

VARIATIONS IN THE BIRD POPULATION OF THE
NORTH-CENTRAL STATES
DUE TO CLIMATIC AND OTHER CHANGES

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THE area where most of our observations on the abundance of birds were made includes Toledo, Bowling Green, and Sandusky, Ohio, extending 25 or 30 miles from each of these cities. In many of the species mentioned here we have evidence that similar changes have taken place over a much wider area, including northern Illinois, southern Michigan, and western parts of New York and Pennsylvania.

EFFECT OF MODERATING CLIMATE

Temperature records in the northern states show that the average in recent years has been higher than the long-time average; in other words, the climate has been moderating. How long this will continue we do not know.

At Chicago, the normal or long-time average is 48.4° F. In the last 18 years the annual temperature has been lower than this only once, and in the 51 years following 1893 only eight times, but in the 33 years, 1845–1877, the annual temperature was below 48.4° twenty-two times.

At Cleveland, the normal temperature is 49.6°. Only four of the 27 years since 1917 have had a lower annual temperature.

“At Indianapolis, February temperatures, 1916–1935, averaged 4° warmer than those for 1896–1915. Between February 19, 1936, and January 2, 1940, reliable thermometers did not reach zero at all; this was the first such long period without any zero weather in that city since the U. S. Weather Bureau was established” (S. S. Visher, *Climate of Indiana*: 358, 1944).

Glaciers afford a means of knowing climatic trends for much more than one century. A period of years with more than average snowfall and temperatures below normal causes the ice to accumulate and move down the valley faster than it melts away, so that the ice front extends farther down than previously. When the weather becomes warmer and less snow falls, the ice front retreats.

During most of the time for more than half a century, glacial fronts have been retreating in all parts of the world where glaciers have been studied. On the North American continent they are found only in the western part, and little study of their motion was made until the latter part of the Nineteenth Century. John Muir wrote: “All the glaciers that have come under my observation in southeastern

Alaska have retreated and shallowed since first I became acquainted with them in 1879 and 1880."

In western Canada, Montana, and the Pacific states as far south as southern California, very few of the glaciers show evidence of advances in recent decades. Nearly all of those whose fronts have been surveyed show retreat, and the rate of retreat has recently shown a marked acceleration.

In the United States, "the annual losses of ice have been much greater during the 1920's and 1930's than during the decades immediately preceding. Three small glaciers in Oregon and several in California have entirely melted away in the past 25 years and those in Glacier National Park and in Montana are wasting away at a rate which, if continued, will result in their total extinction within the next few decades" (François E. Matthes, *Hydrology*: 195 and 196, 1942).

Since the Wisconsin ice sheet started its retreat from its southern limit south of Dayton, Ohio, something like forty or fifty thousand years ago, there have been periods when both the continental glaciers and the mountain glaciers readvanced and again covered parts of the land which had been freed from the burden of ice.

Studies by botanists of the pollen in peat bogs in Ohio, Indiana, Sweden, and other parts of North America and Europe have confirmed and supplemented conclusions based on the study of glaciers. Fir, spruce, and many species of pine can stand more cold than hickory, oak, or maple. Microscopic examination of the pollen in successive layers of the vegetable matter in these bogs makes it possible to infer what changes of climate have taken place.

For thousands of years after the continental ice sheet had disappeared from the northern states, the climate was milder than it is now. About 2000 B. C., conifers began to crowd back southward the deciduous trees which had long thrived in the mild climate. This cool period continued, with numerous brief interruptions, until about 1600 A. D. Then it became still colder; glaciers in Switzerland overran villages and land where forests had been growing for centuries. When our ancestors first landed in New England and New York they encountered a more rigorous climate than had prevailed there in previous centuries. In the 1850's it became much warmer and there was a rapid retreat of glaciers. Since then it has been cooler for a few years at a time, but not so cool as in the Seventeenth and Eighteenth centuries. During most of the past quarter century the weather has been rather mild.



AMERICAN PIPIT: (*Upper*) PARENT PREPARING TO REMOVE A BOLUS OF EXCRETA. (*Lower*) THRUSTING AN INSECT TOWARD THE BACK OF A NESTLING'S MOUTH.

Records of temperature have been kept at a few places in the eastern part of the United States since early in the Nineteenth Century. Those at The Marine Hospital, Ft. Columbus, New York City, cover the period 1822–1874. In the first eight years of this record the average temperature was higher than in any decade that followed. The U. S. Weather Bureau records at New York started in 1871. They show that in that city annual temperatures continued below normal in most of the years to 1897. After that a majority of them were above normal. Likewise, in the North-Central States, relatively cool weather prevailed until sometime in the 1890's.

At New York City, the warmest of all decades was 1930–1939, with an average of 53.7°. In 1830–1839 the average was 2.9° lower; that is, 50.8°. This corresponds fairly well with the rate of change at Cleveland where the average, 51.38°, for the period 1931–1942 was 2.13° higher than the average of 49.25° in 1856–1870. In both of these records I have made due allowance for the difference in location of thermometers. The records of Gustavus A. Hyde at Cleveland extends from 1856–1906, and so overlaps that of the Weather Bureau for many years, giving a good basis for comparison. His instruments were furnished by the Smithsonian Institution.

The range in annual temperatures is much larger than that of decades—seven or eight degrees at places with long records. Changes of climate such as these might have little effect on the bird population in a region where nearly all of the winters are mild, but the area whose bird population we are considering lies mainly between the 40th and 43rd parallels. Throughout the greater part of it the mean temperature from mid-November to mid-March is not very far from 32°. In those winters when it is three or four degrees lower than 32°, snow may be expected to cover the ground during a much larger part of the time than in those winters when it is a few degrees above 32°.

