew-tew-tew" song in late January, and by mid-February pairs had left the winter troops of gleaners and had appeared at their future nesting sites. The actions of paired birds were rather inconspicuous during fall and winter, but from early February the members of each pair continuously followed each other about until the young were out of the nest. Whenever the female was not incubating both birds were usually within sight of each other, apparently always sufficiently close enough to hear each other calling. During incubation, the male also appeared to be always within calling distance of the female on her nest.

Two of 17 nests observed were in old woodpecker holes in dead snags; the others were in cavities of living wood. In several nests growing bark about the cavities made the openings so small that the birds could squeeze in only with much difficulty. Apparently, cavities in living trees were greatly preferred to old woodpecker holes in dead timber. All nests were 10 to 50 feet above the ground.

In early April the female, constantly followed by the male, was seen hunting for and carrying nesting material of dried leaves and grasses, inner bark of vines, fur, and hair. The earliest nest and eggs were noted April 29 (1928, 5 eggs), and the last May 22 (1929, 4 eggs); the first young in the

nest were seen May 15 (1928, 3 young and 1 egg), and the last June 10 (1928, 5 young); and fledglings recently out of the nest were seen from May 22 (1929, 4 young) to July 17 (1932, 5 young). The family remained together until early September, and occasionally a few weeks later. Throughout the nesting season 5 to 15 pairs were recorded daily, and apparently there were between 50 and 75 pairs annually nesting. In late October the birds became more numerous, and for a short time in December the numbers were greater than they were during the nesting season or immediately following it.

Sitta canadensis canadensis Linnaeus
Red-breasted Nuthatch

Usually a rare spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(April 28, 1934)	September 5, 1928
Median date of arrival:	May 2	September 20
Median date of departure:	May 18	October 3
Latest date of departure:	May 19, 1928	(October 18, 1924)

The numbers of the Red-breasted Nuthatch varied greatly from one spring to another. In some years none were recorded, and in others, such as in 1924, as many as 12 were noted in a day. The bird was a May transient, although in the year following the investigation L. E. Hicks recorded 2 individuals on April 28 (1934). More were noted in May than in any other month.

The species was rare in fall, and seldom more than 1 was recorded in a day. The largest number noted in an autumn day was 5 (September 24, 1927). The fall records grouped about the last week in September, and from evidence gathered elsewhere, that was the time of the peak of the fall migration in central Ohio. The species was recorded wintering twice: in 1925-26, when a bird was repeatedly found in Jack's Neck Woods, and in 1931-32, when 4 birds remained in the same woodland.

Certhia familiaris americana Bonaparte
Brown Creeper

Rather common spring and fall transient, rare or uncommon winter visitant.

Earliest date of arrival:	.....	September 23, 1930
Median date of arrival:	(April 1)	October 1
Median date of departure:	May 2	(November 5)
Latest date of departure:	May 9, 1929	.....

There was much fluctuation in numbers of the Brown Creeper in migrations and in winter. The first fall arrivals were generally noted in early October, and from then until early November, 1 to 15 individuals were daily seen. Thereafter, until December or January the species was less numerous or entirely absent. Then a slight increase occurred, and the species became

as numerous as it had been in fall. In February, usually following a sleet storm, another decrease was noted, and until late March or early April, when a distinct flight occurred, which seemingly denoted the beginning of migration, this bird was often rare or absent. The vernal movement lasted until late April. The Brown Creeper was often more numerous at this time than at any other period, and between 5 and 22 individuals were daily noted.

The area was not as suitable for the Brown Creeper as were such other central Ohio sections as the wooded portions of the Scioto and Big Walnut river bottom lands south of Columbus, or the Sugar Grove region. In these sections it was a more numerous transient and winter resident. The species was probably a regular transient and winter resident in the area throughout historic time.

Troglodytes aëdon baldwini Oberholser

Ohio House Wren

Common spring and fall transient and summer resident.

Earliest date of arrival:	April 12, 1930	.....
Median date of arrival:	April 15	September 1
Median date of departure:	(May 25)	October 3
Latest date of departure:	.....	October 27, 1928

The first Ohio House Wrens of spring were recorded between April 12 and 20, and by May 2 between 5 and 20 could be daily recorded. Maximum spring numbers occurred between May 5 and 18, and as many as 75 of these noisy transients and summer residents were then noted in a day. The daily numbers decreased sharply about May 20, and by May 25 all transients, except an occasional straggler, had left.

The Ohio House Wren was a conspicuous summer resident and an estimated 100 to 200 pairs annually nested. Nesting pairs were found rather well distributed over most of the land area, though they tended to congregate about villages, cottages, and farmhouses, where they nested in bird houses and outbuildings. About one-fifth of the population nested in remnant forests which contained nesting sites in logs and stumps. None were found nesting in large cattail swamps, in wet, alder-willow swamps, or in broad, open fields. The nests were placed in a great variety of situations, including bird houses, holes in stumps, trees, logs, fence posts, and in small cavities and crevices about cottages and outbuildings. Of 32 nests observed, 27 contained from 5 to 7 eggs or young each; 3, 4 eggs or young each; 1, 8 young; and 1, 9 young.

The first nests were completed by mid-May. The earliest complete set of eggs (6) was noted May 19 (1928), and the last July 17 (1930, 6 eggs). Young in the nest were noted from May 21 (1931, 4 young) to August 4, (1932, 5 young), and fledglings out of the nest only a few days were seen

from June 2 (1928) to August 11 (1929). From their arrival in spring until their young were out of the nest, the males were tireless and persistent singers; when the last brood had left the nest the males ceased singing. A general shifting of adults and young from the nesting sites about farms, cottages, and villages to the denser tangles of larger woodlands began in late July. This shifting continued throughout August, and by September, when the fall migration began, the species was largely confined to wooded areas. During this migration it was as numerous as in spring, but more secretive habits made it appear to be less numerous than it actually was.

Specimens collected on May 11, 1928, and October 11, 1928, have been identified by H. C. Oberholser as the recently described Ohio House Wren, *baldwini*. It is assumed that all nesting birds belonged to this subspecies. The birds must have been regular transients and summer residents throughout historic time.

Nannus troglodytes hiemalis (Vieillot)²⁰

Eastern Winter Wren

Rather common spring and fall transient, rare or uncommon winter visitant.

Earliest date of arrival:	.....	September 20, 1929
Median date of arrival:	(March 10)	October 1
Median date of departure:	May 2	(November 20)
Latest date of departure:	May 11, 1929	.....

The first Eastern Winter Wrens of autumn were seen between September 20 and October 5. By October 7 the species was present in small numbers, and from then until November or early December between 2 and 12 were noted daily. The peak of migration was attained during the last 2 weeks of October. When the ground first became snow-covered, usually between November 5 and December 20, the species sometimes disappeared. It was absent, except as an occasional and temporary visitor, during winters with much snow; but in seasons with little snow, between 2 and 11 individuals could be found throughout the season.

The earliest spring transients arrived in the first half of March. One to 4 individuals were daily noted from March 15 to April 25. In the period of maximum abundance, between April 5 and 20, as many as 50 were recorded in a day. The last transients disappeared between April 26 and May 11.

Throughout its sojourn the Eastern Winter Wren was found principally in the denser woodlands, especially in swampy ones and those containing much undercover and down timber. In such situations the birds were found twittering continuously, and hopping endlessly in and out of holes and crannies about the bases of uprooted trees, hollow logs, brush heaps, and vine tangles, in search of food.

²⁰ See Wetmore (1939: 212) for use of the specific name *troglydytes*.

Thryomanes bewickii bewickii (Audubon)

Bewick's Wren

Uncommon spring transient, very rare summer resident and winter visitant.

Each year a definite, small migration of Bewick's Wrens passed through the area between March 30 and April 16, and 1 to 9 transients were daily recorded. This species was present throughout three summers and was found nesting once. On May 13, 1929, on the north shore opposite Cranberry Island, I saw a pair carrying feathers and dried grass into a large crack in the concrete foundation of a garage. Because of the location the nest could not be examined. Many observations made after May 13 indicated that incubation had begun by May 20 and that, after June 4, young were being fed. Five fledglings came out of the nesting cavity on June 16.

No evidence was obtained of a southward migration. During 2 years a pair was observed throughout the winter. The pair found nesting in 1929 was recorded in the vicinity of the nesting site until the spring of 1930. The scarcity of Bewick's Wren is difficult to understand, for the species was found nesting not uncommonly in several other parts of the 3 counties in which the area is situated.

Nothing is known of this bird's status in the area prior to 1922, except that on June 15, 1919, Edward S. Thomas found a seemingly nesting pair in the village of Buckeye Lake. It is the opinion of several ornithologists that Bewick's Wren is a rather recent invader of Ohio and that it has been increasing in abundance since its discovery in the state in 1879 (Dury and Freeman, 1879: 101).

Thryothorus ludovicianus ludovicianus (Latham)

Carolina Wren

Usually a common resident.

The numbers of Carolina Wrens fluctuated from one spring to another, depending upon the severity of the winter. After every severe sleet storm or heavy snow there were fewer individuals. Most remarkable decreases occurred in the spring seasons of 1924, 1928, and 1930, following winters with exceptionally heavy sleet or snow storms. The most notable decline in recent years occurred during the very severe winter of 1917-18. In the fall preceding that winter the average number were present throughout central Ohio, but in the spring of 1918 few nesting birds were found. Not until 1922 were they again present in numbers.

During the years when there were few birds the area contained between 15 and 25 nesting pairs; in seasons of greatest abundance between 35 and 55 pairs nested. From the many and repeated observations of recognizable individuals it was evident that the Carolina Wren was very sedentary, and

pairs or individuals were found in a given locality for periods of a year or more. Occasionally, during a cold period, I missed a bird that was wintering in an exposed area and found it in a neighboring woodland. After the weather moderated the bird usually again returned to its former territory. No evidence was obtained denoting a spring or fall migration or an influx of birds in winter.

The species chiefly inhabited woodlands and brushy thickets, especially those containing much undergrowth, many blackberry, rosebush, or grapevine tangles, and many uprooted trees and down timber. A few pairs were found about cottages where trees and brush were present, or along some brushy fence row. The bird avoided wet swamps, cattail marshes, brushless pastures, and cultivated fields.

Nest building began during the latter half of March, was in full force between April 5 and 20, and gradually came to an end in early July. The nests were in such situations as small cavities in walls or underneath floors and roofs of cottages and outbuildings, holes in stumps, logs, trees, and fence posts, and empty boxes, buckets, tea kettles, and tightly wound bales of fencing wire. Seven nests were examined; of these 1 contained 4 young; 2, 5 young; 3, 6 young or eggs; and 1, 7 eggs. The earliest nest with eggs was found April 7 (1929, 7 eggs), and the last July 23 (1930, 6 eggs); the first young were noted April 12 (1930, 6 young), and the last August 4 (1932, 6 young); the first fledglings out of the nest were observed April 30 (1929, 7 young), and the last August 14 (1929, 5 young). Four pairs were observed to raise 2 broods in a year, and it seems probable that the average pair nested twice each season.

In a small ravine at the northeast end of the lake, on June 3, 1928, I found a nest which was in 1 of the 2 compartments of a standard-size orange crate. The nesting compartment was entirely filled with straw, dried grasses, string, bits of rags, paper, and feathers, except for a small space in a corner which contained the 5 young. While walking along the North Bank near the wasteweer, on March 23, 1929, I noticed a pair of Carolina Wrens that were carrying nesting material through a small knothole in a woodhouse to their nest in a crevice under the roof. The birds were scurrying about in their characteristic manner, gathering nesting material—feathers pulled from a dead and partly decomposed chicken, which was about 50 feet from the nesting site. I timed the birds and found that the female carried 11 mouthfuls of feathers to the nest in 19 minutes, and the male, who frequently stopped to scold or sing, made only 4 trips in that time. On April 7 the nest contained 7 eggs, and on April 30 the young left the nest.

Despite its somewhat noisy manner and frequent scolding the Carolina Wren was most likeable. Its frequently given song was very pleasing, espe-

cially on cold winter days when few birds sang. On quiet mornings and evenings its song could be heard across a mile of water.

Cistothorus palustris iliacus (Ridgway)

Prairie Marsh Wren

Common spring and fall transient and summer resident, very rare winter resident.

Earliest date of arrival:	(April 13, 1929)	.....
Median date of arrival:	April 22	(September 7)
Median date of departure:	(May 24)	October 27
Latest date of departure:	.....	(November 11, 1931)

The first Prairie Marsh Wren of spring arrived between April 13 and 26. By May 5 the species was well distributed, and the males had begun to sing. At the spring height of abundance, between May 8 and 20, hundreds and sometimes thousands were daily present. The last obvious transients disappeared before May 25.

At least 200 pairs nested annually. The majority nested in the larger cattail marshes, such as were present about Liebs, Onion, and Charleston islands, and in Little Buckeye, Honey Creek, and other marshes at the eastern end of the lake. A few nested in the inland cattail and sedge marshes scattered along the canal and in Bloody Run swamp (Frontispiece). As was to be expected from the bird's preference for cattails, all except a few nests were made of either the broad-leaf or narrow-leaf cattail. The others were of bur reeds (*Sparganium*) and sedges (*Carex* and *Scirpus*).

Nest building was generally well under way by mid-May. The first completed set of eggs was recorded May 15 (1930, 5 eggs), and the last set July 12 (1931, 5 eggs); the first young were noted May 25 (1929, 4 young), and the last August 8 (1929, 4 young); and the first fledglings out of the nest were seen from early June until mid-August. More than 30 of the 40 recorded nests contained 5 or 6 eggs or young each, and the remainder 3, 4, 7, or 8.

A survey made on Onion Island, June 9, 1928, revealed 35 nests, of which 5 contained eggs or young, and the remainder were empty "cock nests." These nests were of the customary globular type, and all except 4 had their openings in the general direction of south or west. On the next day 31 nests were examined in the cattail marsh at the mouth of Honey Creek; 4 contained eggs or young, and all except 5 opened to the south or west. Since 1928 the openings of 208 nests were observed, and in 161 the openings were south or west. There was 1 colony, noted June 15, 1929, which was an exception, for 11 of 19 nests opened toward the northeast.

The males were very persistent singers. The singing was by no means confined to daylight hours, and sometimes continued throughout the night, especially when there was moonlight. At intervals on the night of June

18-19, 1932, I timed an isolated singing male whose territory was in a small stand of cattail and found that between 10 P.M. and 3 A.M. his average was 9 songs a minute. This individual also sang the next day from 6 A.M. to 10 A.M. and at approximately the same rate as during the night. He slowed down to 4 songs a minute from 10 A.M. to 2 P.M., after which he again increased his amount of singing. In 5-minute timing at 5 P.M. he was singing at the rate of 7 songs a minute. The performance of this individual may not be unusual for the species, for from 1:40 A.M. to 2:50 A.M. on the moonlight night of July 22, 1932, I timed a male that was singing in a small stand of cattail on the north shore of Lake St. Mary's, Mercer County, Ohio, and found that he sang at the rate of 11 songs a minute. The species sang more persistently on cloudy days and in early morning and late evening than it did during the middle of sunny, hot days.

The amount of singing done by these birds declined sharply after mid-August, and by September 5, only an occasional, half-hearted song could be heard. Despite the lack of song the species remained a rather conspicuous marsh inhabitant in early fall, since it did much scolding and was remarkably tame. During the early fall duck hunting season the birds offered much entertainment for the duck hunters, as they persisted in hopping about duck blinds, and even hopped into the hunters' rowboats in pursuit of spiders and insects. Because of the large number of summer residents and the habits of the bird the fall migration was difficult to determine; most of the transients seemed to migrate through the area during the last 3 weeks of September.

There was 1 winter record. During the winter and early spring of 1932-33, an individual was found upon every occasion that it was sought, in an isolated cattail marsh at the head of Jack's Neck Bay. The marsh averaged about 10 yards in width and was 125 yards in length. The bird, apparently a male, began to sing in early April (Trautman, 1935*b*: 322). On December 22, 1935, various members of the Wheaton Club (1936: 64) on their annual *Bird-Lore* Christmas census found 5 individuals. One of these birds was in the cattail marsh on Onion Island; the others were in the marsh at Honey Creek. Probably some of them remained through the winter.

The Prairie Marsh Wren was probably present throughout historic time because a suitable nesting environment was always present. It probably nested in fair numbers about the postglacial ponds before 1828, increased in numbers with establishment of the large marshes about the reservoirs, and after 1890 began to decrease with the shrinkage of marsh acreage. If marsh acreage continues to diminish at the same rate as during the survey, this bird will become an uncommon nesting species within 50 years.

Cistothorus stellaris (Naumann)

Short-billed Marsh Wren

Rare or uncommon spring and fall transient, very rare summer resident.

Earliest date of arrival:	April 30, 1929	.....
Median date of arrival:	May 5	(September 20)
Median date of departure:	(May 20)	October 12
Latest date of departure:	.....	October 15, 1927

The Short-billed Marsh Wren was a secretive and silent transient whose daily numbers were probably greater than the records indicated. With one exception (April 30, 1929) all spring transients were recorded in May. Fall transients were noted in late September and early October. During migrations never more than 5 were seen in a day. Virtually all transients and breeding birds were in a distinct and highly restricted habitat: i.e., in an open, treeless, swampy, ungrazed meadow whose principal plants were various species of bur reeds and sedges (mostly of the genera *Cyperus*, *Scirpus*, and *Carex*), where cattails were almost or entirely absent.

It is probable that 1 or more pairs nested each year between 1922 and 1934, but the species was recorded nesting in only 2 years. On August 4, 1929, James S. Hine, Edward S. Thomas, and Charles F. Walker found a colony of 8 pairs in a bur-reed and sedge meadow along the canal, one-half mile north of Sellars Point. At that time the males were singing persistently. Later visits by myself and others revealed that these wrens sang until early September. On August 14, Hine and I found 2 broods of young with their parents in this colony.

The second nesting was found May 21, 1931, when I noted 2 singing males. This colony was in a bur-reed and sedge swamp-meadow beside the Little Buckeye game refuge. By May 30 the number of singing males had increased to 5. On June 11, 3 other small colonies were found near the first, and altogether there was a total of 16 singing males. A search was made for eggs or young on June 11, but only a few "cock nests" were found. While I was searching for nests the males were most conspicuous as they sat upon the higher weed stalks and sang or scolded. The females were inconspicuous, and it was only by persistent searching that I had an occasional glimpse of one. On July 12 both sexes were noted carrying food, and a male was observed feeding a small fledgling. Unlike the Prairie Marsh Wren, this species appeared to sing most persistently during the warmer portion of the day.

Mimus polyglottos polyglottos (Linnaeus)

Eastern Mockingbird

Rare resident.

The first record of an Eastern Mockingbird was made by Edward S. Thomas, when on June 2, 1917, he saw 2 birds, possibly a breeding pair,

near the village of Buckeye Lake. None were seen during the study until 1925, when a pair was found in a hawthorn-dotted pasture on the north shore opposite Cranberry Island. From 1925 to 1934 between 1 and 4 pairs (1929) were noted each year. Each pair tended to remain in the vicinity of its former nesting site throughout the year, but the young usually disappeared in late summer or early fall. No evidence of a spring or fall migration was noted. A decrease in numbers always occurred during the more severe winter storms. It is possible that during such storms the birds left the area; however, it appears more probable that they perished. It has been noted elsewhere in central Ohio that a decrease in numbers followed the severest winters.

Between 1925 and 1934 nests were noted in a brushy meadow beside Lakeside Woods, in a hawthorn-dotted pasture near the onion fields of Bloody Run swamp, in a brushy thicket near Thornport, beside the canal south of Millersport, and in the hawthorn pasture on the north shore opposite Cranberry Island. In the last locality a nest was found each year from 1925 to 1932.

The bulky nests were usually located in hawthorn or other thorny trees. They were made of small twigs, strips of bark, string, and an occasional rag, and were from 2 to 7 feet above the ground. The earliest set of eggs (4) was found May 23 (1928), the last set (5 eggs) August 2 (1929); the fledglings were seen out of the nest and with the family together, from June 19 (1928) to August 29 (1929). On May 26, 1928, James S. Hine and I collected for Ohio State Museum a nest and 4 eggs that were in a hawthorn tree in the pasture on the north shore opposite Cranberry Island.

Dumetella carolinensis (Linnaeus)

Catbird

Very common spring and fall transient, common summer resident.

Earliest date of arrival:	April 21, 1922	.....
Median date of arrival:	April 25	(September 1)
Median date of departure:	(May 20)	October 15
Latest date of departure:	.....	November 17, 1928

One to 10 Catbirds were recorded every year during the last 3 days of April, and by May 5 the species was common. From May 10 to May 16 the greatest numbers a day for the spring were attained, and as many as 50 were noted daily. A sharp decrease in numbers usually occurred about May 20, and a few days later only summer residents remained.

The majority nested in the lowland thickets and woodlands and were most numerous about the shores of the lake and to the north and west of it. A few pairs were found nesting each year in the denser thickets of upland woods, and a fair number nested about the shrubbery of farmhouses. The species was not adverse to rather wet situations, for a considerable number

were found nesting on Cranberry Island, in cattail marshes and in inland swamps.

The nest was usually placed in rosebushes, blackberry bushes, tangles of vines, shrubbery, and small saplings. It was seldom more than 8 feet above the ground, and 2 nests were built upon the ground. Nest building was usually well under way by May 10. The first completed set of eggs was found May 15 (1932, 4 eggs), and the last June 24 (1927, 6 eggs); the first young in the nest were noted May 26 (1928, 4 young), and the last July 25 (1930, 5 young); the first fledglings, recently out of the nest, were seen June 14 (1928, 4 young), and the last July 25 (1928). The 35 nests observed contained from 4 to 6 eggs or young each. It was estimated that about 200 pairs annually nested.

The males did much singing from their arrival in spring until mid-June. Thereafter a marked decrease in amount of song was noted, and by mid-July only a few sang spasmodically. A slight increase in numbers, denoting the beginning of the southward migration, became evident in late August, and by mid-September the peak of migration was attained. There was 1 exceptionally late fall record of a bird seen on Cranberry Island, November 17, 1928, by Charles F. Walker and me.

The Catbird was a regular transient and nesting species throughout the historic past. When the area was largely forested it probably nested most numerous in bushes and saplings in and about the edges of bogs.

Toxostoma rufum (Linnaeus)

Brown Thrasher

Common spring and fall transient and summer resident.

Earliest date of arrival:	(April 4, 1925)	.....
Median date of arrival:	April 7	(September 10)
Median date of departure:	(May 20)	October 10
Latest date of departure:	.....	(November 2, 1929)

The advance guard of Brown Thrashers was always seen in the first half of April, but it was generally not until the very last of April that the species became numerous. The peak of migration occurred in early May, when as many as 40 could be seen in a day. The transients began to decrease in numbers about May 15, and by May 25 only summering birds were noted.

The Brown Thrasher most frequently nested in osage-orange hedges, in thickets of hawthorn, wild plum, or small honey locust, and in large tangles of rosebushes and blackberry bushes. As these plants were more prevalent in the lowlands to the north and west of the lake, the species was most numerous in those sections. The bird did not always nest in thorny trees or shrubs, for 1 nest was found in a small white elm sapling, and 2 were on the ground beside the trunks of bushy hawthorn trees. The bulky nest was similar in size to the nest of the Eastern Mockingbird, and was most fre-

quently placed from 2 to 14 feet above the ground. Of 14 nests examined, 6 contained 3 eggs or young; 5, 4 eggs or young; 1, 5 eggs; and 2, 6 eggs. The earliest completed set of eggs was found May 7 (1931, 4 eggs), and the last July 16 (1930, 5 eggs); the first young in the nest were noted May 16 (1926, 3 young), and the last August 14 (1929, 4 young); the first fledglings out of the nest were seen May 27 (1926, 4 young), and the last August 20 (1929, 6 young). It was estimated that between 40 and 90 pairs annually nested.

Upon its arrival in spring and until late June the male was a persistent singer. In early July the amount of singing began noticeably to lessen, and by August virtually all singing had ceased. Throughout August and until its departure, the species was secretive and shy, and usually the only evidence of its presence was a sharp, clicking note, coming from some dense tangle or brush heap. Because of this extreme secretiveness the southward migration was poorly defined; what data were accumulated, indicated that migration took place chiefly in late September. No record of a wintering individual was obtained, though there were a few records elsewhere in central Ohio. On December 22, 1935, a wintering bird was found in Lakeside Woods (Wheaton Club, 1936: 64).

Turdus migratorius migratorius Linnaeus

Eastern Robin

Very common spring and fall transient, common summer resident, uncommon winter visitant.

Earliest date of arrival:	(January 29, 1932)	.....
Median date of arrival:	February 22	(September 10)
Median date of departure:	(April 20)	(November 5)
Latest date of departure:	.....	.....

The first large flight of Eastern Robins was seen during the first warm period of late winter. The earliest flight was on January 29, 1932. In the average year the first flight occurred between February 10 and 28, and by the end of that period between 100 and 1600 birds could be seen in a day. The latest flight took place during the extremely backward season of 1926, and then the first arrivals were not seen until March 10. The first large flight of this species usually occurred simultaneously with that of the Eastern Redwings, Bronzed Grackles, Black Ducks, Pintails, and American Mergansers.

The majority of transients were present during the last 3 weeks of March, and then many hundreds, and sometimes several thousands were daily seen. A slight decline in numbers was generally noted about April 1, and by April 20 almost all transients had left. The few that remained during late April and early May were surprisingly wild, flocking together in small groups in the most secluded portions of the larger remnant forests.

The species nested throughout the entire land portion. There were several hundred pairs each year. The nests were most often near human habitations and were usually placed in the more open parts of large shade trees, small saplings, bushes, or about the eaves and pillars of porches. Those nests not in the close vicinity of farmhouses or cottages were usually in saplings and bushes on the edges of brushy fields, along fence rows bordering cleared fields, or under bridges. Occasionally, a nest was found in the central part of the densest swamp forests, as far removed from human habitation as possible. The owners of these forest nests were always extremely shy and difficult to approach. Most nests were 1 to 35 feet above the ground. The exceptions were on the ground beside some large object, such as the foundation of a cottage or the base of a large tree.

The first pairs began nest building in late March, and from then on the number of nesting birds increased daily. By May almost all Eastern Robins were nest building, incubating eggs, or feeding young. A decrease in nesting activity became apparent in early July, and by mid-August nesting was nearly over. The first set of eggs was noted March 31 (1929, 3 eggs), and the last set July 17 (1930, 4 eggs); the first young in the nest were found April 7 (1929, 4 young), and the last August 9 (1930, 3 young); the first fledglings were observed April 18 (1930, 4 young), and the last August 20 (1930). More than four-fifths of the 120 recorded nests contained sets of 4 eggs or young. The remainder contained sets of 3, or more rarely, 5 eggs or young. Only 1 nest contained a Cowbird's egg.

Sometime during late July or early August the majority of the adults and young left the vicinity of the nesting sites and the open country and retired to the more secluded woodlands, where they remained until early September. During this period the molting of adults took place, and both adults and young were more quiet than at any other season. As long as the weather was hot and dry the birds remained in these secluded localities. When a rain storm cooled the atmosphere and thoroughly soaked the ground the birds temporarily came to the lawns and short-grass pastures to feed on worms and other food which the rain had made available. With the coming of cool weather in September, the species became more evenly distributed.

Small groups or flocks were apparent by late July, but it was not until the first cool days of September that this grouping was pronounced. The birds remained in flocks until early spring. The peak of the fall migration occurred in October. Then, several flocks of 50 to 500 birds could be noted during each evening, flying to their roosting places in the woodlands. The number of winter residents varied from a few to several hundred.

The nesting habits of Eastern Robins suggest that the species was more numerous during the investigation than it was at any earlier period of historic time. Nesting pairs were probably present in at least small num-

bers when the area was largely forested, because even today a few pairs nest in a forest habitat such as was present before 1800.

Hyllocichla mustelina (Gmelin)

Wood Thrush

Common spring and fall transient, uncommon summer resident.

Earliest date of arrival:	April 10, 1932	.....
Median date of arrival:	April 28	(August 20)
Median date of departure:	(May 23)	September 20
Latest date of departure:	.....	October 1, 1927

With the exception of 1 year (April 10, 1932), all first spring arrivals were noted in the last half of April or the first 3 days of May. By May 5 solitary birds or small groups could always be found in many large woodlands, and by May 16 the species had reached the height of its spring abundance. Then as many as 35 individuals were recorded in a day. The daily number of transients began to decline sharply by May 22 or a few days thereafter, and by the last of May no transients could be found.

June censuses of singing males recorded between 17 and 26 pairs a year. At least two-thirds of the nesting pairs were in those parts of swampy woodlands which had a profuse shrub layer. The remaining pairs were in the densest shrub layer of the largest, hilly, beech-maple woodlands, and in such small, lowland groves as those adjacent to the North Bank. Nests were most frequently 4 to 40 feet above the ground in forks of small shrubs and saplings and were chiefly made of dried grasses, small twigs, rootlets, paper, and string. The earliest nest was found May 16 (1926, 4 eggs), and the last nest June 15 (1929, 4 eggs); the first young in the nest were noted May 21 (1933, 3 young and 1 young Cowbird), and the last July 4 (1932, 4 young); the first fledglings recently out of the nest were noted June 5 (1929, 4 young), and the last July 25 (1928, 1 young). Of 6 nests recorded, 4 contained 4 eggs or young each; and 2, 3 eggs and 1 Cowbird egg.

The fall migration was much less pronounced than was the spring one, and never more than 18 individuals were recorded in a day. The maximum abundance occurred during late August and early September.

This forest-inhabiting thrush was probably a much more numerous nesting species in early historic time, when the area was largely forested. With the dwindling or overgrazing of the remaining woodlands, the species may be expected to decrease further in nesting abundance.

Hyllocichla guttata faxoni Bangs and Penard

Eastern Hermit Thrush

Very common spring and fall transient.

Earliest date of arrival:	February 26, 1927	September 24, 1930
Median date of arrival:	March 28	September 29
Median date of departure:	May 8	November 10
Latest date of departure:	May 11, 1929	December 26, 1926

The first of these hardy thrushes was recorded between February 26 and April 1 of each year. About mid-April and until April 25, the peak of migration occurred, and then between 20 and 200 individuals were recorded daily. A decline in numbers became apparent during the last 5 days of April, and the last transients left between May 2 and May 11.

The Eastern Hermit Thrush was less conspicuous, and possibly less numerous, in fall than it was in spring. Even during the height of the movement, in the first 3 weeks of October, never more than 95 individuals were recorded in a day, and usually the daily number was below 30. In both movements the species chiefly inhabited the low shrub layer of swamp forests.

No actual evidence was obtained of the species wintering, although a bird, seen in the Big Woods on December 26, 1926, and February 26, 1927, might have been the same individual which had wintered in this woodland. During the investigation several of these thrushes wintered elsewhere in central Ohio.

Hylocichla ustulata swainsoni (Tschudi)

Olive-backed Thrush

Very common spring and fall transient.

Earliest date of arrival:	April 25, 1928	August 29, 1928
Median date of arrival:	April 28	September 6
Median date of departure:	May 30	October 19
Latest date of departure:	June 3, 1928	November 3, 1928

The first Olive-backed Thrush appeared between April 25 and May 2 of each year. The species was rather numerous from May 14 until May 24, when there was a marked decrease in numbers. The last transients departed between May 28 and June 3. The first southbound transients were noted between August 29 and September 11, and from mid-September to October 10 the species was numerous. About October 12 or a few days thereafter a sharp decrease in numbers became apparent, and the thrush disappeared between October 15 and November 3. During the spring and fall periods of maximum abundance between 40 and 300 individuals could be daily recorded. Principally because of its large numbers this was the most conspicuous of the thrushes, particularly in spring when the males sang persistently.

The Olive-backed Thrush inhabited the shrub layer of swampy remnant forests. It was present in small numbers about brushy fields, weedy and brushy fence rows, edges of brushy swamps, cattail marshes, and shrubbery near farmhouses and cottages. Apparently the species has been a regular and numerous transient throughout historic time. Some 50 years ago Wheaton (1882: 207) wrote: "The Olive-backed Thrush is the most numerous of our migrant thrushes."

Hylocichla minima aliciae (Baird)
Gray-cheeked Thrush

Uncommon spring and fall transient.

Earliest date of arrival:	April 30, 1929	September 2, 1930
Median date of arrival:	May 6	September 11
Median date of departure:	May 28	October 11
Latest date of departure:	June 2, 1928	October 13, 1928

This species was usually the last of the thrushes to arrive in spring. It was recorded only once in April, its average date of arrival was not until May 6, and during 2 years it was not noted until mid-May. In the average spring the bird was fairly well represented from May 13 to May 20. There was usually a sharp decline in numbers about May 25, and a few days later only an occasional straggler could be found. The greatest concentration of numbers in fall was from September 24 to October 7. During both migrations seldom more than 12 individuals were noted in a day; the greatest number ever recorded was 45 (May 15, 1932). The species seemed less numerous in fall than it was in spring. Unlike other thrushes of the genus *Hylocichla*, the Gray-cheeked Thrush did not principally inhabit lowland woods, but was found to be fully as numerous in the more open, upland, beech-maple woodlands. Conditions for this species have been favorable throughout historic time, and it probably has been a regular semiannual transient.

Hylocichla fuscescens salicicola Ridgway
Willow Thrush
Hylocichla fuscescens fuscescens (Stephens)
Veery

Uncommon spring and rather rare fall transient.

Earliest date of arrival:	April 25, 1931	August 24, 1928
Median date of arrival:	May 2	September 1
Median date of departure:	May 24	September 27
Latest date of departure:	May 27, 1928	October 4, 1927

In spring the species was first noted in April during 4 years of the investigation, and in 8 years the first was found between May 1 and 6. The period of maximum numbers was May 8 to 18, and the last transients were seen between May 21 and 27. The species was always uncommon; 1 to 5 individuals were usually recorded a day, and the maximum number was 19. The Willow Thrush and Veery seemed to be slightly more numerous in this area in spring than they were in other areas of like size in central Ohio.

The first arrival of the southward movement made its appearance in late August during 3 years, and in the remaining 9 years was first noted between September 1 and 7. The maximum numbers of transients were present between September 5 and 20, and the last birds were seen between Septem-

ber 24 and October 4. During autumn the species seemed less than half as numerous as it was in spring. This scarcity may have been caused almost entirely by the inconspicuousness of these shy birds in the profuse vegetation of late summer and early fall.

The species was chiefly found in the dense shrub layer of the larger swamp forests. Less frequently, it was in brushy swamps in upland forests, in brushy fields, and about shrubbery of farmhouses and cottages. The birds were regular semiannual transients throughout historic time. There is a possibility that the species nested in the area in early historic time; it now nests in the northeastern and northern parts of the state.

The one specimen collected (May 5, 1928) is intermediate between *H. f. fuscescens* and *H. f. salicicola*. In examining specimens taken in Ohio and Michigan I found that breeding birds were intermediate or referable to *salicicola*, most transients were *salicicola* or intermediate instead of entirely *fuscescens* as was formerly supposed, and only a few were referable to *fuscescens*. I conclude that both forms and intermediates occur in the area.

Sialia sialis sialis (Linnæus)

Eastern Bluebird

Common spring and fall transient and summer resident, absent, rare, or uncommon in winter.

Earliest date of arrival:	(February 8, 1925)	.....
Median date of arrival:	February 23	(September 7)
Median date of departure:	(April 15)	November 23
Latest date of departure:	.....	(December 1, 1927)

The first Eastern Bluebird migration frequently appeared simultaneously with the first large blackbird and Eastern Robin flights and the first definite warm period after January. Occasionally, however, this first migration did not take place until early March. The species never became numerous until about March 15. At the peak of migration, March 18 to April 10, as many as 120 individuals were recorded in a day. The last transients left between April 12 and 25. The first southbound transients were noted during the first half of September, and until the end of the month a rather gradual, daily increase in numbers was observed. The migration reached its peak in October, when the bird was as numerous as in spring. In autumn its lispng note, uttered overhead or from a fence post or tree, was one of the most pleasing and familiar of all fall bird calls. The Eastern Bluebird was very conspicuous during the calm, warm "Indian summer" days of late October—such weather was called "bluebird weather" by local sportsmen.

