

LAND VERTEBRATES OF A LIMITED AREA IN EASTERN KANSAS.

by

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LAND VERTEBRATES OF A LIMITED AREA IN EASTERN KANSAS.

This study of the land vertebrates of a limited area in eastern Kansas was made near the old townsite of Geary, Doniphan County, Kansas. The ground is included within a circle whose radius is one and one half miles and whose center is at the point where a creek called Brush Creek enters the flood-plain of the Missouri River. The east edge of the area lies on the ninety-fifth meridian. The center of the area is one half mile north of the line of thirty nine degrees and forty minutes north latitude. Doniphan County is the most northeastly county in Kansas.

A short trip was made to this vicinity in August of 1921. Parts of the summers of 1922 and 1923 were spent in the field here and frequent trips were made during the winter months until the spring of 1925. In all, two hundred days were spent in working upon the birds. The remainder of the time in the field was given over to the study of the other groups of land vertebrates.

The object of this work was to study the relations of the vertebrates to their environment and especially to gather data that would show as nearly as possible (1) what species of land vertebrates were present within the area, (2) the frequency of occurrence and the relative abundance of those species, (3) the local or habitat distribution of each of those species, (4) the factors which determine the presence and habitat distribution of each species, (5) the annual cycle of activity of each species in this area, and (6) a way to

analyze vertebrate associations and successions.

A Ford car was used to get from Lawrence to the ground studied. The trip of nearly eighty miles, only part of which was hard-surfaced road, required nearly four hours time. Board and lodging were secured at a farm house near the center of the area.

Most of the first summer was spent in becoming familiar with the fauna and flora of the vicinity. Some collecting was done in order to make proper determinations of the species and subspecies of the various animals and plants. Complete notes were taken each day on all the activities of vertebrates that could be seen in the field. During the second summer and in later trips, it was possible to spend more time on the details of the activity of each species. Special attention was given to those environmental factors whose effect upon individual animals could be determined. No attempt was made to measure differences in temperature, humidity, or light in the different parts of the habitat. In recording notes, an effort was made to obtain facts in quantitative form rather than qualitative whenever possible. An attempt was made to cover as much of the ground as possible each day or at least to do some work in each of the habitat divisions. This was difficult because of the great diversity of conditions, but was made more likely of attainment by making the size of the area as small as it could be and still contain ground with characteristics of each division.

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The location for work was selected on the Missouri River because: (1) little was known of the vertebrate fauna of that part of Kansas, (2) a great variety in habitat conditions was present due to the influence of the river, and (3) rapid changes in the habitat and vertebrate could be studied.

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PHYSIOGRAPHY.

TOPOGRAPHY. About one half the area included within this study consists of the Missouri River and its floodplain on the Kansas side. The remainder is made up of the bluffs which face the river and which are broken by the valley of Brush Creek, and a small part of the high land back of them. The riverside elevation at this point is about eight hundred feet and the bluffs rise above this from one hundred and fifty to two hundred feet. They are of loess and limestone and are capped with loess. One part of the bluff contains some drift material. There are several shelves on the bluff which mark former levels in the cutting of the river. These shelves are nearly level with very steep slopes above and below them. The bluffs face the east and a little to the south. The creek flows in a deep valley that runs in general from the northwest to the southeast. In many places, it has rather low banks on one side and high nearly vertical cuts of loess on the opposite side. Back of the bluffs, the topography is more rolling.

GEOLOGICAL HISTORY. Concerning the geology of Doniphan County, Hay wrote in 1896 that,

The bedrock, limestone, or shale is of the coal measures period and the cap of loess and the lower gravels and boulders are of the ice age..... There are no deposits between the coal measures and the pleistocene. The loess was deposited by water in pools in front of the retreating ice of the Pleistocene..... The alluvia in the valleys, the gravels, sand, clays, gumbo, or modifications of them are the latest geological product.

BIRDS.

THE HABITAT.

THE RIVER: The Missouri River at this point may be said to have reached a stage of late maturity in the cycle of erosion. There is still a considerable amount of current, but the valley has been eroded to a width sufficient to make room for meanders from bluff to bluff. The width of the valley varies, but in this vicinity it will average about two miles from the base of one bluff to the base of the opposite bluff.

This river, like the Colorado (Grinnell '14), runs very near the west bluff. One factor contributing to this in this region may be the slope of the underlying beds of stone that dip slightly to the south-west in this region.

The water of the Missouri becomes clear in the winter when there is a minimal amount of erosion, but in summer the water is opaque because of the presence of its load of reddish loess material that it picks up in Eastern Nebraska and Western Iowa. During the winter of 1922-23, the river remained open at this point throughout the winter, but late in the season and in early spring it was filled with large cakes of floating ice from its upper waters. During the winter of 1924-25, the river was frozen for more than a month. In the summer the waters are rather warm after flowing through the unshaded, sandy, and in many places shallow bed in Nebraska.

During the winter, when the headwaters of the river are frozen, the water is at its lowest stage. Since there is little material in suspension, erosion is very slight. As soon

as the snows in the Rockies have melted, the amount of water is increased enormously and with this increase there is also a great increase in the amount of material carried in suspension and in the speed of the current. This flood usually begins in May and reaches its height in June. Later in the summer, the water lowers and becomes more clear. The amount of lateral erosion in the valley at this point is great. At one point about thirty miles down the river, the river was reported to have cut laterally about nine hundred yards in less than six weeks in the summer of 1922.

Because of the rapidly changing character of the stream bed and the large amount of inorganic materials carried in suspension in the water, there is a scarcity of vegetation and invertebrate life upon which aquatic birds might feed and so all aquatic birds except those which subsist chiefly upon fishes are not found upon the river for any length of time. Jordan collected 11 species of fishes in the river opposite St. Joseph, Missouri in 1884.

Whenever there is an obstruction in the stream or a sharp turn so that the rate of flow is temporarily checked, a sand bar or an island begins to form and grows rapidly until the water lowers. As the stream bed shifts, these islands are moved downstream. When this work was started (1921), there was an island, over a mile in length, near the Kansas bank of the river at this point. During the next two seasons of flood, this island was entirely removed and its place was taken by the main channel of the river. At the same time that the is-

land was removed, a small patch of land was added to the Kansas side of the river so that it touched the bank and a much larger area was added to the Missouri side.

As soon as the islands or bars appear above the water, a dense covering of weeds and young willow trees begins to grow. This group of plants grows rapidly, but the succession of plant forms is usually stopped within a few years by a change in the course of the river which cuts away the island.

Pools are often cut off between an island and the shore by the deposition of material between the lower end of the island and the shore. A pool of such a nature was formed near the mouth of Brush Creek in the summer of 1923. The silt in the bottom of this pool was ^{silt} and as the water dried, it slowly dried out and was packed together. It was not solid for several months after the water was gone. Very few birds fed at the edges of these pools and none were seen feeding in the water there. Some terns were seen feeding at the surface of the water and flying back and forth above the pools. These pools were not of the right type for the development of a very extensive fauna of invertebrates or for the growth of many aquatic plants.

The nature of the shore line of the river varies with the season and with the height of the water. In the winter and when the water is low, the banks are usually nearly vertical and from six to ten feet above the water level at this point on the river. On the lower sides of the islands and in a few other places there is formed a beach where the water

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was shallow. A few fish-eating birds used these places for feeding grounds and for resting places, chiefly during the seasons of migration. A few birds which burrow into banks for nesting were able to use the vertical banks for nesting sites in the summer. During the seasons of high water, the banks were usually covered with a thick coating of soft mud and they were not used by any species of birds to a great extent.

During the winter, the Missouri River at this point is important to birds chiefly as a feeding ground for a few of the aquatic species which migrate only as far south as they are forced by the frozen waters. During the spring, the river furnishes a highway of travel for nearly all the species of birds that migrate through the region. Some of these transients follow the water closely, some follow one of the shore lines, and many of them follow the bluffs and the strip of bottomland bordering the river. Nearly every species that was seen migrating was evidently influenced in the direction of its flight by the river. It was noted that a few species in flying north left the river near the mouth of Brush Creek and continued up the creek valley. This slight change in the direction of flight may have been due to the presence of the city of St. Joseph, Missouri which was within sight and about fifteen miles northeast of this area. The migrating birds may have left the river at this point and cut across to strike the valley again at a point straight north and thus save several miles of flight which would have been necessary

in following the bend which the river makes to the east.

In summer, the river is used to some extent as a feeding ground by fish-eating birds, but its chief influence upon the birds is indirect. This is its influence as an erosive agent in changing the extent and character of the land in the floodplain. The whole floodplain and its bird population are dependent for their existence upon the work of the river. There is danger during each season of flood that the river may cut to the bluff and destroy the birds that live on the bottomlands or at least destroy their homes.

During the fall, the river again serves as a road way for migrating birds. The birds appear to be dependent upon the river in much the same way as in the spring except that they are not so hurried in their movements and they move down the river more slowly than they go north in the spring.

In summary, it may be stated that the river affects the bird population of this region in two ways; by furnishing a highway for travel to and from the locality or through the region, and by changing the habitat in the bottomlands through the extensive erosion which it effects.

CREEK: Brush Creek, a small stream which is usually dry during a part of the summer, flows across the area. The creek enters the floodplain near the center of the area and after making a curve, it flows into the river at a point near the bluff and about three-fourths of a mile downstream. The stream, therefore, flows through two different types of valley. The valley through the bottomlands is very different from

that through the hills back of the river bluffs.

Brush Creek rises near Troy, Kansas, the county seat of Doniphan County, about ten miles north west of its mouth and a little over two hundred feet above the level of the river. The valley through the hills is deep with a narrow floodplain. In the lower part of its course there is a small amount of lateral erosion. Most of the first bottom is in timber as it is of too small an extent and is subject to too much flooding to be put into cultivation. On the river bottomland, the creek flows through a narrow valley with V-shaped banks that are steep from the water's edge. The stream has cut down from the level of the filled-in land nearly to that of the river at this point.

In winter, the water of the creek is clear and when not frozen, it usually flows throughout the season. At this season it is of little importance to birds. In spring, a few transient water-birds stop to feed at the edges of pools in the creek or in the water of the larger pools. In summer, the flow of water in this stream is very irregular and depends upon the amount of rain. After a very heavy rain, the creek overflows its banks and destroys many nests of birds that build near the ground in its floodplain. The only species of summer bird whose presence in this region is directly dependent upon the presence of the creek is the Louisiana Waterthrush. A number of species of birds go to the creek, during periods of drouth, for water for drinking and for bathing. In the fall, there is a greater abundance of invertebrate

food in the pools of the creek than at any other season and a few species of herons, ducks, and sandpipers extend their feeding range to include these pools in the creek.