We have records of the amount of snowfall at many places since early in this century or the latter part of the Nineteenth Century. Of the twenty-six years since 1918 nineteen have had less snow than the long-time average in Ohio and twenty had less in Indiana. In nine of the seventeen that were below average at Toledo, the amount of snow ranged from 12.2 inches to 21.1 inches; the average, 1885–1942, was 30.4 inches.

In the winters, 1885–1886 to 1917–1918, snowfall was above average at Toledo 22 times; that is, in two-thirds of the whole number. In each of eight of these winters, more than 40 inches of snow fell.

In the winter of 1895-1896 there was five times as much as in the winter of 1918-1919.

In some periods of a decade or two, most of the years have had average monthly temperatures in the two coldest months several degrees below 29°; in other periods of similar length a majority have had averages a few degrees above 29°. Such differences affect our fuel bills to the extent of 25% or so.

The fuel on which a bird depends is the food it eats. When the food is cold, some calories are lost in warming it. A few degrees would not amount to very much were it not for the latent heat in unfrozen food and the lack of it in that which must be thawed out inside of the bird. A large part of the food of birds yields less than 700 calories per kilogram. If the food is frozen, about 80 calories are consumed in thawing it out. A coating of frost or ice may still further reduce its value. If the bird must find and dig out the food from under the snow, its troubles are greatly increased.

NORTHERN BIRDS WHICH FORMERLY WERE OFTEN SEEN IN OHIO IN WINTER

Dr. Carl Tuttle, a former member of A. O. U., has lived in Berlin Heights, Erie County, Ohio, for more than eighty years. He writes: "I distinctly remember when I was 15 years old or so of seeing every winter flocks of Snowflakes. In the last 25 years I have not seen any."

At Three Rivers, St. Joseph County, Michigan, Oscar M. Bryens kept a record of the number of birds of each species that he saw in the winters of 1925-26, 1926-27, and 1945-46. He was away in the intervening winters. He saw Snow Buntings in each of the first two winters, including 97 birds on March 3, 1926, but none in the recent winter.

Elsewhere in the latitude of Toledo these birds, as well as Lapland Longspurs, Northern Shrikes, and Northern Horned Larks, were formerly seen by many bird students in winter, but in a majority of recent years they have been relatively scarce. However, the largest number of Snow Buntings ever seen in one day in the Toledo area was January 31, 1943, when Mr. and Mrs. Fred Stearns saw about 5,500 at Bono.

The common Redpoll has been rare in Ohio for more than half a century. In Dr. Wheaton's time it was a tolerably regular winter resident in northern Ohio. Lynds Jones, who came to Oberlin in 1890, says: "Previous to my residence in Ohio this species was reported as being common in the region of Oberlin nearly every winter." The numbers of Redpolls observed in the last ten years

seem to have been even less than before. In the recent winter Mr. Bryens saw none in St. Joseph County, Michigan, where he saw them on 32 days in the winter of 1925-26-78 birds March 17, 1926.

SOUTHERN BIRDS WHOSE RANGE HAS BEEN EXTENDED NORTHWARD

"In Finland the warmer climate of the past fifty years has caused the influx of birds from the south." In this country the northward extension of habitat has undoubtedly been favored by the milder climate, especially in the case of those birds that winter near the northern limit of their range. A factor that may have been more potent in bringing about the change is the food supply provided by man purposely or otherwise.

In western New York, Cardinals are still uncommon but increasing. There has been a notable increase all the way from Pennsylvania to Illinois. Only two of the many persons consulted have reported their numbers unchanged. In the Christmas bird census at Cleveland, 103 Cardinals were counted in 1940, and farther south at Buckeye Lake, Ohio, 309 were counted in 1943. Most of the time in winter, 25 or more live within 100 yards of the home of Seymour Holloway near Swan Creek, southwest of Toledo. In 1885, when I went to Grand Rapids, Michigan, to teach zoology and other subjects in the high school, the only Cardinal which the naturalists of the Kent Scientific Institute knew about had been seen not long before in the yard of Dudley Waters. At the present time hundreds of Cardinals are living in and near that city. Milton Trautman writes: "In 1925 I found Cardinals north of Grayling, Michigan, but after the 1936 winter they seemed to have been frozen back at least 100 miles to the south."

Between 1860 and 1900, most of the families in Columbus, Ohio, are said to have had a caged Cardinal. John Frey, who then made a business of trapping Cardinals, told Mr. Trautman that trappers had extirpated these birds in a 50-mile radius about Columbus and he had to go into Adams County, Ohio, and to Kentucky to trap his Cardinals. Probably something similar occurred around other cities in about that latitude. After trapping ceased, the wild birds rapidly increased. The cutting of the forest followed by cultivation of the land made it possible for many more Cardinals to find food. Before that, buckwheat, corn, sunflower, and many kinds of weed seeds were not available in great quantities.

When a large number of people became interested in providing food for Cardinals, the birds were quick to respond and most of the other species which were attracted to the feeding shelves were unable to displace them.

Wild Mockingbirds were seen throughout the year in northern Ohio and even in southern Michigan for years before the beginning of the present century. They are still scarce so far north, but have become fairly numerous in recent years in the vicinity of Indianapolis and Columbus, and have extended their range northward in Pennsylvania and New England.