In milder autumns small groups stayed during November, December, and early January. The species largely disappeared before mid-November in colder falls. During the coldest winters, especially those with consider-

able snow, the birds were very rare or entirely absent, but in warmer winters with little snow, a few remained. The species preferred hilly and well-drained fields, pastures, orchards, and open woods to the east and south of the lake.

The 22 recorded nests were in cavities, holes, or bird boxes. Old woodpecker holes in trees, posts, and telephone poles were often used. The first completed nest was noted April 9 (1927); the first nest with the full complement of eggs was found April 16 (1927, 5 eggs), and the last July 13 (1929, 4 eggs); the first young in the nest were noted May 3 (1928, 3 young), and the last August 8 (1926, 4 young); the first fledglings recently out of the nest were seen May 12 (1928, 4 young), and the last August 10 (1924, 2 young). Sixteen nests contained 4 eggs each; the others, 3, 5, or 6. The young birds generally became numerous by June 1, and from then until late summer they were a conspicuous part of the bird fauna. Many pairs nested twice each spring, and the second nesting was well under way by June 10.

There were 30 to 70 pairs of these birds annually nesting between 1922 and 1925, but by 1933 the yearly number had decreased, largely because of fewer nesting sites, to between 20 and 40 pairs. The nesting sites in dead snags and trees were destroyed faster than they were replaced, the Starling became a competitor for nesting sites, and the Eastern Bluebird did not utilize to the fullest extent the nesting boxes erected for its use. It was probably a regular transient and nesting bird throughout historic time.

Poliophtila caerulea caerulea (Linnaeus)

Blue-gray Gnatcatcher

Fairly common spring and fall transient and summer resident.

Earliest date of arrival:	April 7, 1928	.....
Median date of arrival:	April 11	(August 25)
Median date of departure:	(May 20)	September 10
Latest date of departure:	.....	September 23, 1930

A few Blue-gray Gnatcatchers were noted each spring before April 15, and by the last of that month the species had become rather numerous. At the peak of migration, generally between May 3 and 17, 20 birds could be daily recorded and as many as 40 were occasionally noted. A decline in the number of transients took place shortly after May 20, and by May 23 only nesting individuals remained.

Censuses of singing males, taken during June of several years, indicated that not more than 30 pairs annually nested, and that there were fewer nesting pairs in 1933 than in 1922. The change was caused by shrinkage of the woodland habitat. The species was found nesting in large woodlands which still retained many large trees. Both lowland and upland forests were inhabited by the birds, but those of the lowlands appeared to be slightly

preferred. The observed nests were 10 to 60 feet, usually 20 to 35 feet, above the ground, on small horizontal limbs of large trees. The nests were made of soft, tiny dried grasses, rootlets, and shredded bark, firmly held together with spider webs and covered on the outside with lichens. The first nest with eggs was observed May 12 (1928, 3 eggs), and the last June 16 (1928, 3 eggs); the first young in the nest were seen May 17 (1928, 3 young), and the last June 30 (1928, 2 young of this species and 1 young Cowbird); and fledglings out of the nest were noted from May 27 (1926) to July 2 (1932). Five nests contained 3 eggs or young each; 1, 4 eggs; and 3, 2 eggs or young of this species and 1 Cowbird egg.

The family group remained together from the time that the last young left the nest until late July. With disintegration of the groups in early August adults and young became quiet and inconspicuous, which made it difficult to record late summer birds. What evidence was obtained indicated that transients migrated chiefly in late August and on the first few days of September.

A pair of Blue-gray Gnatcatchers was first seen on May 20 near their recently completed nest in the Lakeside Woods. The nest was some 10 feet above the ground, saddled on a horizontal branch of a honey locust. When I climbed the tree to record the contents of the nest the birds became greatly perturbed and vociferous. The next day I found the same pair busily engaged in building another nest, less than a foot farther out on the same limb on which the first nest was built. Fearing that further disturbance on my part would cause the birds to leave the new nest, I did not go near them again until June 2, when the nest contained 4 eggs. The owners again became much excited at my proximity, but they did not desert this nest, for upon my next visit, on June 12, it contained 4 young. By June 30 the young had left the nest.

As the Blue-gray Gnatcatcher is chiefly a forest inhabitant it must have nested more abundantly in the area in early and mid-historic times, before the removal of the forests.

Regulus regulus satrapa Lichtenstein
Eastern Golden-crowned Kinglet

Common spring and fall transient, rare or uncommon winter resident.

Earliest date of arrival:	.....	September 25, 1928
Median date of arrival:	(March 20)	October 4
Median date of departure:	May 3	(December 1)
Latest date of departure:	May 11, 1929	.....

The first Golden-crowned Kinglets of fall could always be found before October 10, and by mid-October 5 to 50 individuals could be recorded daily. At the peak of migration, generally from late October to early December, as many as 70 could be recorded.

At least 3 individuals were found throughout each winter, and in a few years there were as many as 30. The species was much less numerous in this area in winter than it was in almost any other section of central Ohio, notably in the Sugar Grove region. The few which did winter were usually found in the densest of wild plum and hawthorn thickets.

The first spring arrivals occasionally appeared in the first week of March, but usually they did not arrive until March 15 to 23, and it was not until after March 27 that the species could be daily encountered in small numbers. The daily numbers rapidly increased after April 3, and at the height of spring abundance, between April 9 and 21, between 25 and 150 birds were recorded daily. During migrations the majority of individuals inhabited the brushier portions of woodlands, brushy thickets, weedy fence rows, and thickets of hawthorn and wild plum.

Regulus calendula calendula (Linnaeus)

Eastern Ruby-crowned Kinglet

Common spring transient, rather uncommon fall transient.

Earliest date of arrival:	March 30, 1929	September 15, 1929
Median date of arrival:	April 2	September 23
Median date of departure:	May 16	October 26
Latest date of departure:	May 18, 1929	October 30, 1928

The Eastern Ruby-crowned Kinglet appeared between March 30 and April 10. The species remained uncommon until mid-April, when the numbers rapidly increased, and from April 20 to May 10 the greatest daily numbers, 15 to 40, were attained. As many as 60 a day were noted during large flights. The last transients were seen between May 14 and 18. The first arrivals of the southward migration were present by mid-September or a few days thereafter, and the largest numbers were recorded during the first half of October. The numbers rapidly decreased after October 20, and by October 25 only a few were noted. This bird was rather uncommon and inconspicuous throughout the southward movement and usually less than 10, and never more than 27, were seen in a day.

As with the Golden-crowned Kinglet, this species chiefly inhabited woodlands, thickets, and brushy fence rows, and in such situations was found most frequently where there were dense clumps of hawthorn, wild plum, honey locust, and osage orange. The bird appeared to be less numerous in this area than it was in other localities of similar size in central Ohio; it was decidedly less numerous than it was in localities which contained many conifers. A few years after the completion of the survey, on December 26, 1937, Edward S. and John S. Thomas found a bird in the east end of Big Woods (Wheaton Club, 1938: 48).

Anthus spinoletta rubescens (Tunstall)
American Pipit

Common spring and fall transient, very rare winter visitant.

Earliest date of arrival:	(March 1, 1930)	September 10, 1925
Median date of arrival:	March 22	September 22
Median date of departure:	May 12	November 5
Latest date of departure:	May 25, 1929	(November 29, 1924)

The first migrating American Pipits arrived between March 1 and 25. Flocks of moderate or large size, 15 to 500 birds, appeared to be dominant in spring, and only during the very last part of migration were groups of less than 10 birds often observed. The peak of migration occurred from the last of March until mid-April. Then it was possible to record as many as 800 individuals in a day. About April 28 there was a sharp decline in daily numbers, and by May 2 only an occasional small flock or individual could be noted. Throughout spring the species was found principally in recently plowed fields, in wheat fields where the plants averaged less than 5 inches in height, in short-grass pastures, and on the larger mud flats about "sky ponds" or overflow puddles.

The first southbound transients appeared between September 10 and 25, and by October 1 the fall migration had definitely begun. At the peak of migration during the first 3 weeks of October as many as 800 individuals were recorded in a day. A decrease in the number and size of the flocks became apparent in early November, and by mid-November only an occasional small group could be located. The autumn birds were chiefly in the fall-plowed fields and in the short-grass pastures. A few were found on peat islands and mud flats of the lake.

On September 29, 1928, I saw some 20 individuals of this species on a peat island near the east end of Cranberry marsh. They faced a moderate breeze, and individuals from the group were flying into the air 3 or 4 feet, capturing moderate-sized flying beetles, and then dropping upon the island again. Usually 4 or 5 birds were in the air at once. The continual bobbing up and down was a strange sight, and somewhat resembled that of trout in a pool rising after insects.

The American Pipit did not winter as regularly in the area as it did in some portions of southern Ohio, and only upon 3 occasions was it recorded in that season. On December 29, 1928, Robert B. Gordon and I collected an individual in a flock of Horned Larks in a field on the south side of the lake. On February 2, 1929, I found 2 birds feeding with Horned Larks in a snow-covered field a mile south of the lake. On December 24, 1932, Charles F. Walker and I heard and saw 2 as they flew about a plowed field in Bloody Run swamp (Trautman and Walker, 1933: 40). As the species is an inhabitant of fields and mud flats, conditions have been more favorable for it during late historic time than they were earlier, when the land was principally forested and the bog lake contained few or no mud flats.

Bombycilla cedrorum Vieillot
Cedar Waxwing

Usually fairly common in late spring and fall, uncommon in winter, very rare summer resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(May 10)	(August 20)
Median date of departure:	(June 5)	(October 25)
Latest date of departure:	.....	.....

The Cedar Waxwing was very irregular as regards transient, summer, and winter abundance. The species ranged from absent or rare to very common in every month of the year, and there appeared to be almost no indications of semiannual migrations. During 9 years, however, 10 to 115 individuals were noted daily in the latter part of May and the fore part of June, and during 6 years from 5 to 80 birds were daily found in September.

The species was absent or very uncommon in summer, except in 1929, when 2 to 70 individuals—an average of 22 birds for each of 11 field trips—were noted between May and September. The greatest fluctuation was in winter. During some years no individuals were recorded from November to mid-March, in others 1 or more flocks of 10 to 60 birds remained all winter, in still other years, 1 or 2 flocks remained a few days and then disappeared.

At all seasons except, perhaps, winter, the bird seemingly preferred the vicinity of water, and was usually found in brushy swamps, in woodlands about the lake, along tree-bordered streams, and in the wettest portions of lowland woods. In warm weather the Cedar Waxwing spent much time flycatching, especially over water or above an opening in swampy woodlands. In fall and winter the bird was found wherever berries, fruits, and such seeds as those of the blue beech (*Carpinus caroliniana*) and hop hornbeam were present in abundance. Because of the large quantities of cranberries and poison sumac berries and the large numbers of insects on Cranberry Island each autumn, the birds were frequently seen there at that season.

There were 2 nesting records. On June 26, 1929, I found an adult and 3 small fledglings in the brushy thicket at the mouth of Honey Creek. On July 3, 1932, I observed a pair in the brushy thicket beside the lake, opposite the mouth of Honey Creek; on August 7 I saw an adult feed a fledgling that was only recently out of the nest. The species has been annually present throughout historic time.

**Lanius borealis borealis* Vieillot

Northern Shrike

Casual winter visitor.

There is one possible record. On November 8, 1924, I watched a large shrike with distinctly barred breast and light gray forehead for more than

an hour in a field a few miles north of Millersport. It chased an English Sparrow, which eluded capture only by diving into a dense portion of an osage-orange hedge (Wood and Walker, 1925: 47). This sight record cannot be accepted without question, for this bird may have been an exceptionally marked Migrant Shrike. The Northern Shrike has been captured as far south as Buckeye Lake in Ohio, and the species probably has occasionally occurred in the area during historic time.

Lanius ludovicianus migrans Palmer

Migrant Shrike

Uncommon spring and fall transient and summer resident, very rare winter visitor.

Earliest date of arrival:	(March 25, 1929)	(July 23, 1933)
Median date of arrival:	April 3	August 28
Median date of departure:	(April 30)	September 1
Latest date of departure:	.....	(September 8, 1933)

The first Migrant Shrike recorded in each northward migration during the investigation was seen between March 25 and April 5. Usually, the first record was of a solitary bird, but in 2 years it was also that of the largest flight of spring. In the years when a distinct, early flight did not occur, the number of birds increased gradually until approximately April 7. The spring migration was at its height during the last 3 weeks of April, and then as many as 15 birds were noted in a day. In spring all except a few were found about osage-orange hedges, and the remainder were in hawthorn-dotted pastures and thickets. Upon a few occasions shrikes were observed migrating northward in the daytime. The birds flew at a low elevation across the fields in a succession of short flights, stopping frequently to perch for short periods of time upon fences, trees, or telephone poles, and to look for food. A transient followed for 3 miles was still going northward in the same manner when last seen.

Nesting pairs were found in mid-April about their nesting sites in osage-orange hedges and hawthorn thickets. Between 10 to 19 pairs nested annually. The nests were bulky affairs, chiefly of rootlets, dried grasses, very small twigs, bits of paper, twine, and feathers, and were 4 to 15 feet above the ground in thorny trees or bushes. The only nest with a complete set of eggs (5) was found April 30, 1933; the first nest with young was found May 15 (1932, 5 young), and the last June 15 (1929, 6 young); the first fledglings out of the nest were seen June 2 (1928, 4 young), and the last June 26 (1929, at least 3 young). The group of 4 young, recorded June 2, 1928, were first noted upon the top wire of a fence, eating a Song Sparrow, which I had previously seen a parent capture. Later, a fledgling was collected, and its greatly distended stomach contained the whole defeathered right wing, scapular, pelvic girdle, and part of the flesh from the breast of the sparrow.

Throughout spring and the nesting season, adults were rather conspicuous, but after the fledglings could fly both adults and young became very inconspicuous. The southward migration was surprisingly early, for a well-defined movement was noted as early as July 23, and the peak of migration appeared to be during mid-August. By late August only stragglers remained. Further evidence of this early migration was noted elsewhere in central Ohio.

A few were observed during 4 winters. At this season the birds ranged widely in search of food and usually remained only a few days in any locality. The Migrant Shrike was a regular transient and nesting species throughout historic time, but may have been less numerous formerly, when much of the area was forested.

Sturnus vulgaris vulgaris Linnaeus
Starling

Absent or casual visitor in 1922, increasing to very common transient and common resident by 1934.

Earliest date of arrival:	.....	.....
Median date of arrival:	(February 20)	(August 25)
Median date of departure:	(April 10)	(November 15)
Latest date of departure:	.....	.....

In 1922 no Starlings were recorded in the area. In 1929, 8000 were noted in a day. This is the most remarkable change in the status of any bird during the 12-year investigation, and rivals in many respects the spectacular change in the status of Passenger Pigeons in the last century.

The first authentic Starling record appears to be that of a bird which Edward S. and John S. Thomas, Robert M. Geist, Harold S. Peters, and I saw near the village of Buckeye Lake on February 11, 1923. It is probable that an occasional invader had appeared previous to this date, because the first Starling record for Ohio was as early as January, 1916 (Hicks, 1933: 317), the first record for central Ohio was October 20, 1921, and another early record, of a bird seen by Charles F. Walker some 15 miles southwest of the Buckeye Lake area, was for September 18, 1922.

The second Starling was recorded for the area on October 27, 1923, when I saw an individual along the south shore opposite Sellars Point. Small flocks were seen the following winter at various localities in central Ohio, but none were noted at Buckeye Lake until March 21, 1924. None were seen during the spring and summer of 1924, but on September 25 a flock of 10 was recorded, and between October 18 and November 29, from 5 to 15 were noted during each of 5 days. The species was not again recorded until February 8, 1925, though there were Starlings throughout that winter elsewhere in central Ohio, and as many as 200 a day were recorded about barns a few miles south of Columbus. In early March, 1925, a small flight

occurred at the lake, and during April a pair was several times recorded. On May 8, I found the nest of this pair in an old woodpecker hole approximately 40 feet above the ground in a partly dead white elm in a woodlot one-half mile north of the village of Buckeye Lake. During the remainder of 1925 a few birds were recorded each month. There were no wintering birds during the 1925-26 winter, and it was not until the first wave of the spring blackbird migration, on February 23, 1926, that the Starling was again recorded. From February 23 until April 1, 10 to 50 were noted during each field trip. After April 1 there was a decrease in numbers, and never more than 5 were seen in a day until October 1. A pair was observed nesting in a martin house on the south shore opposite Sellars Point. From October 1 to December 11, 1926, 1 to 10 birds were recorded in each of 14 field trips, and a total of 81 birds was seen.

Starlings were observed only on February 6 (10 birds) of the 1926-27 winter. As in the preceding winter the first spring wave of the 1927 blackbird migration, on February 22, brought with it several flocks of Starlings, which totaled 300 birds. There was a definite migration in early March, a decrease in numbers to a few nesting pairs during April and until September, a steady increase in daily numbers until mid-October, and then a decrease. The numbers were larger for every month except January.

In mid-January, 1928, a group of 20 birds was noted. This same group, apparently, was repeatedly seen until the first wave of spring migration, on February 26. The peak of spring migration of the Starling in 1928 occurred in mid-March, and then an estimated 500 and 800 birds a day were recorded. As in other years there was a drastic reduction in numbers during April and until October; however, summer numbers were larger than ever before, and as many as 100 birds were noted in a day (July 30, 1928). There was also an October migration with a peak of 200 birds per day (October 20-27) followed by a decrease to between 10 and 25 individuals.

In January and the first half of February, 1929, an estimated 100 Starlings were in the area. This number was very small in comparison to the wintering or early transient numbers to be found elsewhere in central Ohio. On the night of February 16, 1929, an estimated group of 1500 were roosting in a big cupola of a public building in Columbus, and there were several other large groups roosting elsewhere in that city. The March migration in the Buckeye Lake area in 1929 was larger than ever before, as were the nesting numbers later. There began in mid-June and continued until early August a general flocking of these birds into the marshes about the lake. On the evening of June 26, I recorded an estimated 3000 Starlings going to roost in the cattail marshes about Honey Creek, and by July 13 the number had increased to 5000. The total number roosting in the area on July 13 probably was several times greater than the 5000 recorded.

The number daily noted decreased sharply during September, and there were fewer birds migrating in October than were present in the summer. The wintering number was larger than ever before, and 108 birds were seen on December 28, 1929. The Starling for the first time ranked as a dominant bird of the area in 1929. On each of 69 field trips for 1929 from 10 to 5000 individuals were noted—a total of 12,208 birds, or an average of 177 for each field trip.

The Starling has continued to increase markedly in annual abundance. The spring migration numbers have increased, and as many as 1800 individuals (March 14, 1931) have been noted in a day. Although the nesting numbers are lowest for any season, they have increased to between 100 and 200 pairs a year; the number of autumn and wintering birds has materially increased.

After the close of the investigation in 1934 and until 1936 this species increased in numbers at an astonishing rate, especially during migrations. The fall Starling roost on Cranberry Island, which first became evident in the autumn of 1929, has shown the most spectacular increase. In 1929 the greatest number recorded for any day for this 45-acre island was 400 individuals (October 26); but in 1934 Lawrence E. Hicks estimated between 7200 (August 24) and 51,000 (October 15) individuals present each day during 11 trips from late August to October 22. Upon 14 evenings between September 19 and December 12, 1935, Hicks and others carefully estimated the total number of Starlings roosting on Cranberry Island. The lowest estimate for any evening was 21,100 (December 12), the highest was 132,300 (November 10), the September estimate was 24,100. The estimates for 3 nights in October ranged from 31,200 (October 2) to 97,400 (October 29) and averaged 42,200 an evening, 7 estimates for November ranged from 91,400 (November 26) to 132,300 (November 10) and averaged 111,100 an evening, and 3 December estimates ranged from 71,300 (December 1) to 21,100 (December 12) and averaged 40,800 per evening. After December 12 the roost rapidly diminished in size, and by December 22 only an estimated 360 birds remained.

The nesting numbers increased from 1 pair in 1925 to 100 to 200 pairs from 1930 to 1934. Of 42 recorded nests 26 were in holes in trees, dead snags, telephone poles, or fence posts. The majority of the holes had been excavated by woodpeckers. The remaining nests were in various holes or crevices in barns and other outbuildings, deserted houses, schools, haystacks, or birdhouses. In 1928, 2 pairs nested in the attic of a deserted schoolhouse, and at the same time and within 10 feet of the nest of a pair of Barn Owls, and in the same year 2 occupied Starling nests were found on the same side of a tree and about 3 feet apart, while between them was the occupied nest of a Red-headed Woodpecker (see pp. 287-88).

The nesting sites were well scattered over the land area. The nests were from 4 to 75 feet above the ground and were chiefly of rather coarse grass, straw, rootlets, small twigs, and an occasional feather, string, or bit of rag or paper. The first nest with eggs was noted April 26 (1928, 5 eggs), the last June 10 (1928, 4 eggs); the first young in the nest were seen May 7 (1928, 7 young), the last young in the nest June 30 (1928, exact number unknown, but more than 2); the first fledglings out of the nest were noted May 10 (1932, at least 2 young), and the last in mid-July. The young began to flock during mid-May, and from then on the size and numbers of flocks rapidly increased. In early June, adults began to appear in the flocks of young, and by late June these flocks had increased in size until some numbered as many as 800 individuals. Throughout the summer seasons of 1929 to 1934 huge flocks of young and adults roosted in cattail marshes. Few, if any, roosted in barns, cupolas of public buildings, or steeples of churches, as they did in late fall, early winter, or early spring.

The invasion of the Starling into the area and its amazing increase in numbers between 1923 and 1934 has not, surprisingly, greatly affected the status of any particular bird species or the group of birds as a whole. The blackbirds may have become more crowded in the marshes since the Starling began roosting there in large numbers, and some blackbirds may have been crowded out. Food competition between such field-inhabiting species as meadowlarks, blackbirds, and sparrows may have become more intense, and possibly the Bob-white has been adversely affected during severe winters by having its limited food supply partially consumed by the Starling. It is probable that some nesting sites suitable for Eastern Bluebirds, Purple Martins, Tree Swallows, Prothonotary Warblers, and other hole-nesting species have been forcibly taken by the invader. Whether or not some bird or group of species will eventually become noticeably affected remains to be seen.

Vireo griseus noveboracensis (Gmelin)

Northern White-eyed Vireo

Uncommon spring and fall transient, very rare summer resident.

Earliest date of arrival:	April 25, 1931	.....
Median date of arrival:	May 1	September 12
Median date of departure:	May 12	September 24
Latest date of departure:	(May 20, 1931)	October 6, 1928

A small, regular spring migration of the Northern White-eyed Vireo took place each year from May 1 to 12. Seldom more than 5 were observed in a day, and only once, May 1, 1928, were as many as 10 seen. The southward migration was ill-defined, since few transients were annually noted and never more than 3 were seen in a day. Most fall birds were found during mid-September. Transients during both migrations were usually seen in

brushy situations that were often well drained and in brushy openings of second-growth forest.

It is surprising that so few of these birds nested in the area, since the species nested in considerable numbers in other sections of Fairfield and Perry counties, and in situations similar to those present about the lake. Three pairs of summering birds were observed. The first pair, noted June, 1928, was on the steep, brushy bank of the canal south of Millersport, and on June 28 I saw an adult feed a very small fledgling. The second pair was found at the same place, in June, 1929, and on June 25 I observed adults feeding 2 fledglings. On May 29, 1931, I saw a female carrying nesting material into a huge brushy tangle in Little Buckeye game refuge. On July 12 I found her nest with 3 young, about 3 feet above the ground in the fork of a white elm sapling. The nest was made of small grass blades, very small twigs, a few, dried, small leaves, and a bit of string. The species probably nested most numerous in this area in mid-historic time, when the greatest amount of brushy, hilly land was present.

Vireo flavifrons Vieillot
Yellow-throated Vireo

Uncommon spring and fall transient and summer resident.

Earliest date of arrival:	April 25, 1931	.....
Median date of arrival:	April 28	(August 20)
Median date of departure:	(May 20)	September 17
Latest date of departure:	.....	October 2, 1931

This bird was a regular spring transient, and 1 to 10 individuals a day were recorded in this season. The first arrival was noted each year between April 25 and May 1, and maximum abundance was attained between May 3 and 12. A decrease in numbers usually took place about May 15, and by May 24 only summering residents seemingly remained. The males were persistent singers throughout migration, and for this reason could be readily found.

Between 7 and 12 pairs of Yellow-throated Vireos nested annually. Of these, 1 to 3 pairs were in the Big Woods, 1 or 2 in Jack's Neck Woods, 1 or 2 in a large woods south of the lake, and 1 or 2 in a woods to the northeast. During some years a pair nested in the wooded ravine opposite the mouth of Honey Creek, and another pair nested in the woodland beside Honey Creek. Throughout the nesting season the species remained chiefly in those sections of large woodlands where there were numerous mature oak and maple trees. The bird appeared to avoid the large sections of typical lowland swamp forest of elm, ash, and soft maple trees.

Evidence of 4 nestings was obtained. On May 7, 1928, a pair was noted about a beech-sugar maple association at the extreme eastern end of the Big Woods, and until mid-June, the adults were repeatedly seen. On June

30 they were noted feeding 2 (possibly 3) fledglings, which had recently left the nest. On May 25, 1929, a female was found in the central portion of the Big Woods, carrying material and laying the foundation of a nest. This nest was about 35 feet above the ground in a fork between 2 small branches near the outer end of a large limb of a sugar maple tree. Recent lumbering operations had removed the adjacent, larger oaks and sugar maples, leaving this tree isolated. The nest was completed June 5, and on June 15 it contained 5 eggs, one of which was a Cowbird's egg that I removed. On June 26 the nest contained 4 young, and these had left the nest by July 13. On August 9, 1930, I found 2 adults feeding 4 young in a nest, approximately 25 feet above the ground in the fork of a medium-sized limb of a white oak tree. While I was climbing the tree the young hurriedly left the nest and perched on branches near by. On May 29, 1931, I found a bird building a nest in Jack's Neck Woods. This nest was about 20 feet above the ground, in the fork of a limb of a beech tree. On June 11 a female was flushed from this nest, where she was probably incubating eggs. Because of the position of the nest, the eggs could not be observed.

The males had ceased to sing by mid-July, except for short, occasional bursts of song in early morning. At this time and throughout the remainder of their sojourn both adults and young were very inconspicuous. The ill-defined fall migration seemed at its height during the first half of September.

The Yellow-throated Vireo usually remained in the upper portions of mature forest trees. The species probably nested numerous when the hilly region south and east of the lake was forested in beech, oak, and hard maple, and decreased in nesting abundance when the timber was largely removed.

Vireo solitarius solitarius (Wilson)

Blue-headed Vireo

Uncommon spring and fall transient.

Earliest date of arrival:	April 19, 1925	September 17, 1930
Median date of arrival:	April 29	September 23
Median date of departure:	May 20	October 9
Latest date of departure:	May 27, 1928	October 12, 1926

The Blue-headed Vireo was a regular spring transient. At the peak of migration, between April 30 and May 15, seldom more than 5 individuals were recorded in a day, and only occasionally were as many as 12 noted. These birds, especially the singing males, were readily observed in spring, principally in early May before the foliage was advanced.

In the fall migration, chiefly during the last week of September and the first week of October, the bird appeared to be slightly less numerous than in spring. Seldom more than 4 individuals a day were noted, and only once, October 10, 1929, were as many as 10 seen in a day. It is possible that there

were as many individuals in fall as in spring, but because of the quiet manners of autumn birds, especially of the males, the species could not be readily observed and therefore gave the impression of being present in fewer numbers.

During both migrations the Blue-headed Vireo chiefly inhabited the upper half of the larger trees of woodlots and remnant forests. No preference was shown between lowland and upland types. Occasionally, a bird was noted in a solitary tree, a single row of trees, or in scattered trees about a farmhouse.

Vireo olivaceus (Linnaeus)

Red-eyed Vireo

Very common spring and fall transient, common summer resident.

Earliest date of arrival:	April 28, 1925	.....
Median date of arrival:	May 2	(September 6)
Median date of departure:	(May 28)	October 2
Latest date of departure:	.....	October 7, 1928

Throughout the survey the Red-eyed Vireo was a more numerous transient and summer resident than was any other vireo species. The first spring arrival could always be found between April 28 and May 5, and by May 10, 25 birds could be recorded daily. The peak of migration was generally between May 12 and 20, when from 25 to 140 birds could be noted each day. A decrease in transient numbers became apparent about May 25, and by May 30 there were no obvious transients.

In its nesting and as a transient this pre-eminently woodland species chiefly inhabited the larger wooded areas of both lowlands and uplands. It nested sparingly in small woodlots containing medium-sized or large trees. Its nesting territory was usually well within the woodlands and rarely did a pair nest about the edge of a woodland. Some conception of nesting abundance can be had from a census taken June 16, 1928, which covered approximately half of the larger wooded areas and in which 156 singing males were recorded. Since only half of the woodlands were examined, the actual number of singing males in the area probably exceeded 300. From this and evidence obtained during other years, it appears probable that between 250 and 400 pairs nested annually.

The nesting birds usually became conspicuous about May 20, and from then until incubation of eggs began the paired birds were almost constantly together. Where one went the other followed, when one fed the other fed also, and while the female gathered nesting material the male did likewise or followed, singing. The males, from their arrival until near the end of the nesting period, were among the most persistent of singers, and unlike most bird species continued to sing during the middle of warm days.

Thirty-two nests were found. Beech trees were preferred for nesting sites, with silver maple, red maple, white elm, and slippery elm as secondary choices. The nests were suspended between the horizontal forks of

branches 8 to 80 feet above the ground and were neatly constructed of dried grasses, very small twiglets, the inner bark of vines and shrubs, and an occasional small leaf. Nests were sometimes lined with hair or held together on the outside with caterpillar or spider webbing. The first nest with eggs was recorded May 22 (1939, 3 vireo eggs and 1 Cowbird egg), and the last July 4 (1932, 4 eggs); the first young in the nest were noted May 27 (1928, 2 young and 1 egg), and the last young in the nest July 25 (1928, 3 young); the first fledglings were observed June 9 (1928, at least 2 young) and the last August 9 (1930, 1 young, probably more). Of 14 nests examined, 2 contained 2 eggs each; 3, 2 eggs or young and a Cowbird egg or young each; 1, 2 eggs and 2 Cowbird eggs; 5, 3 eggs or young each; 1, 3 eggs and a Cowbird egg; and 2, 4 eggs each.

The singing of the males, which had been most persistent from their arrival until June 15, began to decrease in amount in late June, and by July 15 only a few still sang at frequent intervals. In August and early September both adults and young were very quiet, except during early mornings or late evenings, when, occasionally, a male sang. What appeared to be transients were noted in early September, and the height of the fall movement occurred between September 12 and 25. During this migration the species appeared to be much less numerous than it was in spring, and seldom more than 30 were noted in a day. This apparent scarcity of fall birds may have been deceptive—the result of the difference in conspicuousness of the birds during the 2 migrations. I assume that this woodland species was formerly more numerous than it has been since 1922.

Vireo philadelphicus (Cassin)

Philadelphia Vireo

Rare or uncommon spring and fall transient.

Earliest date of arrival:	May 8, 1931	September 10, 1932
Median date of arrival:	May 11	September 15
Median date of departure:	May 27	October 4
Latest date of departure:	June 2, 1928	October 7, 1928

The Philadelphia Vireo was a rare or uncommon semiannual transient. Only 1 to 3 individuals were recorded in a day, and the total for any migration was between 3 and 14 birds. All spring records except 1 (June 2, 1928) were in May, and all except a few were between May 15 and 25. The majority of southbound transients were recorded between September 16 and 29.

The bird chiefly inhabited the larger woodlands, but a few individuals were observed in low, brushy willow trees beside the lake, streams, and swamps. Because of its habit of remaining chiefly in the upper portions of large, well-foliated trees, where it was very inconspicuous, and because of the weak, infrequently given song, this secretive transient was probably more numerous than the records indicated.

Vireo gilvus gilvus (Vieillot)
Eastern Warbling Vireo

Fairly common spring and fall transient and summer resident.

Earliest date of arrival:	April 24, 1925	.....
Median date of arrival:	April 28	(August 25)
Median date of departure:	(May 23)	September 20
Latest date of departure:	.....	October 7, 1928

The first Eastern Warbling Vireo made its appearance between April 24 and May 4 of each spring during the survey. The daily numbers usually remained very low until approximately May 8, after which a sharp increase in numbers took place. The period of maximum abundance was generally between May 12 and 18. A lessening in abundance became evident about May 20, and the last transients left by May 30. During the larger flights from 10 to 18 were noted in a day, and it was apparent that at least 100 were daily present at such times.

Among the vireos, the Warbling Vireo was outnumbered in nesting abundance only by the Red-eyed Vireo. Censuses of singing males indicated that between 20 and 46 pairs annually nested. The species chiefly nested and inhabited open groves, scattered groups of trees, and fringes of trees along stream courses and shores of the lake. It obviously preferred "shade trees," scattered or in rows. The majority nested in the vicinity of water; however, it is believed that the principal attraction was the prevalence of the "shade tree," and not the presence of water.

Of 9 nests observed, 5 were in cottonwood trees, 3 in silver maple trees, and 1 in a hackberry tree. The nests were 10 to 50 feet above the ground, suspended between forking twigs or small branches, and were constructed of fine grasses, spider and caterpillar webs, hair, shreds of the inner bark of trees, and the fine, inner fiber of such plants of the preceding year as swamp milkweed. The first nest with eggs was recorded May 25 (1929, 4 eggs), the last June 30 (1928, 3 vireo eggs and 1 Cowbird egg); the first young in the nest were noted June 5 (1929, 4 young in nest of May 25), the last August 4 (1932, 3 young); the first fledglings were seen June 18 (1932, 1 young), and the last August 7 (1932, 3 young from nest of August 4).

The singing by the males began to decrease slightly during mid-July, and by early August it had sharply declined. A few continued to sing at infrequent intervals until mid-September. One sang on early mornings throughout September and until October 7 (1928), the last day that he was seen.

The fall movement was poorly defined, chiefly because of the inconspicuousness of the species. This migration appeared to center during the first half of September. It is probable that the species was less numerous during early historic time, when there were extensive forests.

Mniotilta varia (Linnaeus)
Black and White Warbler

Fairly common spring transient, less common fall transient.

Earliest date of arrival:	April 16, 1927	July 25, 1928
Median date of arrival:	April 25	August 10
Median date of departure:	May 20	September 30
Latest date of departure:	May 26, 1928	October 6, 1928

The first spring arrivals, chiefly males, were noted between April 16 and 30, and between May 1 and 5, 2 to 15 birds, mostly males, could be daily noted. The peak of migration usually lasted from May 6 to May 18, and then from 3 to 42 individuals, consisting of a few old males and the remainder females and young males, were daily observed. On May 18 or shortly thereafter a decided lessening in numbers occurred, and by May 23 all except an occasional straggler had left.

The Black and White Warbler was among the earliest of the warblers to be recorded in the southward migration. The first arrival was noted on July 25 (1928), and the species was always recorded before August 15. It is possible that these birds had wandered into the area from adjacent country and were summer visitants rather than northern transients. The migration became pronounced by August 20, and the maximum numbers were attained between August 25 and September 25. During this period at least 1 bird could be daily noted, usually 2 to 8 were recorded, and occasionally as many as 12 were seen. The last birds left between September 28 and October 6.