The frequent nearly vertical banks of loess material through which the creek has cut furnish suitable sites for nesting for several species of birds including the Bank and Rough-winged Swallows, the Belted Kingfisher, and the Carolina Wren. The Phoebe nests on these banks.

The chief influence of the creek upon the bird-life of this vicinity lies in its work as an erosive agent. Since a large share of the land which the creek drains has been in cultivation, a large amount of soil is carried away every summer during flood times. While most of this material is carried away by the river, some of it has contributed to the production of the Missouri River bottoms within the area of study. The deep creek valley also serves as a roadway for some birds both in their daily excursions to the uplands for food and in their migration flights.

In general, Brush Creek was found to be slightly less important as an aquatic feeding ground than the river. It furnishes a few more nesting sites than does the river and is a very much less important factor in the direction of migration flight than is the river.

THE LAKE: Although there are several ox-bow lakes in the flood-plain of the Missouri River in that part of its course which touches Kansas, most of them are on the Missouri side of the stream. One of the few cut-off lakes on the Kansas side

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of the river is the Roundy Lake which is entirely within the area included within this study. Another older and larger oxbow lake is Doniphan Lake which is three miles down stream and on the Kansas side of the river.

Roundy Lake was formed by a shift in the course of the river which took place about twelve years before these studies were begun (1921). The course of the river was deflected by striking the bluff a short distance above this point so that it swung to the east and left about twenty-five hundred acres of accretion to the Kansas bank. The lake was left in this newly made land. Brush Creek helped to fill in the lower end of the lake and later contributed largely to the decrease in depth and area of the lake.

In the summer of 1921, the water in the lake covered an area of about two hundred acres. Its size was constantly decreased until in the spring of 1925 less than forty acres of water surface remained. During the same period of time the depth was reduced from about four feet to less than two feet in the deepest part. In addition to deposits from overflow from the creek, some material was left each season by the overflowing waters of the river, some material was washed in from the adjacent bluffs, some dust was blown into the lake by the wind in dry times and when the ground was frozen in the winter, and a great deal of organic matter was added by the invading vegetation which grew each summer and was added to the ooze of the bottom of the lake in the fall.

The water in this lake originally came from the river.

Overflow waters from Brush Creek and from the river were added nearly every summer partially to replace that removed by evaporation. In the summer of 1922, no water came into the lake except that from rains which fell on the nearby bluffs. Little rain fell during the following winter and by the next spring all the water in the lake had evaporated except a small pool in the center which was about twenty-five yards in diameter. The river overflowed into the lake in June of 1923 and 1924.

As soon as the water became quiet in the lake, its load of silt settled until the water was clear except on days when the wind stirred up the material on the bottom. Since the water was so shallow and the bottom was of black muck, the water became very warm on hot days.

Both plant and animal life in the lake was abundant. In late summer the water in parts of the lake was filled nearly to the top with various species of filamentous algae and higher plants including Lemna, several species of Potamogeton, and other kinds of floating and submerged plants. A small patch of Nelumbo lutea that was present in the southeast corner of the lake in 1921 spread so that it filled more than half the remaining lake bed in the fall of 1924. During the summer of 1922, a growth of a species of Polygonum came up in the partially dry lake bed which was later flooded. The plants matured and produced a crop of seeds even though they were growing in an average of one foot of water.

Several species of fishes came into the lake with the

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water from the river during each season of flood. Aquatic insects and semi-aquatic insects as well as smaller forms of crustacea were abundant during the summer months in the shallow waters of the lake where the conditions were favorable for their development and existence.

With an abundance of invertebrate and plant food, and being in a rather secluded location that was little disturbed by man, the lake furnished an excellent feeding ground for some summer resident birds, and an even better resting and feeding ground for several species of birds that were transients. Although conditions were better in the fall for birds remaining on the lake, it was used less at this season than in the spring, probably because of the disturbance by hunters who visited the lake several times weekly from the opening of the hunting season (September 1) until about Thanksgiving when the fall flight of ducks was practically over. During August and April, when the lake was little disturbed, the number of feeding birds on the water was probably greater than at any other times of the year.

THE LAKE SHORE: The shore of the lake varies in its character and in its effect upon birds both with the season and with the year, so that the group of birds that it attracted was not the same for any two seasons during the period of this study.

Along the west edge of the lake, where it touched the lower part of the bluff, the shore was rocky and attracted very few birds. On the north side the shore dropped abruptly

from the vegetation so that when the water lowered, the shore was not materially changed in character. The east and south sides were attractive to wading and shore birds.

In the fall of 1921, the water in the lake was very high and the edge was back in the vegetation so that there was no portion of the shore that might in any way be suitable for shore birds. Doniphan Lake, three miles away, had a broad mud-flat around the water's edge upon which several thousand shore birds were feeding at this season. The next fall (1922) the water was low in Roundy Lake and was high in Doniphan Lake so that the mud-flat conditions were the reverse of those of 1921 and the flats at Roundy Lake were covered with feeding birds from early in August until late in September while none were seen at Doniphan Lake.

The water in the south part of the lake was shallow so that when it evaporated, a broad belt of soft mud was left that was not dry for several weeks. This belt of mud was rich in invertebrate life and there were no growths of vegetation to hinder the feeding of flocks of Limicolae. Observations that were made tended to show that in the main the flocks of feeding birds that were on these flats in the fall of 1922 were made up of the same individuals which stayed to feed until unfavorable weather conditions drove them on to the south.

In the fall of 1923, there was little or no mud-flat and so practically no wading birds were found on the lake.

During the spring, even when there was a sufficient amount of mud, the birds stopped for a much shorter time if

they stopped at all. At this season, there was a much smaller amount of food in the mud around the edge of the water than in the fall.

The mud-flats attracted a large number of species that would otherwise not have been found in the area. All of them stopped to feed and a few rested on the mud, but no species was found nesting on the shore and none sought protection there.

The finding of Meadowlarks on the exposed mud-flats on two different occasions indicated a slight relationship of this division of the habitat to conditions of an open prairie.

TYPHA: Typha latifolia was the most important aquatic plant for the birds of this vicinity. It grew in large patches of several acres each in and around the lake and as it grew in nearly pure stands, its relation to the bird life will be discussed under the heading of Relation to Important Plant Genera.

SLOUGH: Several types of bodies of standing water on the floodplain of the river may be classed under the name slough. All are long, narrow, and shallow depressions that are filled with water for a part or all of the year.

One slough ran from the creek to the lake and in addition furnished drainage for a spring. The water was not over one foot deep in any place in this slough and the width was never over twenty feet. In times of high water, one end of the slough was connected with the lake. On one or two occasions water from the creek overflowed through this

slough into the lake. There was little growth of vegetation in the water here. Ducks and at times a few wading birds fed in the water and along the edges of the slough. Wilson's Snipe was a frequent feeder here.

Two other sloughs were located on the bar and below springs. One of them drained into the lake and the other drained into the river. In both, there was a luxuriant growth of vegetation so that although they were much smaller in extent than the lake, conditions in them were more like those of a permanent marsh. The water level was nearly the same throughout the year. The water in the spring was warmer in the winter than the water in other parts of the area and so it did not freeze so quickly. During some winters, it was not frozen through the season and was frequently used by birds for bathing and drinking. In winter, the thick growth of plants furnished a hiding place and protection for flocks of wintering sparrows.

The only species that were found nesting along the sloughs were the Red-winged Blackbird and the Maryland Yellowthroat. The yellowthroat nested near the ground in the grasses and sedges and the blackbird nested higher in the larger and coarser plants.

On hot days in the summer, many small birds came to the springs and the sloughs below them to drink and to bathe. SALIX-POPULUS: The name Salix-Populus was given to that division of the habitat in which members of these genera were the most important plants. Several species of Salix grew in

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mixed and pure stands in various parts of the ground where these plants were dominant.

This type of vegetation covered all the bottomland of the Missouri River except that covered with water and that which was in cultivation. It was also present in narrow zones along the water's edge in the creek valley. In 1921, all the bottomland between the river and the bluff and south of the lake was covered with natural growth of vegetation. By the spring of 1925 more than three fourths of this ground had been cleared and was in cultivation.

The land upon which these plants were growing was left by the river when it changed its course during a season of flood. New soil was brought down and placed over this by flood waters of the creek so that the soil was a very rich sandy loam that had been washed from the nearby hills.

The growths of plants in various parts of the bottomland were of different ages depending upon the age of the land upon which they grew and so they varied in height and in their composition. The earlier stages on the newer portions of land were made up of willow saplings and a few weeds. For a few years the willows grew very close together and formed a dense shade over the ground. Then they thinned themselves by crowding out the weaker individuals. In the patches of larger willows there was a dense growth of weeds chiefly Adicea, Ambrosia, Amaranthus, Chenopodium, and Urtica. In those portions of the ground that had been dry for about fifteen years, most of the willows were dying and their

places were being taken by cottonwoods that had grown slowly at first, but which at that time were growing much faster than were the willows. The dead tops of the willows were broken off at the surface of the ground and quickly rotted away. The cottonwoods continued to grow rapidly. These larger trees require more room for the development of their crowns and so they grew farther apart than did the smaller willows. This left room for a more varied undergrowth. Among these secondary plants were Sambucus canadensis, Prunus, Acer negundo, Cornus asperifolia, Ribes gracile, and many other smaller plants. The vegetation on a part of the land just north of the lake was old enough to be of this type.

Accompanying the rich growth of vegetation on this bottomland, there was an abundance of insect life especially in late summer and in the fall when the birds were preparing for migration and were moving south.

The relations of the various important plant genera to the activities of the different species will be discussed under a different head. These plants in the various combinations in which they were found furnished excellent feeding, hiding, and nesting places for a large number of species of birds, in total more than did any other part of the whole habitat. As several species of small rodents were abundant here, birds of prey were frequently found hunting over this ground. Owls used the dense growths of trees as roosting grounds. In winter, large flocks of small seed-eating birds fed on the weed seeds and some hunted for food over the

trunks and limbs of the trees.

All this part of the habitat was changing rapidly and none of it had reached a stage of dominance. It is probable that before this stage is reached, all the trees will be cut off to make fields or the soil of the ground will be removed by the cutting of the river. In the years 1923 and 1924 the river cut into this land more than half a mile near the lake and added some new ground at the lower end of the bar.

CREEK BOTTOM: The creek bottom included a narrow strip of land which bordered the creek in its course through the area to the point where it flowed into the flood-plain of the river. Here the soil was rich and deep. There was usually sufficient moisture to insure a great amount of vegetative growth during each season. In seasons such as the summer of 1924, when there was an unusually large amount of flooding, the smaller plants and annuals were covered with mud and they had little opportunity to grow.