Dr. J. P. Kirtland in his catalog of the Birds of Ohio, published in the Geological Survey, in 1838, does not include any kind of wren; there may have been none before there were buildings in Ohio. The House Wren was first noticed in Dekalb County in northeastern Indiana in 1883, and until about that time there were areas in Ohio and Michigan where they were rarely, if ever, seen. Now many make their home in the woods as well as where man has provided shelter. In the Southern States the Bewick Wren and Carolina Wren have long made their homes near buildings. The northward extension of the range of the former started as early as the 1870's and the latter as early as the 1880's. Since the extremely cold period in the winter of 1936, the Carolina Wren has been scarcer than before. They are seen occasionally as far north as Grand Rapids, Michigan. Bewick's Wren has made a steady increase at Lancaster, Ohio, in the last four years (Charles Goslin). It has also increased near Cleveland (J. P. Visscher).

In recent years the Hooded Warbler and the Prothonotary Warbler have been nesting in the North. At many places in southern Indiana, the Prothonotary Warbler was first noticed in the 1880's.

The Tufted Titmouse has long been common in a considerable part of Ohio and Indiana. In recent years, the number in the northern parts of Ohio and Illinois has become very great, and they have extended their range northward in Michigan and New York State. In woods near Toledo, the loud call of the Titmouse is likely to be heard oftener than that of any other bird except the Blue Jay.

Wood Thrushes in the past twenty years have been more numerous than formerly in the northern part of their range.

Robins and Bluebirds are now less rare in the North in winter than they used to be, and the former have been unusually numerous from mid-March until late in October.

Little Blue Herons are quite irregular in their visits to northern Ohio. Some have been seen in late summer in a majority of the years since 1923. In August, 1930, nearly a hundred were observed. Very few have been seen in mature plumage.

American Egrets have been seen in the North more frequently than

Little Blue Herons. Since about 1925, they have been observed in Pennsylvania and northern Ohio. For some thirty years before that they were on the verge of extermination, because women paid high prices to get their ornamental plumes. Karl Bartel reports 100% increase in the Chicago area. Bernard Baker saw American Egrets near Grand Rapids, Michigan, in 1939, 1940, and 1941, and at Grand Traverse Bay in 1940. Some have been seen at Rochester, New York, since 1933. Since 1941, relatively few have been seen along streams in northern Ohio, excepting near Lake Erie. Harold Mayfield and Louis Campbell saw 80 Egrets on September 3, 1944, at Reno Beach, east of Toledo, and 104 on August 22, 1945, in the Erie Marsh in Michigan, north of Toledo.

Like the preceding, the Snowy Egrets were too beautiful to be allowed to live, and were sacrificed on the altar of Dame Fashion. They have long been among the rarest of Ohio birds. Although a few nested in southern Indiana half a century ago, we have no evidence that they were ever numerous north of the Ohio River. There was some increase in their numbers in the Toledo area—1934—1939 (Louis W. Campbell). In these years the summers were unusually hot.

"In 1879 there were but five known records of the Barn Owl in Ohio and none in Indiana" (Amos W. Butler, *The Birds of Indiana*: 800, 1891). Early in the present century it was no longer rare in southern Ohio and there were also many living permanently in northern Ohio. For quite a number of years past, Barn Owls have been among the most numerous of the larger birds of prey in this region, and perhaps the most useful, considering their numbers, of all our many useful birds. A glance at the feet of these birds will show why they are not fond of winter weather much farther north than Ohio. They remind us of the scantily haired opossum, which had been increasing in the North for many years prior to the hard winter of 1944—1945. So many perished then that several, perhaps many, years will be needed to restore their numbers. For a long time, quite a number of Barn Owls have had their homes inside large trees on one farm traversed by Swan Creek southwest of Toledo. Apparently they all survived the winter of 1944—1945. Their wings enabled them to fly quickly to good places to find food and return without long exposure to the cold.

In addition to the southern birds mentioned above, all of which are attractive or easily identified, there are other species which are known or believed to have extended their range northward—for example, Bachman's Sparrow and Carolina Chickadee. A list of birds

from the Southwestern and Western States which have established homes in some of the North-Central States will be found under the heading, 'Bird Life Affected by the Activities of Man.'

For many years, Mourning Doves have been common over a wide area. Since early in the present century, when they were considered a game bird, their numbers have steadily increased. The extension of wheat acreage in the Northwest has made them one of the most common birds there. The number now in the whole country may exceed that of any native land bird of larger size except the Crow, but probably is less than the number of Passenger Pigeons in the middle of the last century. They subsist largely on weed seeds and scattered grain, doing very little harm to crops.

One reason for the increase of Mourning Doves in recent years is the fact that those which went south to spend the winter were able to return in spring, because people there were too busy with more important matters to use their shells in shooting birds. Moreover, they have escaped the hazards that have decimated those species that habitually nest on the ground, and their nesting season covers several months, some of which are likely to be favorable for rearing their young. Combines, which are now in general use in many states, scatter a large amount of grain. This has increased the food supply for doves. Milder winters and more food have induced large numbers of these birds to stay farther north than formerly. Hundreds of them remain through the winter in the Toledo area. In the 1940 Christmas census, 155 were enumerated there. In central Ohio, the number has been larger than this at more than one place and in more than one census. In Michigan they are often seen in winter as far north as Lansing.