All except a few were in the larger lowland and upland woodlands that contained a profuse shrub layer. The remaining birds were in smaller and more open woodlands, in small groups and rows of trees, and in large shrubs or saplings. The birds chiefly remained about the trunks and larger branches of medium-sized and tall trees, and at a distance of 3 to 40 feet above the ground.

No evidence was obtained indicating that the Black and White Warbler nested in the area. It did nest (1929) a few miles to the east and also in several other sections of the 3 counties in which Buckeye Lake is situated. Unquestionably, the species nested in the area in the historic past, when the forests were more extensive.

Protonotaria citrea (Boddaert)
Prothonotary Warbler

Fairly common summer resident, common fall transient.

Earliest date of arrival:	April 12, 1930	.....
Median date of arrival:	(May 1)	(August 8)
Median date of departure:	.....	September 16
Latest date of departure:	.....	October 5, 1924

During the more advanced seasons the first Prothonotary Warblers of spring appeared between April 12 and 30. In other years they arrived between May 1 and 6. By May 8 the species was present in small numbers, and by May 10 the summer population was attained. There was no evidence of transients migrating through the area, and at no time did the number of spring birds exceed the summer abundance.

There was a gradual dwindling in the numbers of nesting pairs as the investigation progressed. In 1922 and until 1924, 50 to 80 pairs nested annually; by 1932 and 1933 the yearly number had decreased to between 25 and 45 pairs. This change was caused by the reduction in size of the habitat, and particularly by the destruction of snags, stumps, and dead trees which contained nesting sites. During the first 5-year period (1925 to 1930) after Little Buckeye game refuge had been established the Prothonotary Warbler doubled its nesting numbers in the refuge, but, although there had been 5 nesting pairs in the remainder of the swamp, by the end of this period there were none.

The species nested chiefly in the vicinity of the lake. A few nested in the largest wooded swamps of the lowlands to the north and west. The majority of nests were in natural holes in snags, dead trees, and stumps, or in cavities made by such birds as woodpeckers and titmice. Most of the excavated holes were in willows, apparently because of their abundance and the ease with which various bird species could dig into them. A few nests were in crevices, holes, or containers inside boathouses, cottages, or out-houses. With few exceptions the nesting sites were directly over water or very swampy ground and were 1 to 12 feet above the surface of water or land.

The foundation of the nest was made of dried grass blades and an occasional small rootlet. The inside was lined with fine shreds of the inner bark of dead trees and overlaid with dry moss that had been taken from decaying timber. The 16 nests examined contained from 3 to 6 eggs or young each. Usually the complement was 4, and less often 5. The first eggs recorded were found May 15 (1930, 3 eggs), and the last June 26 (1929, 4 eggs); the first young were noted May 18 (1928, 3 young), the last young July 3 (1932, 5 young); the first fledglings out of the nest were seen June 5 (1929, at least 3 young), and the last July 7 (1928, 1 young).

In early June, 1922, I found a nest with 4 eggs in a minnow bucket that was hanging from a wall inside a boathouse. The adults reached the nest by squeezing through the partly open lid of the bucket. The birds entered the boathouse through the doors or, when they were closed, by flying between the surface of the water and the bottom of a hanging door. As this space was about a foot high by several feet wide the birds had no difficulty in entering or leaving when the waters were quiet, but whenever the waves

were high the birds were forced to hover above the water and fly under the doors between wave crests. There was only a second or a fraction of a second between the wave crests, and on occasion it seemed that the birds would surely be engulfed. They always succeeded in getting in or out safely and were successful in raising 4 young. Under the floor of a shed was another interesting nest, the only entrance to which was through a small knot hole in the shed wall. The owners of this nest were exceedingly tame and paid little heed to the many people who passed by their nesting site each day.

An increase in the number of birds, noted in late July of each year, reached a maximum between August 10 and 20, when as many as 50 birds were recorded in a day, and from 15 to 30 could be noted on Cranberry Island alone. It is possible that this concentration consisted entirely of birds which nested or were raised in the area; however, it seems more probable that the resident numbers were augmented by transients. Shortly after August 25 a sharp decrease occurred, and by September 5 only an occasional straggler remained. Throughout late summer the "peet-chweet-chweet-chweet" song was seldom heard, but the fight song was sung oftener than it was in spring. It was pleasant to see a bird rise on fluttering wings and to hear the long, twittering flight song with its numerous undertones. When a number of these birds were fluttering and singing over Cranberry Island early on a misty August morning, the effect was very striking.

The history of the Prothonotary Warbler in the area is very interesting. The bird was apparently absent between 1865 and 1882, for such careful ornithologists as Wheaton and Jasper did not find it. By 1902 the species was present in considerable numbers, and was so recorded by Field (1903: 141-42), Jones (1903: 173), and Dawson (1903: 115). Between 1902 and 1915, when there were great numbers of snags, swamps, and dead trees scattered throughout the lake and about its shores and nesting sites were abundant, the bird was said to have been very numerous. After 1915 many of these sites were destroyed or removed, which resulted in the reduction in nesting abundance to the 50 to 80 pairs recorded for 1922.

Helmitheros vermivorus (Gmelin)

Worm-eating Warbler

Very rare spring and fall transient.

Earliest date of arrival:	May 2, 1925	August 16, 1931
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	May 16, 1929	September 4, 1931

The Worm-eating Warbler was recorded upon 11 occasions. Never more than 1 was recorded in a day, and of the 11 birds, 7 were noted in spring and 4 in fall. All spring records were for the first half of May, and 3 of the 4 records in the southward migration were for the last half of August.

There was 1 record in September. Nine birds were observed in the lower half of large trees or upper shrub layer of the larger swamp woodlands that were north of the lake, and the remainder in large trees and shrubs of the Hill Woods northeast of the lake.

No nesting evidence was obtained during the investigation; however, several nesting pairs were found in the 3 counties in which Buckeye Lake is situated. In 1928, a pair nested on a wooded hillside only 2 miles beyond the eastern boundary of the area. I assume that the species formerly nested in the area when the woodlands were more extensive.

Vermivora chrysoptera (Linnaeus)

Golden-winged Warbler

Rare spring transient, very rare fall transient.

Earliest date of arrival:	May 7, 1933	August 4, 1932
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	May 15, 1928	August 24, 1928

One to 9 Golden-winged Warblers were recorded during each spring migration. Transients were noted in the first half of May. Usually only 1 was seen in a day, and the largest number for a day was 6 (May 15, 1928). Over three-fourths of the spring birds were males, and with few exceptions their presence was first detected by their song. In the southward migration, which occurred in August, the species was recorded only in 5 years, and never more than 2 individuals were noted in a day nor more than 4 in a season. It is possible that the bird was as regular and numerous during the southward movement as it was in spring. In this migration both sexes were extremely quiet and unobtrusive, and most difficult to observe. During both migrations the species was invariably found in the shrub layer of the wetter and more swampy lowland woods.

There is no evidence of the bird nesting in the area. It probably did nest there the past century and a half, for the species has been recorded nesting elsewhere in central and southeastern Ohio, and the swamp forests which formerly covered a large portion of the Buckeye Lake area should have been a favorable nesting habitat.

Vermivora pinus (Linnaeus)

Blue-winged Warbler

Rare spring transient, very rare fall transient.

Earliest date of arrival:	April 30, 1933	July 25, 1925
Median date of arrival:	May 3	August 15
Median date of departure:	May 19	September 10
Latest date of departure:	May 29, 1931	October 2, 1931

The Blue-winged Warbler was a rare or uncommon spring transient. In some migrations only 2 individuals were noted. The total number for any spring was only 17 (1928), and the maximum number for any day was 12 (May 8, 1928). With one exception, April 30 1933, all spring transients were seen in May.

The species was less frequently recorded in the southward movement than it was in spring, despite a migration period of 70 days in fall in comparison to one of 30 days in spring. During the entire movement never more than 9 birds (1931) were noted, and never more than 4 (September 1, 1931) were recorded in a day. As with many species of small passerine birds, the transient numbers may have been as large in the fall migration as in that of spring, but because the males did not sing and because there was greater difficulty in observing the birds in the heavily foliated vegetation of late summer and early fall, more individuals went unobserved than in spring. In both migrations this transient was chiefly noted in brushy and wooded hillsides to the east and south and occasionally in scattered, second growth timber that contained much high brush in the lowlands to the north.

No nesting birds were recorded during the investigation, but the species nested throughout most of central Ohio and was rather numerous in many sections. Furthermore, the bird was found nesting regularly on some brushy, wooded hillsides only a few miles east and south of Buckeye Lake and in a habitat very similar to that which prevailed on many hillsides to the east and south of the lake. Undoubtedly this species nested in the area within historic time before 1922, possibly in fair numbers. If no unfavorable changes occur it appears probable that the species may be found nesting there in the future.

The hybrid Brewster's Warbler, *Vermivora leucobronchialis* (Brewster), was noted twice. On May 26, 1928, I heard and later saw a male singing and feeding in bushes along the wooded west bank of the canal, south of Millersport. When first heard the bird was singing the usual "shree-zwee-zwee" song of the Golden-winged Warbler, but later sang both this song and the "sweeu-z-z-e-e-ee" song of the Blue-winged Warbler. The second hybrid was noted September 15, 1929. It was feeding in bushes in the same locality in which the first was found. From the intensity of its colors and color pattern, this individual was believed to be a male. Both birds were definitely of the Brewster type of hybrid and had pronounced golden wing bars, yellow foreheads, a black stripe running from bill through the eye to the ear coverts, and whitish breasts suffused with yellow. The fall specimen was much the yellower, and most of its breast and lower throat was tinged with yellow.

Vermivora peregrina (Wilson)
Tennessee Warbler

Fairly common spring transient, common or very common fall transient.

Earliest date of arrival:	May 1, 1928	August 27, 1930
Median date of arrival:	May 6	September 2
Median date of departure:	May 26	October 12
Latest date of departure:	May 29, 1931	October 29, 1933

The daily and seasonal numbers of no warbler species fluctuated as greatly as did those of the Tennessee Warbler. During some spring migrations it was decidedly uncommon, and never more than 5 individuals were recorded in a day nor more than 35 for the spring. During other years as many as 250 individuals (May 16, 1929) were observed in a day, and more than 800 were noted during the migration. In spring the species was present only in May, and more than two-thirds of all vernal transients were observed between May 9 and 19.

This warbler averaged more numerous in fall than in spring, but in both seasons the numbers fluctuated greatly from year to year. During some years not more than 20 individuals could be recorded in a day in the southward migration, nor more than 100 in the season. In other years the bird rivaled the Myrtle Warbler in numbers, and as many as 1000 individuals could be seen in a day and several thousands during a migration. Unlike the Myrtle Warbler, the Tennessee Warbler was not conspicuous in the fall.

The birds in spring chiefly inhabited the upper half of the taller trees of both upland and lowland wooded areas and also the upper parts of rows or groups of tall trees along the lake shore, streams, and about farmhouses. Throughout the southward migration the species did not confine itself to the upper sections of the taller trees as in spring, but was found in almost equal numbers in smaller trees and brushy thickets, in bushes and saplings along fence rows, and in weedy fields.

Vermivora celata celata (Say)
Orange-crowned Warbler

Very rare spring and fall transient.

Earliest date of arrival:	April 29, 1928	September 25, 1929
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	May 11, 1929	October 20, 1926

This warbler, which is rare in Ohio, was recorded in the Buckeye Lake area 10 times in 6 years between 1922 and 1934. Five birds were recorded in spring, on April 29, 1928, April 30, 1933, May 6, 1931, May 7, 1929, and May 11, 1929. The remaining records were made on September 25, 1929, September 26, 1929, September 29, 1928, October 12, 1926, and October 20, 1928. Only 1 bird was noted upon any day.

Eight were noted in lowlands, within 10 feet of the ground, in dense tangles of blackberry bushes, rosebushes, or grapevines. The remaining 2, both fall birds, were in rather well-drained, brushy, and weedy fields. A specimen was collected October 20, 1928, among tall weeds and rosebush tangles on Charleston Island. The species was very secretive and, because of its shyness and lack of pronounced specific coloration, was difficult to identify. Furthermore, the spring males sang very little, and only 1 was observed to sing persistently (May 7, 1929). The song was a very weak trill, somewhat like the trill of an Eastern Clipping Sparrow, but much higher in pitch.

It appears probable that this transient was present regularly and in small numbers each spring and fall during the investigation and that it occurred as regularly before 1922 as it has since.

Vermivora ruficapilla ruficapilla (Wilson)

Nashville Warbler

Common spring and fall transient.

Earliest date of arrival:	April 25, 1925	August 27, 1929
Median date of arrival:	April 28	September 1
Median date of departure:	May 23	October 12
Latest date of departure:	May 26, 1928	October 22, 1927

The first Nashville Warbler was always noted between April 25 and 30. From its arrival until approximately May 5 there was a definite increase in numbers. On or shortly after May 5 a decided influx of transients took place, and until May 17 the species was more numerous than at any other spring period, and as many as 80 individuals (May 15, 1932) were noted in a day. There was a drastic decrease in numbers about May 19, and a few days later the species had either disappeared or was represented only by an occasional straggler.

The first southbound transients were generally seen about September 1, and from then until September 12 a few could be noted daily. The peak of migration was in the last half of September, when from 10 to 100 could be found in a day. A sharp decline in numbers took place in the first few days of October, and by October 10 only an occasional bird remained.

As with many other transient warblers the southward migration of the Nashville Warbler covered a greater period of time than did the spring movement, which usually lasted less than 30 days, whereas the fall movement generally extended more than 45 days.

The total numbers for spring and fall varied little from year to year. In spring the species frequented the upper half of large trees and was more numerous in tall trees of woodlands than it was in smaller groups or rows of tall trees. In fall the species tended to inhabit the middle section of large trees, and it also resorted to the taller bushes and saplings, especially the larger hawthorn trees.

Compsothlypis americana (Linnaeus)

Parula Warbler

Uncommon spring transient, rare fall transient.

Earliest date of arrival:	April 28, 1925	August 26, 1927
Median date of arrival:	May 5	.....
Median date of departure:	May 24	.....
Latest date of departure:	May 27, 1928	October 1, 1927

With one exception, April 28, 1925, all spring Parula Warblers were seen in May, and more than two-thirds of them between May 8 and 20. Usually less than 3 were observed in a day, but during the great warbler flights 3 to 12 were daily noted. The males were indefatigable singers, and many were first noted by their song. Because of their greater conspicuousness, males were recorded in larger numbers than were females.

The Parula Warblers appeared to be rare in the southward migration, though like many warbler species, because of their inconspicuousness at this season, it was difficult to find them. All except a few were seen in September, and the remainder were noted in late August or on the first day of October. The peak of the southward migration was in the middle third of September, but seldom more than 1, and never more than 3, were seen in a day.

During both migrations the species was most often noted in the upper branches of the larger trees of remnant swamp forests. Large pin oaks and shingle oaks were most frequented. There was a wide spreading shingle oak in the central part of Lakeside Woods in which more Parula Warblers were noted than were found in all of the remainder of that woodland. Reasons for the marked preference for that tree are not known. Year after year at the height of spring migration 1 to 3 of these birds could be found in it throughout an entire day, and individuals, marked by some peculiarity of color pattern, were seen in it for as many as 4 consecutive days. Upon 3 occasions, feeding Parula Warblers, first noted in the Lakeside Woods, later flew into this tree, where they remained the rest of the day (see p. 112).

No evidence was obtained indicating that the species nested in the area. It probably did not nest here in the historic past, since in Ohio the nesting birds appear to be restricted to wooded ravines where hemlock is one of the numerous trees. Such a habitat was never present in the area in historic time.

The 2 males from Buckeye Lake in the Ohio State Museum are intermediate between *Compsothlypis americana americana* and *C. a. pusilla*. Their backs are darker than those of typical *americana*, but not so dark as those of the average *pusilla* collected in Michigan. The underparts in Ohio birds are more richly colored than they are in *americana*, and the

dusky bands across the breast are darker and wider; the underparts are less richly colored than those of *pusilla*, the dusky bands are less dark and wide, and they lack the chestnut flanks which are conspicuous on most northern males.

Dendroica aestiva aestiva (Gmelin)

Eastern Yellow Warbler

Very common spring and fall transient, common summer resident.

Earliest date of arrival:	April 18, 1931	.....
Median date of arrival:	April 25	(June 29)
Median date of departure:	(May 20)	September 17
Latest date of departure:	.....	September 29, 1928

The first Eastern Yellow Warblers were always noted between April 18 and 28. In some years the species was numerous by the last day of April, and as many as 45 (April 30, 1933) were noted. In late springs the bird was uncommon until about May 3. The height of the movement began about May 5 and continued until May 12 or a few days thereafter, and then there were usually many hundreds or thousands present. About May 16 a decline in daily numbers was noted, and a few days later all transients apparently left.

The species was the most numerous nesting warbler, and not even the abundant Northern Yellow-throat equaled it in nesting abundance. Data from June censuses indicated that there were between 120 and 325 pairs nesting annually, that there may have been a slight decrease in nesting numbers from 1922 to 1934, and that the change was caused by the draining of some of the larger swamps and the removal of brush. Most of the pairs nested in the lowlands adjacent to the lake and on the islands; a fair proportion were about the wetter and more brushy parts of Bloody Run swamp and about the brushy edges or openings in the lowland woods north of the lake; and a smaller number were along the brushy margins of the streams, in orchards and shrubbery near farmhouses, and in shrubbery in the villages. Only rarely was a pair found nesting in brush upon or near the tops of hills, and none were found nesting in the denser parts of woodlands where the trees grew tall and close together. The nests were usually in a bush or in a small tree and with few exceptions were 1 to 10 feet above the ground. The highest nest recorded was slightly more than 50 feet above the ground, in a sycamore tree on Liebs Island, May 18, 1929. Apparently, many species of shrubs and small trees were used for nesting sites, though smooth alder, willows of several species, red osier dogwood, common lilac, and large rosebushes of several species seemed to be preferred. The nest was placed either in the crotch between the almost vertical branches of a bush or small tree, or was suspended in the apex of a fork of an almost horizontal branch. The nest itself was a splendidly made structure of

light colored plant fibers, shreds of bark, plant down, and dried grasses. It was very similar in form and structure to the nest of the Alder Flycatcher, but could always be identified by the presence of a soft cottony inner lining, which the flycatcher's nest lacked.

Four of the 37 nests examined contained 2 eggs or young each; 4, 2 warbler eggs or young and 1 Cowbird's egg or young each; 5, 3 eggs or young each; 5, 3 warbler eggs or young and a Cowbird's egg or young each; 1, 3 warbler eggs and 2 Cowbirds' eggs; 11, 4 eggs or young each; 4, 4 eggs or young and 1 Cowbird egg or young each; and 3, 5 eggs or young each. The first nest with a completed set of eggs was found May 12 (1928, 3 eggs), and the last July 2 (1932, 3 eggs); the first young in the nest were noted May 18 (1932, 3 eggs and 1 Cowbird egg), and the last July 17 (1930, 4 young); the first fledglings out of the nest were observed May 25 (1929, at least 2 young), and the last July 23 (1930, 1 young warbler and 1 young Cowbird). The singing period of the males extended from their spring arrival until late July. Shortly after June the amount of singing declined sharply, and by mid-July only a few still sang persistently.

The Eastern Yellow Warbler was among the first warbler species to begin its southward migration. The easily recognized flight notes were heard at night and in early morning, as early as June 18-19 (1932). By early July they could be heard almost nightly, and in very early mornings the transients could be seen flying over or dropping from a considerable height, to alight in bushes or trees. A definite increase in numbers took place in late July, and in the first half of August the height of the southward movement was attained. A decrease in numbers was usually observed by August 20, and by the forepart of September only a few could still be found. Only an occasional straggler was noted after September 10.

I assume that the species nested in fair numbers throughout historic time. It probably increased in abundance during mid-historic time, when much of the forest was replaced by brushy fields, and later decreased in numbers because of brush removal and the draining of the land.

Dendroica magnolia (Wilson)

Magnolia Warbler

Common spring and fall transient.

Earliest date of arrival:	April 30, 1926	August 11, 1931
Median date of arrival:	May 4	August 23
Median date of departure:	May 28	October 7
Latest date of departure:	June 2, 1928	October 12, 1929

In spring, except for 1 April and 2 June records, the Magnolia Warbler was found only in May. The first individuals arrived before May 7. From May 9 to May 20 the species was among the dominant warblers of the area, and between 40 and 75 individuals were noted daily. Shortly after May 20

a sharp decrease in numbers took place, and by May 25 only a few remained. In the spring these birds chiefly inhabited the dense shrub layer of remnant swamp forests and tall brushy thickets. A fair number frequented the shrub layer of upland woods, and a few were occasionally found in the larger companies of "tree-top" warblers. These latter individuals, unlike the rest, were sometimes in the upper branches of tall trees.

A persistent search in mid-August always resulted in recording a few early transients, and by the last of the month several were seen each day. The numbers increased gradually through early September. From September 10 to 25 the greatest daily numbers were attained, and 50 to 125 birds a day were noted. The numbers were slightly higher than they were in spring. The fall transients frequented the same types of habitat as did the spring birds, except that more were found in brushy fields or pastures, especially those dotted or thicketed with hawthorn and wild plum. The total number during spring and fall fluctuated comparatively little from year to year. The species was most abundant in the best "warbler years," when local conditions were favorable for many warbler species.

Dendroica tigrina (Gmelin)

Cape May Warbler:

Uncommon spring and fall transient.

Earliest date of arrival:	April 29, 1933	August 27, 1930
Median date of arrival:	May 5	September 3
Median date of departure:	May 22	October 7
Latest date of departure:	May 25, 1929	October 15, 1927

Except for 1 April (29, 1933) record the first spring arrival of the Cape May Warbler was seen between May 2 and 9. The species was always present in small numbers from May 12 to May 18. On May 20, or shortly thereafter, it became decidedly uncommon, and by May 22 the last transients had generally disappeared. The bird was uncommon in every spring except 1, and seldom more than 10 individuals were noted in a day. Between May 14 and 20, 1926, the species was very numerous throughout central Ohio. On May 16 I noted at least 40 individuals in Lakeside Woods, and it was evident that hundreds were present in the area on that day.

The first arrivals of the southward migration were seen during the last days of August or the first week of September. The species continued to be uncommon until September 12 or a few days later, after which there was a definite increase. The height of the movement took place from mid-September until October 1, and then from 4 to 12 individuals were daily noted, and as many as 20 (September 17, 1929) were recorded in a day. The bird was uncommon by October 3, and by October 7 only an occasional individual could be found.

In spring the Cape May Warbler chiefly fed and ranged from the base to the tops of the dead and sparsely foliated dying trees in remnant swamp forests. A second type of habitat was in flowering fruit trees and hawthorns, where the bird fed principally upon flying insects which were attracted by the flowers. During the southward migration the species was more widely distributed and was then found throughout the entire swamp forests, in upland woods, and about orchards and groups of trees near cottages and farmhouses.

Dendroica caerulescens caerulescens (Gmelin)

Black-throated Blue Warbler

Rare or uncommon spring and fall transient.

Earliest date of arrival:	May 4, 1923	September 2, 1929
Median date of arrival:	May 6	September 7
Median date of departure:	May 22	October 8
Latest date of departure:	May 26, 1928	October 12, 1926

The spring migration of the Black-throated Blue Warbler took place entirely in May and usually lasted less than 3 weeks. The first spring transients arrived between May 4 and 8. At the height of the movement, between May 9 and 17, 2 to 10 birds could usually be noted daily; the highest number recorded was 15 (May 12, 1928). After May 17 only an occasional individual, usually a female, was found. The last transients were recorded between May 18 and 26.

The southward migration averaged approximately 4 weeks in duration. The first transients were always noted between September 2 and 15, and during that period the birds were always rare, never more than 2 being recorded in a day. A slight increase became apparent between September 15 and 20, and 1 to 3 birds could be noted daily. The peak of migration took place between September 21 and October 3, when 2 to 8 birds could be noted daily, and as many as 15 (October 3, 1929) were observed in a day. The species became very rare or absent immediately after October 4.

During both migrations the majority of the birds were in the low dense shrub layer of lowland woods north and west of the lake. The remainder were noted in the shrub layer of upland woods and about the shrubbery of farmhouses and cottages. The Black-throated Blue and Canada warblers were close associates in migration and frequented the same habitat niches.

Dendroica coronata (Linnaeus)

Myrtle Warbler

Common spring transient, very common fall transient, very rare winter visitor.

Earliest date of arrival:	(April 12, 1930)	September 4, 1929
Median date of arrival:	April 15	September 18
Median date of departure:	May 23	November 7
Latest date of departure:	May 25, 1929	(November 24, 1928)

Throughout the study, no warbler species migrated through the area in such consistently large numbers as did the Myrtle Warbler, and none had a more prolonged spring or fall migration. The first spring transients, mostly brilliant colored males, were generally seen between April 12 and 20. Thereafter the number of individuals increased rapidly, and from May 1 to May 5 between 100 and 200 birds, mostly males, could generally be daily noted. A marked decrease usually followed this migration wave. Between May 10 and 18, during the period of maximum numbers for most warbler species, there was a second large wave and then 150 to 500, mostly females and young males, were observed daily. A drastic decline in numbers took place shortly after May 18, and by May 23 few or none remained.

This species was a very late warbler transient on its southward journey. The first individuals did not arrive until between September 4 and 25. There was an increase in numbers during the last week of September, and in a few years there were as many as 200 birds in the last days of that month. The numbers continued to increase rapidly until approximately October 5. Between October 5 and 20 the species was more numerous over the entire land area than it was at any other season, and thousands were daily present. It was particularly abundant on Cranberry Island, where it fed upon insects, cranberries, poison sumac, and other berries. On several occasions an estimated number of between 1000 and 1200 individuals was seen within an hour on this island. After October 20 there was a rather gradual decline in numbers. By November 1, comparatively few remained, and in some years the birds had disappeared. The last nonwintering bird was found November 24 (1928).

The Myrtle Warbler was noted twice in winter. On December 22, 1924, Frederick Wood and Charles F. Walker observed 2 in the Big Woods (Wood and Walker, 1925: 47). On February 13, 1932, Walker and I collected 1 in the same woods. The transients were observed in almost every type of habitat suitable for a land bird—woodlands, edges of woodlands, groups or rows of trees, and groups of scattered trees—where they could feed upon the flying insects that swarmed in such situations.

Dendroica virens virens (Gmelin)

Black-throated Green Warbler

Common spring and fall transient.

Earliest date of arrival:	April 20, 1930	August 27, 1930
Median date of arrival:	April 24	September 8
Median date of departure:	May 26	October 15
Latest date of departure:	May 29, 1931	October 27, 1928

The semiannual migrations of the abundant Black-throated Green Warbler were of long duration. There were 2 or 3 waves in each spring migration. After the first arrival, between April 20 and 28, there was al-

most immediately a decided influx of transients. The first wave was comprised chiefly of males; it continued until about May 5, after which a decrease was noted. On or a few days after May 10 there was a second large wave consisting of both sexes in almost equal numbers, and the species became as numerous as it was during the first wave. Shortly after May 17 it became decidedly uncommon or rare. In a few years of the study a small wave, chiefly of females and immature males, appeared about May 20 and remained until May 25. Between 10 and 40 birds were recorded on the average day. In larger flights 50 to 125 were daily recorded, and it was evident that there were several thousands present.

The first arrival of the southward migration was recorded between August 27 and September 15. The birds remained rare until September 20 to 25, after which a definite increase could be noted. The peak of migration most frequently took place from September 25 until October 8, and then between 25 and 100 transients could be observed daily. There was a sharp decline in the numbers shortly after October 8, and the species disappeared between October 12 and 27.

Throughout both migrations the Black-throated Green Warbler was found chiefly in the upper parts of woodland trees and in groups and rows of trees. It was found in fair numbers in the taller brushy thickets and about brushy fence rows. The species has been a regular transient throughout historic time.

In the Lakeside Woods on October 6, 1928, Charles F. Walker and I found a male-plumaged individual, suspended about 20 feet above the ground, with the primaries of the right wing entangled in a strand of spider web. Before it could be released I had to remove two of the entangled primaries. When freed the bird flew a short distance, alighted in a tree, preened itself for a few moments, and began to feed as if nothing unusual had happened.

Dendroica cerulea (Wilson)

Cerulean Warbler

Uncommon spring and fall transient, very rare summer resident.

Earliest date of arrival:	April 30, 1929	(August 9, 1930)
Median date of arrival:	May 4	August 24
Median date of departure:	May 21	.....
Latest date of departure:	(May 26, 1928)	September 23, 1930

The Cerulean Warbler was recorded as an April arrival twice (April 30, 1929, and 1933) in the 12 years; in the remaining 10 years it was first recorded between May 1 and 10. The peak of migration was between May 10 and 18, and then 2 to 8 individuals could usually be noted daily. The species was always uncommon, and never more than 18 birds (May 11, 1929) were recorded in a day. After May 18 the transients became very rare, and by May 22 they had left.

The Cerulean Warbler was observed nesting during 4 years. The nesting pairs were in the tall trees of the Wooded Ravine and adjacent hill (Map 2: No. 35). Four nesting pairs were observed: the first, throughout June, 1928; the second, during late May and June, 1929 (on June 26 both parents were seen feeding 4 very young fledglings that had apparently left the nest that day); the third, throughout June, 1930; and the fourth, throughout June, 1931 (on July 3, 3 fledglings were seen, accompanied by their parents).

The first arrivals of the southward migration were usually noted in the latter half of August. The height of the movement seemed to take place during the first 2 weeks of September. The last transients were seen between September 10 and 23. In fall fewer individuals were noted than in spring. It is possible, however, that I was simply unable to find the silent birds in the densely foliated upper branches of the tall trees of the largest woodlands.

The Cerulean Warbler was found nesting in fair numbers in many remnant forests elsewhere in central Ohio, especially in such forest types as the wooded bottomlands along the Scioto River south of Columbus, other swamp forests of Franklin and Licking counties, and remnant upland forests in Fairfield and Perry counties. As swamp forests were once extensive in the lowlands of the Buckeye Lake area and upland forests covered the hilly sections it appears very probable that in early and mid-historic times the Cerulean Warbler was a much more numerous nesting species than it was during the investigation.

Dendroica fusca (Müller)

Blackburnian Warbler

Common spring and fall transient.

Earliest date of arrival:	April 25, 1931	August 20, 1930
Median date of arrival:	May 1	August 29
Median date of departure:	May 25	October 7
Latest date of departure:	May 29, 1931	October 12, 1928

The Blackburnian Warbler was recorded in April during 9 spring migrations. It appears probable that a few individuals were always present in the area by the last day of April. From May 6 to 10 the species was always present in small numbers. The peak of migration was between May 10 and 18, when usually 8 to 20 birds were daily noted. As many as 30 were observed in a day. A decrease in numbers took place between May 18 and 22, and after that only an occasional transient was seen.

The first southbound transients were recorded between August 20 and September 5. One to 15 were present between September 6 and 10. An increase then took place, and until October 4 from 5 to 30 individuals (60 on September 26, 1925) could be seen daily. The species was usually found

in fair numbers until the day before its final disappearance. The last birds were seen between October 5 and 12.

The Blackburnian Warbler principally inhabited the more secluded parts of the larger remnant swamp forests, where there was much dead timber and many dying trees and woodland pools. The birds fed and moved about in the trees at a height of between 10 and 60 feet above the ground, and the spring males sang loudly and persistently. Some of these birds were observed in other woodland types and in groups or rows of large trees, and occasionally a few were seen in the taller thickets. The Blackburnian Warbler associated with the Cape May Warbler, and, in the area, the habits of both were very similar.

**Dendroica dominica albilora* Ridgway
Sycamore Warbler

Very rare transient.

On the afternoon of August 11, 1931, I saw a male Sycamore Warbler feeding in the taller red maple trees on Cranberry Island. After several minutes the bird flew across the lake in a southeasterly direction. It is odd that no other Sycamore Warblers were seen during the investigation, since the species nested in small numbers along the streams of southern and southeastern Ohio.

It is probable that this warbler has nested in the area within historic time. Former conditions, especially along the South Fork of the Licking River, the canal, and the mouth of Honey Creek, must have been very favorable for its nesting.

Dendroica pensylvanica (Linnaeus)
Chestnut-sided Warbler

Common spring transient, uncommon fall transient.

Earliest date of arrival:	May 6, 1924	August 18, 1925
Median date of arrival:	May 8	August 27
Median date of departure:	May 24	October 3
Latest date of departure:	May 27, 1928	October 6, 1928

The first Chestnut-sided Warbler of spring was always noted between May 6 and 10. During this period the first arrival was repeatedly seen before this date elsewhere in central Ohio, and in 1923 it was recorded as early as April 30 (Walker, 1928b: 21). In the Buckeye Lake area the bird became common immediately upon its arrival or a few days thereafter. Until May 20 between 5 and 20 individuals were usually seen daily, and as many as 75 (May 11, 1929) have been recorded. A few days later none could be found.

The first southbound transients arrived between August 18 and September 5. The period of maximum abundance was between September 12 and

28. During the following few days the numbers decreased sharply, and the migration ended in early October. The number of birds recorded a day in the southward movement averaged much less than it did in spring, for in fall usually less than 8 were noted daily, and only on a few occasions were as many as 20 observed. In fall this inhabitant of dense thickets and shrubs was very inconspicuous.

The Chestnut-sided Warbler was principally found in the dense shrub layer of swampy woodlands, and to a lesser extent in the shrub layer of upland woods, about thickets and bushy fence rows, and in shrubbery in the vicinity of farmhouses and cottages. It frequently associated with the Magnolia Warbler.

Dendroica castanea (Wilson)

Bay-breasted Warbler

Common spring transient, very common fall transient.

Earliest date of arrival:	April 28, 1925	August 18, 1925
Median date of arrival:	May 9	September 1
Median date of departure:	June 1	October 15
Latest date of departure:	June 3, 1928	October 30, 1928

The Bay-breasted Warbler was a late spring arrival, since it was recorded only once in April (28, 1925) during the investigation; it was generally first seen between May 5 and 12, and in 2 springs none were seen until May 15. During the average year a few could be noted daily after May 12, and by May 15 the species had usually become numerous. The peak of migration was between May 17 and 28, when 10 to 45 individuals could be seen daily. On May 28 or 29 a sharp decline in numbers took place. The last transients were observed between May 30 and June 3.

The first arrival of the southward migration was recorded between August 18 and September 12. After its appearance the bird continued to be rare or uncommon until September 18 or a few days thereafter. At the height of the movement, which took place between September 21 and October 8, it was more numerous than at any other period. Then 15 to 150 birds could be recorded daily, and it was obvious that there were several hundred, and sometimes several thousand, individuals present. There was a decrease in numbers on or shortly after October 8. The last transients had normally disappeared by October 15, and only in a few years was an occasional straggler noted later.

The Bay-breasted Warbler was principally an inhabitant of the upper half of larger trees, especially in spring. It was found in equal numbers in both upland and lowland woods and was frequently noted in groups and rows of tall trees. Occasionally, a few fall birds could be seen feeding in the taller brushy thickets. This warbler was more readily observed in its

southward journey, since it was then present after trees were partly defoliated; in spring it did not arrive until the foliage was far advanced. The conspicuousness of fall birds probably made the recorded percentage of the total number greater than it was in spring.

Dendroica striata (Forster)

Black-poll Warbler

Common spring transient, very common fall transient.

Earliest date of arrival:	May 7, 1931	August 31, 1931
Median date of arrival:	May 10	September 8
Median date of departure:	June 1	October 23
Latest date of departure:	June 3, 1928	October 31, 1925

The Black-poll Warbler was among the last of the warblers to make its appearance in spring. The latest date for spring arrivals was May 15. In the average year a few could be seen daily after May 15, and by May 18 the species was common. At the peak of migration, between May 18 and 27, 10 to 40 birds could be observed daily. The species then generally disappeared very suddenly, for by May 29 all except a few stragglers had departed.