Juglans nigra, Ulmus americana, Gymnocladus dioica, Cercis canadensis, Platanus occidentalis and other trees found very favorable conditions in the rich, deep soil along the creek and grew to a large size. The fact that there was no uniformity in the size of the various species of trees or in their spaciation indicated that the vegetation in this part of the habitat had reached a stage of dominance. Climbing plants were frequent and most of the trees supported one or more species of vine. The most common were Vitis vulpina, Smilax hispida, and Rhus toxicodendron. Although most of the

ground was shaded, there was an abundant growth of plants in the herbaceous layer. These grew very close together and sometimes as high as eight or ten feet. Some of the more common plants of this layer were, Urtica gracilis, Impatiens biflora, Adicca pumila, and Ambrosia trifida.

In proportion to the amount of ground taken up by this part of the habitat, the number of birds which performed some major activity in connection with the creek-bottom timber was large. This part of the habitat ranked next below the Salix-Populus division in its attractiveness to land birds at all seasons. It differed from the Salix-Populus in being less changeable and more nearly the same in the corresponding seasons of the year both in species and in the number of individuals.

In spring, transient birds fed in flocks among the unfolding leaves in the tops of the trees. In summer, a great variety of nesting situations was found in this timber. Kentucky Warblers hid their nests on the ground. Wood Thrushes nested in small trees usually near the ground. Cardinals and Indigo Buntings nested in the vines and in the low bushes. Hummingbirds, Crows, and Wood Pewees nested in the higher branches in the tops of the trees. Woodpeckers, Chickadees, and Bluebirds nested in holes in the dead and dying trees. Willow trees near the edge of the creek were suitable for those birds which use cavities for nesting. In early fall, there was an abundant supply of insect food in the tops of the trees and smaller plants, and the small transients fed

there in small groups which moved slowly toward the river. In most years there was a good crop of seeds on the weeds which was used by winter seed-eating birds. During the summer of 1924, practically no crop of weed seeds was produced and so few wintering birds except those which fed on insect material on the trunks of the trees were found near the creek in the winter which followed.

The dense growth of plants and the high hills nearby acted as a protection from the wind for the birds at all seasons of the year.

THE BLUFF: The timber on the bluffs covered nearly all the ground, not in cultivation, within the area except that which was in the flood-plains of the river and the creek. The vegetation on this part of the habitat was in a climax stage. The dominant trees were the various species of Quercus and of Hicoria. Other trees were found chiefly as shrubs, although a few of them reach a large size. The herbaceous layer was neither very tall nor very dense. It is made up of a variety of species which vary in the different parts of the timber as the nature of the soil and the amount of shade varies. Where the soil is thin, on the steeper slopes of the bluff and near the limestone outcrops, the trees and other plants are smaller than where there is a greater amount of soil.

In the spring and in the fall, the influence upon feeding birds is much the same in the timber on the bluff as in the timber in other parts of the habitat except that there is a lesser attraction here for those birds that are usually

found near the ground and which require a more dense ground cover than is present on most of the bluff. In winter, there is less protection and less food in the timber on the bluff, except in the timber in the deeper ravines, than in other types of timber and so this is the least used part of the woods at that season. Only small bands of birds which feed on the branches and trunks of trees are usually found on the bluff in the winter. A few raptorial birds are found on the bluff throughout the year. In summer, the nesting facilities on the bluff are best suited to those birds which nest at some distance from the ground in the branches of trees such as the tanagers, vireos, hawks, some warblers, and gnatcatchers, although a few nest on the ground (Kentucky Warbler), some nest in the bushes (White-eyed Vireo), and some (woodpeckers and titmice) nest in cavities of the trees.

The bluff at this point has one peculiar relation to the daily activity of birds that was not noted in other parts of the habitat. That part of the bluff on which most of the work was done faces the east. In the mornings the rising sun strikes the whole side of the bluff and it is quickly warmed so that insects become active and in turn the birds are active early after sunrise. In the afternoon, shadows from the lowering sun fall over the bluff and it becomes cool sooner than more level ground nearby so that activity of birds as well as other animals ceases earlier in the day on the bluff than on more level portions of this area which receive sunlight until later in the day. In winter, the activity ceases

between three and four o'clock in the afternoon. In summer, activity stops on the bluff between five and six o'clock. It was also noted that activity ceases earlier in the afternoon on the lower part of the bluff than it does near the top where the warmth of the sun lasts for a longer time.

TIMBER EDGE: Along the edge of the timber on top of the bluff and around small patches of timber, there is a small belt where conditions are partly like those of the timber and partly like those of open ground. Here are found small thickets of shrubs of various species and sometimes a dense growth of woods and other herbaceous plants. Some kinds of birds such as the flycatchers were frequently found in the trees along the edge of the timber where they had an open ground on one side where they might make flights for insects. Several species seemed to prefer perches in the edge of the woods from which they sang or where they rested. Other birds moved in a line which closely followed the edge of a patch of woods.

The Dickcissel was the most characteristic nester in this part of the habitat. It usually nested in the thickets and near the ground.

SPROUTS: Whenever a field that had been cleared of timber was allowed to lie fallow for one or more years or was used as a pasture, sprouts immediately began growing from the roots of the trees that had been removed. Among these sprouts, there was usually a dense growth of some weeds such as Melilotus alba which together with the sprouts often formed

a dense tangle that was seven or eight feet high. These sprouts grew rapidly if they were left alone, but usually they were removed after two or three years and the ground again put into cultivation. In all, about forty acres of the ground in this area was growing up in sprouts while this work was being done.

These fields of sprouts had the greatest influence in the summer when several species of birds selected them for nest sites. Among them were, Yellow-billed Cuckoo, Cardinal, Dickcissel, Indigo Bunting, Field Sparrow, Bell's Vireo, and the Yellow-breasted Chat.

ORCHARD: The three small apple orchards within the limits of this area included less than an acre of ground and less than one hundred trees. Most of the trees were old and had not been properly pruned for several years and were not sprayed in the summer. The ground under the trees and between them was usually plowed and planted to some truck crop such as potatoes. All the trees belonged to the genera Pyrus and Prunus and their influence upon the bird life will be discussed in the section of this report which deals with the influence of important plant genera.

ROADS: The public roads within this area totaled nearly six miles in their aggregate length. Most of these roads were narrow and were bordered by timber on one or both sides. Most of the roads were fenced off from the adjacent farm land. When the roads ran through or bordered timber, the vegetation at their sides was practically the same as that of

the timber edge and the relation to birds was practically the same in both. Parts of these roads were bordered by orange which furnished favorable nesting sites and protection for several species of birds.

Birds were frequently seen gathering food from the bare ground in the middle of roads. Blue Jays and Mourning Doves frequently did this.

Carolina Wrens nested in holes in the cuts along the roads where the banks were steep.

PASTURE: The amount of land in permanent pasture in this area was less than that which was in cultivation. Most of the land in pasture was on slopes that were too steep for convenient cultivation. Other than a few scattered trees, the chief vegetation was blue grass (Poa pratense). The thickness of the cover which this grass made was dependent chiefly upon the amount of grazing which was permitted on it. Few birds were found in these pastures in winter. In summer, the Lark Sparrow nested in some of the pastures. In one or two places where the cover of grass was especially thick, Meadowlarks built nests. These birds also fed in the pastures.

CULTIVATED FIELD: This part of the habitat was entirely artificial. Probably less than one tenth of the ground not on the floodplain that was included in this area was in cultivation. The fields were small and were usually hilly. A larger portion of the land in the river bottom was cultivated because it was level here and was free from rocks. The chief crop on the floodplain was corn. On the upland, corn

and wheat were raised and some land was sown to hay crops such as clover, alfalfa, and timothy.

Nearly all the birds that were found in the cultivated fields came there to feed. In summer, there was an abundant supply of insect food on the ground, on the crop plants, and on the weeds. In winter, there was usually a good supply of weed seeds in the fields or around the edges of them. Horned Larks fed on the nearly bare wheat fields in winter and a few nested there in early spring. Crows fed on the waste corn that was left in the field over the winter and in the spring they ate insect larvae that were turned out by the plow. Franklin's Gull and the Black Tern fed in the fields that were being plowed on the river floodplain in the spring. A few other species fed here and in vacant fields in lesser numbers. Grasshopper Sparrows were found in Alfalfa fields throughout the summer. It was not found that any crop was noticeably damaged by any species of native bird on this particular area and during the time of this study.

YARD: The part of the habitat which is considered under this head is that small bit of ground which surrounds each group of farm buildings within this area. Around each house, there are numerous large shade trees that are not too crowded to have large and well developed crowns. These trees are of the same species as those found on the bluff and along the creek. The ground beneath the trees is usually bare.

In winter and during the seasons of migration, the birds which feed in the trees in the yard are the same small groups

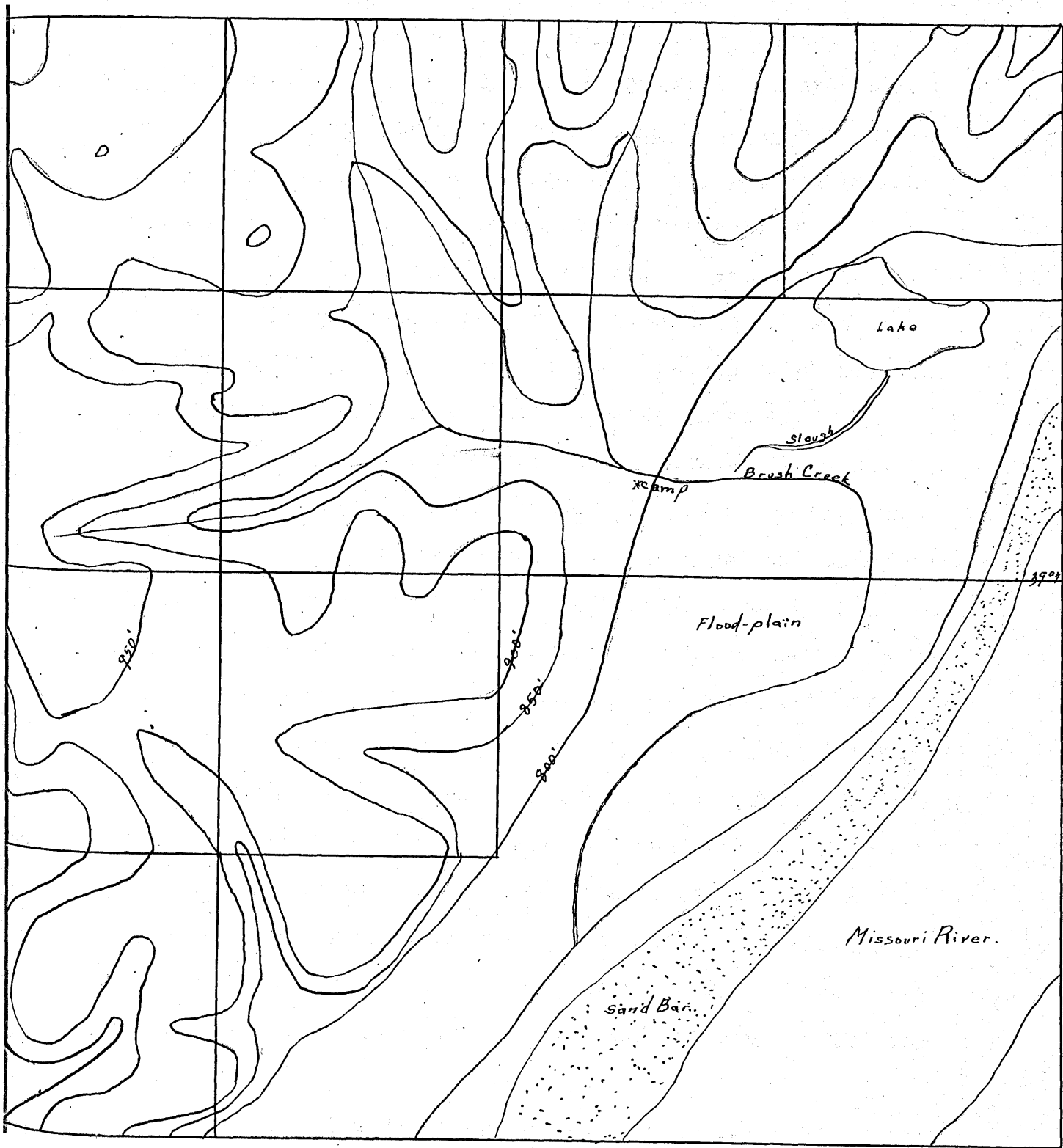
which move along the creek bottom and along the bluff. A few birds occasionally pick up scraps of food from the ground.