EFFECTS OF WET AND DRY PERIODS

In the entire record of precipitation since the Weather Bureau started in 1871, there were no other three consecutive years in which so much rain fell in northern Ohio each spring as in 1943, 1944, and 1945. At Cincinnati, rain in these three springs has not been surpassed since the early 1880's. The ground was unusually wet also in the nesting season of 1942, 1940, and 1937. Ground-nesting birds must have found it difficult to rear their young in all of those years, especially where the land is as flat as it is around Bowling Green. Hungarian Partridges and Bob-whites have become rare in the Bowling Green area; the numbers of Pheasants, Meadowlarks, Bobolinks, Grasshopper Sparrows, Vesper Sparrows, and Song Sparrows have been reduced. For some of them it seems probable that unfavorable

nesting conditions have been the most potent factor in bringing about the change. Decrease in some of these birds may be due also to the increase of Crows and of those birds of prey which feed on birds—Sharp-shinned, Cooper's, and Marsh Hawks.

The dry summers that characterized most of the twelve years from 1930 to 1941 were unfavorable for many kinds of birds. July, 1936, was hot as well as dry. At that time I spent a few hours on West Sister Island in Lake Erie, where there were thousands of nests of the Black-crowned Night Herons. On the ground under the nests there were hundreds of the young birds dead or dying. These herons do not maintain a colony in one place so long as do the Great Blue Herons. For two or three decades past they have been much more numerous in northern Ohio than they were earlier in the century. The reason is probably better protection for herons in general. In a colony north of Bay City, Michigan, in 1941, Walter P. Nickell estimated there were 300 breeding pairs.

Dry summers are unfavorable for Woodcock, Snipe, Water-Thrushes, and Short-billed Marsh Wrens; their numbers have been much reduced. Other birds were affected by the poor crops. In some of these summers the yield of grain, weed seeds, and berries was much less than usual.

VAGARIES OF THE WEATHER

Some meteorological phenomena not implying any change of climate occasionally cause the destruction of large numbers of birds. On dark, stormy nights at time of migration, many thousands have perished by flying against lighthouses or beacon lights. Birds whose winter range is in the Gulf and South Atlantic States have at times encountered such bad winters there that a majority perished and five or more years were needed to restore their former numbers. This is likely to occur to birds like the Phoebe which feed on insects they catch while flying.

Thunder storms have sometimes killed many birds in summer. In one of the little parks at Sandusky, Ohio, more than a hundred English Sparrows were found dead early one morning. They had drowned in pools of water where the ground was dry the previous evening. A heavy rain after midnight had probably chilled and weakened them. Another downpour before sunrise knocked them off their perches.

At times sleet storms have proved disastrous over a wide area. Milton Trautman's observations of Carolina Wrens in the vicinity of Buckeye Lake, Ohio, illustrate this and also a great reduction in their numbers caused by severe winters. "During a sleet storm in

the winter of 1917-18 a great decrease in numbers occurred and for a few years thereafter only a few pairs nested within the 40 square mile area. By late 1923 as many as 30 individuals could be recorded daily; then that winter another sleet storm greatly reduced their numbers. Other reductions in numbers occurred in 1928 and 1930. In late 1935 I recorded 40 to 50 daily; then came the severe winter of 1935-36 and after that less than 5 per day could be recorded. The numbers rose again to 25 per day in 1941. Then the two hard winters of 1943-44 and 1944-45 so reduced their numbers that in December of 1945 only one bird could be found in the area and it was at a feeding station."

EFFECT OF INTRODUCED FOREIGN BIRDS ON OUR NATIVE SPECIES

In my boyhood days in Branch County, Michigan, in the 1870's, the familiar Chipping Sparrow nested in a bush in our front yard. It was very peaceable. The aggressive English Sparrow was unknown to us. Cliff Swallows, long common in the West, became abundant in Ohio after barns were built there, affording them nesting sites under the eaves and plenty of flies for food. English Sparrows appropriated all the good nesting places they could find around the buildings. They drove these swallows into oblivion. They made trouble, too, for Purple Martins and other birds, but greatly augmented the food supply of Screech Owls and Sparrow Hawks. In recent years the English Sparrows have become less numerous. In the village of Berlin Heights, Dr. Tuttle estimates that less than a hundred of these unwelcome guests still remain. Their decrease may be due partly to the scarcity of horses on the roads, but probably two other factors have had more effect on their numbers. On many farms, straw stacks are no longer seen because the harvesting of small grains is done with combines, and the straw, if it is not left in the field, is baled. Those straw stacks were very useful to the sparrows, affording them protection from storms and predators, nesting sites, and considerable food. Still more important has been the competition of Starlings with the sparrows. This began before combines were in common use in Ohio and affected both country and city.

Starlings were observed in Erie and Ottawa counties, Ohio, by Lynds Jones in 1921. They increased year after year, although the number in the state now may not be greater than it was a few years ago. Their competition with other small birds for food and nesting sites has reduced the numbers of many species, especially those that nest in holes. They are very aggressive birds and seem to delight in persecuting other kinds. One Starling, although it is armed with

a sharp beak, would not make headway against a Sparrow Hawk, a Flicker, or a Red-headed Woodpecker, but by "ganging-up" in large numbers and attacking energetically and persistently, they succeed in driving all of these birds away from the cavities in which they would like to nest. This has been an important factor in causing Red-headed Woodpeckers to become scarce where they were formerly abundant. Decrease in the number of Sparrow Hawks in some areas may be due to the same cause, although they are not always driven away by Starlings.

In many places, Flickers have decreased in numbers. In some places they have held their own, or even increased. Their eviction from nesting sites by Starlings has frequently been observed, but some have eventually found cavities where they succeeded in rearing young. They are very prolific.

Downy Woodpeckers have held their own fairly well. Suet put out by their admirers has helped them. They have also benefited, and so have the farmers, from their persistence in finding European corn borers. While working in his corn field, Seymour Holloway has noticed in one day about a dozen of these dynamic midgets diligently searching for borers in the stalks.