The first southbound transients were seen between August 31 and September 14, and the species was always rare until September 15. An increase became apparent by September 17, and from then until October 10 it could be regularly recorded. The peak of migration came between September 25 and October 10, and then 10 to 150 individuals could be daily observed. A sharp decrease in numbers took place between October 10 and 15, and by October 23 the species was usually absent.

The Black-poll Warbler was a "tree top" warbler and was found in all woodlands where there were groups or rows of tall trees. In spring the bird frequented medium-sized or tall willows, and in these trees the males sang persistently. In fall a few could be found in tall saplings and bushes or thickets.

The Black-poll and the Bay-breasted warblers were close associates during migrations. Both were late spring and fall transients, both chiefly inhabited tall trees, and their maximum numbers during migrations were almost equal. In fall their plumage coloration was very similar, particularly in females and young males. This similarity of color made identification of some individuals difficult; however, under moderately favorable conditions, virtually all could be identified by the color of their underparts. In the Black-poll Warbler the breast and upper belly were tinged with yellow, and the under tail coverts were distinctly whitish; in the Bay-breasted Warbler the under tail coverts, the breast, and the belly were yellowish.

**Dendroica pinus pinus* (Wilson)

Northern Pine Warbler

Very rare spring and fall transient.

Earliest date of arrival:	April 19, 1924	September 17, 1930
Median date of arrival:	.....	.....
Median date of departure:	.....	.....
Latest date of departure:	May 12, 1928	October 3, 1930

The Northern Pine Warbler was consistently rare throughout the 12 years. At no time was more than 1 seen in a day nor more than 3 in a migration; in 4 years none were recorded; in 6 years 1 or 2 were noted during 1 migration; and in the remaining 2 years 1 or more birds were noted during both migrations. Despite the scarcity of records I believe that a few passed through the area annually, for the species readily escaped observation. During spring its song was rather weak and usually difficult to distinguish from the songs of the abundant Eastern Chipping Sparrow and the Slate-colored Junco, and in fall the quiet and plainly colored birds were rather difficult to identify.

This species was among the earliest of spring warbler transients; 5 of the 9 records were in the last half of April, and the remainder were before mid-May. The birds apparently migrated southward chiefly in late September and early October. My evidence is substantiated by the 1922 to 1928 records of the Wheaton Club for the remainder of central Ohio (Walker, 1928b: 21).

The majority of the birds were found in apple orchards or in pastures containing large hawthorn trees. The remainder were in the taller trees of woodlands and small groves. This lake area entirely lacked coniferous trees, except for an occasional exotic Norway spruce or red cedar about some farmhouse, and it is therefore obvious why this conifer-inhabiting bird was rare. Elsewhere in central Ohio where many conifers were present, such as in the Sugar Grove region and in Greenlaw Cemetery at Columbus, the Pine Warbler was noted oftener.

**Dendroica discolor discolor* (Vieillot)

Northern Prairie Warbler

Very rare spring and fall transient.

The first of 3 records of the Northern Prairie Warbler was made on May 6, 1924, when Charles F. Walker and I found a singing individual in a brushy field beside Jack's Neck Woods. A bird was found on Cranberry Island by Walker, on October 2, 1927. The last record was made on May 11, 1929, when I saw one in the bushes at the western edge of Lakeside Woods.

The Northern Prairie Warbler is to be expected occasionally in the area; it is surprising that more transients or summer visitors were not noted. During the investigation the species nested in fair numbers in the Sugar Grove region. That it did not nest at Buckeye Lake is not strange, since its Ohio nesting habitat of dry brushy hillsides of small pines, sumacs, and sapling deciduous trees, abandoned, brushy hilltop fields, and brushy orchards, such as occur in southeastern and southern Ohio, was not present in the area. It is probable that the species was very rare or absent as a nesting bird in historic time, for conditions seem to have been generally unfavorable.

Dendroica palmarum palmarum (Gmelin)

Western Palm Warbler

Usually an uncommon spring and fall transient, one winter record.

Earliest date of arrival:	(April 18, 1931)	August 9, 1933
Median date of arrival:	April 24	September 9
Median date of departure:	May 16	October 25
Latest date of departure:	May 20, 1931	(November 13, 1922)

The number of Western Palm Warblers fluctuated greatly from one migration to another.²¹ In some spring migrations only a few were noted, in others as many as 50 individuals were observed in a day. In 1926 and 1927 a total of less than 10 individuals was recorded during each spring, but in 1928 from 4 to 40 birds were seen daily between May 1 and 16, and several hundreds were observed during the migration.

The species was an early spring transient. The first arrival was noted during the latter half of April, and in the more advanced springs as many as 10 birds a day were seen in that month. The peak of migration took place from May 1 to 12, and, in the large migrations, 3 to 50 birds could be noted daily. A few days after May 12 a sharp decrease in numbers usually became apparent, and by May 16 the species was normally absent.

The earliest record for the first southbound transient, an extremely early date, was made by L. E. Hicks on August 9, 1933. The first arrival generally appeared between September 3 and 17. The peak of migration was between September 20 and October 7, and the last transients were usually noted between October 14 and November 13. During this movement the species was always less numerous than it was in spring, for seldom more than 10 individuals were noted in a day, and never more than 28 (September 24, 1930, by Charles F. Walker).

The Western Palm Warbler chiefly inhabited brushy thickets, particularly those beside woodlands. In the fall it was also found in weedy fields and along fence rows overgrown with vines and brush. Because of preva-

²¹ The same marked fluctuations in transient numbers were found elsewhere in central Ohio.

lence of brushy thickets and weedy fields north of the lake, the species was most numerous there. The bird habitually flocked by itself in a brushy thicket of less than an acre in extent, at the east side of Jack's Neck Woods. In at least 4 years between 80 and 95 per cent of the birds noted in the area were recorded in this thicket.

There was 1 winter record. On February 28, 1925, Walker found an individual in Big Woods. Elsewhere in central Ohio during the survey, wintering individuals were observed twice; 1 was seen throughout December, 1924, and 1 throughout the 1926-27 winter (Walker, 1928a: 232).

Seiurus aurocapillus (Linnaeus)

Ovenbird

Common spring and fall transient, uncommon summer resident.

Earliest date of arrival:	April 20, 1930	(July 30, 1930)
Median date of arrival:	April 24	August 15
Median date of departure:	May 20	October 4
Latest date of departure:	(May 25, 1929)	October 11, 1928

The first spring Ovenbirds could always be seen between April 20 and 30. In backward seasons the bird was sometimes uncommon in April, and never more than 3 were noted in a day. In advanced seasons 5 to 12 birds could be seen on each of the last 5 days of April. The peak of migration took place between May 4 and 16. Then from 8 to 30 birds could usually be noted daily, and as many as 50 (May 11, 1929) were observed. There were fewer transients by May 17 or 18, and by May 20 they had usually disappeared. In spring this woodland warbler was noted principally in the larger swamp forests north and west of the lake.

It nested in the vicinity of small pools in swamp forests, where there were many prostrate, moss-covered logs, and where the forest floor was deeply covered with humus and dead leaves. June censuses of several years, indicated that from 12 to 20 pairs annually nested; 2 to 4 pairs were in Jack's Neck Woods, 5 to 16 pairs were in Big Woods, and an occasional pair was in the ravine of a large woods northeast of the lake (Map 2: No. 36). Because of lumbering operations, which destroyed its nesting habitat, the species decreased in nesting abundance as the survey progressed. This was particularly noticeable in the Big Woods, where much lumbering was done.

Two successful nestings were noted. On June 19, 1928, a fledgling was seen in the Big Woods, accompanied by its parents; on June 16, 1929, another fledgling was observed in the same woods. Upon a third occasion, June 16, 1928, an adult was seen in Jack's Neck Woods feeding a large fledgling Cowbird. Birds were seen carrying nesting material upon several occasions between May 16 and June 3.

During late July of several years, Ovenbirds, presumably transients, appeared on Cranberry Island, a locality where the species did not nest and where none had been seen since May. Obvious transients were seen in both swamp forests and upland woods by August 10, and from August 20 until September 28, they could be daily encountered. The height of the movement took place between September 10 and 25, and then from 5 to 25 birds were usually seen each day. The species became very uncommon by October 1, and the last transients were noted a few days later. In fall more were found on Cranberry Island, where swampy conditions were prevalent.

The Ovenbird was a regular transient and nesting species throughout the historic past. It probably nested in considerable numbers in early historic time, when the area was principally forested, and has probably decreased greatly in abundance. It is possible that this nesting species will become extirpated from the area within the next 25 years.

Seiurus noveboracensis noveboracensis (Gmelin)

Northern Water-Thrush

and

Seiurus noveboracensis notabilis Ridgway

Grinnell's Water-Thrush

Fairly common spring and fall transients.

Earliest date of arrival:	April 25, 1931	August 14, 1929
Median date of arrival:	April 29	August 24
Median date of departure:	May 24	October 1
Latest date of departure:	May 27, 1928	October 13, 1928

The first spring arrivals were noted in late April in 9 years. In the more advanced springs, as many as 10 were daily noted by the last of April. The peak of migration was between May 4 and 15, and then from 5 to 20 birds could be seen daily. The species disappeared between May 22 and 27. In spring it was found chiefly about woodland pools of the remnant swamp forests, where it associated with the Ovenbird. It was also found in small numbers about Cranberry Island. The males were persistent singers.

The first southbound transients were seen during the latter half of August, always on Cranberry Island. The species could invariably be recorded by September 1, and a few were found daily from that date until September 25. The height of the movement was between September 5 and 22, but the bird was less numerous than it was in spring, since usually only 2 to 12 birds were daily noted. After September 28 they normally became rare, and after October 1 and until October 13 only an occasional transient could be found. In late summer and fall the swamp forests were usually dry, the woodland pools of spring had long since disappeared, and general conditions were unfavorable. The bird was much less numerous in swamp

forests in fall than it was in spring. Cranberry Island, however, contained more individuals than in spring, and during some southward movements more than 85 per cent of all recorded water-thrushes were from this bog island.

It was formerly thought that *Seiurus noveboracensis noveboracensis*, the Northern Water-Thrush, was the form which migrated regularly through Ohio, and that *S. n. notabilis* was a very rare transient, if it occurred at all. In this investigation attempts were made to collect those water-thrushes which had the greatest amount of yellow on the underparts, in the hope that *notabilis* might be obtained. Examination of 5 collected specimens disclosed that 3 (2 taken April 28, 1928; 1, October 6, 1928) were referable to *notabilis* and that the remainder (May 1, 1923, and May 16, 1929) were intermediate. Investigations elsewhere indicated that *notabilis* was the more numerous transient in Ohio and was also the nesting form (Aldrich, 1934: 100), and that the typical race was present sparingly. Since only the yellower birds were collected, and the eastern form has been seen elsewhere in Ohio, I assume that *noveboracensis* also appeared occasionally about Buckeye Lake. The species was probably a regular transient throughout historic time.

Seiurus motacilla (Vieillot)
Louisiana Water-Thrush

Rare or uncommon spring transient, very rare or rare fall transient.

Earliest date of arrival:	March 27, 1902	August 27, 1929
Median date of arrival:	April 15	September 1
Median date of departure:	May 17	September 20
Latest date of departure:	May 21, 1931	October 9, 1927

The earliest record of the Louisiana Water-Thrush appears to have been made by Field (1903: 143): "One specimen taken at Licking Reservoir [Buckeye Lake] March 27, 1902." This remains the only record of the species in March; the earliest spring date during the survey was April 10 (1932). The species was noted in March elsewhere in central Ohio.

The first water-thrush of spring was always found before April 25. At the peak of migration, between April 28 and May 14, as many as 12 birds were recorded in a day. Although at this time the species was most numerous, it usually was not recorded daily. The bird became very rare by May 17. In spring, the Louisiana Water-Thrush was found chiefly about woodland pools of swampy lowland woods and on Cranberry Island. It was an associate of Grinnell's Water-Thrush and the Ovenbird.

The species was usually rare throughout the southward migration, and never more than 3 were seen in a day nor a total of more than 6 birds in the season. The first arrival was noted between August 27 and September 8. The peak of migration was between September 5 and 12. Thereafter only

an occasional bird was seen. All except 2 of the fall birds were on Cranberry Island; the 2 were in the Big Woods.

The Louisiana Water-Thrush was found nesting in deep, rocky, and wooded ravines within a few miles of the area. Wooded ravines were present in early and mid-historic times, and then the species may have nested in the area, or it may formerly have nested in the large swamp forests, as it still does in northern Ohio and southern Michigan.

Oporornis formosus (Wilson)

Kentucky Warbler

Uncommon spring transient, rather rare fall transient, very rare summer resident.

Earliest date of arrival:	April 28, 1928	(August 14, 1929)
Median date of arrival:	May 2	August 25
Median date of departure:	May 18	September 20
Latest date of departure:	(May 21, 1931)	September 29, 1928

The Kentucky Warbler was not recorded on more than 4 consecutive days in spring, usually no more than 5 individuals were noted in a day, and the greatest number for any day was only 15 (May 11, 1929). The first spring arrival was seen between April 28 and May 7, and the peak of the migration generally took place from May 4 to 15. The last transients were observed between May 16 and 21.

Four nesting pairs were found. One, in 1929, was in the hilly upland woods northeast of the lake. This pair was seen from May 10 to August 14, and on June 15 the female was observed gathering and carrying food. From May 10 to August 9, 1930, a pair was noted in the same woodland. In 1931 this woodland contained 2 nesting pairs, and the males were recorded upon every visit from May 8 to July 31. On July 12 a nest contained 3 large young. The nest was about 8 feet from the bottom of a wooded ravine that was 30 feet deep. The bulky nest was built upon the ground under blackberry bushes; it was made of fine grasses and bits of dead leaves and was lined with tiny rootlets.

Southbound transients arrived as early as August 14 and as late as September 5; they usually came between August 20 and 30. The largest number of transients were present between September 2 and 15. Never more than 3 birds were noted in a day, nor more than 9 in an entire movement. The species disappeared between September 15 and 29.

Transients inhabited both hilly and swampy types of woods. In the hilly woodlands they were most often in the ravines and the wetter parts. The birds in the swamp forests were in moderately wet situations, but apparently they avoided such extremely wet places as the vicinity of the woodland pools, where the Ovenbird and Grinnell's Water-Thrush were found.

The Kentucky Warbler may have nested in the area more numerously in early and mid-historic times, for then the ravines were wooded and there

were extensive lowland forests. During the survey the species nested in fair numbers in eastern and southeastern Ohio in seldom flooded lowland woods similar to those about Buckeye Lake.

Oporornis agilis (Wilson)
Connecticut Warbler

Rather uncommon spring transient, rare or very rare fall transient.

Earliest date of arrival:	May 10, 1930	September 2, 1930
Median date of arrival:	May 17	September 5
Median date of departure:	June 2	October 1
Latest date of departure:	June 6, 1925	October 11, 1928

The Connecticut Warbler was among the last of the warbler transients to appear. The earliest arrival was not observed until May 10 (1930), and in 2 years the first arrival was not seen until May 19. The peak of migration was from May 20 to 28, and between May 30 and June 6 the species disappeared. In the average year no more than 15 individuals were seen in a day, usually only 1 to 3. Only in 1929 was the species numerous, and then 15 to 25 birds were noted daily between May 22 to 25.

In spring this warbler was found almost entirely in brush tangles of the remnant swamp forests, and on only 2 occasions was an individual seen in the upland type of woodlands. The birds were most secretive, and since they were present in late spring when the brushy tangles were completely foliated, they were usually extremely difficult to observe. Between 7:00 and 8:30 A.M., however, some males left the dense tangles to perch and sing from small trees or bushes. While sitting almost motionless the males sang persistently in a loud clear voice for several minutes at a time. The power of their voices was well illustrated on the morning of May 19, 1928, when, in Big Woods, I heard a male singing more than 300 yards away. Even at that distance the song was readily heard above a brilliant morning bird chorus. The males usually sang a single type of song, which I interpreted as "chip-a-dilly, chip-a-dilly, chip-a-dilly, quoit." More than 80 per cent of all identified birds were singing, and had it not been for the singers the species would have been considered very rare rather than uncommon.

The first arrival of the southward movement was usually seen between September 2 and 9; the peak of migration appeared to be from September 7 to 20; and the last transient was observed between September 25 and October 11. In this migration the species was not recorded as frequently nor in as large numbers as in spring, and seldom more than 3 birds were seen in a day. It is probable that the species was as numerous as it was in spring, since the nonsinging birds appeared in equal numbers in both seasons. In fall this warbler was not confined to dense tangles of remnant swamp forests, but also inhabited brushy, weedy, and fallow fields.

Ornithologists in the past have considered the Connecticut Warbler as a rare transient in Ohio. Wheaton (1882: 272) and Jones (1903: 190) considered it to be very rare, and Dawson (1903: 180) stated that it was the only warbler, of 40 species then credited to Ohio, which he had not seen. There seems to be no reason to suppose that the species was a less regular transient before 1922. Possibly the birds were less concentrated formerly, when general conditions were more favorable, and were therefore more difficult to find; or, possibly, the earlier workers did not know the song, did not recognize the bird's habitat niche, or did not know its periods of migration.

Oporornis philadelphia (Wilson)
Mourning Warbler

Rather rare or uncommon spring transient, very rare or rare fall transient.

Earliest date of arrival:	May 8, 1931	August 27, 1928
Median date of arrival:	May 11	September 7
Median date of departure:	May 30	October 5
Latest date of departure:	June 2, 1928	October 20, 1928

The earliest spring record for the Mourning Warbler was May 8 (1931); the latest date was May 16.²² The peak of migration took place between May 17 and 28. At that time 1 to 5 individuals were noted daily, and occasionally as many as 10 were seen. From May 22 to 25, 1929, an exceptionally large flight took place, and 15 to 50 birds were present each day. The species usually became rare by May 28.

In spring the Mourning Warbler inhabited chiefly the dense shrub layer of the remnant swamp forests, and, occasionally, the dense tangles of hilly woodlands. The birds in the upland woods were almost invariably in the wetter sections, such as in the lower third of a ravine. The females and some males were very secretive, remaining in dense shrubbery, except when flying in a skulking manner from one tangle to another, or when scolding for an instant upon some terminal branch in response to much "Screech Owl" whistling. The high-plumaged males, however, seemingly sang each morning, and while singing were most conspicuous. The males usually remained quiet during the early morning warbler chorus. About 7 A.M. their sharp, "chip" note could be heard in tangles, and shortly thereafter they appeared singly and in small groups. They perched on small twigs, peered about for a moment, flew upward a few feet, and alighted upon the twigs of small, rather isolated bushes or saplings. There they perched quietly for a few moments before beginning to sing. After singing in loud clear voices several times they hopped upward to the next branches and repeated the song, and then continued alternately to perch higher and sing

²² For central Ohio between 1922 and 1927 the earliest date of arrival was May 1; the average date was May 9 (Walker, 1928b: 22).

until the tops of the shrubs or saplings were reached. Thereupon, they flew to other bushes or saplings and repeated the behavior. After several repetitions they flew into the tangles and remained there, silent. On May 25 I saw at least 25 males going through this performance at once.

In the southward migration never more than 3 individuals were seen in a day. The first arrival was observed between August 27 and September 12; the peak of migration was between September 10 and 28; and the last transients left between October 1 and 20. Both sexes were very secretive in this migration. Because of their inconspicuousness I believe that a smaller percentage of the total number of transients was seen in fall and that the species was more numerous than the records indicated. The fall transients were in the same dense tangles of woodlands that they occupied in spring; they were also in brushy fence rows, in fallow weedy fields, and in shrubbery about farmhouses and cottages.

The Mourning Warbler was a close associate of the Connecticut Warbler. The 2 species were present at the same time, occupied similar habitats, and the morning song periods coincided. The principal difference appeared to be that almost twice as many Mourning Warblers were annually noted. The species was probably as numerous a transient before 1922 as it has been since. Edward S. Thomas found the bird in this area before 1922, on May 17 and 24, 1914, May 18, 1919, and May 22, 1921.

Geothlypis trichas brachidactyla (Swainson)

Northern Yellow-throat

Very common spring and fall transient, common summer resident.

Earliest date of arrival:	April 22, 1922	.....
Median date of arrival:	April 27	(August 10)
Median date of departure:	(May 21)	October 14
Latest date of departure:	.....	November 2, 1929

The first spring Northern Yellow-throat could always be found between April 22 and 30. In more advanced seasons as many as 25 birds were recorded on each of the last few days of April. In backward seasons the first birds did not appear until the last 2 or 3 days of April, and then only 1 or 2 were seen a day. Their numbers always increased greatly during the first few days of May. The period of maximum abundance extended from about May 4 to May 20. At this time 20 to 200 individuals could be daily recorded, and several hundreds, and possibly thousands, were present. A decrease in transients usually took place almost immediately after May 20, and by May 25 only summer residents could be noted.

During migrations and in the nesting season the Northern Yellow-throat was distributed over most of the land of the area. It congregated, however, in brushy and fallow fields, along weed-choked and brushy fence rows, along edges of roads, in ditches, at the edges of cattail swamps where there were

rank growths of herbaceous plants and the ground was not entirely covered with water, and in dense tangles of the more open woodlands and the edges of woods. The bird was rare or absent, especially in the nesting season, in close cropped pastures, in fields of growing corn, and in the densest parts of the largest woodlands.

This species was the second most numerous nesting warbler. Ninety to 150 pairs annually nested. Only 14 nests, however, were found. These were well hidden in rank vegetation and were placed directly upon the ground or a few inches above it in various herbaceous plants. Unlike many bird species, the Northern Yellow-throat usually left its nest unobtrusively before the human intruder came near, and did not betray the location by scolding or other actions. The bird did not always react in this manner toward intruders other than man. On 2 occasions I found a rabbit within a few feet of a nest, and the female near by, scolding loudly. When a nest with eggs was found and the eggs were handled or the surroundings of the nest were changed, the birds usually deserted it. Once my 3-minute examination of 3 half-grown young in a nest apparently caused the parents to desert them. The nest was generally made of bits of last year's leaves, blades of grass, and strips of bark. It was lined with rootlets and hair from cattle, horses, or rabbits.

Females carrying nesting material have been seen as early as May 15, and nest building appeared to be in full swing by May 25. The earliest date for a nest with eggs was May 20 (1931, 4 eggs), and the latest June 26 (1929, 3 eggs of this species and 1 Cowbird egg); the first date for young in the nest was May 27 (1928, 2 young of this species and 1 young Cowbird), and the last July 28 (1928, 4 young); the first date for young out of the nest was June 10 (1928, at least 2 young), and the last August 8 (1926, 1 young). Of 14 nests examined, 1 contained 2 eggs; 1, 2 young of this species and 1 Cowbird young; 2, 3 eggs or young each; 2, 3 eggs and 1 Cowbird's egg each; 3, 4 eggs or young; 1, 4 young of this species and 1 Cowbird young; 1, 4 eggs of this species and 2 Cowbird young; 2, 5 young; and 1, 6 young.

The song period began with the first male arrivals in spring, reached its height in mid-May, and continued undiminished until late June. There was less singing in early July, and by August it had ceased almost entirely. A few birds continued to sing throughout summer and fall, especially in early morning. An individual on Lieb's Island sang during late October and until November 2, 1929, the last day on which he was observed.

Because of the large number of summering birds it was impossible to discover when the first southbound transients arrived. Upon a few occasions the "chip" note of night migrating birds was recognized as early as late July, and a few apparent transients were seen dropping earthward in

the early mornings. Evidence of migration was always apparent by August 10. The peak of migration took place between late August and late September, and then the species was as abundant as it was in spring. It disappeared between October 5 and November 2.

Throughout the survey nesting conditions were very favorable for this weedy field- and brush-inhabiting warbler, and it appears probable that conditions were as favorable as, or more favorable than, at any other period of the historic past.

Icteria virens virens (Linnaeus)
Yellow-breasted Chat

Common summer resident.

Earliest date of arrival:	April 25, 1931	.....
Median date of arrival:	May 2	.....
Median date of departure:	.....	August 30
Latest date of departure:	.....	September 5, 1929

The first spring arrival of the Yellow-breasted Chat was noted between April 25 and May 8. In 5 years the species was first noted in April, and it is possible that unrecorded birds were present on each April of the survey. In the average year the species was fairly numerous by May 8, and between May 10 and 15 the summer numbers were attained. At no time was there evidence of transients migrating through the area, and either the transients were most inconspicuous, as I observed them to be in Yucatán, or there were very few of them.

The species was a common nesting species, but its annual numbers fluctuated greatly. In June censuses I recorded 91 nesting pairs in 1928, 46 pairs in 1929, 103 pairs in 1930, and 43 pairs in 1931. It is probable that the total number in 1931 was no more than 55 pairs, although in 1930 it may have been as high as 150 pairs. The fluctuation in nesting numbers was not caused by variations in amount of suitable nesting habitat (see pp. 124-25 for possible explanation).

The Yellow-breasted Chat nested in dense brush and tangles. It congregated along the canal south of Millersport, in the Lakeside Woods and adjoining brushy fields, in brushy parts of the Big Woods and its environs, and in the eastern hilly woods and brushy fields. The males were conspicuous and noisy during the first half of the nesting season, and because of the curious actions of both sexes one was led to expect that it would be easy to find the nests. Few birds, however, were more adroit in leading one astray. The 9 nests recorded were in bushes or saplings in the midst of dense, brushy, and vine-covered tangles or thorny brier patches. The bulky nests were made of grasses, last year's leaves, and shreds of bark and were a few inches to 7 feet about the ground. The earliest date of a nest with eggs was May 20 (1931, 4 eggs), the latest July 12 (1931, 3 eggs of this species and 1 Cow-

bird egg); the first date for young in the nest was May 26 (1928, 4 young), the last July 21 (1928, 5 young); the first fledglings out of the nest were seen June 2 (1928, 4 young), and the last July 30 (1930, 1 young, probably more).

The males were noisy and conspicuous until about July 15. Thereafter both sexes became secretive and silent. The paucity of records for the first 2 weeks of August gives the impression that the species was rare during that period. Whenever I crouched among the brambles near a dense thicket and repeatedly gave the "Screech Owl" whistle the birds scolded. It was always surprising to find many were present. This warbler was undoubtedly among the first of the summer residents to disappear. Only an occasional bird was noted in late August, even in the best coverts.

The changes in vegetation and landscape in the area during the historic past have enlarged the habitat of the chat in recent years. The number of nesting pairs has probably increased following deforestation and brush removal.

Wilsonia citrina (Boddaert)

Hooded Warbler

Very rare spring transient.

The Hooded Warbler has been recorded twice. On the early morning of May 19, 1928, I heard and later saw a singing male in the Big Woods. I observed a singing male and female in the Lakeside Woods on May 11, 1929. The female was collected.

It is odd that this lovely bird was not seen more often during the investigation. It was a fairly numerous nesting species in the Sugar Grove region during the survey, and it has nested in Fairfield and Perry counties. It is probable that the species nested in the Buckeye Lake area within historic time, for the formerly wooded hills of the eastern half contained the same type of habitat as do the wooded hills in other sections of Perry and Fairfield counties where it still nests.

Wilsonia pusilla pusilla (Wilson)

Wilson's Warbler

Fairly common spring transient, uncommon fall transient.

Earliest date of arrival:	May 10, 1930	August 24, 1928
Median date of arrival:	May 12	August 27
Median date of departure:	May 31	September 24
Latest date of departure:	June 2, 1928	September 29, 1928

In each spring the dainty little Wilson's Warbler was always among the last of the warbler transients to appear. The earliest spring date was May 10, and the latest date May 16. The lateness of these first transients was also indicated in the records of the Wheaton Club for central Ohio (Walker,

1928b: 22). At the peak of migration, between May 16 and 25, 3 to 15 individuals could be seen daily, and at rare intervals as many as 25 were noted in a day. A decrease in numbers was usually observed by May 27, and the species disappeared between May 29 and June 2.

The first southbound transients arrived between August 24 and September 2, and the peak of migration took place between September 4 and 21. At this time seldom more than 10 birds, and never more than 18, were noted in a day. Like many other early southbound transients, this warbler was very difficult to observe because of its secretive habits and the density of foliage, and, despite the records, it is probable that the species was as numerous in fall as it was in spring.

The Wilson's Warbler was noted chiefly in the thickets of shrubs and deciduous saplings that were from 10 to 20 feet in height, and in rows or clumps of willows which in many places bordered the shores of the lake, the banks of streams, and the edges of swamps. In these willows the spring males did much singing, and there both sexes were found in close association with the Black-poll Warbler.

Wilsonia canadensis (Linnaeus)

Canada Warbler

Fairly common spring and fall transient.

Earliest date of arrival:	May 7, 1931	August 19, 1933
Median date of arrival:	May 10	August 25
Median date of departure:	May 29	September 22
Latest date of departure:	June 1, 1924	September 24, 1930

The Canada Warbler was another late spring warbler transient. The earliest arrival was not seen until May 7, and in 2 years it was not noted until May 16. The species was always fairly numerous from May 18 to approximately May 25, after which a rapid decrease in numbers took place. The bird disappeared by June 1. At the peak of migration 3 to 25 individuals were seen daily. Between May 22 and 25, 1929, 25 to 55 were daily observed. In spring the species was found in the greatest numbers in the profuse shrub layer of the larger upland and lowland remnant forests. This lovely warbler had a decided preference for the spicebushes (*Benzoin aestivale*) of the swamp forest, and it fed and sang its pleasing song among these newly-leaved flowering shrubs.

In the southward migration the bird was first recorded between August 19 and September 2. It was usually fairly common from September 5 until September 18. The last transients were noted between September 20 and 24. The Canada Warbler was probably as numerous during the southward migration as it was in spring, but fewer were recorded, because of the dense September foliage and the secretiveness of the birds. In autumn seldom more than 10 transients were seen in a day. The southbound birds were

principally in the dense shrub layer of the larger forests, but some were found on Cranberry Island and in the more swampy brushy thickets of the mainland.

Setophaga ruticilla (Linnaeus)
American Redstart

Common spring and fall transient, uncommon summer resident.

Earliest date of arrival:	April 25, 1931	(July 23, 1930)
Median date of arrival:	May 2	August 4
Median date of departure:	(May 22)	October 7
Latest date of departure:	.....	October 11, 1928

The first spring American Redstart was recorded in April during 4 years of this study. In the remaining 8 years it was first noted between May 1 and 5. During the average year a marked increase in numbers took place between May 1 and 6. The period of maximum abundance extended from May 10 until approximately May 20. A marked decrease in numbers usually took place about May 22, and a few days later it was apparent that virtually all present were summer residents. At the peak of migration 10 to 40 individuals could be daily recorded.

With few exceptions, all nesting pairs were in the elm, ash, soft maple, and pin oak association of the larger, most mature remnant swamp forests. The bird remained principally in the upper shrub layer and middle sections of the taller trees. A few pairs were in the same types of trees and brush of the ravines in the larger upland woods. Censuses of June birds indicated that deforestation, especially in the Big Woods, had caused a decrease from a possible 40 to 60 nesting pairs in 1922 and 1923 to between 30 and 45 pairs between 1930 and 1934.

All 6 recorded nests were in dense grapevine tangles and were from 10 to 20 feet above the ground. They were made of grasses, small root fibers, and bits of dead leaves and were lined inside with shreds of bark taken from such plants as last year's swamp milkweed (*Asclepias incarnata*). The outside walls were covered with plant fibers, spider webs, and lichens. The nests greatly resembled those of the Yellow Warbler.

Nest building was usually well under way by May 25 and continued until June 10, and the females were then conspicuous as they looked for nesting material. The earliest record of a nest with eggs was May 19 (1928, 2 eggs of this species and 1 Cowbird egg), the last June 26 (1932, 3 eggs); the first young in the nest were seen June 5 (1929, 3 eggs in process of hatching), and the last July 4 (1932, 3 young from the same nest as June 26); fledglings out of the nest were first noted June 12 (1928, 1 young being fed by a female), and the last July 23 (1933, 1 young). Of 6 nests, 1 contained 2 eggs of this species and 1 Cowbird egg; 3, 3 eggs each; 1, 3 eggs of this species and 1 Cowbird egg; and 1, 4 eggs.

The males sang persistently from their arrival until early July; they were among the conspicuous birds of the swamp forests. By mid-July they sang much less, and by early August only an occasional song could be heard.

The southward migration began rather early, as it was evident by August 5, and transients flew southward across the lake as early as July 23 (1930). The peak of migration took place from August 20 until September 25. Probably because the birds were silent seldom more than 20 were seen during a day. A sharp decrease in numbers took place during the last few days of September, and by October 5 the species had disappeared, except for an occasional straggler. As a transient the bird was most frequently observed in the larger upland and lowland wooded areas, and to a lesser extent in groups or rows of tall trees. Occasionally, a few, especially in fall, were found in the taller brushy thickets which contained no mature trees.

As the American Redstart was an inhabitant of mature woodland and was partial to swamp forests, it probably was a common nesting species throughout historic time. Because of the continued shrinkage of forest acreage the bird must have decreased in nesting abundance during the historic past. If the forests are removed in the future as rapidly as they were during the survey it is probable that the species will become extirpated as a nesting species within the next 50 years.

Passer domesticus domesticus (Linnaeus)

English Sparrow

Very common resident.

It is not definitely known when the English Sparrow first appeared in the vicinity of Buckeye Lake, though circumstantial evidence indicates that it must have arrived during or slightly before the year 1885. The species was introduced into many sections of Ohio between 1869 and 1882 (Jones, 1903: 221), and by 1885 it had become rather generally distributed. Since its invasion into the area the species has greatly increased in numbers and has been for many years a very common resident. Between 1922 and 1934 it was very numerous, and as many as an estimated 900 were recorded on a summer's day. The breeding population averaged more than 700 pairs.

Throughout the colder portions of winter the bird was found principally about farmhouses and their outbuildings, in villages, and near inhabited cottages. At this season it remained chiefly in the vicinity of human habitations, though on warmer days it foraged in adjacent fields and woodlands. At night the bird roosted in crevices and holes of houses and outbuildings, in hay lofts of barns, in cavities of trees and posts, and in corn shocks. In milder winters it roosted in trees and shrubs which retained their foliage. Occasionally, flocks of from 20 to 125 individuals roosted in large straw or hay stacks, by digging holes in the stacks. The openings of the roosting

cavities were roughly circular in shape, and the cavities, which were 4 to 18 inches deep, were grouped in a narrow band around the stack immediately below the angle where the sloping top merged with the sides. When about to roost the sparrows gathered in groups upon fences, trees, or buildings near the stack. After many had assembled they flew in a compact flock around the stack and then perched again. After several flights the circling birds darted into their roosts in the stack.

The English Sparrows began to select their nesting sites in late winter and early spring, at a time when the native, hole-nesting species were congregated in groups in woodlands or were far to the southward. The sparrows, therefore, had first choice, and when the native species began to seek nesting sites the English Sparrow was well established. Its occupancy of nesting cavities in birdhouses, stumps, snags, trees, and posts certainly increased the nesting competition for some native species and possibly reduced their nesting numbers.

The English Sparrow nested throughout the land area. Most pairs congregated about human dwellings and the shores of the lake. The remainder nested along fence rows, in rows of trees, and in woodlands. The nest was usually in cavities in telephone poles, posts, snags, trees, straw and hay stacks, and corners and crevices of outbuildings and houses. Many nests were built in trees, and although all species of trees were used the Lombardy poplar (*Populus italica*) and osage orange (*Toxylon pomiferum*) were seemingly preferred. The nests were large bulky affairs of grass, straw, bits of paper, and string and were usually deeply lined with poultry feathers. The nests in buildings or in cavities in stumps, snags, or posts were not always roofed over, but those in trees or bushes were domed and had a small entrance at the side. The species was somewhat colonial in nesting.