The nesting population of the yards is much greater in proportion to the number of trees than it is in the surrounding woods. This popularity of farm yards for nesting purposes may be partly due to the presence of more suitable situations in the trees that are found there, but it is likely that it is largely due to the greater protection which this nearness to man affords. Although a few new enemies such as the house cat are encountered, many natural enemies are escaped when birds select their nest sites near human dwellings. Of course, this applies only to those species which nest in trees as they are the only one which find suitable nest sites in the yards.

BUILDINGS: Four groups of farm buildings were found within the limits of this area as well as several scattered sheds and deserted buildings that stood alone. These houses and buildings furnished nesting sites for several species among them; the Chimney Swift, Phoebe, Western House Wren, and the Carolina Wren. English Sparrows nested in barns and around houses. Screech Owls were frequently found roosting during the day in empty buildings.

There were two bridges across the creek and several smaller bridges within the area. Carolina Wrens and Phoebes nested under these bridges. Rough-winged Swallows were seen flying near a bridge on one occasion.

Some birds used the roofs of buildings for perches.



Map of the Area.
Scale 2" = 1 mi.

INFLUENCE OF IMPORTANT PLANT GENERA.

Acer. Two of the species of larger trees of the area belonged to this genus. The white maple (Acer saccharinum) was a common tree where it had been planted in yards and in other places near houses. They were not usually crowded, so that there was plenty of room for the tops to become large and for large limbs to develop. A few feeding birds gathered insect food from the branches of the maples. This tree did not furnish especially suitable nesting sites and only a few species nested in it. One nest of the Mourning Dove was found thirty feet from the ground and on a large sloping limb of a maple. A Blue Jay's nest was found on a similar limb three inches in diameter. Another was seen building a nest in a crotch made by two limbs and twenty feet from the ground. A third nest of the Blue Jay was twenty-five feet from the ground. The Baltimore Oriole placed nests in the ends of drooping branches. One was found ten feet from the ground. A Red-eyed Vireo's nest was found hanging from a horizontal fork of a limb three-eighths of an inch in diameter seven feet from the ground in a tree forty feet high that was growing on the bar east of the lake. Robins built a nest four feet from the end of a small branch in the top of a maple.

The box elder (Acer negundo) was more generally distributed over the area than was the maple. These trees were found in yards, along the road on the lower part of the bluff, along the creek and the ravines, and in the older parts of

the bar. In addition to the supply of insect food on its leaves and branches, the crop of seeds furnished some food for winter seed-eating birds such as Cedar Waxwings. Most of these trees were not large. A Mourning Dove's nest was found ten feet from the ground on a horizontal limb. Yellow-billed Cuckoos nested in similar situations. Bronzed Grackles were found nesting in the tops of trees of this species, twenty feet from the ground, that were growing along the creek. A Cardinal's nest was found six feet from the ground in a small, bushy box-elder. Rose-breasted Grosbeaks nested on horizontal limbs ten feet from the ground and in a position similar to that selected by one pair of Summer Tanagers for a nest site. A Red-eyed Vireo built a nest nine feet from the ground in a medium sized tree along the lower part of the bluff. Robins nested in an upright crotch twelve feet from the ground and on a horizontal limb fifteen feet from the ground. Blue Jays nested in a crotch near the top of a tree and thirty feet from the ground.

AMBROSIA. Several kinds of weeds including Ambrosia, Cannabis, Amaranthus, Chenopodium, Melilotus, and Rumex grew in dense tangles in patches of waste ground all over the area and especially in fence rows, road sides, on waste parts of the bar, in fields that were not well cultivated or that were not planted, and in artificial clearings on the bluff. These dense growths were from five to ten feet high. During the summer, there was some insect food on these plants, but they

were of most use to birds in furnishing a nest site. Indigo Bunting and Dickcissel were common nesters in these weeds. Their nests were usually placed from two to four feet from the ground. Red-winged Blackbirds nested in patches of Rumex that grew near the lake.

In August and early September, these weeds furnished an abundant supply of insect food and many resting places for the smaller species of migrating birds. Some of the more frequent species in these flocks were Orchard Oriole, Baltimore Oriole, Indigo Bunting, Dickcissel, Blue-headed Vireo, Bell's Vireo, Worm-eating Warbler, Nashville Warbler, Orange-crowned Warbler, Tennessee Warbler, Kentucky Warbler, Mourning Warbler, Maryland Yellowthroat, Yellow-breasted Chat, Wilson's Warbler, Canada Warbler, Catbird, and Western House Wren.

During the winter months, many of the seed-eating birds spend their time feeding on the large crop of seeds produced by these weeds. The species which regularly feed here at this time are; Downy Woodpecker, Red-winged Blackbird, Purple Finch, Goldfinch, Pine Siskin, Harris's Sparrow, White-throated Sparrow, Tree Sparrow, Slate-colored Junco, Song Sparrow, Lincoln's Sparrow, Swamp Sparrow, Fox Sparrow, Towhee, Cardinal, Indigo Bunting, English Sparrow, Mourning Dove, and Chickadee. The Winter Wren, Golden-crowned Kinglet, and Ruby-crowned Kinglet are sometimes found here.

Celtis. The hackberry (Celtis occidentalis) is not a dominant tree of the region, but it exerts an influence upon the bird life. The larger trees of this species were found in

yards and along the creek. Others were found along the bluff and especially on the lower part. In addition to the usual amount of insect food found on the foliage of this tree, there was each year a crop of fruit which ripened in the fall and which was on the tree through the winter. Cedar Waxwings and Robins were seen feeding on the fruit of this tree.

A nest of the Mourning Dove was found on a hackberry limb thirty feet from the ground. Orchard Orioles nested in the end of a branch fifteen feet from the ground.

Cercis. The redbud (*Cercis canadensis*) is one of the more important, of the smaller trees of this region, for birds. It is found along the creek and in sprout fields and as an invader on the river bluffs. It grows usually as a small spreading tree with a rounded top and many branches. In the more crowded situations, this tree grows taller and with fewer branches. In this form, this tree is less favorable for use by birds. During the latter half of April, redbud trees are in flower and they attract many small insects which in turn attract the flocks of small, migrating insectivorous-birds many of which do most of their feeding at about the level of the tops of redbud trees.

Several species of small summer residents found suitable nesting sites in redbud trees. A nest of the Mourning Dove was found on a leaning main trunk and nine feet from the ground. This tree furnished one of the most favorable nest sites for the Yellow-billed Cuckoo; five nests being found in the bushy tops, from four to twelve feet from the

ground. A nest of the Cardinal was found in a fork three and one half feet from the ground. A nest of the Yellow-breasted Chat was found four feet from the ground in a redbud sprout. A natural cavity four and one half feet from the ground in a main trunk of a redbud held a nest of a Tufted Titmouse.

Cornus. The rough-leaved dogwood (Cornus asperifolia) is one of the most abundant of the secondary trees both on the bluff and on the later stages of growth on the bar. Dogwoods are also found growing in the bottomland timber along the creek. The tree usually grew with a spreading top of many branches that were covered with a thick growth of leaves. These trees were usually not over fifteen feet high.

In addition to the insect food that birds find in the leaves and on the branches of dogwood, there is a large crop of white fruit that ripens in August of each year and which is a popular food supply for large flocks of birds that gather before and during the first movements toward the south in the fall. This fruit ripens about the last of August and usually hangs on the tree until it is eaten by the birds. Some of the species most often seen feeding on the fruit of dogwood are Kingbird, Catbird, and Brown Thrasher. A Red-bellied Woodpecker was seen picking the ripe fruit which it ate.

A Screech Owl was found hiding in the thick tops of a thicket of dogwood that was growing along the lower edge of the bluff.

At least eight species of birds found suitable nesting sites among the branches of the dogwood. Two nests of the

Yellow-billed Cuckoo were found on horizontal branches five and six feet from the ground. Two nests of the Cardinal were found in dogwood sprouts and two nests of the Indigo Bunting were found in the thick tops of small dogwoods. These nests were well hidden by the leaves. A pair of Red-eyed Vireos nested in the end of a limb of dogwood five feet from the ground. Two nests of Bell's Vireo were found at the ends of lower branches of dogwoods on the bar and within three feet of the ground. Yellow-breasted Chats nested in a dogwood sprout and three feet from the ground. A nest of the Brown Thrasher was found in the top of a dogwood eight feet from the ground. Two nests of the Wood Thrush were found in forks of a main trunk seven feet from the ground.

Hicoria. Several species of hickory trees were found in the timber on the bluff. Hicoria ovata was the most common of these and affected the bird life a little more than did the other species. The hickory is one of the largest trees in this region; the size being partly dependent upon the thickness of the soil covering over the rocks, and the nearness of other trees. When the trees grow close together, the trunks are limbless for several feet and the tops are small and consist of few branches.

Several species of birds hunted over the trunks and limbs for insect food in winter and hunted in the leafy branches in summer.