In Toledo there has been a notable decrease in chickadees and nuthatches in recent years. Their numbers have probably been reduced also in other cities where Starlings abound.

Walter P. Nickell of the Cranbrook Institute of Science, near Detroit, writes me: "Not one pair of Bluebirds has nested in the numerous cavities in our old apple tree back of the Museum for at least ten years, while an average of 15 or 20 nests of the Starling are found every year. Three hundred miles farther north, in Charlevoix County, Starlings are much less common, and no competition between Starlings and Bluebirds for nest cavities has been observed. Cedar Waxwings are also numerous there."

The decrease in Cedar Waxwings has been observed over a wide area and has probably been caused by their inability to find enough fruit left by the Starlings.

In the last week of March, 1946, I watched outside my window a Mourning Dove as she brought sticks from the yard to build a nest in the crotch of an old silver maple. Despite annoyance from both English Sparrows and Starlings, she was able to complete the nest. A few days later I found, on the sidewalk beneath, two broken eggs which the dove had laid. The large splotch and the shell fragments from one of the eggs were still plain amid the droppings of Starlings

a week later, but the dove had not been seen in the tree since the eggs fell.

Ring-necked Pheasants had become well established in the Bowling Green-Toledo area by 1923, after several attempts to introduce them. The number living in Wood County in the late 1930's was estimated at 175,522. This means about a dozen birds for every family on all of the 4,816 farms in the county, as well as those living in Bowling Green and a score of smaller towns, villages, and hamlets. Most of these birds, when they reach maturity, weigh between two and three pounds. No one expects them to do this without consuming a large amount of food. Barnyard fowls, if not closely confined, obtain considerable food for themselves and in doing so damage various crops. Pheasants have to find nearly all of their food, and the farmer cannot reasonably expect them to make a living on his land without molesting some of the crops he is attempting to grow.

Even if the Pheasants served no other good purpose, their usefulness in protecting crops from the ravages of insects and mice would offset what damage they do to sprouting grain and to unharvested grain. In dry seasons, when water is hard to find, they are likely to pick into many tomatoes and probably some melons, but melon growers have sometimes accused them of eating melons when they were really eating destructive insects. Crows also account for much damage which careless observers have assumed was done by Pheasants. Water in crocks in melon patches is said to lessen the damage done to the fruit by birds. R. S. Phillips of the Findlay Bird Club counted 131 squash bugs which he found in a single Pheasant. The Pheasants are known to eat also large numbers of cucumber beetles, cutworms, crickets, grasshoppers, and other destructive insects.

For a few years past the Pheasant population of Ohio has decreased to such an extent that after the shooting season of November, 1945, the number of birds in Wood County remaining alive and not crippled, was probably less than ten per cent of the average summer population during the 1930's. Naturally, this is a matter of deep concern to sportsmen and to many farmers. An appraisal of the relative importance of the various factors that have brought about this decrease is difficult. I will give some of them in the order of importance as I see it, but many persons who have had more experience with Pheasants will disagree with me.

1. *The shooting of hen Pheasants carelessly or otherwise.*—Near Toledo a great many Pheasants have been killed out of season by poachers shooting from their parked cars. In the hunting season,

returned soldiers who assumed that their service in the war entitled them to many special privileges have killed hen Pheasants deliberately. In the excitement engendered by the great numbers of hunters in the first few days of the open season, some who are usually law-abiding have killed or crippled hen Pheasants. In Wood County, in the late 1930's, it was found that about forty hen Pheasants were shot for every one hundred cocks bagged. In the past two years the percentage of Pheasants illegally killed has probably been still larger.

2. *The alfalfa mill.*—These mills take care of a large amount of hay in a short time, using it before it is tall enough to afford good protection for the Pheasants. Much of the mowing is done with high-powered machinery, operating at night as well as through the day. At night many Pheasants are killed. Those nests that escape instant destruction are usually abandoned and the eggs exposed, to be consumed by Crows and four-footed prowlers.

3. *The clearing of the banks of ditches and natural streams.*—Formerly the saplings, bushes, brush, grass, and weeds were used by Pheasants and by many other birds for concealment and for nesting sites. The birds also found in them a variety of food different from the kinds found in the fields. In order to give employment to persons on relief, the work of clearing the stream banks was authorized by township trustees or county commissioners, and much of it by the C. C. C. and W. P. A. If this work is done before July 10, many nests and young birds are destroyed at the time, but whether it is done early in the summer or later, years are required to restore a favorable environment for wild life.

4. *Foxes.*—Never before were there so many red foxes in Ohio or Michigan as in the past few years. Tuscarawas County, 75 miles south of Cleveland, had paid bounties on 300 foxes less than two weeks after the commissioners had appropriated the money, January 1, 1946. Union County, 25 miles northwest of Columbus, paid bounties on 92 foxes, November, 1945, to January, 1946. Wyandot County, sixty miles north of Columbus, paid bounties on 43 foxes, November, 1945, to April 7, 1946. In each case the bounty was three dollars. In the flat country south of Toledo, where nearly all of the land is cultivated, foxes have increased but are not so numerous as in rugged parts of the state.

5. *Cats.*—In many of the Pheasant areas, cats are believed to kill more of the young birds than are killed by any other predator. This is most noticeable near towns. Feral cats, which find their living entirely in the wild, are more numerous than most people realize.