The birds were remarkable for their persistency, and once a pair decided to nest in a certain place it took much to discourage them. Following a severe storm on June 18, 1928, several pairs which had their nests destroyed began rebuilding them the next day. By June 21 several of the new nests were completed. One pair was building a nest in a hole in the porch of an overturned cottage while the owner was at work razing the structure, and it was not until the man had begun tearing down the porch itself that the birds deserted their nesting site.

Several dozen nests with eggs or young were observed. These contained from 3 to 8 eggs or young each, usually 4 to 6. No Cowbird egg or young was found in the nests, but on June 11, 1931, I saw a female English Sparrow feeding a young Cowbird that was only recently out of the nest. The earliest date for a nest and eggs was March 23 (1929, 4 eggs), the latest August 5 (1922, 3 eggs); the first young in the nest were seen April 11 (1925, in a cavity of a stump on Cranberry Island, at least 3 young), and the last

August 12 (1922, 3 young, in same nest as the eggs of August 5); the first fledglings out of the nest were seen April 23 (1929, 2 young), the last August 20 (1925, 1 young).

In April and May many English Sparrows were found in wooded areas, feeding upon the buds and newly formed seeds of trees and associating with Eastern Purple Finches, Eastern Goldfinches, White-throated Sparrows, and others of the sparrow tribe. Flocking began in early June. At first the flocks consisted principally of young, but as June advanced the percentage of adults increased, and by mid-July the flocks averaged about 60 per cent young and 40 per cent adults. Throughout the last two-thirds of July and all of August flocks of 15 to 200 individuals could be found in grain fields and along roads, feeding upon the ripening grain and upon insects. Many young and adults in family groups and flocks frequented the fences, trees, and telephone wires of highways. The birds captured insects over the roads and very frequently flew across them from one field to another.

Many inexperienced slow flying young were killed by automobiles during late July and August. On several days each summer, along the more important highways, I recorded 1 to slightly more than 5 dead English Sparrows per 5 miles. During the warmer days and on the more traveled roads the killed birds disappeared or became unrecognizable after a day or two; in cooler weather or on less traveled roads they remained recognizable for as long as a week. I conclude that in July and August at least 4 birds (possibly as many as 12) were killed each day by automobiles. The total number of English Sparrows killed by machines was greater than for any other bird species.

With the coming of autumn the birds began to leave the open fields and gathered in flocks near human dwellings.

Dolichonyx oryzivorus (Linnaeus)

Bobolink

Common spring and very common fall transient, common summer resident.

Earliest date of arrival:	April 25, 1931	.....
Median date of arrival:	May 1	(July 29)
Median date of departure:	(May 29)	October 12
Latest date of departure:	.....	October 27, 1928

In 9 years of this survey the first Bobolink of spring was recorded in April. In the remaining 3 years the first arrival was not noted until May 1 to 6. The early transients appeared in small flocks of 4 to 20 individuals and usually consisted of males. The males became numerous by the last few days of April in more advanced seasons, and then a few females were also seen. In backward springs the males remained rather uncommon throughout early May, and the first females were not seen until May 5 to 12. The peak of migration took place between May 10 and 20, when 20 to 250

could be seen daily. A decrease in numbers became apparent on May 22 or a few days later.

The Bobolink nested usually in small loose colonies of 3 to 20 pairs in the wetter sections of high-grass pastures and fields of timothy, clover, and alfalfa. A particularly favorable nesting habitat was the broad border of a sedge-grown temporary pond, where the sedges of such genera as *Carex* and *Scirpus* intermingled with cultivated forage plants and dry-land grasses. The lowlands to the north and west of the lake contained more favorable nesting habitats and more nesting pairs than did any other section. There were scattered colonies in the hilly section, principally in meadow swales. Between 1922 and 1925 from 75 to 120 pairs nested annually. Because of increased drainage and overgrazing of land the nesting numbers were reduced to between 40 and 60 pairs by 1934.

The 22 nests on which field notes were taken were built on the ground and were usually well concealed by overhanging vegetation. They were made of stems and blades of grass and of rootlets. The complement consisted of 3 to 7 eggs. In 3 nests a Cowbird's egg or young was found. The earliest nest with eggs was recorded May 26 (1928, 4 eggs), the latest July 4 (1932, 5 eggs); the first nest with young was seen June 3 (1928, 4 eggs of this species and 1 Cowbird egg), the last July 17 (1932, 4 young, the same nest as on July 4); and the first fledglings out of the nest were seen June 16 (1929, at least 2 young), the last August 5 (1927, 1 young). Of 9 nests containing eggs, 6 were recorded between June 1 and 10. Apparently more than three-fourths of the annual nesting population had nests with eggs during early June.

The males were conspicuous from the time of arrival in spring until mid-June. They sang much while flying about the meadows or perched upon some weed stalk. Females were also fairly conspicuous during this period. After mid-June both sexes became secretive. In early August many left the dry meadows, where they had nested or had been raised, and drifted into fallow fields, where the weeds grew rank and tall, or into weed-grown swamps and cattail marshes. In these situations the fall transients were found.

Migrating flocks were seen as early as the last few days of July, and by August 10 the movement was well under way. Its peak was reached between August 15 and September 15. A few days later a decided decrease in numbers could be noted, and by October 1 the species had become rare. The last transients were seen between October 5 and 27. In the southward migration between 100 and 500 individuals could usually be seen daily as they migrated overhead or fed in marshes and fallow fields. Upon a few occasions from 600 to 2000 were observed in a day.

The Bobolink was a conspicuous, southbound, land bird transient, and migrating flocks or individuals were often seen or heard at night and during

early morning or evening hours in August and September. While in a boat near Sellars Point, between 5:30 A.M. and 6:00 A.M. on September 3, 1931, I heard flight notes of Bobolinks, and upon looking into the cloudless sky I saw a flock of approximately 50 flying in a southerly direction. The roughly rectangular flock was about one-fourth as deep as long and was advancing with a long side in front. At approximately 200-yard intervals behind this group came 31 other such flocks. No flock in this long irregular column contained less than 35 individuals nor more than 75, and the distance between each was remarkably constant. The birds appeared to be about 200 feet above the water, and could barely be seen with the naked eye. This migration was unusual because of its large size and its regularity and uniformity. During other migrations the flocks passed overhead at more irregular intervals, though the roughly rectangular shape of the flocks was the same.

The Bobolink must have been a rather uncommon nesting species before 1800, for apparently the only situations available were the sphagnum bogs and the edges of swamps. I believe it nested in these bogs, for recently I have seen the species nesting in similar bogs in forested sections of northern Michigan. As the timber was removed from the area and cultivation of the land began, the Bobolink must have begun to increase in nesting numbers. By 1890 and until possibly 1915 the greatest nesting numbers were presumably attained. After that, as during this survey, the nesting numbers probably decreased slowly because of the reduction of the nesting habitat.

Sturnella magna magna (Linnaeus)

Eastern Meadowlark

Very common spring and fall transient, common summer resident, rare or uncommon winter resident.

Earliest date of arrival:	(February 9, 1929)	.....
Median date of arrival:	February 23	(September 1)
Median date of departure:	(April 15)	November 14
Latest date of departure:	.....	(December 15, 1926)

The Eastern Meadowlark was one of the first of the smaller land bird transients to appear in late winter; although not as conspicuous as were the Eastern Robin and the blackbirds, it appeared in fully as large numbers. In warmer winters the first definite wave of migration took place in early or mid-February; during the average winter it came between February 20 and 26; and in colder winters it did not appear until March 5 to 14. By mid-March the bird was always present in large numbers, and the peak of migration was reached between March 15 and April 10. Then individuals and loose flocks of 5 to 60 birds could be found over all of the land area, except in the interior of the largest woodlands; several hundred could be daily recorded, and it was obvious that several thousands were present. By April 15 the transient flocks had disappeared.

Several hundred pairs nested annually. Many observations have led me to believe that in the 10,000 most suitable land acres in the area, there was at least 1 pair for every 7 acres—about 1400 pairs. Most of the nesting territory was in fields of grain (except corn), fields of forage crops, fallow fields, meadows, pastures, golf courses, clearings in wooded areas, and in less dense parts of brushy thickets. All 19 recorded nests were built on the ground, chiefly of blades and stems of grasses and parts of larger herbaceous plants, and were lined with fine grasses. About half of the nests were domed over to conceal the eggs or young. Two nests contained 3 eggs or young; 2, 4 eggs or young; 1, 4 eggs of this species and 1 Cowbird young; 1, 4 eggs of this species and 1 Cowbird egg; 6, 5 eggs or young; 6, 6 eggs or young; and 1, 6 young. The earliest date for eggs in the nest was April 30 (1929, 4 eggs), the latest July 4 (1932, 6 eggs); the earliest date for young in the nest was May 6 (1922, 5 eggs in process of hatching), the last July 13 (1929, 5 young); the first fledgling out of the nest was seen May 16 (1926, 1 young fed by a parent), and the last August 12 (1931, 1 young). Most nests with eggs were found between May 15 and June 6; the majority of young in the nest, from May 28 to June 18; young out of the nest became conspicuous by June 12 and remained so until early September.

In late June the fledglings and an occasional adult began to congregate into loose companies of 5 to 25 birds, and by late July almost all were flocking. Because of the many resident birds, it was impossible to learn when the first transients arrived, but the southward migration had definitely begun by September 1. The height of the movement took place between September 15 and October 25. Then the species was usually somewhat more abundant than it was in spring, and many thousands were daily present. All except a few transients had left by November 15, and only those attempting to winter remained.

Few Eastern Meadowlarks were seen or heard migrating in very late evenings and early mornings, but many were observed in the daylight hours. In late March and April individuals and loose flocks of as many as 60 flew northward at a low elevation across the lake. Loose flocks of 5 to 100 birds were often observed flying during spring and fall. The flocks generally flew a short distance and began to feed. Presently, those in the rear rose into the air and, flying over the flock, alighted in front to feed again. This maneuver was many times repeated. When the flock reached an obstruction, such as a woods, cattail swamp, or lake, it flew over in a long loose column. The flocks traveled in this leisurely manner at 2 to 6 miles an hour. Sometimes the flocks stopped feeding and flew 1 to 3 miles at a low elevation before dropping to earth to feed again. This method of feeding and flying was observed many times in blackbirds and Starlings, but with those species it appeared to be a method of feeding rather than of feeding and migrating.

The Eastern Meadowlark was noted throughout 10 winters. In the average winter 10 to 30 birds could be found during a day's field trip, but when the species was most numerous as many as 210 were seen in a day. The wintering birds were found in fields and meadows whenever these were largely free of snow. When there was deep snow the birds congregated about manure piles, straw stacks, and in barnyards and adjacent fields where stock was fed.

Few native birds have so benefited by the white man's invasion as has the Eastern Meadowlark. Before 1800 it was undoubtedly a rare or uncommon nesting species in this region of ponds, swamps, and forests, and it may have been absent. With the establishment of pastures and fields a suitable nesting habitat appeared, and as more timber was removed more nesting territory became available and nesting pairs increased. It is probable that the number has grown rather steadily throughout historic time, and that there were more nesting Eastern Meadowlarks between 1922 and 1934 than there were at any other period. It may well be that with further timber removal and the draining of remnant swamps the bird will increase. During this investigation, however, several pastures were overgrazed and the fertility of the soil in some fields became so low and vegetation so scant that they were no longer suitable as nesting territory. If these unfavorable conditions spread, the Eastern Meadowlark, which has so greatly benefited by the presence of the white man, will again decline in nesting abundance.

Several old men have told me that in their youth the Eastern Meadowlark was considered a fair game bird, and that in late summer and fall many were killed for food and sport. The flesh was said to be well flavored and not inferior to that of many game birds. As sport, the bird was less favorably considered than were the Ruffed Grouse, Bobwhite, and Woodcock. The Eastern Meadowlark usually did not allow the dog or hunter to approach it closely and flushed before the hunter came with gunshot range.

Agelaius phoeniceus phoeniceus (Linnaeus)

Eastern Redwing

Very common spring and fall transient, common summer resident, rare or uncommon winter resident.

Earliest date of arrival:	(February 4, 1928)	.....
Median date of arrival:	February 23	(September 15)
Median date of departure:	(April 15)	November 20
Latest date of departure:	.....	(November 24, 1927)

Throughout the 9 warmest months in each year the Eastern Redwing was one of the 10 most numerous bird species. Few other native birds so dominated the area for so great a portion of the year.

The bird became prominent each year during the first big wave of migration, for it was one of the first of the northbound transients to appear. In

warm winters large flocks arrived by the last week of January or the first 2 weeks in February, during the average winter in the last week of February, and in the coldest winters between March 5 and 12. At no season were these blackbirds more welcome, bringing as they did life and pleasant activity to the thawing marshes, soggy fields, and bleak woodlands. On clear spring evenings flock after flock flew across the blue evening sky and alighted in the marshes or, temporarily, in the trees, to sing and chatter before going onward.

The species was always very numerous by mid-March and so remained until late October. The spring height generally was between March 20 and April 7, and then many thousands were present daily. A sharp decrease was noted in mid-April, and after that only a few small flocks of transients remained.

Few or no bird species nested in larger numbers, and it was evident that many hundreds of pairs nested annually. The majority nested in the large cattail marshes, such as those near the mouth of Honey Creek, Little Buckeye game refuge, Maple swamp refuge, and Liebs and Onion islands. At the height of the season as many as 200 nests were recorded in a day. The species also nested in swamps of willow, buttonbush, and alder which contained little or no cattail, about sedge-bordered ponds, in depressions overgrown with sedges, and in meadows of forage crops. A few nests were found in bushes in the thickets on very dry hillsides. The species began to pair and select its nesting territory by April 10, and by May 10 nest building was at its height. Most of the nests with eggs were noted between May 15 and June 5, and most of the young in the nest were seen between May 28 and June 15. Hundreds of nests containing 2 to 7 eggs or young were noted. The majority had 3 to 5 eggs or young each. A Cowbird's egg was found in each of 4 nests. These nests were isolated. Apparently, it was sometimes possible for a Cowbird to lay its egg in a solitary nest without discovery, whereas if it attempted to lay an egg in a nest in a colony, it was driven away. Once eggs were in the nests the Cowbird was not tolerated about the nesting colonies.

The earliest nest with eggs was seen on April 16 (1927, 4 eggs), the latest June 26 (1932, 3 eggs); the first nest with young was noted April 28 (1927, 3 young and 1 egg in same nest as of April 16), the last July 4 (1932, 5 small young); the first fledglings out of the nest were noted May 16 (1926, at least 2 young), and the last in mid-July.

Flocking began in early June and consisted almost entirely of young birds. As the season advanced the flocks increased in size and number, and the proportion of adults became increasingly great. By mid-July almost all adults and young were in flocks. The summering birds scattered over the entire land area to feed, but at night all except a few came to the cattail

marshes to roost. Throughout August the number of individuals continued to increase, for apparently birds came from surrounding territory to roost in the marshes. The actual beginning of migration was impossible to detect, but it had begun by early September. It was at its peak from mid-September until late October. With the coming of the first snows and freezing weather of early November, the numbers decreased sharply, and by mid-November all except a few had left. During fall the species was more numerous than it was at any other season, and many thousands were present daily. On September 10, 1927, Edward S. Thomas took a picture of a small part of a flying flock. There were more than 400 birds in the picture, and we estimated that there were at least 10,000 in the flock. Undoubtedly, there were days during each fall when 20,000 to 50,000 were present.

This blackbird was found during each winter of the survey. Throughout some winters only a few could be noted, but in warmer winters several hundred were present, and flocks containing an estimated 200 birds were found. Some wintering birds roosted in cattail marshes, as did the species in summer and in migrations, but the majority roosted in inland swamps which contained dense brush.

From observations of present-day nesting birds, I assume that this blackbird nested in at least fair numbers before 1800. The swamps and shores of the small postglacial lakes should have been fair nesting territory. Forest removal and the creation of the reservoirs with the establishment of large cattail marshes must unquestionably have greatly increased the amount of available nesting area and the number of nesting pairs. It is possible that the peak of nesting abundance was about 1900, for then the cattail marshes were extensive and many recently drained inland swamps were then potential nesting territory. The species seems to have been more numerous between 1922 and 1925 than it was between 1930 and 1934. In the latter years many swamps were drained and parts of marshes were reclaimed for cottage sites, which rendered them unsuitable for nesting. With further draining and more intensive use of land, which now seems imminent, a decided decrease in nesting numbers may occur.

At least 60 Eastern Redwings were examined and measured which were unquestionably referable to *A. phoeniceus phoeniceus*. All summer birds examined were of this form and so were all except 1 transient and 2 winter visitors.

Agelaius phoeniceus arctolegus Oberholser
Giant Redwing

Seemingly a rare or uncommon transient and winter resident.

The exact abundance and migrations of the Giant Redwing during the 12 years were not ascertained. Unfortunately, this subspecies could not be

distinguished in the field from the more abundant Eastern Redwing. To have obtained an accurate estimation of abundance, it would have been necessary to collect dozens of specimens during the colder months. Thirty-four Redwings were collected during migrations and in winter, and of these 3 definitely belonged to the subspecies *arctolegus*. From this ratio it is concluded that the Giant Redwing was possibly a rare or uncommon late fall and early spring transient and winter resident.

The first Giant Redwing was collected by Charles F. Walker and me on October 28, 1927, as it sat by itself in a tree on Cranberry Island. Harry Fabert and I collected the other 2 specimens from a flock of approximately 100 birds on January 2, 1933. At the same time we also collected 8 other specimens from the flock which were referable to *A. p. phoeniceus*. If this sample was indicative of the entire group, it consisted of approximately 80 per cent *phoeniceus* and 20 per cent *arctolegus* (Trautman, 1935b : 322).

The 2 *arctolegus* taken with the 8 *phoeniceus* from the flock of 100 were well within the weight and size ranges of *arctolegus*. As can be seen from Table VIII they are readily separable.

TABLE VIII
WEIGHT AND MEASUREMENTS OF 2 SPECIMENS OF THE GIANT REDWING
AND 8 SPECIMENS OF THE EASTERN REDWING

Subspecies	Sex	Number of Birds	Weight in Grams	Average Wing Lengths in mm.	Tail Length in mm.	Length of Culmen in mm.	Depth of Bill at Base in mm.
<i>A. p. arctolegus</i>	♂	1	66.25	123.50	90.00	23.00	12.50
<i>A. p. phoeniceus</i>	♂	1	60.55	117.10	88.00	22.20	12.00
<i>A. p. arctolegus</i>	♀	1	56.20	106.50	78.00	20.00	12.70
<i>A. p. phoeniceus</i> *..	♀	7	47.14 (43.50- 48.55)	101.00 (100.00- 101.50)	74.35 (70.00- 75.50)	18.75 (17.50- 19.90)	10.35 (10.00- 11.00)

* The upper figures are average weight and measurements of 7 females of *phoeniceus*; figures in parentheses are extremes in weight and measurements.

**Icterus spurius* (Linnaeus)

Orchard Oriole

Rare spring transient, very rare fall transient and summer resident.

Earliest date of arrival: April 30, 1929

Median date of arrival: May 6

Median date of departure:

Latest date of departure: August 17, 1930

The Orchard Oriole was a consistently rare spring transient. Never more than 4 individuals were recorded in a day nor more than 6 in a season, and in 4 years none was recorded. It appears probable that a few were

present each spring. Despite the scarcity of spring birds the species was noted more often at this season than at any other.

Single pairs were recorded nesting during 3 summers. The first pair was seen from May 2 to July 25, 1925, about an orchard near the wasteweer. On June 20 the female was observed feeding a fledgling that was recently out of the nest, and at least 2 other fledglings were seen in the vicinity. The second pair was noted on several occasions between May 18 and July 25, 1928. They frequented a row of small shade trees near Sellars Point, and though undoubtedly nesting, no nest or young were found. The last nesting pair was repeatedly seen from April 30 to July 13, 1929, about some medium-sized shade trees on Liebs Island. On July 13 I found the nest and 4 well-grown young in a small willow tree beside the water's edge. This nest, approximately 8 feet above the ground between the forks of a small branch, was well built of fine grasses and was lined with horsehair and the inner shreds of bark from herbaceous plants.

A few birds, thought to be southbound transients, were seen during late July and early August, and the last individual for any year was noted August 17. The species was undoubtedly among the first of the summer residents to leave. It also departed early from the remainder of central Ohio (Walker, 1928b: 18). During this investigation the species was fairly numerous in several sections of central Ohio, especially in the Sugar Grove region.

Wheaton (1882: 359) considered it a "common summer resident" in central Ohio, and Field (1903: 140) stated that it was a "common summer resident [Licking County] from May to September."

Icterus galbula (Linnaeus)

Baltimore Oriole

Common spring transient, uncommon fall transient, fairly common summer resident.

Earliest date of arrival:	April 24, 1925	.....
Median date of arrival:	April 29	(August 10)
Median date of departure:	(May 18)	September 5
Latest date of departure:	.....	September 17, 1924

The first Baltimore Oriole of spring was seen in April during 8 years of the investigation; in the remaining 4 years it was first observed between May 1 and 5. It is probable that during April of all years a few unrecorded birds were present. In more advanced seasons this oriole had become rather numerous by the last of April, but in backward springs it was not numerous until May 5 to 10. The peak of migration generally took place between May 10 and 20, when 10 to 25 birds were daily recorded. At this time the species was more conspicuous and apparently more numerous than it was at any other period. A slight decrease in numbers took place following May 18, and shortly thereafter no transients could be found.

Censuses taken in June indicated that 35 to 70 pairs nested each year. The tall shade trees along the North Bank from the village of Buckeye Lake to Sellars Point held many nests. The trees along the remainder of the shore, on the wooded islands, along the roads, about the farmhouses, along the village streets, and on the wooded banks of the larger streams also contained a fair number of nests. A solitary tree or one slightly removed from the rest was most often used for a nesting site, and although all types of shade trees were used the white elm (*Ulmus americana*) and the slippery elm (*Ulmus fulva*) were seemingly preferred. Many dozens of nests were seen, but only 3 were examined. It was difficult to look at the contents of a Baltimore Oriole's nest, and frequently it was impossible to count the eggs without destroying the nest. The first of 3 nests examined was found on June 21, 1928, near the wasteweir. It was in a white elm tree which had been uprooted by the violent storm of June 18. The eggs, probably 4 in number, were smashed. The next nest was examined on June 5, 1929. It contained 5 eggs and overhung a road north of Sellar Point. I reached the nest from the top of an automobile parked in the road. On June 16, 1929, the third nest was examined. It was suspended 12 feet above the ground from a small branch of a sycamore tree and contained 4 half grown young.

Observations indicated that nest building began as early as May 10. Most of the nests were in process of construction between May 15 and 30, and the majority were completed and ready for eggs between May 25 and June 10. The first fledglings out of the nest were noted on June 26 (1929), and from July 4 until July 25 fledglings could be frequently seen. The last fledglings were observed during early August.

In May and June the Baltimore Oriole was fairly conspicuous, and the males were persistent singers. During July both adults and young were conspicuous, but in that month the amount of singing by the males greatly decreased. The birds were very quiet throughout August. Evidence of migration was observed in early August, and apparently the southward movement took place in the last 3 weeks of that month. The records indicated that this species was an uncommon southbound transient. It may have been more numerous than I have indicated, for throughout this movement it was very retiring and difficult to observe. The last individuals were noted between September 1 and 17.

The Baltimore Oriole has been present in the area for many years past, and probably throughout historic time. Between 1751 and 1800 the bird probably nested in trees of the more open swamps, about the shores of the small postglacial lakes, and along the banks of streams. It is probable that because of the removal of the forests the species has increased in nesting numbers.

Euphagus carolinus (Müller)

Rusty Blackbird

Common or very common spring and fall transient, an occasional rare or uncommon winter resident.

Earliest date of arrival:	(February 22, 1930)	September 26, 1931
Median date of arrival:	February 28	October 3
Median date of departure:	May 12	November 21
Latest date of departure:	May 22, 1929	(November 24, 1928)

The spring vanguard of the Rusty Blackbird made its first appearance between February 18 and March 2. Its numbers were small until almost mid-March. Then or a few days later a sharp increase in numbers took place, and until approximately April 12, from 50 to 3000 individuals could be recorded daily. There was generally a decrease in numbers shortly after mid-April, and from then until May 5 only 5 to 50 individuals were observed in a day, and never more than 100 were seen. The last transients were recorded between May 8 and 22.

The first arrivals in fall were noted between September 26 and October 5. A few days later large flocks usually made their appearance. The species had become common by October 15, and so remained until approximately November 15. In fall the daily numbers did not average as high as they did in spring, for usually only 50 to 1000 birds could be daily recorded, and only occasionally in late October could as many as 2000 be observed in a day. The last transients were noted between November 18 and 24.

A few Rusty Blackbirds were recorded as winter residents during 6 years, and it is possible that there may have been a few unobserved wintering individuals during the other winters. The largest number, approximately 75 birds, was recorded during the 1931-32 winter.

During migrations the birds were found most frequently on wet ground or near water. Many spent the day in the cattail marshes and on the shores of the lake, where they fed while wading in the shallows. In the inland brushy swamps they also fed in shallow water or on wet ground. There were flocks about the "sky ponds" and overflow puddles in fields, especially in early spring, and small groups were along the banks of the streams. At night all except a few roosted in cattail swamps about the lake, on Cranberry Island, or in the denser and more brushy inland swamps. Throughout the bird's entire sojourn it was a close associate of the Eastern Redwing, and to a lesser extent of the Bronzed Grackle, Cowbird, and Starling. Wintering individuals fed about the water as long as it was free of ice, but whenever the lakes, ponds, and streams were ice-covered, they were to be found in fields of uncut corn or of rank weeds near brushy thickets. Wintering birds roosted in cattail marshes and in the denser and more brushy inland swamps.

During the investigation the Rusty Blackbird was more numerous in the Buckeye Lake area than it was in any other area of similar size in central Ohio. Transients also remained longer in spring and fall than they did elsewhere in central Ohio.

Quiscalus versicolor Vieillot²³

Bronzed Grackle

Very common spring and fall transient, common summer resident, occasional rare or uncommon winter resident.

Earliest date of arrival:	(February 15, 1930)	.....
Median date of arrival:	February 24	(August 9)
Median date of departure:	(April 10)	November 20
Latest date of departure:	.....	(November 26, 1933)

The first Bronzed Grackles of the northward migration appeared between February 15 and March 10. In some years the species came in large numbers in February with the first great flights of Eastern Redwings and Eastern Robins, and as many as 2000 were recorded in a day. In other years it did not appear in large numbers until early March, when the second or third large waves of migration were in progress. The species was unusually late in 1928, and the first arrivals did not appear until March 10.

Each year the species was numerous by March 12. The peak of migration took place between March 15 and April 8, and then 200 to 2000 were daily recorded. Shortly after April 8 a sharp decrease became apparent, and after that few or no transients could be noted. During spring the birds remained in flocks of 8 to 500 birds or flocked with other species of blackbirds and Starlings. The majority fed principally in the drier fields and pastures and roosted at night in spruce trees about farmhouses, and in willows, alders, and buttonbushes of the inland swamps. In spring the Bronzed Grackle was not as aquatic in its habits and feeding as were the Eastern Redwings and Rusty Blackbirds.

From June counts it was estimated that between 70 and 100 pairs nested annually. The large spruces and pines about farmhouses and in villages were the chief nesting sites, and as many as 28 pairs nested in a large Norway spruce (*Picea abies*). Small colonies or isolated pairs nested in alder or willow swamps and in groups of willows along streams. A few small colonies nested in the open ironwork of bridges. The very bulky nests were loosely made of coarse grasses, stems, and leaves of herbaceous plants, a few feathers, and, sometimes, a bit of horsehair, string, paper, or rag. Of 21 nests with eggs or young, 8 contained 4 eggs or young each; 8, 5 eggs or young each; 4, 6 eggs or young each; and 1, 7 eggs.

Nest building began in mid-April and was well under way by April 25. Most of the nests contained eggs between April 25 and May 15, and young

²³ See Wetmore, 1939: 230, for use of the specific name *versicolor*.

in the nest were most numerous between May 10 and June 5. The earliest nest with eggs was recorded April 19 (1928, 5 eggs), the latest June 15 (1929, 5 eggs); the first young in the nest were noted April 23 (1929, 4 young), and the last June 21 (1928, 5 young); the first fledglings out of the nest were recorded May 15 (1930, 3 young), and the last July 4 (1932, several young).

Family groups of adults and young were noted in fair numbers by May 25, and from then on became daily more numerous. The groups left the nesting colonies almost as soon as the young were out of the nest and went to feed in pastures, grain fields, meadows, and on the lake margins. All except a few of the young were out of the nest and in fields or about the lake by June 15, and then family groups were very conspicuous. In early July these groups began to merge into flocks, first in the evenings as they flew toward their roosts, and later throughout the entire day. By mid-August most of the birds were in groups of 8 to 200 individuals or in association with Eastern Redwings. Throughout summer the species roosted chiefly in cattail swamps. A small percentage roosted in spruce trees and in brushy and wooded swamps. In August, birds from outside the area began to flock into the marshes each evening to roost, and by the latter part of that month the marshes contained hundreds, sometimes thousands, of birds. During the warmest weather the Bronzed Grackles were more aquatic in feeding than they were at any other period, and many waded and fed in the shallows. Much of their aquatic food consisted of small invertebrate organisms and the small fish fry that swarmed in the shallows. Occasionally, they fed upon large dead fish, snakes, or frogs that drifted to shore. They also ate garbage.

The fall migration became apparent in early September. At the height of the movement, from mid-September until late October, the species was as numerous as it was in spring, and there undoubtedly were thousands present daily. Throughout this migration the bird fed chiefly in grain fields, especially those planted in corn, and at night roosted in the cattail marshes.

The Bronzed Grackle was recorded throughout 5 winters of this investigation. In 4 winters never more than 12 individuals were noted. In the remaining winter the several small flocks totaled 102 birds. In 2 winters following the close of the investigation Wheaton Club members found Bronzed Grackles in the area, and on December 22, 1935, they recorded 333 of the birds (Wheaton Club, 1936: 64). This was the largest number ever noted in late December. The wintering birds remained chiefly about barn yards, in fields where stock was fed, and in the larger uncut cornfields. They roosted in spruces, in cattail marshes, and in the brush of inland swamps. I assume that the bird was present throughout historic time. The oldest residents have told me that it was abundant 70 years ago.

Molothrus ater ater (Boddaert)
Eastern Cowbird

Common or very common spring and fall transient, common summer resident, rare or uncommon winter resident.

Earliest date of arrival:	(February 22, 1926)	.....
Median date of arrival:	February 28	(August 18)
Median date of departure:	(April 18)	November 23
Latest date of departure:	.....	(November 30, 1929)

The Eastern Cowbird generally did not appear in large numbers until early March, although a few males could sometimes be found in large February flocks of other blackbird species. The peak of the spring migration took place from March 12 to April 8. The transient flocks began to disappear in mid-April, and by April 22 all remaining appeared to be summer residents. The number recorded during a spring fluctuated more from one year to another than did the numbers of any other blackbird species. During some years not more than 300 birds were noted in a day, but in others between 500 and 2000 could be observed daily. The birds associated in larger numbers with the Bronzed Grackle than they did with any other blackbird species, and they habitually fed in drier situations than did the Eastern Redwing or the Rusty Blackbird. They roosted with other blackbirds in cattail swamps and inland marshes.

Pairs and small groups of courting birds were seen in late March, though it was not until mid-April that courtship and mating became general. The courting pairs or groups were conspicuous and numerous from late April to early June and could then be found in woodlands, brushy thickets, fields, pastures, and meadows. Solitary females, slinking about through the woodlands or brushy thickets looking for nests in which to deposit their eggs, became a familiar sight from early May to mid-June. Throughout the breeding season 15 to 45 birds could be daily noted, and there apparently were several hundred always present. The first Eastern Cowbird egg for the year was found on April 19 (1928) in a nest with 5 Phoebe eggs. The last was found on June 30 (1928) in a nest with 4 Yellow Warbler eggs. The majority of the Cowbird eggs were found between May 18 and June 25, during the height of the breeding season of most small land birds (Table IX).

The first young of the year, unaccompanied by foster parents, were usually noted between May 15 and 25, and by mid-June they were very numerous. Flocking of young and adults became apparent in late June and early July, and by early August most individuals were in flocks of 6 to 50 birds of their own kind, or in flocks of other blackbird species or Starlings. In spring and summer Eastern Cowbirds remained principally in meadows, pastures, and fields, usually in those containing cattle. During the warmest days a few could be found in wetter situations, such as on the

TABLE IX
BIRD SPECIES PARASITIZED BY THE EASTERN COWBIRD

Species	Number of Nests with no Cowbird Eggs or Young	Number of Nests with Cowbird Eggs	Number of Nests with Cowbird Young	Nests Recorded	Number of Observations of Birds Feeding Cowbird Fledglings out of the Nest
Yellow-billed Cuckoo	7	1	0	8	0
Phoebe	125 +	6	3	134 +	2 +
Alder Flycatcher	7	6	3	16	12 +
Acadian Flycatcher	2	0	0	2	2
Eastern Wood Pewee	0	0	0	0	1
Carolina Wren	7	0	0	7	1
Catbird	35	0	0	35	2
Eastern Robin	120 +	1	0	121 +	3
Wood Thrush	4	2	0	6	1
Blue-gray Gnatcatcher	6	2	1	9	1
Starling	42	0	0	42	2
Red-eyed Vireo	9	3	2	14 +	4
Warbling Vireo	6	2	1	9	0
Prothonotary Warbler	0	0	0	0	1
Yellow Warbler	23	5	9	37	16 +
Ovenbird	0	0	0	0	1
Northern Yellow-throat	9	2	3	14	2
Yellow-breasted Chat	7	1	1	9	1
American Redstart	4	2	0	6	0
English Sparrow	Several dozen	0	0	Several dozen	1
Bobolink	19	1	2	22	0
Eastern Meadowlark	17	1	1	19	0
Eastern Redwing	Hundreds	4	0	Hundreds	0
Eastern Cardinal	22	4	5	31 +	13 +
Indigo Bunting	11	2	3	16	10 +
Eastern Goldfinch	12	2	2	16	10 +
Red-eyed Towhee	7	1	1	9	2 +
Eastern Vesper Sparrow	11	2	1	14	2 +
Eastern Chipping Sparrow	6	2	0	8	7 +
Eastern Field Sparrow	17	4	2	23	15 +
Allegheny Song Sparrow	37	6	9	52	30 +

shores of the lake and in the cattail marshes. Indications of the beginning of the southward migration became apparent between August 15 and 25 and by September 10 were well under way. The height of the fall movement took place between September 15 and October 25. The autumn numbers fluctuated as markedly from year to year as did those in spring. In some autumns seldom more than 200 were recorded in a day, during others as many as 1000 were noted in a day. Throughout the fall the species was found in grain fields and in the vicinity of cattle. In the evenings it flew in large flocks of its own kind or with other blackbirds and Starlings to roost in the marshes and swamps.

The Eastern Cowbird was recorded during the 9 winters in which the most field work was done, and I assume that a few were present in the re-

maining 3 winters. Usually, only a few individuals or a few small flocks totaling less than 20 birds were noted in winter. In 2 years 50 to 300 wintered. The birds remained throughout the day about barnyards and adjacent fields where cattle were kept. Some roosted at night in brushy inland marshes or in cattail swamps, and when only a solitary individual or a few were present, they most frequently roosted and associated with English Sparrows. The Eastern Cowbird was probably present as a breeding species throughout historic time, for the bird's hosts were present then and it is not averse to wooded conditions.