Not many species of birds nested in hickory trees. The larger trees furnished nesting sites for only two species of

birds. Two nests of the Ruby-throated Hummingbird were found on small horizontal branches twenty feet from the ground. A nest of a pair of Scarlet Tanagers was found on a larger limb twenty feet from the ground. A nest of the Cardinal was found six feet from the ground in a hickory sprout. A pair of Red-eyed Vireos built a nest near the end of a branch of a sprout and eight feet from the ground.

Juglans. The black walnut is one of the larger trees in the richer portions of ground along the creek, in low places on the bluff, and in yards. When not too crowded, this tree produced a large crown with large branches. Some large walnuts that were dying furnished good perches for woodpeckers and flycatchers and other birds that require exposed perches for considerable periods of time. The large tops furnish feeding grounds for many small species of insect-eating birds during the spring migrations. The walnut prefers rather rich soil and it usually grows where the soil is sufficiently deep for a large tap-root to be sent down.

This tree furnishes poorer nesting facilities than do some of the other kinds of large trees. Mourning Dove's nests were found on horizontal limbs ten feet from the ground and twenty-two feet from the ground. A nest of the Yellow-billed Cuckoo was found on a small lower limb of a walnut that was seven feet from the ground. Three nests of the Baltimore Oriole were located in the ends of walnut limbs at heights of from twelve to thirty feet from the ground. A nest of the Dickcissel was found in a walnut sprout four

feet from the ground. A pair of Blue-gray Gnatcatchers built a nest in the crotch of a small limb twenty feet from the ground. A Robin's nest was found on a horizontal limb twenty feet from the ground.

Maclura. The osage-orange or hedge (Maclura pomiferum) is not a native tree in this part of Kansas, but it has been introduced and it furnishes an excellent protection for many kinds of birds as well as very good nest sites for some. This plant is usually set out in rows to serve as fences to mark the boundaries of fields and pastures. Sometimes it is kept closely cut back and its growth regulated so that it makes a dense low thicket. Some trees are found growing singly in the pastures where they have grown up after escaping from the fences. These trees are usually the center of a small thicket which is always popular with thicket-inhabiting birds. Most of the osage orange trees on the area studied are in fences that have not been cut or otherwise disturbed. Most of these fences are along roads and they have a belt on either side of from ten to twenty feet that has grown up with shrubs and weeds that meet the lower branches of the trees in the fence and so make the tangle more dense.

In addition to the birds that find food and protection from the wind and predatory animals, there are several species that use these thickets for nest sites. Three nests of the Mourning Dove were found in osage orange trees. A Yellow-billed Cuckoo's nest was found eight feet from the ground on a horizontal limb of one of these trees. Cardinals

nested six feet from the ground in a hedge fence. A pair of Bell's Vireos built a nest five feet from the ground in the end of a limb of a tree in a fence. Brown Thrashers built a nest five feet from the ground, but in the center of a fence and near the main trunk of a tree.

Morus. The red mulberry (Morus rubra) grew scattered throughout the timber as a small tree which was not important for the birds. This tree in summer produces a large crop of soft fruit that is used as food by birds, but the number of trees in this area was small and the trees themselves were not large enough to produce a fruit crop of sufficient size to influence the feeding of many birds. A Red-bellied Woodpecker was seen hovering at one tree and picking the ripe berries which it ate.

Mulberry trees seemed to be unsuitable for nesting sites and only one nest was found in this location. This was a Cardinal's nest that was eleven feet from the ground and which was shaded by a vine.

Nelumbo. The chinquapin or lotus (Nelumbo lutea) was an important plant in the stages of the lake when the water was shallow and it contributed largely to the filling up of the lake. The leaves usually started to grow rather late in the season and could not be seen until about the first of June. The plants grew rapidly and within a few weeks the large leaves, two feet or more in width, and the stalks, four or five feet high, were grown and the large yellowish-white flowers were produced. Most of the flowers were gone before the end

of August. During September, the large heads three to five inches in diameter and containing from twenty to forty nuts grew and ripened. During the first part of October, the plants dried up and died. The material in the stems and leaves was added to the bottom of the lake. This plant grew in large patches that rapidly spread into all parts of the lake where the water was of suitable depth.

The lotus is of value to birds for the food which it produces in the nuts and as a screen for the birds that feed in the shallow water and mud. In the winter, Crows spent a great deal of time at the lake feeding on the lotus nuts which they picked out of the heads. They obtained these either from the mud at the edge of the water or from the ice in the lake. Wood Ducks that fed in these patches of plants may have eaten some of the nuts. Other birds that were found in the lotus patches, probably because of the need for a screen and possible because other kinds of food were more abundant there were; Shoveller, Bittern, Great-blue Heron, Green Heron, Sora, Coot, Wilson's Snipe, Solitary Sandpiper, Spotted Sandpiper, Killdeer, and the Louisaina Water-Thrush. In the fall, Red-winged Blackbirds settled on the stems of this plant to roost and to rest. Spotted Sandpipers were seen a few times walking on floating leaves of the lotus.

Platanus. The sycamore (Platanus occidentalis) grows in the timber along the creek and near the lower edge of the bluff both on the bar and on the bluff. The sprouts of this tree are bushy and are suitable for nesting. The medium sized

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trees are spindling and have little-spreading limbs and are not especially desirable for nest locations. The limbs of the larger trees which grow in places where they are not crowded are nearly horizontal and some of them are near the ground. These furnish many desirable nest sites.

Two nests of the Kingbird were found twelve feet from the ground in sycamores. One was on a horizontal limb and one was in a fork next to the main trunk. Nests of the Wood Pewee were found near the ends of limbs that were twenty-two feet and thirty feet from the ground. A nest of the Cardinal was found seven feet from the ground on a horizontal limb of a small sycamore. Indigo Buntings nested three feet from the ground in a sycamore sprout. A natural cavity near the ground in a large sycamore near Doniphan Lake was used by a nesting pair of Prothonotary Warblers. Tall sycamore trees along the lower edge of the bluff were favorite feeding places and singing perches for small birds especially the Parula Warbler.

Polygonum. In the early part of the summer of 1923, when the lake was nearly dry, a large part of its bed was covered with a dense growth of smartweed. Later, when the overflow from the river flooded the lake, the smartweed remained and continued to grow until fall, when the plants died and fell into the water after the seeds were mature. They did not grow in the summer of 1924. In the fall of 1923, several kinds of birds were flushed regularly from the patches of smartweed. Some of them may have been feeding on the seeds of Polygonum. The birds most frequently seen are; Mallard, Blue-winged Teal,

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Bittern, Great-blue Heron, and Coot.

Populus. The cottonwood (Populus deltoides) is one of the dominant trees on the bar along the river. They were found in varying sizes from very young saplings to trees forty or fifty feet high. Nearly all the taller trees were along the lower edge of the bluff or along the creek where the soil had not been disturbed for a number of years. Nearly all of the trees of this species were between fifteen and twenty years old and had trunks about eight inches in diameter.

The medium sized cottonwood trees furnish food and resting places for a large number of species of smaller birds at all seasons. Black-crowned Night Herons were frequently found roosting during the day in the tops of cottonwoods. Various species of hawks used these trees as lookout perches.

This tree was not especially desirable for nesting. Most birds did not find suitable sites in its branches. Green Herons nested in a fork twenty feet from the ground. Yellow-billed Cuckoos nested near the main trunk on a limb fifteen feet from the ground. Five nests of the Crow were found from ten to twenty feet from the ground in cottonwood trees on the bar. One of these nests was used a second season by a pair of Long-eared Owls. Cardinals nested six feet from the ground in a small fallen cottonwood that had fallen over and whose leaves had dried. Orchard Orioles nested in the top of one of these trees. A nest of the Indigo Bunting was found nine feet from the ground in a cot-

tonwood sapling. The Warbling Vireo, although no nests were found, preferred and was usually found in the tops of medium sized cottonwoods on the bar. Bell's Vireo nested five feet from the ground in the end of a branch of a small sapling. A nest of Brown Thrashers was found four feet from the ground which was fastened between two trunks of cottonwood.

Prunus. A few peach trees were found in the orchards as well as a few plum and cherry trees. There were a few wild plum and wild cherry trees on the bar and along the roads. These trees were present in too small numbers to have much influence upon the bird life. Most of them bore fruit in the summer that attracted birds. A Catbird was seen carrying ripe cherries from an orchard.

Brown Thrashers built a nest four feet from the ground in the center of a plum thicket. Mourning Dove built on a horizontal limb of a peach tree in an orchard.

Pyrus. Apple trees (Pyrus malus) were planted in orchards at most of the houses within the area. The trees were nearly all old and as they had not been trimmed or properly cared for, many of them were dead or dying. The insects that came to the flowers on the trees in the spring attracted many birds and apple orchards that were not regularly sprayed furnished an abundant supply of insect food throughout the summer. The wild crab apple trees that grew on the bluff were also good feeding grounds for many small species of birds.

The low and widespreading limbs of the apple trees furnish desirable nest sites for several species of birds.

Mourning Doves nested twelve feet from the ground in an apple tree. A nest of the Kingbird was found in a fork twelve feet from the ground. Rose-breasted Grosbeaks nested in the center of the top of an apple tree and about fifteen feet from the ground. A Catbird's nest was found nine feet from the ground in the center of a bushy top of a small tree. Robins nested thirteen feet from the ground in the top of an apple tree. Downy Woodpeckers and Bluebirds nested in holes that had been made by woodpeckers in the main trunks and large limbs of apple trees.

Quercus. Oak trees of several species (Quercus rubra, Quercus macrocarpa, Quercus coccinea, and Quercus alba.) make up the most abundant and most important trees on the bluff. Oaks are also found along the creek. Oak sprouts came up in the out-over fields that were not kept in cultivation. Some of the largest trees on the area were oaks. The size of the tree depended upon the nature of the soil as well as its age. The trees growing near the outcrops of rock where the soil is thin are usually smaller than those that grow in better soil. The trees are usually crowded so that they are tall and have small tops with few branches near the ground. Large numbers of birds find insect food on oak trees, on the leaves in summer and the trunk and limbs in winter. Blue Jays and Red-headed Woodpeckers ate the acorns that ripened in the fall.

Oaks of all sizes are suitable for nesting and a large number of species prefer to build their nests in them.