One farmer of my acquaintance killed fifteen feral cats in the winter of 1945-1946, about half of them on his own land in Lucas County. On the Stitt Game Preserve in Wood County, sixty of these pests were killed in one winter. Most of these feral cats were probably born in Toledo and smaller towns. Their owners, having too many, took them miles away to shift for themselves.

6. *Hawks*.—Most kinds of hawks are not restricted to a diet of mammals, fish, or any one class of animals, but take what is easiest to get. Cooper's and Sharp-shinned Hawks are now numerous in areas where Pheasants abound. Near Lake Erie, Marsh Hawks are most numerous and probably take some young Pheasants. Red-tailed Hawks have increased and are now so numerous in some counties that they are the worst offenders. In Wood County they are believed to kill more Pheasants than are taken altogether by other species of hawks. In winter, Rough-legged Hawks and Goshawks are uncommon or rare in Ohio, but both of these winter visitors have increased in recent years.

7. *Crows*.—One farmer southwest of Toledo reports finding the shells of Pheasant eggs that had been eaten by Crows—enough eggs to fill a three-gallon pail. "During the period 1912-20 pest hunts were almost unknown in Wood County. After that, thousands of crows were killed at their roosting places and the great rookery on the western edge of Bowling Green was broken up. Pheasants had a chance to hatch their eggs, and almost unbelievable increases were noted in the Pheasant counts" (James Stitt).

8. *Bad weather*.—In some years spring freshets have drowned out many nests of ground-nesting birds. The unusual succession of very wet springs must have frustrated the attempts of many Pheasants to rear their young, especially where the land was poorly drained. In the very dry summer months, with little dew and the vegetation withered, probably many suffered for lack of water.

The long, cold winter of 1944-1945, with the ground snow-covered most of the time, was hard on Pheasants. Many that would have perished were saved by man's aid. About 400 of the birds found their food in the standing corn on one farm near Monclova. A farmer near Whitehouse had an even larger number feeding during the winter in his field. Illness had kept him from harvesting the corn. He was partly reimbursed by sportsmen's clubs.

9. *Other egg eaters*.—Bird eggs appeal to the appetite of a great variety of mammals, birds, and reptiles. For many species no other kind of food is more attractive. Pheasants protect their nests from

small intruders, yet the number of Pheasant eggs devoured in the past twenty years in Wood County probably exceeds the number of hen eggs consumed by all the people of any one town in the county, except one or two of the largest.

One of the worst offenders is the opossum. Favored by mild weather for many years prior to the cold winter, 1944–1945, these odd creatures had been increasing in northern Ohio and southern Michigan. In their nocturnal wanderings they find many Pheasant nests. Skunks also are notorious egg eaters; their destruction of Pheasant nests has been noticed in many places. However, their number in the Toledo area in the past few years has been less than formerly. Farmers have attributed this to the multitude of opossums; they are believed to devour skunks in their burrows when they are hibernating. Because nearly all the opossums perished in the winter of 1944–1945, the young skunks born later came through the following winter unmolested. At any rate, skunks have recently been observed in unusual numbers.

Raccoons were quite numerous in 1945. Unlike opossums, they are well protected by fur coats and can hibernate for long periods of time in hollow trees where they are safe from storms and traps. Opossums are southern animals and seem to be incapable of going long without food. Raccoons are passionately fond of eggs; they found many Pheasant nests in 1945.

Rats, the most destructive of all mammals, probably destroy many Pheasant nests. Stray dogs also are known to find and eat the eggs.

10. *Owls*.—In the nesting season of 1945, Laurel VanCamp of Genoa, southwest of Toledo, found fifteen nests of Great Horned Owls. In many places, Barred Owls are more numerous, but they probably do not kill so many Pheasants. A Snowy Owl was shot near Bowling Green, November 20, 1945, when it was carrying a Pheasant. Few, if any, are killed by owls of other species.

11. *Automobiles*.—These have maimed and killed numerous Pheasants and caused the death of others by aiding those unscrupulous persons who indulge in illegal shooting. "On one Sunday in 1941 I counted 70 dead Pheasants and rabbits between Findlay and Bowling Green; fully half of them were Pheasants" (James Stitt).

PHEASANTS AND NATIVE BIRDS

Where there are not more than twenty Pheasants per square mile, they may have little effect on the numbers of the other species present, but in Wood County there have often been two or three hundred for each square mile of farm land. They have caused a large

increase in the number of hawks, owls, and Crows and a decrease in those species which naturally eat the same sort of food.

In Wood County, in 1945, James Stitt, who for many years has spent most of his time in producing and maintaining the large Pheasant population, received the following reports of birds of prey, mostly from men at the feeding stations: Hawks shot, 671; trapped, 33; owls shot, 19; trapped, 41. The whole number killed in 1945 within thirty miles of Bowling Green probably exceeded three thousand, including those killed by poultry raisers.

Pheasants have been seen eating the eggs of Bob-whites and Meadowlarks, although they may not search for them, nor find enough to change materially the number of successful nestings. Birds whose decrease is probably due in part to the abundance of Pheasants are Meadowlarks, Bobolinks, Grasshopper Sparrows, Vesper Sparrows, and Bob-whites. Even the Sparrow Hawks are less numerous where Pheasants are abundant, probably because their food supply is reduced both by the Pheasants themselves and by the numerous large birds of prey that feed on the Pheasants.

For some years past the increase in the number of predators has been greater than the increase in Pheasants. "The proportion (of predation) rises and falls progressively with increase or decrease in numbers of the available food organisms" (W. L. McAtee).