Piranga erythromelas Vieillot
Scarlet Tanager

Uncommon spring transient, rare summer resident, rare fall transient.

Earliest date of arrival:	April 30, 1929	.....
Median date of arrival:	May 3	.....
Median date of departure:	(May 23)	(September 16)
Latest date of departure:	.....	September 25, 1929

In 1929 and 1933 the first Scarlet Tanager of spring was noted on the last day of April. In the remaining 10 years the first arrival was recorded between May 1 and 10. For some reason not apparent the species made its appearance in the Buckeye Lake area later in spring than it did elsewhere in central Ohio (Walker, 1928*b*: 19).

The species was always present by May 10, and from then until May 20 migration was at its height. During this period the bird was more numerous than it was at any other season, though even then transients were not recorded daily. During the largest migrations, it was not unusual to record 3 to 7 in a day, and on May 19, 1928, an estimated 25 birds were observed. The last transients had seemingly left by May 25.

The Scarlet Tanager was a rare nesting species, and only 1 to 6 (1928) pairs were annually recorded. Without exception these pairs were always in the larger and more mature woodlands, and the majority were in the upland beech-oak-hard maple woods. Few nested in lowland woods, and those which did generally nested on the low ridges where grew beech, hard maple, and white oak trees.

Evidence of 4 nestings was obtained. From May 6 to July 16, 1924, a pair was repeatedly noted in a beech-hard maple-white oak section of Big Woods, and on July 12 I saw the female feeding a fledgling that was learning to fly. On May 26, 1928, I found a nest containing 2 eggs, in a Redbud tree (*Cercis canadensis*) in the wooded ravine at the northeast end of the lake. On June 2, 1928, I found a nest with 4 eggs, in a sapling oak on the wooded west bank of the canal, about one-half mile south of Millersport. I found the last nest on August 9, 1930, in the wooded ravine at the northeast end of the lake. This nest was in a sapling sugar maple (*Acer saccharum*)

and contained 4 half-grown young. All 4 nests were thin and flat and were poorly constructed of fine grasses, rootlets, and the inner shreds of the bark of grapevines or herbaceous plants. They were between 5 and 16 feet above the ground on horizontal branches of small trees.

The southward migration was poorly defined, for seldom were more than 2 individuals seen in a day or more than 6 in a season. The majority were seen in late August and early September, and the last transients were noted between September 5 and 25. The Scarlet Tanager was present throughout historic time and was probably more numerous formerly as a nesting species, when the hills to the south and east of the lake were wooded. Wheaton (1882: 284) stated that the species was a "very common summer resident" in Ohio, and Field (1903: 141) said it was a "tolerably common summer resident from April to late in September [Licking County]." The bird was a fairly numerous resident in many wooded sections immediately south and east of Buckeye Lake.

**Piranga rubra rubra* (Linnaeus)

Summer Tanager

Very rare spring transient.

The Summer Tanager was noted upon 3 occasions. The first time was May 6, 1924, when Robert Jennings, Charles F. Walker, and I saw 1 in Jack's Neck Woods. The second bird I noted in the Lakeside Woods on May 11, 1929, during a huge migration of land birds. I saw the third in Jack's Neck Woods on April 30, 1933.

It is odd that the Summer Tanager was not recorded oftener during this investigation, for it was noted regularly elsewhere in central Ohio, and it nested in the 3 counties in which Buckeye Lake is situated, and within 4 miles of it.

It seems certain that the bird must have occasionally nested in the area within historic time before 1922, when the hilly sections were more brushy and wooded.

Richmondia cardinalis cardinalis (Linnaeus)

Eastern Cardinal

Very common resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(February 27)	(October 2)
Median date of departure:	(April 8)	(November 14)
Latest date of departure:	.....	.....

The Eastern Cardinal was one of the most numerous and conspicuous of the so-called resident species. In an all-day field trip one could always record between 100 and 300 individuals, and it was obvious that more than

300 were always present. There was, however, a seasonal and annual fluctuation in numbers and a slight indication of semiannual migrations. The species also was more nearly equally distributed at some seasons than it was at others.

In the coldest portion of the year, especially when there was much snow, the bird was largely confined to the dense cover of the larger of the brushy thickets, fallow fields in which giant ragweed (*Ambrosia trifida*) and other weeds had grown rank and tall, weedy fields of uncut corn, and the dense shrub layers and grapevine tangles of woodlands. As rich lowland fields, brushy thickets, and swampy woodlands were more numerous and extensive north and west of the lake, the bird was found there in the largest numbers. A few remained throughout winter in the dense shrubbery about farmhouses, cottages, and in villages, especially where they were fed. There were few in the more open beech-hard maple upland woods south and east of the lake, and these principally remained in the more sheltered intervalles. Occasionally, a few could be found wintering in the large cattail marshes which contained some brushy border.

Throughout the winter, the conspicuous Eastern Cardinal gathered in flocks of between 4 and 60 individuals. Its winter numbers fluctuated considerably, for some years the bird appeared to be less numerous than it was in summer, but in others it was much more numerous. In a few instances, a decrease in wintering numbers was noted immediately following a severe sleet or snow storm of exceptionally long duration.

Early in January a few brightly colored males began to sing. By early February most males sang a little, especially on clear mornings. The amount of singing steadily increased, and by early March the species was almost in full song. Its song, with that of the Carolina Wren, Tufted Titmouse, and Carolina Chickadee, constituted the dominant bird music of the late winter months. With the disappearance of cold weather in early March the Eastern Cardinal began to leave dense cover and scattered over the remaining land. In March, especially the first half, the species appeared to be more numerous than it was in winter, indicating that possible transients were present. On a few occasions small groups of apparent transients were seen dropping to earth from high in the air.

By early April the winter groups and transients had disappeared, the species had become distributed over all of its breeding habitat, and most of the males were defending territory and singing. It was evident that more than 150 pairs nested annually, and that during some years there may have been as many as 225 pairs. As at other seasons, there appeared to be a noticeable yearly fluctuation in the number of spring birds. The species was less numerous following severe winters.

The Eastern Cardinal nested in brushy fields and thickets, along over-

grown fence rows, in brush about the edges and openings of wooded areas, in woodland pastures where grazing had not destroyed all of the brush and saplings, in shrubbery about farmhouses, cottages, and villages, and along the brushy shores of the lake and the edges of cattail marshes.

The nests were rather poorly constructed of grasses, twiglets, rootlets, inner bark of grapevines, Virginia creeper, or herbaceous plants and were lined with finer portions of the same materials, with a little cattle or horse-hair. The nests were usually in shrubs, small saplings, or vines and were 1½ to 20 feet above the ground. Of 31 nests examined, 1 contained 2 young; 3, 2 eggs or young of these species and 1 Cowbird egg or young each; 11, 3 eggs or young each; 4, 3 eggs or young of this species and 1 Cowbird egg or young each; 9, 4 eggs or young each; 2, 4 eggs or young and 1 Cowbird egg or young each; and 1, 5 eggs. The earliest nest with eggs was found on April 25 (1931, 3 eggs of this species and 1 Cowbird egg), and the latest June 30 (1928, 3 eggs); the earliest nest with young was found April 30 (1929, 3 young just hatching), and the latest July 4 (1932, 2 small young); the first fledgling was seen on May 9 (1930, 1 young), and the last July 29 (1930, 1 young). The majority of nests with eggs were found between May 4 and June 4; most of the nests with young from May 15 to June 20; and most of the fledglings out of the nest from May 25 to July 5.

The song period was at its peak from early April to early June. Shortly after June a decrease in singing was noted, and by early August it had almost entirely ceased. During early August both sexes became increasingly quiet and secretive, and by mid-August and until early September they were more retiring than they were at any other period. In late summer many adults and some young left the more open fields or thickets and congregated in denser woodlands and thickets, where most of the individuals wintered. There the molting adults could be found with patches of body skin exposed. In some birds all the feathers of the head were missing, leaving the dark skin exposed, and giving this usually crested, rather jaunty bird a most woe-begone appearance. The adults were then very retiring, and it was difficult to get them to scold in response to the "Screech Owl" whistle.

In mid-September, with the plumage of the adults largely renewed, the birds became much more vociferous, the males attempted to sing a little, and many left the denser coverts to roam about the surrounding fields and thickets. From early October to early November, an increase in daily numbers was noted. Small groups, probably transients, could be occasionally seen dropping out of the sky. Upon the coming of the first snows or cold weather in late November, many again began to congregate in the denser thickets and woodlands.

The Eastern Cardinal has probably been a resident of the area throughout historic time. It must have increased in numbers since 1800, because the

removal of mature forests and subsequent establishment of brushy thickets, weedy fields, and open woodlands greatly increased the extent of the suitable habitat.

Hedymeles ludovicianus (Linnaeus)

Rose-breasted Grosbeak

Uncommon spring and fall transient.

Earliest date of arrival:	April 28, 1927	August 20, 1925
Median date of arrival:	May 3	September 8
Median date of departure:	May 23	October 2
Latest date of departure:	May 26, 1928	October 7, 1928

In 4 years of the investigation the first Rose-breasted Grosbeak of spring was noted between April 28 and 30. During the remaining 8 years it was first observed from May 1 to 9. The period of maximum spring numbers was between May 5 and 19. Seldom more than 10 birds were observed in a day and never more than 21 (May 16, 1929). The last transients were seen between May 20 and 26.

The first fall arrival appeared between August 20 and September 14. The species was always rare from this first appearance until shortly after mid-September. Immediately after that and until September 28 a few could usually be daily recorded. The last transients were seen between September 27 and October 7. During this migration the birds were slightly less numerous than they were in spring, and seldom more than 8 individuals were recorded in a day.

During migrations the species chiefly inhabited second-growth lowland woods which contained scattered trees of large size and a considerable amount of dense undergrowth. In such woodlands the birds were principally in the upper part of the undergrowth and in the taller trees. In tall trees the spring males sang much. A few birds were also found in the hilly upland woods, and an occasional individual was seen in the taller brushy thickets.

The Rose-breasted Grosbeak undoubtedly was a regular semiannual transient throughout historic time, and it is probable that the species formerly nested. Wheaton (1882: 346) wrote that it was a regular transient in middle Ohio, and that a "few remain and breed." Field (1903: 141) stated that the bird was a "tolerably common summer resident from May to September" in Licking County and that it nested there.

Passerina cyanea (Linnaeus)

Indigo Bunting

Very common spring and fall transient, common summer resident.

Earliest date of arrival:	April 28, 1925	.....
Median date of arrival:	May 2	(August 26)
Median date of departure:	(June 2)	October 4
Latest date of departure:	.....	October 8, 1929

The Indigo Bunting was among the last of the sparrow tribe to make its spring appearance. During 3 years between 1922 and 1934 it was recorded in late April, and in the remaining 9 it was first noted between May 1 and 8. In the more advanced seasons an increase in numbers took place between May 6 and 10. In the more backward ones it remained uncommon until as late as May 12, and then it was not until May 15 or a few days later that the bird became common. The peak of migration generally began on May 18 and continued until approximately May 28. There was a sharp decrease in numbers, denoting the disappearance of most transients, during the last few days of May. By early June little evidence of migration could be observed. At the peak of migration 30 to 90 birds could be seen daily, and it was obvious that there were several hundred present.

This bunting was one of the more numerous and conspicuous nesting birds, and the brightly colored males were among the most constant of singers throughout late May, June, and July. As with the Red-eyed Vireo, this bird did not cease to sing during the heat of the day, but continued at rather regular intervals from early morning until dusk. It nested wherever there was a fair amount of brush, and all brushy thickets, fields and meadows, overgrown fence rows, edges of woodlands, openings in wooded areas, and borders of dirt roads contained nesting pairs. Because of greater prevalence of brushy situations north and west of the lake there were more birds there than elsewhere. Nesting birds avoided the wetter portions of swamps, cleared fields, heavily grazed meadows, pastures, and woodlots, and the most mature forests with little shrub layer. June censuses indicated that over 125 pairs nested annually, and that in some years there may have been as many as 275 pairs. Of 16 nests examined 5 contained 3 eggs or young each; 3, 3 eggs or young of this species and a Cowbird egg or young each; 6, 4 eggs or young each; and 2, 4 eggs or young of this species and a Cowbird egg or young each. The nests were made chiefly of small rootlets, grasses, inner bark of vines and herbaceous plants, and bits of leaves and were lined with finer grasses, hair, or feathers. The nests were placed in shrubs, bushes, or small saplings and were 1 to 11 feet above the ground. Females were seen carrying nesting material as early as May 20, and by May 30 nest building was well under way. The earliest nest and eggs was found May 27 (1928, 3 eggs), the latest August 4 (1932, 3 eggs); the earliest nest with young was seen June 12 (1932, 4 young), the latest September 5 (1929, 4 young); the first fledgling out of the nest was noted June 21 (1925, 1 young), and the last September 12 (1929, 2 young). Most of the nests with eggs were found from June 16 to July 20, the majority of nests with young from July 10 to August 10, and most of the fledglings out of the nest from July 15 to August 20.

The southward migration began early for a sparrow and was in progress

while some resident birds still had young in the nest or were in family groups. Transient flocks were observed flying overhead during early mornings of late August, and by early September migration had become pronounced. The peak took place between September 10 and 27, and then the species was as numerous as it was in spring, but was less conspicuous. In late summer the males were quiet, and both adults and young were rather secretive. It was only during early morning, when the birds still migrated overhead or when many were feeding in the tops of high bushes and trees, that some estimate of abundance was obtained. A decided decrease in numbers took place during the last few days of September, and by early October only an occasional late straggler remained. In this southward movement the species was found in the same brushy cover which it inhabited in spring and summer and was likewise found wherever herbaceous plants grew tall and abundant and the weed seed crop was large.

The Indigo Bunting probably nested in the area throughout historic time. It must surely have increased in abundance with the replacement of much mature and climax forest by brush lands.

Spiza americana (Gmelin)

Dickcissel

Occasional, rare, or uncommon spring and fall transient, occasional, rare, or uncommon summer resident.

Earliest date of arrival:	April 30, 1929	.....
Median date of arrival:	May 8	.....
Median date of departure:	(May 30)	(August 25)
Latest date of departure:	.....	September 27, 1930

The Dickcissel was a most erratic transient and summer resident. During some years it was a rather numerous transient or nesting species, and in others it was rare or absent. These fluctuations were not caused by a lack of available nesting or feeding habitat, for many apparently suitable alfalfa and clover fields and fallow weedy fields were annually present.

The Dickcissel was not recorded in 1922, 1924, 1927, and 1933; it was recorded only as a transient in 1926, 1929, and 1930; during the remaining 5 years it was noted throughout each summer. The first arrival was noted between April 30 and May 18, and most transients were seen between May 8 and 30. Seldom more than 5 were observed in a day or more than 12 during a migration.

As a summer resident the Dickcissel's numbers fluctuated from 1 pair in 1931 to 40 pairs in 1932. The species was first recorded as a summer resident in 1923, when on June 2, I found a colony of 11 pairs in a clover field on a gently sloping hill on the south shore opposite Sellars Point. The colony was noted repeatedly throughout June and until August 19, and fledglings recently out of the nest were seen from July 3 to August 12.

Between July 11 and August 1, 1925, I repeatedly saw Dickcissels in another clover field on the hilly south shore of the lake opposite Sellars Point, and on August 1, I found a fledgling there. In 1928, 2 pairs were seen on several days from May 18 to July 21, in a fallow weedy field, which was a mile east of Kirkersville. From May 29 to July 12, 1931, a pair was repeatedly seen in a well-drained alfalfa field adjacent to Little Buckeye game refuge, and on July 12 I found 2 fledglings there. In 1932 Dickcissels nested in at least 5 clover and alfalfa fields north of the lake, and the estimated total of 40 pairs were in colonies of 2 to 10 pairs each. No nests were found despite much searching in 3 fields, but from July 5 to 17 I found fledglings in 2 colonies. In 1932 nesting Dickcissels were also more numerous throughout the eastern half of central Ohio than they were during any of the remaining 11 years.

The few transients seen during the southward movement indicated that migration took place principally in late August. In this movement the bird was very inconspicuous; it remained chiefly where weeds grew in profusion.

It is possible that the Dickcissel may have been entirely absent in this area of bogs, pot-hole lakes, and forests before 1800 and that it invaded the area upon establishment of cultivated and fallow fields. Wheaton (1882: 344) wrote that it was an "abundant summer resident from May to September" in central Ohio. Field (1903: 141) recorded it as a "very common summer resident from May to September," in Licking County.

Carpodacus purpureus purpureus (Gmelin)

Eastern Purple Finch

Rare, uncommon, or common spring transient, rare or uncommon fall transient, very rare winter visitor.

Earliest date of arrival:	(March 9, 1929)	September 24, 1930
Median date of arrival:	April 17	September 28
Median date of departure:	May 16	October 25
Latest date of departure:	May 18, 1928	(November 24, 1929)

The Eastern Purple Finch was a rather irregular spring transient. In some years, such as 1925 and 1928, the species was recorded daily during the height of spring abundance, in other years, such as 1931, only 1 was noted. Extreme dates for first arrivals ranged from March 9 (1929) to May 7 (1928). The period of greatest concentration was as early as April 15 to 25 and as late as May 7 to 18 (1928). During years of greatest abundance from 50 to 125 individuals could be noted daily for a period of 8 to 11 days. The last transients were usually seen between May 5 and 18.

In spring the transients remained chiefly in trees of the more mature forests and apparently preferred the swampy type of woodland. The bird fed largely upon newly formed seeds of such trees as silver maple, sugar maple, black maple, red maple, white elm, and slippery elm. When feeding

in these trees it was frequently found in association with flocks of Eastern Goldfinches, and White-throated, Field, Chipping, and English sparrows.

The Eastern Purple Finch was less abundant during the southward migration than it was in spring. In 5 autumns it was not recorded at all, and in the remaining 7 never more than 25 individuals were seen in a day nor more than 100 in a migration. The first arrivals were noted between September 24 and October 5, the majority between October 7 and 27, and the last between October 20 and November 24. Throughout fall the bird was found in trees of mature woodlands and in the larger and more profuse weed patches. Individuals in woodlands fed to a large extent upon the fruits of blue beech (*Carpinus caroliniana*) and hop hornbeam (*Ostrya virginiana*), which grew chiefly in swamp forests. In weed patches the birds fed principally upon weed seeds, and seemingly preferred those patches which contained a large amount of giant ragweed (*Ambrosia trifida*) and many of the taller sunflower species of the genus *Helianthus*.

On December 22, 1922, F. Dale Pontius, Frederick Wood, and Charles F. Walker found 2 birds in Big Woods (Pontius, Wood, and Walker, 1923: 32). After the close of the investigation, on December 24, 1935, Harry Fabert and I found 2 in some small trees besides Honey Creek marsh.

**Acanthis flammea flammea* (Linnaeus)

Common Redpoll

Very rare winter visitor.

The Common Redpoll is one of those bird species which undoubtedly appeared at infrequent intervals within historic time, but which was not seen before or during the investigation. It was not recorded in the area until December 22, 1935, when Charles F. Walker and John S. Thomas found a solitary individual. When first seen this bird was sitting in a small sapling beside Honey Creek marsh (Wheaton Club, 1936: 64). The observers believed the bird was *A. f. flammea* because of its small size, plumage coloration, and size of bill. In the past *A. f. flammea* has been recorded more frequently and in greater numbers in Ohio than have the other forms (*A. f. rostrata* and *A. hornemanni exilipes*).

Spinus pinus pinus (Wilson)

Northern Pine Siskin

Occasionally a rare or uncommon spring transient, very rare fall transient and winter visitor.

Earliest date of arrival:	(March 3, 1933)	October 15, 1925
Median date of arrival:	April 20	.....
Median date of departure:	May 14	.....
Latest date of departure:	May 22, 1924	(November 29, 1924)

During 5 spring migrations the Northern Pine Siskin was not recorded, in 6 migrations it was rare, and once it was sufficiently numerous to be recorded daily for a short period. Extreme dates of first arrival varied from March 3 (1933) to May 10 (1930). The majority of spring birds were seen between April 28 and May 12, and the last transients between May 12 and 22. It was evident that the greatest spring concentration usually took place in late April and early May; during this period no more than 5 individuals were usually seen in a day, and then only on a few scattered days of each season. The exception took place between April 30 and May 11, 1929, when 10 to 30 individuals were recorded daily. In spring the species was most frequently found associating with flocks of Eastern Goldfinches and Eastern Purple Finches; and it fed and chiefly remained among the taller trees of mature woodlands.

It was recorded as a fall transient during 5 years. Never more than 6 individuals were seen in a day or more than 12 in a migration. All except a few of the fall transients were noted between October 25 and November 10. As in spring, the species usually associated with Eastern Goldfinches or Eastern Purple Finches and fed with them in trees of the larger and more mature forests. The only winter record was made December 22, 1924, when Charles F. Walker found 2 birds in Jack's Neck Woods. During the investigation wintering birds were rather frequently observed in other sections of central Ohio, especially where there were many conifers, such as in the Sugar Grove region. Upon a few occasions before 1922 Wheaton Club members noted a large late April and early May migration of Northern Pine Siskins in central Ohio. The last notable visitation took place in 1920, when on May 8 Walker recorded the species as "very common" in the vicinity of Buckeye Lake and estimated that hundreds of birds were present. From early Ohio records it is assumed that the bird was an irregular transient in the area throughout the historic past.

Spinus tristis tristis (Linnaeus)

Eastern Goldfinch

Very common spring transient, common fall transient and summer resident, rare or uncommon winter resident.

Earliest date of arrival:	.....	.....
Median date of arrival:	(April 12)	(September 15)
Median date of departure:	(May 22)	(November 8)
Latest date of departure:	.....	.....

The first spring Eastern Goldfinches made their appearance between March 20 and April 22. The daily numbers always remained few until between April 23 and 26. During the last few days of April there was a large flight, and from then until May 18 the species was very numerous. At this spring height usually 25 to 250 birds could be daily recorded, and at

infrequent intervals as many as 500 were noted in a day. On or shortly after May 20 a sharp decrease in numbers was observed, and by May 25 the large, obviously transient flocks had disappeared. Throughout spring the bird was found principally in moderate-sized or tall trees of the woodlands, and in groves and rows of trees about houses and cottages, where it fed upon newly formed seeds and buds. A few could be found in brushy thickets where last year's weeds still remained in profusion. The males sang throughout the spring, and in some early mornings the chorus was so loud as to make it difficult to hear the weaker songs of warblers and other birds.

The Eastern Goldfinch was a numerous, though extremely late nesting species, and most of its nesting was done after many other small land birds had finished rearing their young. The majority nested in weedy, fallow, and brushy fields, in thickets, and along weedy fence rows. The remainder nested about the weedy brushy edges of woodlands and in the larger openings in woods. In this lake area, as elsewhere throughout Ohio, the "thistle bird" nested most numerous where one or more species of the thistle genus *Cirsium* grew in profusion. Censuses, taken in late June, July, and August of several years, indicated that at least 120 pairs nested annually, and that as many as 275 pairs may have nested during some years.

Sixteen nests with eggs or young were recorded. Of these 1 contained 3 eggs of this species and a Cowbird's egg; 3, 4 eggs or young each; 2, 4 eggs or young of this species and 1 Cowbird's egg or young each; 8, 5 eggs or young each; 1, 5 eggs of this species and 1 Cowbird's young; and 1, 6 young. The nest was a beautiful, cup-shaped structure, principally of fine grasses and soft thin shreds of the bark of vines and dead bits of herbaceous plants. It was lined with thistledown or other soft material and was usually 2 to 16 feet above the ground, suspended from the fork of a small branch of a sapling or tree, or built upon the twigs of some shrub or in a vine tangle, or near the branching top of some herbaceous plant, such as a tall goldenrod, joe-pye weed, or ironweed.

Although the breeding population had apparently been present since mid-May, nest-building activity was unmarked until June 9 (1928); it did not become pronounced until the very last of June, and was last recorded on August 20 (1929). The earliest nest with eggs was noted June 19 (1928, 4 eggs), the latest August 27 (1929, 5 eggs); the first young in the nest were seen July 3 (1932, 5 young), the last September 5 (1929, 5 young); the first fledglings out of the nest were observed July 12 (1931, at least 2 young), and the last September 10 (1931, 1 young). Young were conspicuous from early August until early September, flying over the weedy fields and thickets or sitting upon some twig or tip of a small plant, repeatedly calling "bay-bee, bay-bee."

It was impossible to discover when the first southbound transients ar-

rived, because of the large number of summer residents. The first definite increase could be noted during mid-September, and by early October it was evident that the autumn migration was well under way. The height of the movement took place between early October and early November. There was a sharp decline in numbers usually between November 5 and 12, and after that the species was rare or uncommon. During fall the Eastern Goldfinch was not as conspicuous as it was during the shorter spring period of concentration, nor was it daily so numerous, for usually only 20 to 200 individuals could be seen, and seldom more than 275 were observed. Throughout fall flocks of 4 to 60 birds chiefly inhabited weedy fields and pastures, brushy thickets, and more open woodlands which contained a rather dense shrub or weed layer. In the warmer parts of the year small groups were a familiar sight as they fed, sang, and hopped about the shores of the lake, islands, and inland ponds and swamps. In such situations they could be found among groups of blackbirds, doves, horned larks, and shore birds.

Eastern Goldfinches were present during each winter. In the colder winters with much snow they were rare or, possibly, absent for short periods. During warmer winters, especially when the weed seed crop was plentiful, 5 to 60 were noted during each day afield. The birds were mostly found in the densest weed patches, in weedy and uncut corn fields, and in woodlands containing a dense shrub layer.

The bird has probably been a regular nesting species throughout historic time, though it must have increased in nesting numbers with forest removal and the introduction and increase of cultivated and fallow fields, brushy thickets, and open woodlands. Several of the older residents have told me that the "thistle bird" or "summer canary with black wings" was a common summer resident as early as 1870.

Pipilo erythrophthalmus erythrophthalmus (Linnaeus)

Red-eyed Towhee

Common spring transient, uncommon summer resident and fall transient, occasionally a rare or very uncommon winter resident.

Earliest date of arrival:	(February 21, 1931)	.....
Median date of arrival:	March 8	(September 18)
Median date of departure:	(May 12)	November 12
Latest date of departure:	.....	(November 24, 1927)

The time of arrival in spring of the first Red-eyed Towhees appeared to depend upon the size of the wintering population of these birds in southern and south central Ohio. During those winters, such as the winter of 1931, when the population of the Sugar Grove region and elsewhere immediately to the south was rather large, the species appeared at Buckeye Lake during the first warm period of late February. When few wintered in central or southern Ohio the first migration was not noted until as late as March

30 (1929). Even when the first transients appeared in late February only 5 to 12 individuals could be daily noted in March, and the greatest number ever recorded was 25. With the coming of April, there was an increase, and by mid-April the species was always numerous. The peak of migration took place between April 15 and May 8, and then 15 to 60 individuals were daily seen. A sharp decrease in numbers took place between May 10 and 16, and after that few or no transients were noted. Throughout spring the majority of individuals were in woodlands, especially those containing much leaf mold; a fair proportion were in tall thickets and brushy fields; and a few were found in shrubbery about farmhouses and cottages.

The annual number of nesting pairs was rather constant. Eighteen to 40 pairs nested yearly. The species nested in all large remnant forests and in some of the more brushy woodlots and was found principally in those sections which contained a dense shrub layer and much leaf mold. Such conditions were more prevalent in swampy woods to the north of the lake, and the majority nested in that section.

Nine nests were found; 3 contained 4 eggs or young each; 1, 4 young of this species and 1 Cowbird young; 3, 5 eggs or young each; 1, 6 eggs; and 1, 6 young of this species and 1 Cowbird egg. The nest was made of grasses, rootlets, twiglets, bits of leaves, string, or shreds of bark; a few nests were lined with cattle hair. Four nests were built upon the ground beneath brush tangles, 2 were built in piles of dead brush over which a dense leafy tangle had grown, and the remaining 3 were 1 to 5 feet above the ground in vine tangles or upon small branches of bushes. The earliest nest with eggs was recorded April 30 (1929, 4 eggs), and the latest July 12 (1931, 5 eggs); the earliest nest with young was found May 11 (1929, 4 one-third grown young in same nest as of April 30), and the latest July 17 (1932, 4 young); the first fledgling out of the nest was seen May 20 (1931), and the last August 4 (1930, at least 2 young being fed by parents).

In spring and early summer the Red-eyed Towhee was a rather conspicuous bird of brushy thickets and woodlands, but with the ending of the nesting season in early August it became more retiring. Throughout August and the first half of September fewer birds were recorded a day than during the preceding 2 months. This seeming scarcity probably was attributable to their more secretive habits at this period. Shortly after mid-September a slight increase in numbers was observed, and this continued through the month. The greatest concentration was during October and until November 3. A sharp decrease in daily numbers usually took place between November 5 and 12. During fall the species was never as numerous or conspicuous as it was in spring; never more than 25 and usually less than 18 were noted in a day. The autumn birds principally inhabited brushy woodlands, brushy thickets, and shrubbery about farmhouses and cottages.

A few were in weedy uncut cornfields, along weedy fence rows, and in fallow fields overgrown with weeds.

The Red-eyed Towhee was recorded wintering during 8 years. Never more than 6 individuals were seen in a day. The wintering birds were found in the densest cover of woodlands and brushy thickets.

I assume that the species has been a regular summer resident throughout historic time. It is possible that its nesting abundance increased with forest removal and the increase of brushland during the 1800 to 1850 period, that nesting abundance was greatest between 1850 and 1890 when the most land was in brush and woodland, and that with a decrease of brushland after 1890 there began a decline in nesting numbers.

Passerculus sandwichensis (Gmelin)

Savannah Sparrow

Fairly common spring transient, very rare summer resident, common fall transient, very rare winter resident.

Earliest date of arrival:	(March 17, 1928)	(September 10, 1932)
Median date of arrival:	March 23	September 15
Median date of departure:	May 7	October 28
Latest date of departure:	(May 16, 1926)	(November 7, 1925)

The first Savannah Sparrows of spring were seen between March 17 and April 1. In the forward seasons 3 to 15 individuals could be daily noted between March 24 and 30, but in backward years it was not until after April 5 that similar numbers were observed. The species was always present in fair numbers by April 8, and from then until April 28 the greatest concentration of spring took place. During this period 5 to 25 were daily noted, and occasionally as many as 60 were seen. A sharp decrease took place between April 29 and May 2, and after that only an occasional individual or small group was noted. In spring the Savannah Sparrow was found most frequently in recently plowed fields, in short-grass pastures, and in fields of wheat, alfalfa, timothy, or clover in which the plants averaged only a few inches in height. A few were found about the sparsely vegetated shores of the lake or around some inland temporary pond.

The Savannah Sparrow was found nesting once. On May 18, 1929, I found 2 singing males in a heavily grazed meadow across the road and immediately west of Lakeside Woods. They were guarding territory and probably nesting. On May 25, while I watched these males, a third Savannah Sparrow, presumably a female, was noted carrying food. On June 5, an adult was seen feeding 2 small fledglings. These young were barely able to fly.

The first southbound transients were noted between September 10 and 18, and by September 20 the species was present in fair numbers. The peak of migration took place between September 25 and October 25. Then the

bird was more numerous than it was in spring, for between 15 and 50, frequently between 60 and 180, individuals could be daily noted. A sharp decline in numbers took place during the last 5 days of October, and after that the bird was rare or absent. In autumn it was most often found in short-grass pastures and meadows, in recently plowed fields, on barren shores, on mud flats, and on peat islands of the lake, and about barren depressions left by the drying up of inland ponds and swamps. The birds frequenting the shores and islands of the lake were often seen in company with Eastern Goldfinches, American Pipits, Eastern Mourning Doves, Eastern Redwings, Rusty Blackbirds, and many species of smaller shore birds.

There was 1 wintering record. On January 24, 31, and February 7, 1932, I found at least 3 birds in an upland uncut timothy field, on the south shore opposite the village of Buckeye Lake. During that winter, which was exceptionally warm, I found Savannah Sparrows in 3 other central Ohio counties (Trautman, 1933: 236). These appear to be the first wintering records for central Ohio.

In a recent study of the geographic variation of eastern North American Savannah Sparrows, Aldrich (1940: 1-8) has indicated that the breeding population of these sparrows over the greatest part of southeastern Canada and northeastern United States is represented by a heretofore undescribed form, which he has named *P. s. mediogriseus*, the Southeastern Savanna Sparrow. This is the breeding form in northern Ohio, the one most numerous during migrations in all sections of the state, and the one which should breed at Buckeye Lake. Aldrich has identified the specimen collected on March 31, 1928, at Buckeye Lake (Licking County), as belonging to the form *mediogriseus*. He has found that, in Ohio, *P. s. oblitus* is rather numerous during migration and that *P. s. labradorius*, *P. s. savanna*, and *P. s. nevadensis* are rare or sporadic. Intensive collecting should result in the recording of more than the 1 form for the area.

Ammodramus savannarum pratensis (Vieillot)

Eastern Grasshopper Sparrow

Common spring and fall transient and summer resident, casual winter visitant.

Earliest date of arrival:	(April 7, 1929)	.....
Median date of arrival:	April 16	.....
Median date of departure:	(May 22)	(September 12)
Latest date of departure:	.....	(October 11, 1928)

There was a surprisingly wide range in the first recorded spring dates of arrival of the Eastern Grasshopper Sparrow. The variation, from April 7 (1929) to May 1 (1926), may not have existed in reality. During the 6 years when the species was recorded before April 20 the birds were non-singing individuals, whereas in the remaining 6 years the first recorded birds were singing. This rather secretive sparrow may have always been

present before April 20, but may have been unrecorded because of my inability to find the nonsinging birds.

The Eastern Grasshopper Sparrow was fairly numerous by May 3. From May 5 to 20, 10 to 60 males sang and fluttered conspicuously about over fields and meadows. The females were much more secretive during this period, and few were daily noted. Because of the large number of summer residents and the secretiveness of the transients, it was impossible to learn when the spring migration definitely ended. The evidence suggests that it was between May 18 and 30.

Throughout the spring migration and the nesting period the bird was almost wholly confined to fields of small grains and forage crops, fallow fields, and high-grass meadows. Fields of timothy and upland or well-drained fields contained the most pairs. These fields were more prevalent south and east of the lake. The singing period was pronounced between May 20 and June 10, and then the males were more conspicuous than they were at any other season. Censuses recorded as many as 60 singing males and indicated that between 100 and 200 pairs annually nested.

Only 3 nests were found. These were built in hollows in the earth, and with the rim flush with the surrounding ground; they were mostly of thin blades of grass and were sparsely lined with cattle or horse hair. The first nest, found June 3, contained 3 eggs. It was in the grassy meadow immediately west of Lakeside Woods. The other 2 nests were found on June 15, 1929, in an upland timothy field, on the south side of the lake near the Little Buckeye game refuge. One contained 5 small young, and the other 4 large young, which left the nest at my approach. Nest building was at its height in late May; the majority of nests contained eggs during the first half of June; and young were in the nest from early June until mid-July. Fledglings out of the nest were noted from June 5 (1929) to August 3 (1932).

With the gradual ending of the nesting season in late July and early August, the males ceased to sing almost entirely. By mid-August both sexes and young had become secretive and inconspicuous and skulked about in the lush meadows or rank growths of uncut hay or fallow fields. Few could be seen after August 10, and little is known of the southward migration. Apparently all except a few left in late August. In early September only an occasional bird could be found.