A Mourning Dove was seen building a nest on a horizontal limb fifteen feet from the ground and fifteen feet from the main trunk. One nest of Cooper's Hawk was found thirty feet from the ground and one twenty-five feet from the ground. Both were in forks of the main trunk of medium sized oak trees. A Red-tailed Hawk's nest was found twenty-five feet from the ground in a fork of an oak tree, whose trunk was one foot in diameter at the base. Yellow-billed Cuckoos selected a variety of nesting situations in oaks. One nested four and one half feet from the ground in a sprout. Another nested on a horizontal limb and ten feet from the ground. It was five feet from the main trunk. A third nest was found in the top of a tree and twenty feet from the ground. Seven nests of the Ruby-throated Hummingbird were found saddled on small twigs near the ends of oak limbs and from ten to twenty-five feet from the ground. Two nests of the Wood Pewee were found on horizontal limbs of oaks that were twenty feet above the ground. A pair of Acadian Flycatchers built a nest six feet from the ground in the end of a lower limb of a medium sized oak. The material in the nest was chiefly staminate flowers of oak. A Crow's nest was found twenty feet from the ground in a fork of an oak. Baltimore Orioles were seen feeding young in a nest at the end of a limb in the top of a tree thirty-five feet high. A nest of the Field Sparrow was found three feet from the ground in an oak sprout eight feet high. Cardinals nested five feet from the ground in an oak sprout. Two nests of the Summer Tanager were found on

horizontal limbs about fifteen feet from the ground. A Red-eyed Vireo's nest was found hanging from the end of a lower limb of an oak five and one half feet from the ground. Brown Thrashers nested three feet from the ground in a sprout. Tufted Titmice nested in a natural cavity in the main trunk of an oak and five and one half feet from the ground. Three nests of the Blue-gray Gnatcatcher were found near the ends of limbs in the tops of oak trees, and twenty feet from the ground. A Wood Thrush's nest was seen eight feet from the ground on a lower horizontal limb.

Trees of this genus furnish much better nest sites than any other that grow on the bluff.

Rhus. Several species of this genus are found on the area. Sumac (Rhus glabra) is found frequently as a good sized shrub that grows at the edges of the timber on the bluff, in pastures, and in clearings in the timber. A large supply of seeds ripened in the fall and stayed on the plant during the winter. Robins and Bluebirds were seen feeding on these seeds. The poison ivy (Rhus toxicodendron) climbs over the trees in the timber. It also produces a fruit that birds eat.

Yellow-billed Cuckoos nested four and one half feet from the ground in sumac. A pair of Indigo Buntings nested four feet from the ground in sumac.

A Cardinal's nest was found in a vine of poison ivy that was climbing up the trunk of a cottonwood. The nest was nine feet from the ground.

Ribes. Two or more species of gooseberry (Ribes sp.) grow as

an important plant in the secondary layer of the vegetation of the timber on the bluff, along the creek, and on the bar. Clumps of these plants growing together often make dense thickets five or six feet high and several feet in diameter. In these, protected by a dense cover of leaves and by the many thorns on the stems, Catbirds and Brown Thrashers nested.

Rosa. Wild rose bushes grow in clumps on the older parts of the bar and in the timber on the bluff and along the creek. Each clump furnishes a good protection because of the many sharp thorns. Sometimes these roses climb over other plants or objects. A Yellow-billed Cuckoo nested six feet from the ground in one of these vines. A nest of the Cardinal was found five feet from the ground in the top of a rose bush. Yellow-breasted Chats nested in wild rose bushes.

Salix. The willows were dominant trees in the early stages in the development of the bar along the river. They normally cover the bars for the first few years after they are formed. Willows were present on the bar, during the period of this study, in all sizes from the small saplings to trees thirty or more feet in height. Several species were present. Others were found along the creek in a narrow line. Plants of this genus were used by birds for some important activity such as nesting, resting, or hunting food more times than those of other genera. At least more definite records were obtained for these trees.

Possible reasons for this apparent popularity of the genus Salix with birds are the great number of individuals

of this genus on the area and the great variety of form of these plants due to difference in age. Plants of this genus had an influence upon some important activity of at least seventy-one species of birds during the time that these studies were being made. A great number of these birds were seen feeding on the numerous insect pests that are found on willows. These feeding birds were especially numerous in the late summer and during the early fall migrations. Some birds were seen picking bag-worms from their cocoons in the winter. Most of the growth of the willows on this bar took place in the first fifteen years after the bar was formed. During this time, they were being continually thinned. After they stop growing, other trees, especially Populus overtop them and crowd them out.

Several species of birds, especially flycatchers, used willows as perches where they waited for flying insects. Others rested in the trees. Owls and herons used them in this way.

Willows provide a variety of situations suitable for nest sites. Mourning Doves nested in a dead willow stump two feet above the water in the lake. A nest of the Yellow-billed Cuckoo was found in a similar location and one was found seven feet from the ground in a living tree. A Red-winged Blackbird's nest was found in a willow four feet above the water of the lake. Two other nests of this species were five feet from the ground in willows growing on the bar. A pair of Orchard Orioles built a nest thirteen feet from

the ground in a willow top. A nest of the Baltimore Oriole was seen in the top of a large willow tree. Nests of the Cardinal were found in willows three, five, eight, and ten feet from the ground. Two nests of the Indigo Bunting were located in willows and were about five feet from the ground. Four nests of Bell's Vireo were found that were fastened to the ends of small twigs from two and one half to five feet from the ground in small willow saplings. Yellow Warbler's nests were found five and eight feet from the ground in forks of the main trunks of slender willows. Two nests of the Yellow-breasted Chat were found in forks of small willows and two and one half feet from the ground. A Catbird's nest was found in the fork of a small willow tree and four feet from the ground. A nest of the Wood Thrush was fastened fifteen feet from the ground and next to the main trunk of a willow on the bar. Birds that nested in cavities of dead willows are, Tree Swallow, Prothonotary Warbler, Downy Woodpecker, Western House Wren, Chickadee, and Bluebird.

Sambucus. The elder (Sambucus canadensis) is a common shrub in pastures and sprout fields, in thickets at the edge of the timber on the bluff and is prominent in the secondary layer of shrubs on the bar. It is also found in clearings in the timber and along the roads. This plant produces a rich crop of fruit in late summer and several kinds of birds feed on it. The berries are dark red and hang in clusters in the tops of the bushes. The bushes are not high and did not furnish especially good sites for nesting birds, but four smaller

species found them suitable.

Acadian Flycatchers built a nest hanging from the end of a branch five feet from the ground. Four nests of the Cardinal were found four to six feet from the ground and were placed in forks in the centers of the bushes. Indigo Buntings nested one and one half feet from the ground in a small elder. Three nests of the Dickcissel were from two to four feet from the ground in forks of elder.

Symphoricarpos. The coral berry (Symphoricarpos symphoricarpos) is a common small shrub at the edges of the timber, in partial clearings, along roads, and in pastures. It grows in scattered bunches or in small clumps that are from three to five feet high. The stems of the plants are tough though they are small. The small leaves are close together and make a good screen. Five species of birds nested in these bushes.

A nest of the Field Sparrow was found one and one half feet from the ground in a clump of coral berry. Three nests of the Cardinal were found from three to four feet high. Three Indigo Bunting nests were found that were one, two, and two and one half feet from the ground. A White-eyed Vireo's nest was seen that was two feet from the ground. Two nests of the Yellow-breasted Chat were two and two and one half feet respectively from the ground.

Typha. The cat-tail (Typha latifolia) grows in and around the lake in dense patches that are almost pure stands. The old growth each year does not fall back entirely to the ground and the new growth is added to make the thicket more dense.

This makes a good hiding place for the birds usually found there. Birds find an abundance of insect food in patches of cat-tail as well as good cover and for a few species good nesting sites. For every use, this is one of the more important plant genera on the area. The activities of at least twenty-five species of birds were found to be related to Typha. Grebes, ducks, herons, rails, coots, snipe, sandpipers, and water-thrushes swam or waded among the cat-tails to feed or to hide. Tree, Song, Lincoln's, and swamp sparrows, Maryland Yellowthroats, and Winter Wrens fed or rested among the stems of cat-tail that were out of the water, more frequently in winter and during the migration seasons. Purple Martins and Tree Swallows roosted in large numbers in the cat-tail thickets in the fall.

Yellow-headed Blackbirds, Red-winged Blackbirds, and Prairie Marsh wrens were found nesting among the cat-tails; usually over the water. A few other species may have nested there or probably will in future seasons if the growth is allowed to continue and accumulate. Most of the species which nested in the cat-tail require some growth from a previous season to help support and hide their nests. The new growth of a single season is not sufficiently dense.

Ulmus. Two species of elm are found; the white elm (Ulmus americana) and the slippery elm (Ulmus fulva). The white elm is a dominant tree in the timber on the bluff. It is common along the creek and is found in the farmyards. In favorable conditions, this is one of the largest trees on the area.

The trunks, branches, and leaves supply an abundance of insect food for many species of birds. The leaves are especially dense and furnish hiding places for birds like the Screech Owl.

In some of the older elms there were cavities in which several species of birds nested. Six nests of the Mourning Dove were found from six to thirty feet from the ground in elms. Those near the ground were in smaller trees. One nest of the Yellow-billed Cuckoo was found ten feet from the ground on a horizontal limb of a small elm. A Ruby-throated Hummingbird's nest was seen on a small twig of an elm and fifteen feet from the ground. Four nests of the Blue Jay were found in elm trees. One was twelve feet from the ground in a fork near the main trunk. The others were on limbs that were horizontal or nearly horizontal and were from twenty-five to thirty feet from the ground. A Crow's nest was found in a fork of the main trunk of a medium sized elm and twenty-five feet from the ground. A nest of a pair of Orchard Orioles was placed in the end of a lower limb and seven feet from the ground. Four nests of the Cardinal were found in elms. Three of them were in saplings and were from three to six feet from the ground. The other was in a low drooping limb of a large tree and was within nine feet of the ground. A White-eyed Vireo's nest was found one and one half feet from the ground and hanging from a small twig of a sapling. A small tree had a Catbird's nest saddled on a branch next to the main trunk and six feet from the ground. A nest of

the Blue-gray Gnatcatcher was placed twenty-five feet from the ground and was saddled on a small limb near the top of the tree. Three nests of the Wood Thrush were found on lower limbs of elms. They were all about twelve feet from the ground. A Robin nested in an elm and twenty feet from the ground.

Vitis. The wild grape (Vitis vulpina) is found as a climber throughout the timbered land on the bluff, along the creek, and on the bar. It also grows along fence rows and roads. By means of tendrils, the vine climbs over trees, bushes, fences, or other objects so that the leaves may reach the light above. Its large leaves help to make a dense shade over whatever the vine covers.

Screech Owls rested in the dense shade of the grape vine during the day. In late summer and early fall, many of these vines bore a heavy crop of fruit which was eaten by several species of birds. The tendrils and shreds of bark provided materials for nest building for birds, especially the Cardinal. The birds that built nests in grape vines that were growing over other plants were Yellow-billed Cuckoo, Cardinal, Indigo Bunting, and the Yellow-breasted Chat. As a rule, the nests were placed in shaded portions of the vine. The grape is the most important vine to birds of the area.

INFLUENCE OF OTHER ENVIRONMENTAL FACTORS.

Bare-ground.