The great number of hawks, Great Horned Owls, Crows, foxes and other predators in the past ten years may have been more effective in reducing the number of Bob-whites, Hungarian Partridges, Meadowlarks, and other species in the areas having a high concentration of Pheasants than the reduced food supply caused by their presence.

The following abridged statements show some of the conclusions of Professor Paul L. Errington of Iowa State College relative to competitive relations of Ring-necked Pheasants and Bob-whites: "Wintering Bobwhites avoid coverts having many Pheasants, much as they do places overpopulated with their own kind. . . . Even very low densities of Pheasants have their competitive significance to the Bobwhite. . . . Pheasants have displayed vastly more tolerance of crowding than have the Bobwhites."

Both of these valuable birds suffer in cold winters when there is deep snow, unless they can get to ample food supplies provided by man. Of the two, the Bob-white is less hardy and succumbs more quickly to lack of food. Its chief advantage over its competitors in Ohio is that it is protected from shooting. Most of the farmers realize that it is highly beneficial to crops and does little or no harm.

In large parts of the state where Pheasants have not been numerous, the Bob-whites were holding their own prior to the severe winter of 1944-45. In Michigan, also, the shooting of Bob-whites is illegal, and their range has slowly extended northward as far as the Strait of Mackinac.

Crows are not foreign birds, but as trouble makers they are unsurpassed. They have not been scarce within our recollection and have shown a marked increase in Ohio in recent years, despite the fact that a great many have been shot. Their damage to crops has been very great, in many places greater than that of any other birds. They ruin tomato crops by picking into one fruit after another as soon as it turns red. They eat sprouting corn to such an extent that much replanting is necessary to get a fair crop. In some wet seasons, tons of ripening corn have been ruined in a single field by Crows which open the husk and eat the kernels near the top of the ear, leaving the remainder to be spoiled by beetles and fungi. They have continued to seize the eggs and young of various other birds. The increased amount of animal protein available for them has enabled them to produce and feed more young Crows. They watch ducks when they are at a distance from the farm buildings and take their eggs as soon as they are laid.

One Toledo hunter, loading his own shells, claims to have shot nearly a thousand Crows in the season of 1944-1945. I know a farmer who shot at least 150 in the spring of 1945. Some other farmers would have done this if they had had enough ammunition. In general, the farmers are grateful to anyone who succeeds in killing Crows. A few years ago, when shells were supplied to Crow hunters by the state, Max Kempker of Toledo shot between six and eight thousand of these pests each year.

BIRD LIFE AFFECTED BY THE ACTIVITIES OF MAN DECREASE

Decrease in the numbers of many kinds of birds has been caused by man. The cutting down of forests deprived numerous species of their natural habitat. Because of its great fertility when well drained, the land in the northwest quarter of Ohio was cleared more thoroughly than that in other quarters of the state. It no longer has Wild Turkeys, Ruffed Grouse, Ravens, Passenger Pigeons, Carolina Paroquets, or Pileated Woodpeckers. There are still a few Red-bellied Woodpeckers. They are increasing in eastern Ohio, western New York, and near Chicago, probably because of better protection and milder winters.

In Wilson's time there were numerous Ravens, but no Crows, along the south shore of Lake Erie. Their extirpation in Ohio made more room for Crows, just as the later extinction of Passenger Pigeons gave more room for Mourning Doves. In the museum of Bowling Green State University we have a well preserved pigeon net, about fifty feet long, the owner of which succeeded in catching 292 pigeons at a single throw, thereby beating his father, whose best was an even 24 dozen, or 288 birds. This was probably about 1870.

Paroquets may never have been numerous in Ohio. In 1862 a flock of 25 or more was seen in the Capitol Square of Columbus. A specimen shot near Newark, October 9, 1884, was mounted. When I was teaching at Sandusky in the early 1890's I had a report of a Carolina Paroquet seen six miles south of that city.

Doctor William Graefe collected and had mounted many interesting specimens of birds which are now preserved in the University Museum at Bowling Green. He told me that in 1880 he shot a Prairie Hen near Sandusky. In Ohio these birds may have lived only in those few counties which had some prairie, most of them in the northwest quarter.

Probably most of the species mentioned above would have disappeared eventually as a consequence of the cutting of the big timber even if they had not been hunted, but extirpation of most of them was hastened by man's desire to eat their flesh. Even the Pileated Woodpecker, or 'Logcock,' was a game bird. About sixty years ago I prepared a skin of one I found at a meat market in Grand Rapids, Michigan. These large Woodpeckers have increased in recent years at some places in eastern Ohio and western Pennsylvania, due probably to better protection.

A century ago there were many Bald Eagles nesting near Lake Erie and Sandusky Bay, probably more than a hundred pairs, each using the same nest year after year, as long as it was safe. Great Horned Owls, Barred Owls, Red-tailed Hawks and Red-shouldered Hawks were also common at that time.

Great Blue Herons are still common, but probably less so now than long ago. The largest heronry in Ohio contained 1,118 nests, May 2, 1935; nearly all of them were occupied. This is in Sandusky County nine miles northwest of Fremont. In the Waggoner Woods, where the heronry is now, the birds began to build nests in 1912 or 1913, because the woods three miles nearer to Lake Erie, which had previously harbored them, no longer contained enough large trees. We know that the older site had been used continuously since about 1840. It may have been used long before that.

Close to the Michigan line, sixteen miles west and north of Toledo, is another old colony of Great Blue Herons, where Reverend Hammond counted 214 nests in 1932. Its present location, in woods of John Ford, has been used only about sixty years. This colony previously had to change its site more than once. In 1871, the year of the great Chicago fire, it was so dry in October that forest fires wrought terrible havoc to both human and avian settlements. Up to that time this heron colony had been using tall cottonwood trees in heavily timbered swamp land about four miles northwest of the Ford woods.