On the cold wintery day of December 29, 1928, Robert B. Gordon and I flushed an Eastern Grasshopper Sparrow from an old uncut timothy field on the south side of the lake opposite the village of Buckeye Lake. After flushing the bird several times we succeeded in collecting it. This individual was a very fat male and apparently had withstood cold weather well; however, a pathological condition was present in the bill and feet, for

both were considerably swollen and a toe was gone. This diseased condition may have been a contributing factor in preventing the bird from migrating. Late fall and winter individuals may be more numerous than was formerly supposed. In late November, 1929, E. V. Prior of Newark captured a bird a few miles north of the area. It was fat and well feathered, and it seemed to be in good physical condition. On November 28, I released this bird in an uncut timothy field on the south shore of the lake.

As the Eastern Grasshopper Sparrow was almost wholly restricted in its nesting and migrations to cultivated and fallow fields I assume that it was much less numerous during early historic time and that it increased in nesting abundance with the continued extension of cultivated land.

Passerherbulus caudacutus (Latham)

Leconte's Sparrow

Casual visitant.

Considerable time was spent in wet meadows, swales, and fallow fields looking for the more secretive sparrows of the sharp-tailed group. I conclude that Leconte's and Nelson's sparrows were very rare or casual transients. Between 1922 and 1934 few records of either species were obtained elsewhere in Ohio.

In the late summer and fall of 1936 a spectacular invasion of Leconte's Sparrows occurred in Ohio. Some observers found more than 30 individuals. They were found in the type of meadow and swale which had repeatedly been investigated in years past. Unfortunately, no one investigated the Buckeye Lake area during this invasion, but on November 23, 1936, L. E. Hicks (1937: 546) collected a female in a swamp of sedges (*Carex* and *Cyperus*) about 1 mile northeast of Hebron, in Licking Township, Licking County, and less than three-fourths of a mile north of the arbitrary northern boundary of the Buckeye Lake area. Leconte's Sparrow can therefore be considered a casual visitant of the area.

Passerherbulus henslowii henslowii (Audubon)

Western Henslow's Sparrow

Very rare or rare spring and fall transient and summer resident.

Earliest date of arrival:	April 6, 1929	.....
Median date of arrival:	(April 20)	.....
Median date of departure:	.....	(October 3)
Latest date of departure:	.....	October 12, 1926

The Western Henslow's Sparrow was not recorded between 1922 and 1925, but from 1926 to 1934 it was regularly a rare transient and summer resident. More birds were seen between 1930 and 1933 than between 1926 and 1929. This evidence suggests that the species invaded the area during

the investigation and that it has been increasing in numbers. This was not true. During the first 4 years of the survey, I was almost entirely unacquainted with this secretive sparrow, its habitat, and song, and I overlooked it entirely. In 1925 I and other Wheaton Club members began studying the species in northern Ohio, where it was rather abundant. Later we looked for and found small colonies of the birds near Columbus. In late April and May, 1926, I made the first thorough survey of the possible nesting habitat of this species in the Buckeye Lake area, and this resulted in finding a few pairs. I conclude that Henslow's Sparrow probably was more numerous during the earlier years of the survey, when more of its habitat was present, than it was during the later years.

The extreme dates of first arrival of Henslow's Sparrow were April 6 and May 3. This wide range in first spring dates may not have existed in fact, but, as with the Eastern Grasshopper Sparrow, may have been caused by difficulty in observing silent, early spring birds. The birds may have been unnoticed until the males began to sing in late April or early May. The little data concerning transients suggests that the majority were present between April 25 and May 15.

Both transients and summer residents were chiefly noted in swampy bog remnants, about edges of ponds and swamps where a *Scirpus-Carex* association was dominant, about temporary ponds or swampy areas in pastures and meadow, and in swales in fields of forage crops and small grain. Brush was seemingly avoided.

The lowest number of nesting pairs for any season after 1926 was 2 in 1927. The greatest number was in 1932, when in July, I recorded an estimated 30 pairs. In 1932, 3 pairs were solitary, and the remainder were in 4 colonies. The smallest colony, 3 singing males, was in the swampy tall-grass pasture across the road and immediately west of Lakeside Woods; the next larger, 5 singing males, was about the *Scirpus-Carex* bordered edge of a pond in a swampy meadow at the west end of Big Woods; the third, 9 singing males, was in the wetter portion of a clover field on the north shore of the lake near the wasteweir; and the largest colony, 10 singing males, was in a bog meadow beside Little Buckeye game refuge. No nests with eggs or young were found, but on 3 occasions fledglings recently out of the nest were noted. The first was seen on June 16, 1929, when I saw 1 as it was fed by an adult in the pasture immediately west of Lakeside Woods. The second fledgling I saw on July 12, 1931, in the lowland meadow that was adjacent to Little Buckeye game refuge. On July 29, 1932, I saw fledglings fluttering about a nesting colony in the clover field on the north shore near the wasteweir.

The males sang much from early May until mid-July. During late July less singing was noted, and by early August it had almost ceased. Both

adults and young were most secretive throughout August and September, and it was only after much tramping that an occasional fleeting glimpse of one was obtained. The little data accumulated indicated that the bird migrated in late August and September and that all except a few had gone by October 1.

In Ohio State Museum there is a skin which bears a label with the following data in Dr. Jasper's handwriting: "*Coturniculus henslowi*—Henslow's Bunting—male—May 6, 1872—Loc., Licking Reservoir [Buckeye Lake], Ohio." Walker (1928c: 45) in first recording this specimen mentions that Wheaton, a friend of Jasper, was apparently ignorant of the existence of this skin (Wheaton, 1882: 328). Jasper's specimen is of particular interest, for, with the exception of the questionable record of Audubon (1841: 76), who stated that the bird was "accidental in Ohio," this skin represents the first definite appearance of the species in this state. It was not until June 4, 1894, that it was again recorded, when Lynds Jones and W. L. Dawson collected a specimen near Oberlin (Dawson, 1903: 61). Edward S. Thomas observed 1 on April 18, 1920.

Although some ornithologists think that Henslow's Sparrow is a comparatively recent invader in Ohio, it is my opinion that the species has been nesting in the state and in the Buckeye Lake area throughout historic time. Suitable nesting situations must have been present in the area in and about the more open cranberry sphagnum bogs during early historic time, as well as later when the lowland fields of forage crops and grain and the pastures became established.

Ammospiza caudacuta nelsoni (J. A. Allen)

Nelson's Sparrow

Very rare spring transient.

On April 18, 1925, while wading in the cattail marsh at the south side of Little Buckeye game refuge, Robert M. Geist and I saw a brightly colored sparrow which we believe was Nelson's Sparrow. The identification must remain doubtful, since our observation was of short duration, and the date is more than a month earlier than most other spring records for central Ohio. On May 26, 1928, James S. Hine and I collected a female from a high-grass swampy meadow west of Lakeside Woods, and we saw another there. The next day we returned to the same field and found 1 singing, which gave us opportunity to note carefully the song, which was wheezy and thin and approximately as long in duration as the song of the Eastern Grasshopper Sparrow. I have recorded it thus, "chip-weesh-swee-stick." The first syllable was sharp and short, the "weesh" was the longest of any part and on a rising scale, and the remaining 2 notes were sharp and explosive.

Poocetes gramineus gramineus (Gmelin)

Eastern Vesper Sparrow

Very common spring and fall transient, common summer resident.

Earliest date of arrival:	March 8, 1930	.....
Median date of arrival:	March 18	(September 12)
Median date of departure:	(May 7)	October 29
Latest date of departure:	.....	November 30, 1933

The first Eastern Vesper Sparrows of spring were noted between March 8 and 24. After March 25 and until April 1, 3 to 12 birds were usually seen daily and in advanced springs as many as 25 were observed in a day. A large wave of transients appeared between April 3 and 6, and the spring peak of migration took place from the beginning of this wave until the last of April. Then, between 15 and 160 individuals could be daily seen, and it was obvious that several hundreds were present. The numbers of transients had decidedly decreased by May 3, and between May 5 and 10 all transients had seemingly disappeared.

Throughout spring the species principally inhabited the better-drained and more upland fields and pastures. It was found in greatest numbers in sparsely vegetated fields, and in close-cropped pastures and meadows. It never flocked in large numbers in spring, and seldom more than 15 birds were seen in a well-organized flock, and then only early in the season. During the last half of the migration it was always well scattered over fields and pastures. When several birds were flushed they did not group together, but flew a short distance by themselves and dropped independently to earth.

There were few localities in the area in which the lovely far-reaching song of this bird did not penetrate. This was particularly true on quiet early mornings and late evenings. The species mostly nested in short-grass pastures and meadows, and in better-drained fields of short sparse vegetation that were cultivated or fallow. It appeared to avoid heavy viscous clays and concentrated in lighter soils which contained considerable sand and gravel. Because of its preference it was found in greatest nesting abundance on the gravelly and well-drained slopes and tops of glacial moraines south and east of the lake. Censuses indicated that more than 200 pairs annually nested and that in some years the number may have been as large as 400. Throughout the nesting season, and to a less extent in migration, the species was an associate of the Prairie Horned Lark.

All nests were built in small depressions made in the earth by the bird previous to actual nest building. The nests of rootlets and fine grasses were in some instances lined sparingly with cattle or horse hair. All except a few were placed beside a clod of earth or a tuft or bunch of grass and were so situated as to be almost completely hidden when viewed from above. Of 14 nests examined, 2 contained 3 young each; 1, 3 eggs of this species and 1

Cowbird egg; 4, 4 eggs or young each; 1, 4 eggs of this species and 1 Cowbird young; 5, 5 eggs or young each; and 1, 6 eggs of this species and 1 Cowbird egg. Pairs of birds and males guarding territory were noted as early as April 4. Nest building was first observed in mid-April. The earliest nest with eggs was found April 26 (1928, 4 eggs), and the latest July 4 (1932, 3 eggs); the earliest nest with young was seen May 10 (1930, 5 young), and the latest July 17 (1932, 3 young in same nest as of July 4); the first young out of the nest were observed May 17 (1930, at least 2 young), and the last August 13 (1925, 1 young). Most of the nests contained eggs between May 18 and June 19 and held young between May 25 and June 25. Young out of the nest were conspicuous from late May to early August.

Because of the decrease in amount of singing, the cessation of nesting, and the great profusion of ground cover during late July and August, the Eastern Vesper Sparrow was more inconspicuous than in spring or early summer. Although fewer were recorded there was no decrease in the actual summering numbers.

Because of the large summering population it was impossible to determine the exact time of arrival of the first fall transients. Migration was obviously well under way from mid-September until about October 25. In most years a sharp decrease in the number of birds took place during the last 5 days of October, but in a few years the number remained high until November 2. During the last days of October, 1926, as many as 300 were daily noted. After November 3 of each year the species was either absent or rare. Only 1 bird was seen after November 15. On November 30, 1933, I found this bird in a fallow field on the north shore near Sellars Point. It is possible that this late straggler may have wintered, for the species has been recorded wintering elsewhere in central Ohio during the period of investigation (Trautman, 1935b: 322-23).

During the greatest fall concentrations, between September 18 and October 25, the species was more numerous than at any other season, 50 to 500 individuals were daily noted, and occasionally thousands were present. The fall birds flocked more than at any other season, and flocks of 100 to 300 were frequently encountered. The fall transients were found principally in the more sparsely vegetated or close-cropped fields, in short-grass meadows, and in pastures. In both migrations the Eastern Vesper Sparrow was found associating with the Savannah Sparrow in the better-drained fields, but the Eastern Vesper Sparrow did not habitually invade the wetter, more swampy fields and pastures, and only upon a few occasions was 1 found on the mud flats, peat islands, and barren shores of the lake, where many Savannah Sparrows were observed.

It is probable that this inhabitant of open brushless fields was a rare summer resident during early historic time, when most of the land was ill-

drained and in bogs, brush, and forests, and that the species increased in nesting abundance with increase in the cultivation of the land.

**Chondestes grammacus grammacus* (Say)

Eastern Lark Sparrow

Very rare summer resident.

The first records for the Eastern Lark Sparrow are given by Field and Jones. Field (1903: 141) stated that the Lark Sparrow was a "rather common summer resident from April to August [and that it] breeds." In the same year Jones (1903: 146) stated: "Mr. I. A. Field has found it not uncommon at Granville and at Licking Reservoir [Buckeye Lake]." Most of Field's work was done between 1899 and 1903.

The species was recorded in 2 years between 1922 and 1934. On July 3, 1923, I found a pair feeding a fledgling, in a rolling, sparsely vegetated timothy field beside a gravel pit. The field was on the south shore near Custer's Point, Fairfield County. Hine and I saw an individual taking a dust bath along the edge of a hilly road near Thornport, Perry County, on August 11, 1929. During the investigation the Eastern Lark Sparrow was noted as a summer resident in the 3 counties in which Buckeye Lake is situated. Since the species is an inhabitant of open country it may not have invaded the area until some forest had been removed and the cultivation of the fields had begun.

**Aimophila aestivalis bachmanii* (Audubon)

Bachman's Sparrow

Very rare spring transient.

Bachman's Sparrow was recorded upon 2 days during the study. On May 18, 1928, I found 2 in an old neglected apple orchard on the east bank of the canal, south of Millersport. One was singing. On the following day I visited the orchard again and after much searching found a nonsinging individual. Hoping that the species might nest I visited the locality many times during May and early June, but found no birds.

It is odd that Bachman's Sparrow was not recorded oftener, since it was noted nesting in all 3 counties in which the lake is situated, and it nested in fair numbers only 25 miles southward. Furthermore, there were several old fields and orchards upon the hills and slopes south and east of the lake that appeared to be suitable nesting habitat.

This secretive bird was unknown to Wheaton and other early ornithologists, and it was not until 1890 that it was first recorded for Ohio. Field (1903) did not record it for Licking County. Despite the lack of evidence I consider it probable that this sparrow formerly nested in the area and that

it was probably present in central Ohio many years before the first specimen was collected at Columbus in 1890 (Jones, 1903: 150).

Junco hyemalis hyemalis (Linnaeus)

Slate-colored Junco

Common or very common spring and fall transient, rare, uncommon, or fairly common winter resident.

Earliest date of arrival:	.....	September 23, 1930
Median date of arrival:	(March 5)	October 2
Median date of departure:	May 8	(November 28)
Latest date of departure:	May 18, 1925	.....

The first Slate-colored Juncos of fall always appeared between September 23 and October 9. By October 12 the species was invariably present in small numbers. In the latter half of October, 10 to 40 individuals could be daily noted, and occasionally as many as 80 were seen. The maximum fall numbers usually were present during the first 3 weeks of November, and then between 30 and 200 individuals could be daily recorded. The disappearance of most transients was coincident with the first definite cold period and moderate snowfall of December. During the mildest Decembers between 30 and 125 birds could be recorded daily.

As a winter resident the species varied in numbers from few to very numerous. This fluctuation was principally caused by prevailing weather conditions and the amount of suitable cover and food. In the average year wintering numbers tended to remain stationary after the first cold period until the first vernal transients appeared. In cold seasons there was a decrease during each heavy snow fall in late December and January, and by February the species was very rare, or absent for short periods, but in mild winters with little snow and a large amount of available food, 30 to 300 individuals could be daily noted.

The first spring transients were seen during the first warm period between late February and mid-March. Migration had always begun by March 20, and the spring height took place between March 25 and April 20. In spring the species was more conspicuous and numerous than it was at any other period, and 50 to 500 birds could be daily recorded. Sometimes thousands were present. The birds were numerous until the last few days of April. By May 3 only a few remained, and the species usually disappeared within the next 10 days.

The transient and wintering birds were found principally in the shrub layer of woodlands, in brushy thickets, in brushy fence rows, in weedy and fallow fields, and in weedy fields of uncut corn. In early autumns, when the lowlands were dry, the birds were more numerous in lowland woods, swampy thickets, and fields, but when the lowlands were wet the majority were in the uplands. Whenever the lowlands became flooded in late fall the

Slate-colored Junco left these areas and did not return until late in the following spring. During winter most birds were in well-drained ravines, on brushy hillsides, and in weedy fields south and east of the lake. With the influx of mid-spring transients and the partial drying of the swampy areas, the species reinvaded the lowlands in numbers. By the last half of April it was as numerous in such lowland woods and fields, if not more so, than it was in upland situations. The last transients did much singing, especially in the lowlands, where their early morning chorus, with that of the Eastern Goldfinch, was often sufficient to drown out many of the warbler songs. The last males of spring were most frequently in the darkest and densest part of the lowland woods, where they sang a great deal.

The Slate-colored Junco averaged as numerous in this area in migration as it did in the remainder of central Ohio, but it was not as numerous in winter in this area as it was in a few other sections. It was a regular transient and winter visitant throughout the historic past.

Spizella arborea arborea (Wilson)

Eastern Tree Sparrow

Common or very common spring and fall transient and winter resident.

Earliest date of arrival:	.....	October 11, 1928
Median date of arrival:	.....	October 14
Median date of departure:	April 23	.....
Latest date of departure:	May 7, 1933	.....

Sometime between October 11 and 17, while the migration of most transient sparrow species was at its height, the first Eastern Tree Sparrows of fall made their appearance. No matter how warm the day, the sight of these winter birds made one realize that summer was past and that winter was at hand. During the last of October the birds were seen daily in small numbers and by early November as many as 100 were present each day. The numbers continued to increase throughout the remainder of November, and by early December this sparrow had become very numerous. Because of the large wintering numbers it was impossible to note definitely when the last fall transients departed. Probably because of changing weather conditions, birds were coming or leaving the area throughout the entire winter.

The Eastern Tree Sparrow was the most numerous of the wintering birds. It was found over almost the entire land area, though it tended to congregate, both in winter and in migration, in weedy and fallow fields, in shrubbery and orchards about farmhouses, about cottages, along weedy and overgrown fence rows, in cattail marshes and along their borders, and in bushy inland swamps. It avoided the most barren fields, such as were on the tops of hills to the south of the lake, and the overgrazed woodlands which contained no ground cover.

Along roads or in woodlands or fields one almost invariably saw at least a few Eastern Tree Sparrows in winter. During an all-day field trip 200 to 700 could be recorded, and it was evident that there were always many hundreds, and sometimes many thousands, present. The species was very gregarious, the flocks generally consisting of 6 to 100 individuals. They associated freely with groups of other sparrows and other small land birds.

No other bird species seemed so little distressed by adverse weather. Even during the most violent snowstorms or when the vegetation was sleet-covered and a cold rain was falling, the Eastern Tree Sparrows went about almost as unconcernedly as if weather conditions had been more favorable. Their winter numbers did, however, fluctuate. These variations were undoubtedly related to climatic conditions. During some heavy snows there was a decided influx of birds, and in others there was a marked decrease in numbers. Likewise, during warm winter weather there was sometimes a decided increase or decrease. Despite these fluctuations some individuals were strictly winter residents, and upon many occasions I noted birds, identifiable by some peculiarity of color or color pattern, that remained in a particular weed patch or woodland throughout a winter.

Because of the large wintering population it was impossible to discover when the first spring transients appeared. The vernal movement had always begun by late February, and from then until late March the "chips" of these birds were heard almost nightly, and in early mornings small groups were seen dropping into thickets and fields. Throughout March, in which came the peak of migration, the bird was very numerous. A decrease took place in early April, and after that it was uncommon or rare. In some years, such as 1929, none was seen after April 15; in other years, such as 1933, 5 to 15 individuals were present during the last few days of April. The only May record is that of a bird seen on May 7, 1933. Throughout their entire sojourn the twittering of the Eastern Tree Sparrows was one of the most familiar of winter bird sounds. The males began to sing in late winter, and by late March they were singing a great part of the time.

The species was a regular transient and winter resident throughout historic time. It probably became more numerous during recent years, when the land was converted into fields, brush, and open woodland.

Spizella passerina passerina (Bechstein)

Eastern Chipping Sparrow

Fairly common spring transient and summer resident, very uncommon fall transient, very rare winter visitor.

Earliest date of arrival:	(March 17, 1928)	.....
Median date of arrival:	March 28	(September 10)
Median date of departure:	(May 8)	October 25
Latest date of departure:	.....	(November 2, 1929)

It was sometime between March 17 and April 2, usually the last week of March, that the first Eastern Chipping Sparrows arrived. A few days after April 1 a small wave appeared, and by April 10 the species had become numerous. The peak of migration began about April 12 and continued until April 30. Usually, all transients had disappeared by May 5. During the largest flights 5 to 35 could be daily encountered. The earlier arrivals were in groups of 3 to 6 individuals of their own kind, or in flocks of Eastern Field and Allegheny Song sparrows. They could be found about weed patches, weedy and vine-entangled fence rows, and brushy thickets near woodlands. After mid-April individuals and pairs were most frequently observed on lawns, in trees, in shrubbery, and in fields, and about farmhouses, cottages, and villages. In spring the species preferred uplands and well-drained situations.

Between 35 and 70 pairs annually nested. With few exceptions, all were in the immediate vicinity of buildings, especially those surrounded by many shade or orchard trees. A few nested in orchards far removed from buildings. More nested about farmhouses in the hilly, well-drained uplands to the south and east than in the wetter lowlands with heavy clay and dark soils.

Many males began to guard territory and to sing persistently by April 7, and some females began nest building. Of 8 nests with eggs or young observed, 2 contained 3 eggs or young each; 4, 4 eggs or young each; 1, 4 eggs of this species and 1 Cowbird egg; and 1, 5 eggs of this species and 1 Cowbird egg. One nest was about 11 feet above the ground in a vine that grew beside a farmhouse porch; 2 were 6 to 9 feet above the ground in tall shrubbery; and 5 were 10 to 35 feet above the ground in trees (4 in apple trees, 1 in an elm tree). All nests were made of fine grasses and were lined with long cattle or horse hairs. The earliest nest with eggs was noted April 16 (1927, 4 eggs) and the latest June 19 (1928, 3 eggs); the earliest nest with young was seen April 28 (1927, 4 young; same nest as of April 16) and the latest June 30 (1928, 2 young and 1 infertile egg; same nest as of June 19); the first young out of the nest were seen May 15 (1932, 2 young), and the last July 12 (1924, 1 young). Most nests were constructed between April 20 and May 28, most eggs were incubated between May 1 and June 15, and most of the feeding of young took place between May 15 and July 1.

From late April until mid-June the males sang from very early morning until late evening. After mid-June singing gradually diminished, and by mid-July had almost entirely ceased. During the nesting season both sexes were very conspicuous, and for a few days after the young had left the nest they, too, were readily noted. The family groups remained together and near the vicinity of the nesting sites for several days after the young were flying and largely feeding themselves. By late July the species was found

principally in hilly fields, in meadows, along fence rows, and on the edges of woodlands, and many had joined the flocks of Eastern Field and Allegheny Song sparrows. The decided decrease recorded in daily number of August birds, I attribute wholly to their inconspicuousness at this time. Evidence of migration was noted by mid-September, and the peak was reached during late September and October. The migration in autumn was not as well marked as it was in many sections of eastern Ohio. Fall birds were principally found in the hilly portions to the south and east of the lake, and seldom more than 12 were noted in a day.

On February 16, 1929, I found an Eastern Chipping Sparrow in a large flock of Eastern Tree Sparrows. It may have been a winter resident, or it may have recently migrated into the area from the Sugar Grove region, where the species wintered in small numbers. The previous week had been unseasonably warm, and considerable migration of Eastern Tree Sparrows and other birds had taken place.

The species is not now a forest or swamp inhabitant, and it is probable that it was rare in early historic time. With the clearing of the uplands and the building of houses with their attendant shade trees and orchards the species probably increased in nesting numbers.

Spizella pusilla pusilla (Wilson)

Eastern Field Sparrow

Very common spring and fall transient, common summer resident, very rare winter resident.

Earliest date of arrival:	(March 16, 1929)	.....
Median date of arrival:	March 20	(September 20)
Median date of departure:	(May 3)	October 30
Latest date of departure:	.....	(November 12, 1927)

The first Eastern Field Sparrow always appeared between March 16 and 24, and in the last few days of March, 5 to 25 individuals were daily recorded. A decided increase took place in early April, and from then until April 26 this species was one of the most numerous of small land birds. After April 5 from 20 to 400 individuals could be recorded daily, and it was apparent that several hundreds and sometimes several thousands were present. The flocks of transients disappeared in late April or early May.

As a transient and summer resident this sparrow was an inhabitant of brushy situations. It was particularly numerous in fields and thickets where the bushes and trees averaged 5 to 15 feet in height, in brushy openings and edges of woodlands, and along brushy fence rows. It was found in fair numbers about brushy swamps, brushy borders of cattail swamps, and in orchards containing brush. It avoided short-grass fields and meadows where no bushes or saplings were present, dense woodlands, and wetter parts of buttonbush and cattail swamps. Nesting pairs were more restricted in

their range than were transients, for few nesting birds were found in weedy fallow fields and meadows or in weedy fields of uncut corn. The bird preferred the brushy parts of better-drained situations, and therefore the concentration was greatest in brushy sections of the well-drained hilly uplands. Since the lowlands contained more brushy land, although the concentration was less dense, the total numbers for each section were about equal.

The Eastern Field Sparrow nested abundantly, and, with the Allegheny Song and the Eastern Vesper sparrows, was one of the most numerous nesting species of the subfamily Emberizinae. At least 200 pairs and perhaps as many as 450 nested annually. As a result of the gradual "cleaning up" of the land there seemed to be a slight decrease in the annual nesting population from 1922 to 1934. Of 23 nests recorded, 5 contained 3 eggs or young each; 1, 3 eggs of this species and 1 Cowbird egg; 8, 4 eggs or young each; 4, 4 eggs or young of this species and 1 Cowbird egg or young each; 1, 4 eggs of this species and 2 Cowbird eggs; 3, 5 eggs or young each; and 1, 6 eggs. The nests were $1\frac{1}{2}$ to 14 feet above the ground in small shrubs, saplings, or lower limbs of taller trees and were principally made of fine grasses and rootlets. Some contained a few shreds of bark or were lined with cattle or horse hair. The species began to pair and the males to defend territory as early as mid-April, and by the latter part of the month nest building was well under way. The earliest nest with eggs was noted April 30 (1933, 3 eggs), and the latest July 12 (1925, 4 eggs); the first young in the nest were found May 11 (1928, 5 young), and the last July 23 (1930, 4 young of this species and 1 young Cowbird); the earliest young out of the nest were seen May 17 (1930, 2 young), and the latest August 26 (1933, 1 young). I conclude that nest building took place between May 5 and June 20 and that most of the young were in the nest between May 15 and July 15. Fledglings out of the nest were most conspicuous between May 28 and August 12.

The amount of singing began to diminish rapidly in late July and early August, and by mid-August only an occasional song could be heard. A consolidation of family groups became noticeable during the last week of July, and in August the birds were mostly in loose groups or companies of 6 to 35 individuals. Throughout September and October flocks consisted of 10 to 60 birds. The species was rather inconspicuous between late August and mid-September.

The fall migration seemingly began in late August and early September, for the "chips" of what were believed to be transients were heard at night, and upon a few occasions small groups flying over the lake or dropping earthward were identified. The migration was very apparent by September 25. The greatest concentration took place during the first 3 weeks of October,

and then the species was as numerous as it was in spring. The birds tended to flock more in fall than they did at any other season. A sharp decrease in numbers took place during the last week of October, and by November 1 only an occasional straggler could be noted. There was 1 wintering record. On several occasions between November 30, 1929, and February 23, 1930, an Eastern Field Sparrow was seen in a flock of Allegheny Song Sparrows, Eastern Tree Sparrows, and Slate-colored Juncos. This flock was in the brushy thicket at the western end of Lakeside Woods. After the investigation closed, on December 24, 1939, an Eastern Field Sparrow was found near the eastern end of the lake by members of the Wheaton Club.

The Eastern Field Sparrow must have been a summer resident at the beginning of historic time. With the draining of the larger swamps and the establishment of much brush land it undoubtedly increased greatly. It is possible that the species was more numerous between 1880 and 1910, when a greater amount of brush land was present, than between 1922 and 1934, when brushy areas were less extensive.

Zonotrichia querula (Nuttall)
Harris's Sparrow

Casual transient.

On October 20, 1928, while identifying members of a large flock of sparrows which were feeding in a weedy field on the southern edge of Big Woods (Licking County), my attention was attracted to a most unusual bird note which came from a brushy tangle. Upon investigating I frightened a large sparrow. As it flew up I glimpsed its buffy cheek and faintly spotted breast. Returning later, I imitated a "Screech Owl" whistle, which stimulated the bird, an immature female Harris's Sparrow, to scold and thereby I was able to locate and collect it. The Harris's Sparrow is a very rare transient throughout Ohio, especially in the eastern half.

Zonotrichia leucophrys leucophrys (Forster)
White-crowned Sparrow

Rare, uncommon, or common spring transient, common or very common fall transient.

Earliest date of arrival:	April 23, 1929	October 1, 1929
Median date of arrival:	May 1	October 3
Median date of departure:	May 22	October 29
Latest date of departure:	May 25, 1929	November 3, 1928

The first dates of arrival of the White-crowned Sparrow ranged from April 23 to May 10, and last dates of departure from May 15 to 25. In some springs, such as the spring of 1931, a total of less than 4 were noted; in others, such as the spring of 1930, at least 10 could be recorded daily over a 10-day period, and as many as 30 birds (May 17) were seen. The average

number recorded for spring was 11.2 birds. Most of the transients were observed between May 8 and 20.

The spring transients were almost invariably found in brushy situations, such as brushy openings or edges of woodlands and brushy fields and pastures. Two habitat types were seemingly preferred. One was an osage-orange hedge or brushy fence row which contained many saplings and a profusion of weeds. The other was a pasture in which grew clumps and solitary small hawthorn or wild plum trees. In such pastures the males sang more frequently than elsewhere.

In fall the first arrivals were noted between October 1 and 8, and the last transients between October 26 and November 3. At the peak of migration, between October 10 and 27, 5 to 100 individuals could be daily seen. During each mid-October there were several hundreds present daily.

The ratio between fall birds in adult and immature plumages varied considerably, but with few exceptions immatures greatly outnumbered adults. Upon a few occasions the difference in ratio was as great as 3 adults to 97 immatures, and seldom was the ratio of adults greater than 35 per cent. As in spring, the birds were found in brushy situations, but many were also present in dense patches of high weeds, and in weedy uncut cornfields. Autumn sparrows were somewhat more secretive than were spring birds, and it was only by remaining quiet in a dense weed patch or brushy thicket and giving a "Screech Owl" whistle that a true indication of numbers could be obtained.

Zonotrichia gambeli (Nuttall)
Gambel's Sparrow

Apparently a casual transient.

While observing birds in Lakeside Woods on October 13, 1928, my attention was attracted to a peculiar-appearing sparrow of the genus *Zonotrichia*, which was associating with a flock of adult White-crowned Sparrows. I collected the bird, and it proved to be a female Gambel's Sparrow. This appears to be its first recorded occurrence in Ohio (Trautman, 1935b: 323). Since it is usually impossible to distinguish immature *gambeli* from *leucophrys* in the field it is probable that Gambel's Sparrow may have been more numerous than the 1 record indicates.

Zonotrichia albicollis (Gmelin)
White-throated Sparrow

Common spring transient, common or very common fall transient, very rare winter resident.

Earliest date of arrival:	(March 17, 1928)	September 17, 1930
Median date of arrival:	March 28	September 25
Median date of departure:	May 24	November 8
Latest date of departure:	May 27, 1928	(November 10, 1928)

The spring dates of first arrival for the White-throated Sparrow varied widely. In the warmest seasons the first arrival came between March 17 and 25. When March was unseasonably cold it was not recorded until April 6 to 10. When present in March or early April less than 5 were recorded in a day, and never more than 25, and it was not until April 12 to 20 that many were noted. After April 20 and until mid-May, 10 to 50 individuals were seen daily, and during the largest flights, between April 25 and May 10, as many as 350 (May 3, 1928) were recorded in a day. On May 20 or a few days later there was a decided decrease, after that the species was rare, and by May 28 all had apparently left.

Throughout spring the White-throated Sparrow was found wherever there were brushy fields and thickets and brushy open woodlands. A fair number were present in old weedy fields, along brushy fence rows, and in brushy inland swamps. Such brushless areas as the well-cleaned or recently plowed fields, short-grass pastures, and mature forests with little ground cover were almost entirely avoided. The birds were in groups of 4 to 60 individuals.

The White-throated Sparrow appeared to be very partial to seeds, and even in spring when animal food seemed abundant it could be seen busily engaged in eating the seeds of herbaceous plants of the previous year. During late April and May the species ate great quantities of the newly formed seeds of such trees as white elm, slippery elm, silver maple, sugar maple, and red maple. To obtain these while they were still on the trees the birds left their usual haunts in the brush and weeds. They fed extensively in company with Eastern Purple Finches, Eastern Goldfinches, Rose-breasted Grosbeaks, Cardinals, and English Sparrows. When disturbed the White-throated Sparrows usually dove in a body into the brush, accompanied by the Cardinals. The other species usually flew away or into the upper parts of near-by trees.

As spring advanced the White-throated Sparrows sang progressively more. After May 15 they were most often found in the denser lowland woods.

The first fall arrivals made their appearance between September 17 and October 4. After October 7 the daily increase was rapid. The species was always well represented from October 12 until November 1. The bird usually disappeared between November 4 and 10. During the greatest concentrations of fall, 100 to 200 individuals could usually be recorded in a day, and upon a few occasions there were several thousands present. Throughout fall these birds were found in the same situations that were occupied in spring, but they congregated more in weedy, than in brushy, areas. They were less conspicuous in autumn, for then the males rarely sang and both sexes remained well hidden in the profuse cover. It was only when the ob-

server gave the "Screech Owl" whistle that they scolded and perched in conspicuous places.

Upon several days between February 7 and mid-March of the exceptionally warm winter of 1931-32, at least 5 individuals were noted in the brushy thicket at the western end of Big Woods. Whether they had wintered there or were very early transients is not known. It is assumed that the White-throated Sparrow was a regular transient throughout historic time.

Passerella iliaca iliaca (Merrem)

Eastern Fox Sparrow

Rare, uncommon, or common spring and fall transient, very rare winter resident.

Earliest date of arrival:	(March 1, 1925)	September 24, 1930
Median date of arrival:	March 7	October 12
Median date of departure:	April 18	November 14
Latest date of departure:	April 21, 1928	(November 24, 1927)

The large, handsome Eastern Fox Sparrow made its first spring appearance between March 1 and 17. Whenever the first spring thaw came in late February the bird arrived between March 1 and 5, but, when cold weather prevailed, none appeared until after March 10. About March 20 there was a decided influx, and from then until April 12 the peak of migration took place. The species disappeared between April 14 and 21. In 1931 never more than 2 were seen in a day; in 1928 and 1929 between 25 and 75 individuals were recorded daily.

In spring the Eastern Fox Sparrow was found principally in wet and brushy situations, such as brushy inland swamps, wet brushy thickets, and lowland woods which contained a dense ground cover. It was also found in smaller numbers along brushy fence rows, in fallow weedy fields, and in upland woods and thickets. On warm sunny afternoons as many as 15 sang simultaneously in some brushy swamp or about a brushy woodland pool. The males could be stimulated to sing if the observer gave the "Screech Owl" whistle or whistled a sprightly tune. Wheaton (1882: 342) wrote of the bird: "Its only note with us is a low but rather sharp *tschip*." Its song is so outstanding and so frequently heard in Ohio, that the statement by this splendid naturalist has long puzzled me.

During a few autumns the first arrivals came between September 24 and 30. No immediate increase in numbers followed these early arrivals, and it was never until mid-October that a definite increase could be noted. In the average year the first arrivals were seen between October 8 and 15, and in the warmest seasons not until October 17 to 20. It is possible that a few early arrivals were annually present before October 20, but were missed because of their quiet habits. A fair number were usually present from October 20 to October 25. The peak of migration took place between

October 25 and November 9. By November 12 there was a decline in numbers, and the species disappeared a few days later. The numbers of birds fluctuated considerably. Some years never more than 6 were recorded in a day; in others, 15 to 25 were noted daily during the height of migration. Throughout autumn the Eastern Fox Sparrow was found, as in spring, in brushy lowland fields, in thickets, and in wooded areas, but in fall many were also present in weedy fallow fields or weedy fields of uncut corn.