Bare ground was found in some of the newly formed islands in the river, along the recently exposed portions of the lake shore, in the roads, in farm-yards, and in freshly plowed or burned fields. No birds were found nesting in these situations within the limits of this area. Pelicans and Canada Geese rested on the exposed ground in the center of the river. Wading birds, ducks, terns, gulls, herons, and swallows were often seen in late summer and early fall resting on the mud at the edge of pools of water in the lake.

Some species of birds chose those patches of bare ground for feeding. Insects were common in those places that were moist and most of those species of shore birds which rested on the flats also fed there. In the newly plowed ground, there was a supply of insect food which Franklin's Gull, Black Tern, Crow, Red-winged Blackbird, Bronzed Grackle, Cowbird, Robin, and Bluebird hunted at various times. These birds usually fed in flocks. Single birds of those species which nested near houses were frequently seen running over the bare ground of the yards, picking up nest material and food particles. A few species such as the Mourning Dove, Bob-White, Prairie Horned Lark, and Blue Jay habitually fed in the bare parts of the roads in the vicinity.

Cut-banks.

Cut banks were found along some parts of the roads, where they had been cut by road graders; along the edges of the river;

and along the creek. The cuts along the creek were the largest, some of them being over fifty feet high. These high banks were cut through deposits of loess and so it was possible for them to be almost vertical.

Birds used these vertical banks chiefly as nest locations. The Belted Kingfisher, Bank Swallow, and Rough-winged Swallow nested in holes of their own excavation. Phoebes and Carolina Wrens built their nests in shallow cavities in some of the banks.

A few birds used the crevices and nooks of the cuts as roosting places.

Open-water.

An account of the extent and character of the open water of this area has been given. Many species of aquatic-birds showed a preference for this part of the habitat in their feeding and resting activities.

Buildings-bridges-posts.

An account has been given of the number and character of the buildings and bridges of the area, and of their influence upon the bird life by providing suitable nest sites for several species. Nearly every field was fenced and was surrounded with a line of wooden posts. Some of these posts had cavities in which Chickadees and Bluebirds nested. Many passerine birds used the fence posts as perches where they rested and from which they sang. Occasionally a bird found some insect food on a fence post.

Trees-hollow-stumps.

The dead remains of trees were found throughout the timber. They were used as perches by many birds, especially those flycatching species which required an unobstructed view of the surrounding air so that they might locate approaching insects. For other birds such as the Robin, Cardinal, and Brown Thrasher, these dead branches were favorite singing perches.

Most of the cavities in the trees were small so that the birds which nested in them were chiefly limited to the smaller species such as the Screech Owl, the woodpeckers, the titmice, The Crested Flycatcher, and the Bluebird. Carolina Wrens nested in the tops of low stumps.

Animals (Cowbird).

Cowbirds were seen in small groups which followed herds of grazing cattle and horses in pastures in their search for food.

DANGERS.

Man.

Man is a direct menace to the lives of a great many individuals of a few species of birds within this area. Most of the smaller species are not directly harmed by men and boys here. With the game birds, the situation is very different. Most of the land game-birds have been hunted so much that their numbers have been greatly reduced or they have become extinct. The river at this point, being almost equally distant from both St. Joseph, Missouri and Atchison, Kansas, is a favorite hunting ground for parties from both cities as well as the residents of the surrounding country. Hunting on the lake is much better than that on the river, and during the hunting season, ducks were shot there nearly every day. Practically no birds were killed on the lake out of season, but a few shots were occasionally heard on the river during the closed season. Most of these hunters came from the Missouri side of the river. It is very likely that the number of game birds killed in any one year within this area and during this study, did not exceed five hundred.

A very few larger land birds were killed by farmers who thought that the birds were doing damage or who could not resist the temptation to kill any strange and conspicuous bird which they might see. The smaller birds were usually not harmed and most of those that were killed, lost their lives by accidentally being trampled in nests or by some other unavoidable accident.

Cat.

A few house cats were kept at farm houses on the area. In summer, these animals depended to some extent upon the surrounding bird population for food for themselves and their broods of kittens. Young birds in the nests and near the ground in the immediate vicinity of houses, and others that had just left the nest, were the ones most often killed by cats. The large number of young rabbits that was available during the summer season, made it possible for this animal to be substituted for young birds by the cats and so the losses to the bird life were reduced. No increase could be noticed in the number of pairs of nesting birds near the houses in years when no cats were present.

Snakes.

Snakes, especially the Pilot snake and the Blue Racer, were found to be important as natural enemies of birds during the nesting season. Snakes were seen taking young Cardinals and young Blue Jays out of nests and others were seen in deserted Phoebe's nests and in holes in trees that had been excavated by woodpeckers. These snakes were able to climb the trees to reach the nests and as they were common, they probably destroyed many nests full of young birds or eggs during each summer season.

Other animals.

Other animals that were natural enemies of birds were chiefly a few species of predatory mammals and some raptorial birds. In the fall, mink tracks were seen leading to and

away from the remains of ducks, but they may have been cripples that would have died from the shock of their wounds. As a raccoon took a few chickens from coops near houses, and as they were common, they may have destroyed birds in the woods. A few skunks of the genera Mephitis and Spilogale were present and may have killed some birds although no actual instances were noted. Coyotes and foxes were present in such small numbers that they could not have killed many birds. Squirrels were present in considerable numbers and may have destroyed a few nests.

Several species of raptorial birds were present in sufficient numbers to provide an important check upon birds both in summer and in winter. These birds were not only serious dangers during the nesting season, but as they were able to capture adult birds on the wing, they were feared at all seasons. Screech Owls were present during the whole year and in sufficient numbers to hunt over the whole territory. Short-eared Owls were found on the bar in winter and contents of pellets that they ejected showed that they had eaten Cardinals, Red-winged Blackbirds, and some smaller sparrows. Examination of these pellets indicated that less than one per cent of the food of this flock of owls during the time that they were present at this point, consisted of birds. Other owls were found in much smaller numbers.

A few pairs of Cooper's Hawk nested in the timber and fed their young with chickens and probably other birds. Sharp-shinned Hawks were present in small numbers.

Weather.

No records of adult birds being killed by storms or bad weather were obtained during these studies. High water from long continued and hard rains may have destroyed some nests that were placed too low. High winds destroyed some nests, but most of them were rebuilt.

Miscellaneous.

Examples were noted of a few danger that are not included in any of those listed above. In late August when the woods were filled with spider webs of various sizes, there is some danger of small birds becoming entangled in them. A Redstart was seen that was struggling to free itself from one of these webs on August 30, 1922. A gunshot nearby caused greater exertions and freedom for the bird. An instance that is similar to this in which a Philadelphia Vireo was entangled in a spider web has been recorded (Beckham 1888).

A crippled Virginia Rail which had probably hit a nearby telephone wire was found in a pasture on September 10, 1923.

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RELATIONS TO CULTURE.

INFLUENCE OF CULTURE UPON BIRDS.

Favorable.

The settlement and development of the land in this vicinity has been a benefit to birds in several ways. It has been accompanied by a decided increase in the variety and amount of food suitable for many species of birds. The planting of cultivated crops has provided an abundant supply of grain which is available for a short time between the time of ripening and the time of harvesting. Usually, there was left in the fields some waste grain, which a few species of birds hunted out and ate. Insects have been introduced and have developed into a great variety of pests along with the planting and cultivation of crops. These are available for insect-eating birds. Many species of weeds have been introduced which have taken up every available bit of waste ground as well as the cultivated land when special measures for their destruction have not been used. In addition to the insects for which these plants are hosts, they furnish an abundant crop of seeds which is available through the winter for seed-eating birds. There has probably been an increase in the rodent population of this area that was proportionate to the amount of land that was put into cultivation. Greater numbers of these animals insured a much larger food supply for birds of prey.

Development of the land has made possible a greater variety of situations suitable for home sites for birds.

This has made possible a greater variety in the species of birds which might nest in the vicinity and probably a greater number of individuals, since a given bit of ground will support a larger population of birds, if there are several species present than if only one or a few species live there. Clearing of land that was not immediately put into cultivation gave an opportunity for a new growth of sprouts and so new possibilities for nest sites. If the land were pastured, blue grass became the dominant plant and so another type of site was available for nesting. Orchard trees, shade trees, and trees along roads that were planted were spaced differently from those that grew naturally in the region and as a rule they had a different form from the native trees in their natural situations. Some species preferred these trees to the native trees for nest sites. Improvements such as bridges and buildings provide nest sites that are chosen by several species in preference to any that are found in the natural habitat. Making roads through the woods, introduced more openings and tended to break down the climaxial character of the environment and by making it more complex made possible the presence of more species and individuals of birds.

The presence of man brought protection to some species of birds in several ways. Screech owls often roosted in deserted buildings during the day. Juncos and other sparrows found excellent protection from the elements and from natural enemies by roosting in the tops of shocks of corn that were left in the fields. The same shocks were sometimes used in

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the daytime by resting Screech Owls. Human presence was also a benefit in that it caused the removal or decrease in numbers of some of the enemies of birds. Many raptorial birds were killed by hunters and farmers. Foxes, mink, bob-cats, and nearly all species of snakes were killed at every opportunity so that their menace to bird life was greatly decreased. An increased interest in all birds, which most farmers in this vicinity have acquired, has lead them to take special precautions in many instances for the protection and preservation of most species of birds.

Unfavorable.

Development of this region had in some ways been detrimental to the bird life of the vicinity. Mowing of hay lands while birds were nesting there, has destroyed many nests with eggs or young. Cutting the timber, especially the larger trees of the bottomland, has removed some of the available nest sites of the larger species of birds so that they have gone to other localities to nest. Stock in pastures trample some nests.

The large amount of land that has been put into cultivation has affected the drainage so that most of the surface water runs off the ground rapidly after it falls, causing floods in the creek valley and so destroying many nests that are placed near the ground. This change in the process or speed of erosion has tended to cause a restriction in the available supply of water for drinking especially dry seasons when the creeks are nearly dry. This has some effect upon the local distribution of some species in the summer.

Destruction of some species of birds has been increased since human settlement. Two important enemies, the cat and the dog, were brought in. They kill many birds. The destruction caused by these animals is greater than that of the same number of individuals of predatory animals that are native, because the birds have developed no good means of escape from them. Men destroy many birds for sport and others because of an idea, sometimes mistaken, that they are harmful to agriculture in some way. An increased use of the roads by people in automobiles and the noise which the engines make as well as frequent picnic parties to the woods, the river, and the lake frighten some of the more timid species away from the vicinity. Automobiles make hunting more destructive since this area is made more easily available by their use.

INFLUENCE OF BIRDS UPON CULTURE.

Damage.

A few pairs of nesting Cooper's Hawks fed their young chiefly upon small chickens which they took from farmyards in the neighborhood. English Sparrows damaged some of the vegetables that were grown in gardens by picking the young green leaves. The small amount of fruit that was grown on the farm within this area was damaged to a slight extent by birds. Catbirds were the chief fruit eaters, but they ate only a small part of the crop. Some small patches of grain that were sown near houses were damaged by English Sparrows which took nearly all the crop before it was harvested.