The number of herons in these two old colonies has depended largely on the activities of man, especially in the matter of shooting, for they have been able to defend themselves from other predators and have an unfailing food supply in Lake Erie and waters connected with it. Other colonies in Ohio have declined in consequence of the destruction of forests, drainage of the land, and the long succession of dry summers, 1930-1941.

Numerous other birds that lived in the forest—tanagers, vireos, thrushes, ovenbirds, Cerulean Warblers, and others are probably less numerous now. The drainage of swamps has greatly reduced the habitable areas formerly available for Sandhill Cranes, rails, gallinules, snipes, and a number of land birds which prefer to nest near water—Short-billed Marsh Wrens, Swamp Sparrows, and Yellow Warblers. The clearing away of the bushes on stream banks has decreased the favorite nesting sites of many species.

Telegraph and other wires have caused many bird fatalities, especially in the migrating seasons. Red-headed Woodpeckers and various other birds have been hit by automobiles. Both game and song birds have been slaughtered by hunters who depend on their cars to take them to the homes of the birds. The introduction of domestic cats, English Sparrows, Starlings and Pheasants has added to the troubles of many native species.

Guns, nets, and traps have exterminated a few kinds of American birds, have reduced almost to the vanishing point several others, and have materially decreased the number of many kinds. In recent years, many nests of birds that live in the open fields have been destroyed by mowing machines and by plows and other implements used in fitting the land. Introduction of the alfalfa mill accounts for the earlier mowing of meadows with resulting destruction of numerous nests.

INCREASE

On the other hand, many kinds of birds have become more numerous because the activities of man have provided more food for them. In many of the years since Bowling Green State University started in 1914 as a training school for teachers, Golden Plovers have been seen in large numbers, thousands of them in some years. On their way to their nesting grounds in Arctic America they tarry on the rich land around Bowling Green when it is being plowed for corn. Apparently some flocks remain in one neighborhood for two or three weeks. Many of the birds acquire the summer plumage while they are here. Most of them leave before May 10. After crossing Lake Erie they probably do not make such a long stop again until they come near the Arctic Ocean. On their way back to enjoy the mild weather prevailing in the southern hemisphere during our northern winter, a few flocks are usually seen somewhere in the Toledo-Bowling Green area.

Until there were orchards, Cape May Warblers could not have found so many insects during their fall migration. Their marked increase in recent years may be due to the fact that farmers have been too busy to spray their orchards.

We have previously mentioned southern birds which have extended their range northward both because of a mild climate and more food. The increased amount of food has helped also many other birds—Killdeers, Upland Plovers, Pectoral Sandpipers, Tree Sparrows, Juncos, and other birds which had always been here for at least part of the year.

Destruction of forests, followed by cultivation of the land, made Indiana and Ohio attractive to birds which had previously lived only on the prairies or plains. A number of plants not found in forests, but common in treeless parts of the West and Southwest, migrated eastward and northeastward after the land was cleared. Some came in baled hay or in bedding for cattle, others as impurities in seed shipped eastward for planting. Where empty cars which had carried loads of wheat were swept out, unfamiliar weeds sprang up. Many kinds were brought by the wind. Various grasses, sunflowers, and other composites, pigweeds and amaranths, and plants of the mustard and legume families which had been common in the West were brought here in one way or another and added to the food supply of native birds as well as of those whose homes had been where the plants came from.

Examples of birds formerly unknown or merely accidental east of

the Illinois prairies are the Dickcissel, Lark Sparrow, Western Henslow's Sparrow, Leconte's Sparrow, Nelson's Sparrow, Western Meadowlark, and Yellow-headed Blackbird. Most of these birds are still uncommon as far east as Ohio, but the Western Henslow's Sparrow nests in considerable numbers at some places in Ohio and Pennsylvania and has increased also in New York State. Prairie-Horned Larks have long been common in open places, but until the land was cleared there were none within 300 miles of Toledo. Western Meadowlarks have been observed in larger numbers, 1938-1945, in Michigan, and near Indianapolis and Chicago.

Man has also purposely augmented the food supply of birds. He has left, in fence rows and hedges, weeds and shrubs whose seeds or fruits are relished by the birds. He has planted sunflowers and numerous other herbs, shrubs, vines, and trees to provide food for them. Man has aided the birds in other ways. Shelter of plant growth on the borders of fields, nesting boxes, feeding shelves, and drinking and bathing places have added to their safety and comfort. Putting out food for them has enabled many to survive in bad weather.

Many kinds of birds are safer when living near man. He no longer confines them to cages to hear them sing. In this country, except in lawless communities, he does not shoot song birds for food or because he has no other living creatures to shoot at. This changed attitude toward birds has come about mainly in recent decades. Much credit for it is due the Audubon Societies and other associations for the protection of birds. Probably even more has been done by the schools, many of them aided by natural history museums. They have succeeded in getting the children interested in finding out more about the life of birds and in that way becoming more sympathetic toward them.

Bowling Green
Ohio

BARON VON PERNAU,
PIONEER STUDENT OF BIRD BEHAVIOR

BY ERWIN STRESEMANN

HARDLY anyone interested in the study of bird behavior will have heard of Ferdinand Adam Pernauer, Baron von Perney. His name has never been mentioned in any of the treatises on the history of ornithology, and his writings have remained in almost complete obscurity until quite recently, yet he deserves to be ranked among those who paved the way for the modern methods of inves-