In the brushy western end of Big Woods on January 31, 1932, I heard an Eastern Fox Sparrow sing. On February 7 a thorough search resulted in finding at least 5 birds, 1 of which sang vigorously. These birds were noted until February 28. After the investigation, on December 22, 1935, 1 bird was found along the brushy canal north of the lake (Wheaton Club, 1936: 64).

Melospiza lincolnii lincolnii (Audubon)

Lincoln's Sparrow

Rare or uncommon spring transient, uncommon or common fall transient.

Earliest date of arrival:	April 30, 1929	September 4, 1931
Median date of arrival:	May 3	September 17
Median date of departure:	May 18	October 26
Latest date of departure:	May 22, 1929	November 3, 1929

Lincoln's Sparrow was noted once in April (30, 1929), and in the remaining 11 years it was first recorded between May 1 and 10. In those springs when the species was most numerous, it could be regularly observed between May 9 and 17. Then from 1 to 4 individuals could usually be recorded in a day, and in a few instances as many as 12 were seen. In 8 years only 2 to 6 birds were noted. The last transients were seen between May 15 and 22.

Lincoln's Sparrow was rather secretive in spring, remaining chiefly in dense tangles and brush heaps of the openings and edges of the woodlands and brushy thickets. It was only upon rare occasions, generally early mornings or late evenings, that a bird left the dense cover to perch on some object to chirp or sing. Its song was pleasing, and of much the same quality as that of the Allegheny Song Sparrow.

Fall dates of arrival ranged from September 4 to September 29. Usually, it could be found daily after September 25, and by October 1 it was rather numerous. The peak of migration came between October 3 and 25. Then the species was far more numerous than it was in spring, and 5 to 200 individuals could be daily recorded. A sharp decrease in numbers was noted on or shortly after October 25, and by November 1 the species had become rare or absent. Wheaton (1882: 329) in first recording the bird for the Buckeye Lake area, noted the concentration of fall birds. He wrote: "I found them quite abundant at the Licking Reservoir, in company with Swamp, White-throated, and White-crowned sparrows."

Throughout autumn Lincoln's Sparrow was more secretive than it was in spring. During the earlier years of the survey I had difficulty in finding fall birds. In 1927 I discovered that they readily responded to the "Screech Owl" whistle, and from then until the end of the investigation they were recorded in much larger numbers. In order to obtain a response from the birds it was necessary to remain quiet for a few moments beside a brush tangle or weedy field where there was a flock of Allegheny Song, Swamp, and White-throated sparrows, and then whistle. After a brief silence, there would be a murmur among the flock. Conspicuous among the notes was the sharp query of the Lincoln's Sparrow. When I whistled a few times more, one after another of this species left their retreat, flew upward, and perched prominently upon some twig or branch; and there, with the feathers of the crest elevated to the utmost and a general ruffling of body feathers, they chipped loudly for minutes at a time. It was indeed surprising how many appeared from a thicket which a few moments before seemingly contained none. On a few occasions after whistling I have counted as many as 42. At an unguarded movement on the part of the whistler the birds would dive into dense weeds and brush, and it was then most difficult to get them to reappear or chip again.

Throughout fall Lincoln's Sparrow was found in the openings and edges of wetter parts of such places as the woodlands where there was considerable brush, in brushy thickets and fields, in weedy meadows, in weedy fields of uncut corn, and in the weed-grown borders of the shores and islands of the lake and inland swamps and ponds.

Melospiza georgiana (Latham)

Swamp Sparrow

Common spring and fall transient, very rare summer resident, rare or uncommon winter resident.

Earliest date of arrival:	(March 17, 1928)	(September 4, 1931)
Median date of arrival:	March 28	September 17
Median date of departure:	May 15	November 5
Latest date of departure:	(May 21, 1930)	(November 11, 1931)

The Swamp Sparrow came between March 17 and 25 whenever the month was warm. When climatic conditions were moderate the first arrival was seen between March 28 and April 3, and when it was unseasonably cold and there was much snow, none were noted until April 5 to 11. The species usually remained rare or uncommon until after April 8. In 1929 it became numerous exceptionally early, for on March 30, 25 individuals were noted, and it was numerous from then until early May. In other years it was not until a few days after April 8 that a decided increase was apparent. The bird was always numerous by April 12, and the peak of migration took place between April 15 and May 9. Then 10 to 60 individuals usually could be daily

recorded, and sometimes there were many hundreds present daily. The species disappeared between May 13 and 21.

The Swamp Sparrow is well named, for during migrations it was almost entirely restricted to swampy fields and thickets and to marshes. Most of the transients were about the shores and islands of the lake and lowlands to the north and west. During early spring when the area was saturated with water from melting snows and spring rains the bird sometimes appeared in fair numbers in the hilly lands to the south and east. As the uplands became dry the bird gradually disappeared from these and the better-drained lowlands. In the very last part of migration the species was found only in the wetter high-grass swamps in the Bloody Run district and on Cranberry Island. In both situations the males sang much.

The first nesting record was made on July 14, 1904, when E. L. Rice found several pairs on Cranberry Island. No eggs or young were seen. On May 30, 1908, Rice again visited Cranberry Island and found several adults feeding young. During the investigation none was found nesting on Cranberry Island, although this sphagnum-cranberry bog appeared to be very similar to the northern Ohio bogs in which the species nested annually. The other nesting record was made on June 30, 1928, when I found a fledgling, only recently out of the nest, in a buttonbush-alder swamp in Little Buckeye game refuge. When first seen this youngster was loudly calling for food, and shortly thereafter an adult appeared and fed it.

The first fall transients were found between September 4 and 28, and by October 1 the species had usually become rather numerous. Between October 3 and 28 the bird was more abundant than at any other period. Despite its secretiveness and the profuse vegetation, 15 to 80 individuals were daily seen, and it was apparent that on many days the total number was several thousands. A sharp decrease in numbers took place in late October, and by November 8 all transients had seemingly disappeared.

The first winter record was made January 11, 1925, when H. S. Peters and I found the bird in a high-grass swampy meadow near Little Buckeye game refuge. On November 24, 1927, Charles F. Walker and I found 5 birds in a lowland meadow of high grass and sedges on the south shore opposite Journal Island. Later in the 1927-28 winter I made a survey of all swampy, high-grass, and sedge meadows and found 1 to 4 Swamp Sparrows in 4 of them. Since that winter and until the end of the survey I found these sparrows every winter in 3 to 7 meadows, and the total number each winter ranged from 9 to 27 birds. Since I found these birds consistently after discovering their highly restricted wintering habitat, I conclude that the species was annually wintering before 1927.

The meadows in which the Swamp Sparrow wintered were generally less than an acre in extent. All contained a rank growth of sedges and finer

grasses. This vegetation was peculiar in that it did not tend to mat upon the ground or become sodden by rains or crushed by snows, but remained sufficiently upright so that the upper foliage formed a shelter which was 4 to 24 inches above the ground. Under this shelter the Swamp Sparrows appeared to remain. The wintering birds were most secretive and extremely difficult to flush, but if the observer carefully approached, waited a few moments, and gave the "Screech Owl" whistle they temporarily left their customary haunts to perch upon the taller vegetation and scold. Apparently, once a bird began to winter in an area it attempted to remain until spring. Throughout several winters I repeatedly saw the same number of individuals in the same meadow, and in some instances was able to note repeatedly a particular individual which was recognizable by color, or color pattern.

From the past history of this area it may be assumed that the bird was a transient during the entire period, that it may have increased in transient numbers after the removal of much original forest, and that it nested about the cranberry and sphagnum bogs throughout much of historic time and until 1908.

Melospiza melodia euphonia Wetmore

Allegheny Song Sparrow

Common resident, very common during spring and fall.

Earliest date of arrival:	.....	.....
Median date of arrival:	(February 27)	(October 1)
Median date of departure:	(April 5)	(November 7)
Latest date of departure:	.....	.....

The Allegheny Song Sparrow was recorded during every field trip, and it was apparent that several hundreds were always present. During migrations the numbers were usually higher than they were in summer or winter, and there was some seasonal fluctuation from year to year.

In January and the first 3 weeks of February between 20 and 200 individuals were recorded during every field trip, and among land birds the Allegheny Song Sparrow was usually outnumbered only by the Eastern Tree Sparrow. Occasionally a slight decrease was noted following heavy snows or severe sleet storms. During a warm period of exceedingly long duration there sometimes was an increase in numbers. There appeared to be a greater variation in numbers from winter to winter, a condition seemingly correlated with the amount of food and cover. When the weed seed crop was poor and the cover was scanty, the number seemed below the 12-year average; when weeds and other vegetation had grown rank and tall and had seeded well, and much vegetation had been left standing, there appeared to be a greater than average number of birds.

In the first definite warm period in late February or very early March, and coincident with the first large migration of Robins, Eastern Redwings, and Bronzed Grackles, there was a noticeable increase of Allegheny Song Sparrows. By mid-March the total population appeared to be from one-fifth to one-half larger than it had been in the preceding winter. The number usually decreased somewhat in the latter half of March, and by mid-April summer numbers were attained. During the greatest spring concentrations many thousands were daily present.

Wintering birds were usually rather uniform in coloration. The light ground color of the breast and belly was a medium gray, and the streakings of the breast and feathers of the back were various shades of dark reddish brown. With the increase of birds in late February and March there appeared, sometimes in large numbers, a bird with the ground color of the breast almost white, and with the streakings of the breast and feathers of the back bright rusty browns, reddish browns, and brownish grays. In these brightly colored or "spring type" birds, the markings of the breast appeared broader and much more intense than in the darker or "winter" type, and the difference between the extremes was pronounced. At first I believed the 2 types were different forms, but after collecting a few and washing a dark bird, I found that the "wintering" type was more dirty and sooty, and that the supposed greater width of the breast streakings in the "spring" type was caused by sharper contrast between the light background and reddish brown streakings. Apparently the "spring" type had wintered in cleaner territory than that occupied by the wintering Buckeye Lake birds. In late March the light-colored birds disappeared. Either they left or their plumage also became dirty.

In the fall of 1930 I mentioned these findings to Margaret M. Nice.²⁴ We discovered that both of us had noted these types and had reached the same conclusions. By banding the birds Mrs. Nice had definitely proved what I had assumed: the darker and more dirty sparrows were winter residents, and the lighter ones were transients (Nice, 1931: 90; 1933: 222).

The daily and total numbers throughout late April and May seemed to remain constant. With the appearance of many young out of the nests in late May, there was a slight increase in numbers, which continued until early August. During late August and September the species was always conspicuous, and its numbers were rather constant. Because of the abundance of vegetation and the more even distribution of summer birds, fewer were daily recorded than were noted in winter. It was obvious, however, that in the average summer the bird was as numerous as it was in winter.

In late September or early October an increase in numbers became apparent. The greatest concentration took place between October 7 and

²⁴ At that time Mrs. Nice was conducting her noteworthy investigations on the life history of the Allegheny Song Sparrow, near her home at Columbus, Ohio (Nice, 1937).

November 1, and then there were several days when the species was fully as numerous as it was in March. Autumn birds were rather uniform in coloration, and only 1 color type was apparent. A decrease in numbers was noted during early November, and by late November wintering numbers had generally been attained.

Throughout the survey the Allegheny Song Sparrow was found over almost the entire land area. In winter the bird was abundant in brushy thickets, fallow fields of rank weed growth, weedy fields of uncut corn, brushy edges and openings of woodlands, brushy fence rows, brushy and weedy swamps, weedy edges of the canal, and cattail marshes. It was less numerous or entirely absent from the bleak snow-swept fields and pastures, from the vicinity of farmhouses containing little shrubbery, and from orchards and woodlots which had no ground cover. During spring and fall it was also noted in small numbers in more barren localities, such as pastures, meadows, and last year's forage and grain fields.

In the nesting season, from late March to early August, the species was found in the greatest concentrations in lowland weedy situations. Many pairs nested on the islands and lowland shores of the lake where herbaceous plants and brush were present, about weedy and brushy borders and isolated brushy areas of cattail swamps, in weedy and brushy inland swamps, in brushy edges and openings of woodlands, along brushy fence rows, in fallow and weedy fields, and in the openings and borders of brushy thickets. A few also nested along weedy or brushy fence rows, in fields of smaller grains and forage crops, and in woodlots containing little ground cover. It was only in the barren upland fields and on the crests of wooded hills that nesting birds were absent.

The hundreds of nesting observations indicated that the majority of the males had established nesting territories by late March or early April; that in late June there was a decrease in number of guarding males; that the majority of the eggs were in the nests from late April to mid-June; that the majority of young were in the nests from early May to mid-July; and that young recently out of the nest were most conspicuous between late May and early August. More than 100 nests were found, though eggs and young of only 52 were recorded. More than three-fifths of the nests were built directly upon the ground, usually under a tuft of grass or other vegetation, or protected by a clod of earth. The remaining nests were built in low bushes, in herbaceous plants, or in brush heaps and were 2 to 27 inches above the ground. During wet years and in swampy situations a greater number were built above ground. On Cranberry Island, where the sphagnum-cranberry ground mat was always saturated, 14 nests were placed in low bushes or saplings, and only 6 were directly upon the ground mat. The nests were chiefly made of dried grasses, with an occasional rootlet, bit of leaf, or some horsehair.

Of the 52 recorded nests, 3 contained 2 eggs or young each; 2, 2 young of this species and 1 Cowbird young each; 11, 3 eggs or young each; 4, 3 eggs or young of this species and 1 Cowbird egg or young each; 2, 3 eggs of this species and 2 Cowbird eggs each; 15, 4 eggs or young each; 3, 4 eggs or young of this species and 1 Cowbird egg or young each; 1, 4 young of this species and 2 Cowbird young; 8, 5 eggs or young each; 2, 5 eggs or young and 1 Cowbird egg or young each; and 1, 6 young. The earliest nest with eggs was noted April 13 (1929, 4 eggs), the latest August 2 (1932, 4 eggs); the earliest nest with young was seen April 21 (1932, 3 young of this species and 1 Cowbird young), the latest August 13 (1925, 3 young); and the first young recently out of the nest were observed April 25 (1931, at least 2 young), and the last August 26 (1933, 1 young).

Fargo (1932: 208) examined 6 breeding Buckeye Lake Allegheny Song Sparrows and referred them to the subspecies *beata*. Later, Wetmore (1936: 2) referred this form to *euphonia*.

Calcarius lapponicus lapponicus (Linnaeus)

Lapland Longspur

Rare late fall and early spring transient, rare winter resident.

Earliest date of arrival:	.....	November 3, 1926
Median date of arrival:	.....	(November 15)
Median date of departure:	(March 10)	.....
Latest date of departure:	March 23, 1928	.....

The Lapland Longspur was recorded in 7 winters. Despite this irregularity in recording wintering individuals I assume that the bird was present at some time of each winter, for in those seasons when a persistent search was made a few were always found. All except a flock of 6, which I saw flying over the lake near Sellars Point on November 3, 1926, were found associating with horned larks, chiefly in well-drained hilly fields and meadows south and east of the lake. Seldom were more than 4 individuals seen in a day, and the greatest number ever recorded was 12 (February 14, 1929). There must have been occasions during and before this survey, in November or late February and March, when the species was much more numerous than the records indicate. Flocks of 100 to 300 birds have been found elsewhere in central Ohio in recent years, and there is no reason why they should not have infrequently appeared in similar numbers about Buckeye Lake.

A few late February and March birds sang at infrequent intervals. On March 3, 1929, a highly-colored male sang for several minutes, as it stood upon a clod of earth on the summit of a hill near Thornville. Generally, the birds sang from a perch upon the ground, but occasionally one sang while in the air. The usual note of both sexes resembled in miniature the rattle of the Kingfisher.

Plectrophenax nivalis nivalis (Linnaeus)

Eastern Snow Bunting

Rare or uncommon late fall and early spring transient and winter resident.

Earliest date of arrival:	.....	October 30, 1926
Median date of arrival:	(February 14)	(November 20)
Median date of departure:	February 22	.....
Latest date of departure:	March 3, 1929	.....

I shall long remember the first Eastern Snow Buntings I ever saw. At dawn on the wintry morning of December 4, 1923, while rowing a boat parallel to the then exposed "Middle Bank" near Sellars Point, I saw 2 of them drop out of the sky and alight upon a floating log. Before that day I and other Wheaton Club members had not seen the Eastern Snow Bunting in central Ohio, and the writings of earlier ornithologists had led us to believe that the species was rare in the vicinity. Subsequent work indicated that the species was annually present in central Ohio, and that it was not as rare in winter as was formerly supposed.

The Eastern Snow Bunting was noted during 9 winters, and I assume that it was present during each winter of the survey. The first autumn birds were usually seen in late October or November, always flying over the lake or perching on stumps, mud bars, or islands. In mild late autumns and early winters the birds remained about the lake until January. If December was cold and snowy the birds disappeared from the vicinity of the lake in that month. Those not recorded about the lake were with large flocks of horned larks on the rolling upland fields and meadows.

Seldom more than 5 were noted in a day, but during the 1928-29 winter as many as 25 birds were seen in a day in late November, and between February 14 and March 3, 15 to 78 individuals were observed daily.

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PLATE I

FIG. 1. View of east end of lake from high hill on northern side. In late summer during the investigation the rooted aquatic vegetation in this sheltered section was very profuse. It occasionally became necessary to mow or cut a channel through the vegetation so that boats from Thornport could reach open water. Large numbers of several species of grebes, herons, ducks, rails (including Coots and Florida Gallinules), and terns frequented the vegetation beds at various seasons. A few fish species, such as large-mouthed bass, pumpkinseed, and yellow bullhead, were more numerous among the vegetation than elsewhere. Photographed September 9, 1930.

FIG. 2. View at western end of lake on a windy day, northwestward from Sellars Point. All accounts indicate that shortly after the filling of the reservoirs with water and until 1900 this portion of the lake contained an abundance of aquatic vegetation. Wave action was consequently not severe. I saw great beds of vegetation (mostly of the submerged type) in this bay on August 11 and 12, 1906, and many stumps and much timber. Wave action causes the softer organic and inorganic matter of the lake bottom to be washed away, thereby roiling the water and exposing a harder bottom which lacks the basic fertility necessary to support as abundant a bird and fish life as does a softer, chiefly organic one. Photographed April 2, 1932.

PLATE I



ROSCOE W. FRANKS

Fig. 1.



Fig. 2.

PLATE II

FIG. 1. A relatively undisturbed area in Maple Swamp, overgrown with emergent aquatics and bordered with herbaceous plants, shrubs, and trees. During the investigation many such areas about the lake were dredged and most of their aquatic vegetation was destroyed. Several similar areas in Bloody Run swamp were drained and the land cultivated. Photographed about 1927.

FIG. 2. The "North Bank" looking westward from Stony Point to Sellars Point. The water along the bank from Sellars Point eastward to Buckeye Lake Park is from three to eight feet in depth, it contains no rooted aquatics and is subject to much wave action from wind and power boats. The part of the bank pictured was widened a few years after the completion of the investigation. Photographed about 1927.

PLATE II



Fig. 1.

ARTHUR R. HARPER



Fig. 2.

ARTHUR R. HARPER

PLATE III

FIG. 1. The "North Bank" at Stony Point, with a small part of the row of cottages which line the entire bank. Photographed March 28, 1937.

FIG. 2. The "North Bank," at the beginning of the present century. Dawson (1903: 115) entitled this picture "The Prothonotary Warbler's front yard," because the species then nested in the wooded swamp immediately behind the bank. His description of this "fairy dell of woods and water" contrasts sharply with conditions during the investigation. Until 1930 remnants of the swamp remained, and small numbers of Prothonotary Warblers nested there. After the successful completion of a drainage project in 1930 the Prothonotary Warbler disappeared. By 1934 the swamp had been converted into a series of back yards and fields, and a highway parallel to the "North Bank" extended throughout its former length.

PLATE III



Fig. 1.

EDWARD S. THOMAS



Fig. 2.

FROM DAWSON

PLATE IV

FIG. 1. A farm on the till plain immediately west of Buckeye Lake. A hundred and fifty years ago this land contained wooded swamps and bogs, and had a flora and fauna that was unusual for east-central Ohio. A series of drainage projects made possible the conversion of the immensely fertile soil into farmland. In 1922 the farm was under intensive cultivation, but retained brushy fence rows and sufficient cover for a nesting and wintering population of Bob-white and other brush- and field-inhabiting species. By 1936 intensive cultivation, grazing, and draining had so reduced the brush and herbaceous cover that no swamp-forest species remained and few brush- and field-inhabiting birds nested or wintered. Only those species inhabiting open fields have maintained or increased their nesting or wintering numbers. The swamp flora has almost entirely disappeared, and a flora similar to that of the cultivated till plains of central Ohio has taken its place. Photographed September 20, 1936.

FIG. 2. A well-managed farm on the till plain two miles northwest of the western end of Buckeye Lake, in the old Bloody Run swamp. Though rather intensively cultivated this fertile land contains considerable cover and food for nesting and wintering brush- and field-inhabiting species of birds. The wood lot and adjacent fallow fields and corn fields will harbor many wintering birds. Intensive cultivation and grazing would rapidly convert this farm into one similar to the above. Photographed September 20, 1936.

PLATE IV

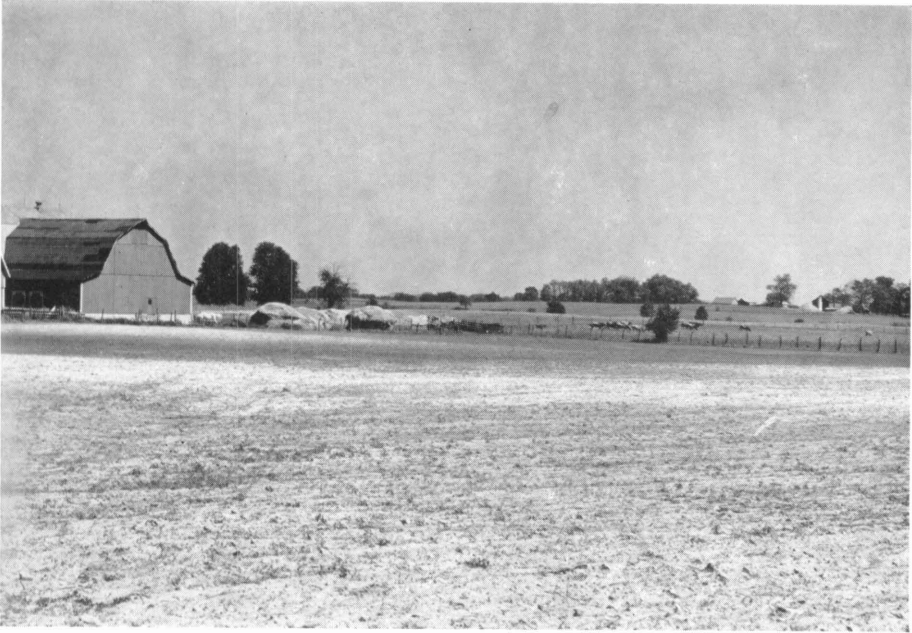


Fig. 1.

EDWARD S. THOMAS



Fig. 2.

EDWARD S. THOMAS

MILTON B. TRAUTMAN

PLATE V

FIG. 1. Westward from the high hill near the eastern end of Buckeye Lake. Photographed September 9, 1930.

FIG. 2. Part of the cranberry-sphagnum bog meadow and shrub zone of Cranberry Island. The tufts of white are the plumes of the cotton-sedges. The partly dead red maples in the left background are about thirty-five feet in height and apparently are the largest trees that this bog island can support. Photographed in late summer, 1926.

PLATE V



Fig. 1.

ROSCOE W. FRANKS



Fig. 2.

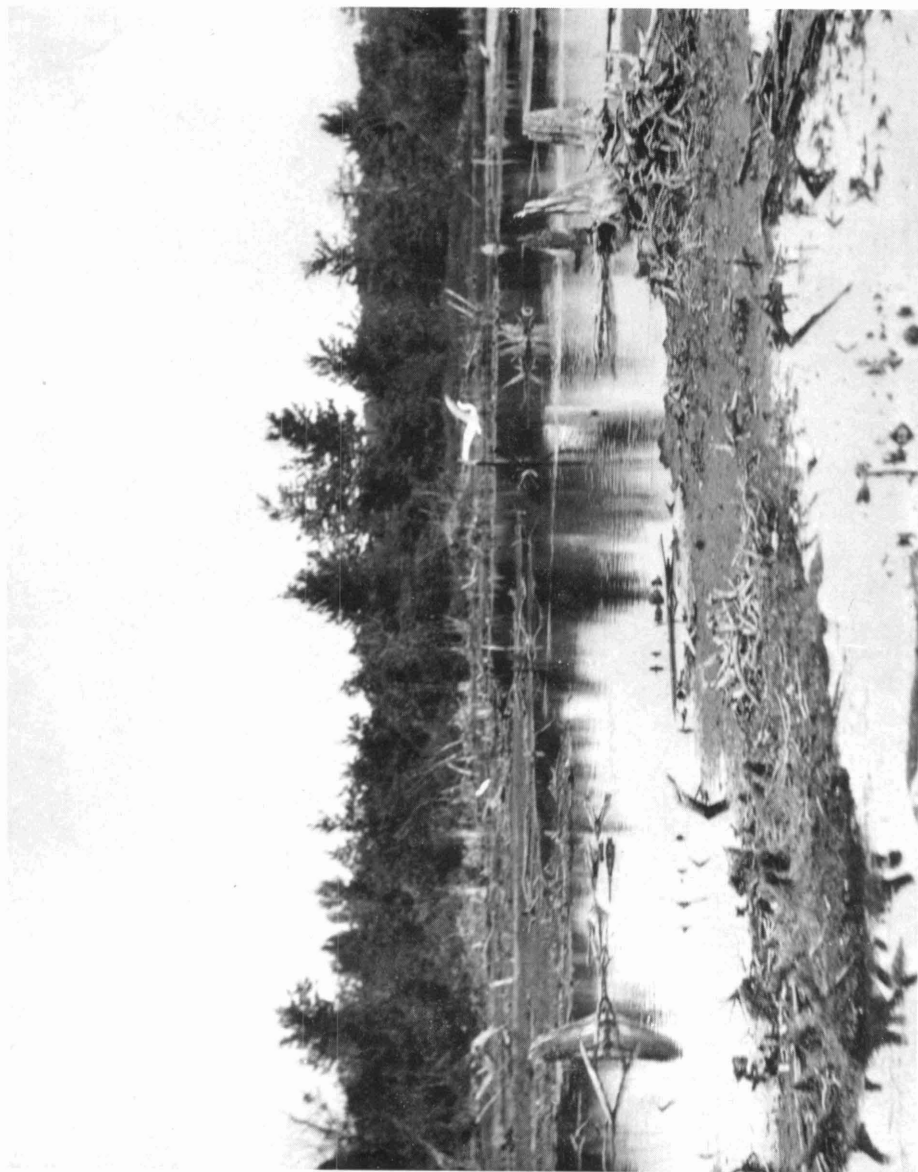
ROBERT B. GORDON

MILTON B. TRAUTMAN

PLATE VI

Recently emerged peat islands, Cranberry Island in the background. In spring the peat islands were 1 to 7 feet under water. During midsummer the generation of gas from bacteriological action was sufficiently great to lift them to the surface. All contained stumps and timber and those rising first and from shallow water produced considerable vegetation. The majority of the shore birds seen in late summer and early fall were found on these islands. There was a gradual decrease in the number and size of the islands during the investigation. An American Egret is flying, and a Little Blue Heron is standing to the left. Photographed August 7, 1930.

PLATE VI

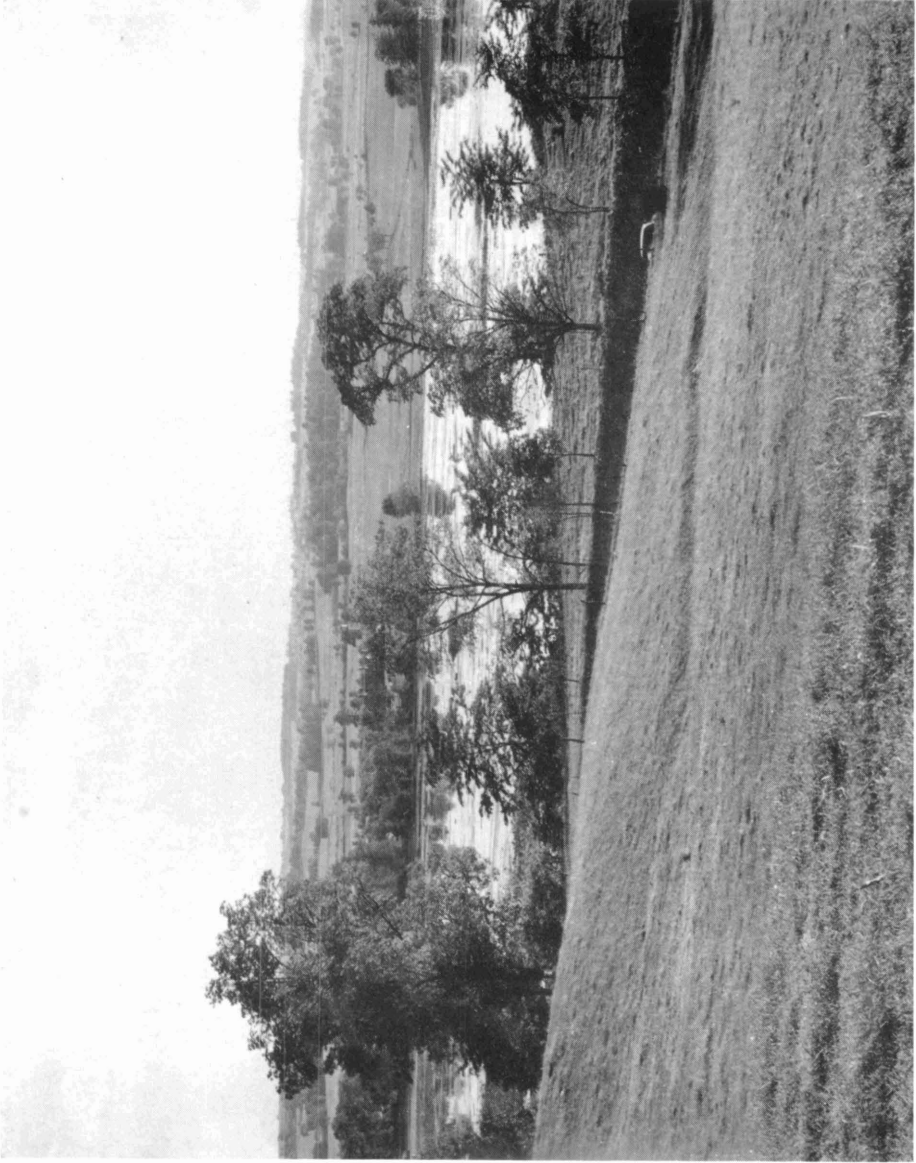


ROSCOE W. FRANKS

PLATE VII

Southward from the high hill near the eastern end of Buekeye Lake, toward the village of Thornport. At this point the lake is about three-eighths of a mile wide. The hill from which the picture was taken is approximately two hundred feet above the water. The gently sloping hills in the distance are about one hundred and fifty feet higher than the partly filled, interglacial valley in which the lake lies. The meadow in the foreground is heavily grazed by sheep. Each year during the investigation such plants as the blue-stems and beard grasses, indicators of declining soil fertility and heavy grazing, were increasing in abundance in this field. The profusion of aquatic vegetation in the lake at this eastern end is apparent. Photographed September 20, 1936.

PLATE VII



EDWARD S. THOMAS

MILTON B. TRAUTMAN

PLATE VIII

Northwestward across a small bay and cultivated field to Jack's Neck Woods. The bay is near the mouth of Maple swamp. It contains the usual white water lily-water lotus-cattail association and fringe of trees along the shore. The aquatic plant association will disappear with the building of cottages on the shore, and the erection of concrete retaining walls along the bank. Photographed September 20, 1936.

PLATE VIII



EDWARD S. THOMAS

PLATE IX

FIG. 1. A part of the abandoned canal between Sellars Point and Hebron as it appeared during the investigation and until the fall of 1936. The road paralleling the canal on the right was once the towpath. The broad border of cattails and other emergent aquatics contained a moderate nesting population of marsh birds and was winter cover for many small land birds. Photographed September 20, 1936.

FIG. 2. The canal on March 28, 1937, after a Federal Relief Project to give men employment had "cleaned out" the canal. The plant association will eventually return if given opportunity. Photographed March 28, 1937.

PLATE IX



Fig. 1.

EDWARD S. THOMAS



Fig. 2.

EDWARD S. THOMAS

PLATE X

FIG. 1. A woodland pool in an elm-ash-soft maple association of Jack's Neck Woods. The dead timber in this mature second growth contained a large population of woodpeckers throughout the year. The great abundance of many insect species resulted in a large transient and summering bird population. The American Redstart and Ovenbird were characteristic nesting species in the vicinity of these woodland pools. Photographed January 10, 1932.

FIG. 2. A beech-oak ridge in Jack's Neck Woods contained large second-growth trees. In the background, and at an elevation averaging only a few feet lower than the ridge, is the woodland pool pictured in Figure 1. The Acadian Flycatcher was one of the characteristic nesting birds of the low ridges. Photographed January 10, 1932.

PLATE X



Fig. 1.



Fig. 2.

MILTON B. TRAUTMAN

PLATE XI

A part of the wooded ravine near the eastern end of the lake (Map 2: No. 36). Such well-drained remnant woodlands contained a beech-maple association, which was the dominant forest type of the eastern half of the area. The bird-carrying capacity in winter was low, for those upland woods bore little ground cover. Photographed in 1931.

PLATE XI



EDWARD S. THOMAS

MILTON B. TRAUTMAN

PLATE XII

Eastward from the high hill near the eastern end of the lake. The trees, brush, and herbaceous vegetation in the scene are more abundant than is usual in this section of glaciated, gently rolling hills. Much of this land is heavily grazed. Brush is usually scarce, except along fence rows, the weed seed crop is low, the soil on the upper slopes of many of the hills is poor, and soil erosion is increasing. Characteristic nesting species are the Prairie Horned Lark and Vesper Sparrow. The wintering population in the fields, of such seed-eating birds as the sparrow tribe, is very low. Photographed September 20, 1936.

PLATE XII



EDWARD S. THOMAS

PLATE XIII

FIG. 1. Snow on Liebs Island. Deep snow covers most of the food of ground-feeding birds of such diverse types as the Black Duck, Dove, Bob-white, Eastern Meadowlark, Carolina Wren, and Red-eyed Towhee. Photographed February 2, 1926.

FIG. 2. A high-grass swamp meadow at the western edge of the Big Woods, across the road from the canal (Map 2, No. 12). The sedges and grasses are unmatted. Such meadows always contained available food and shelter for wintering, small land birds. The meadow contained Swamp Sparrows during each winter between 1927 and 1933. The greatest winter concentrations of Bob-whites found anywhere were in these meadows. Many of them were drained or otherwise eliminated during the investigation, and probably it will be only a few years before this swamp meadow type will disappear entirely. Photographed February 5, 1932.

PLATE XIII



Fig. 1.

EDWARD S. THOMAS



Fig. 2.

MILTON B. TRAUTMAN

PLATE XIV

A King Rail on a nest containing eleven eggs. The nest was in the small cattail marsh at the eastern end of Liebs Island. Photographed May 18, 1929.

PLATE XIV



EDWARD S. THOMAS

MILTON B. TRAUTMAN

PLATE XV

A Sora at the edge of a marsh. Photographed September 10, 1927.

PLATE XV



EDWARD S. THOMAS

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