Flocks of Bronzed Grackles in the fall damaged a few grain crops before they were harvested, but they obtained only a

small part of the grain.

Benefits.

The game birds that were killed were used for food although they were hunted chiefly for sport and recreation. When this country was first settled, the people were more dependent upon game for food, but now the value of wild birds for food is very small in this vicinity.

Although most of the birds that were resident here fed upon insects or weed seeds, it was noted that in nearly every case the feeding range did not include the cultivated fields. Insect-eating birds fed chiefly on insects that were found on the native vegetation. Birds that fed on weed seeds fed mostly on the waste ground where the growth of weeds was more dense and the available seed supply was greater than on the cultivated ground. Although these birds each season destroyed great quantities of weed seed, they apparently did not act as a check on the growth of weeds in the following season as every bit of available waste ground and all the fields, where the weeds were not cut or plowed out, were filled with a dense growth of the weeds.

In the same way, the birds of this area had little effect upon insect pests of the farm crops. Protective methods of cultivation were necessary to keep the fields and orchards free from insects as well as free from weeds.

The presence of the birds was necessary to keep in check the native species of plants and insects which without some check would also have become injurious. They cannot be

depended upon to keep down those introduced pests which must be contended with in every effort to cultivate plants. The fact that the stomach of a bird shows that it has eaten some injurious weed seed or harmful insect cannot be evidence that that species of bird is actually beneficial unless it is shown that the bird really reduced the damage which the pest was doing to the crop. Careful notes made in this area in the period of this study show that the weed seed-eating and insect-eating birds were of little value in destroying the actual pests of the crops that were cultivated. No attempt was made to determine to what extent these birds prevented native plants and insects from becoming serious pests to the crops. The situation is different in the timber. Very little of the timber is suitable for lumber and that which is used is chiefly used for firewood and for fenceposts. Insect-eating birds which fed in the woods obtained their food directly from the trees and probably were very important as checks to prevent the increase of insect enemies of the trees.

Most of the Raptores were important as enemies of rodents, although it is doubtful whether or not they had a great deal to do with the number of these rodents. The increase and decrease in the numbers of the various species of rodents appeared to go on independently of their destruction by birds of prey. It was noted that when rabbits and field mice were most abundant, the number of hawks and owls present within the area was larger than when the number of rodents was small. Since whole colonies of these rodents would disappear

suddenly, it is probable that their destruction was due to some other cause than being eaten by birds, in which case they would have decreased in numbers more gradually. It appears, then, that the number of rodents present has more influence in regulating the presence of predatory birds than the number of birds has in regulating the presence of the rodents. The birds must have the food supply of rodents, but they have little power to decrease the number of the mammals.

RESPONSE TO SEASONAL CHANGE.

Spring.

With the beginning of spring weather, which is accompanied by the breaking of the ice on the river and the thawing of the ice on the creek and lake, the early migrating ducks appear. Late in January, Mallards and Pintail come. There is little change among the smaller land birds. Small groups of some of the species wander over several sections of territory on warm days. During cold waves, they seek sheltered places and move very little. In February, more of the water birds arrive. Herring Gulls, geese, and Lesser Scaup Ducks were seen on the river. There are more warm days in this month and so there is more activity among the smaller species. In March more species and larger flocks of ducks are found. The Pectoral Sandpiper, Greater Yellowlegs, and Killdeer are the wading birds that arrive in this month. Some of the winter visitant raptorial birds leave in March and others come from farther south. Belted Kingfishers become common. The first Phoebes that arrive in March are sometimes unable to find flying insects. Flocks of Blackbirds begin to arrive during this month. Field Sparrows and Swamp Sparrows become common and the Ruby-crowned Kinglet arrives. There is some mating activity among the ducks on the lake and the Red-tailed Hawk and the Prairie Horned Lark begin to nest in this month.

During April and the first half of May, most of the summer residents arrive and begin nesting and the transients

pass through on their way to the north. The earliest dates of arrival may be found on the table of monthly occurrence.

Summer.

During the first week in June, a few straggling transients chiefly crippled and aquatic birds are still present around the lake. Most of the bird activity consists in caring for the young birds which in the case of most summer residents have hatched by this time in those nests that have met with no serious accident. Later in the month, another nest is built by those species which nest a second time or which are not always successful with the first brood. Seventy-four species of birds were found in July, nearly all of which nested within this area. Some species that nested here and were not common, were not found in July and a few that were found in July may not have nested within the limits of this area, but all of them probably nested within a few miles of this place. On some of the hot days in July most of the birds are quiet and they are found in the shaded ravines where there are small pools of water. Larger birds such as the Crow were seen flying over on hot days with their mouths open on account of the heat. After the period of nesting, many of the birds are hard to find for a few weeks while they are molting. In some species, the young and old birds gather in small flocks which range over a small territory in search of food.

Fall.

In early fall, the bird population is increased by a few

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species that reach this point in their southward migrations by the first of August. The first to arrive are some of the Limicolae. Some species, as the Little-blue Heron, were found during their post-nest season wanderings. In the last part of the month, several species of Warblers arrive and are found for a few days feeding in the dense growth of vegetation. The largest number of species and individuals is present in the first two weeks of September. Ducks are found on the lake from the last of August until the middle of November. Most of the insect-eating birds leave by the middle of October and for the next two weeks the smaller transients are chiefly the seed-eating Fringillidae.

Winter.

The winter visitants arrive in November and December and for a period in late December and early January there is a minimum of bird activity, when most of the birds present consist of flocks of seed-eaters which feed in the weed pathes, and the Raptores which feed on the small mammals. Thirty-four species of birds were found in December, the month with least activity.

RELATIONSHIPS BETWEEN SPECIES.

The relations, that were noted between the species of birds, that were noted in making this study were largely food relations. Some of the birds of prey depended to a large extent upon their success in catching the smaller birds for a sufficient food supply. The sparrows and other small species that fed in thickets near the ground almost always flew hurriedly to thicker cover and became quiet whenever one of the smaller hawks appeared. At these times, the feeding flocks of swallows over the lake usually gathered into more compact flocks, rose higher into the air, and appeared to increase their speed of flight. Flocks of feeding shore-birds became nervous, called, and flew short distances when hawks flew near them. To what extent the various species of owls found within the area depended upon other birds for food was not determined. Pellets that were gathered from the roosting ground of a flock of Short-eared Owls contained remains of three species of small birds, but the number of individuals of birds eaten was very small in proportion to the whole amount of food which was composed largely of rodents and shrews.

When any raptorial bird was discovered by Crows, the Crows began calling and flying around it and within a few minutes several hundred would be calling excitedly near the bird. If the bird moved, the Crows followed and continued their noise. If the bird remained quiet, the Crows soon tired of their excitement and gradually scattered. These gatherings of Crows were more often seen in winter than in summer

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as more and larger flocks of Crows were present in winter and there were more raptorial birds in winter.

Some discord was frequently noted between different species that nested near each other. Blue Jays chased Robins out of their nest tree. Wood Pewees drove Blue Jays from the vicinity of their nests. Blue-gray Gnatcatchers and Ruby-throated Hummingbirds were frequently seen flying at some larger bird that was perched in or near their nest tree. In contrast, several instances were noted in which two different species nested in the same tree. Blue Jays and Summer Tanagers nested at the same time in the same tree. Orchard Orioles and Yellow Warblers nested in the same willow tree.

Usually when two or more species nested in the same kind of tree or in the same part of the habitat, they chose very different situations for their nests, so that in most cases the type of surroundings of the nest site was peculiar to each species. Sometimes, two or more nearly related species chose nest sites that were similar, but there were some features that were distinct specifically. For example, the Red-winged Blackbird and the Yellow-headed Blackbird nested in Typha and at about the same height, but within this area, the Yellow-headed Blackbird was limited to those patches of Typha which grew in water while the Red-winged Blackbird in addition to these locations sometimes chose more dry situations and even nested in trees. This variation in the choice of a home site made possible a much larger bird population since the supply of suitable nest sites would accommodate

many more pairs than it would if they were more nearly alike in their choice.

On the feeding ground, there was less necessity for insuring a permanent food supply as the adult birds could move to new grounds when the supply was exhausted. It is impossible for most species to move their nestlings so that a device is necessary to provide for the proper spaciation of the nesting pairs of birds. The capacity of each species to select a nest site of a type peculiar to it provided this device.

After the close of the nesting season, during the seasons of migration, and in the winter, groups of several species of birds were often found together and feeding. Sometimes, as in the case of those water birds which feed in flocks, most of the shore birds, the swallows which fly over the water, and most of the smaller birds which feed in weed patches, the various species showed very little preference peculiar to each one. For other species which gather food singly as most of the Raptores or which feed in groups which move through the timber where there are many types of feeding habitat, there is usually some choice in the particular part of the feeding ground which the individuals of each species occupy. The kinglets, the creepers, the titmice, the woodpeckers, the sparrows, the warblers, and the wrens in a group of feeding birds each selected a part of the feeding ground peculiar to it and over which it fed without conflicting with birds of other species.

For roosting and for cover it is still less necessary that each species occupy a "niche" (Grinnell, 1914) than for the other types of major activity. It was found that a particularly desirable thicket was used by many small species of birds as a refuge from enemies and as a roosting place. As for feeding, it was customary to find several similar species together in roosts. For this purpose, most of the birds of a family or even of an order were often found together. Some of the more important of such groups were gulls, terns, ducks, wading birds, horned larks, blackbirds, crows, some sparrows, and swallows. Many of the birds were more solitary and were usually found singly or in small groups of a single species.

Therefore, it appears that in making any study of the associations of birds it is necessary to first take into account the major activities of the species concerned. The knowledge of the mere presence of birds of two species in the same or a similar habitat is not significant unless the activity of each of those species in that habitat is known.

SUCCESSION.

In every part of the habitat, there was a constant change in the environmental conditions. These changes proceeded at different rates in the various divisions. Within this area, the vegetation serves not only as an index to other environmental conditions, but for most of the nesting birds it is the most important factor in their presence or absence and in their local distribution.

Within the habitat area studied, there are two kinds of habitat changes that are of chief importance to the bird life of the vicinity. Each has a different cause and each has a different effect upon the birds. First, there are the natural changes, the most important of which are those which depend upon the erosive action of the Missouri River. When a change in the course of the river leaves a saucer lake such as the Roundy Lake, a group of the birds which migrate up and down the river, but which do not regularly feed there, stops to feed in the more favorable lake waters. As soon as the aquatic vegetation has had a chance to develop in the lake to an amount sufficient to provide hiding places and nest sites, another group of birds is attracted which although present in smaller numbers, usually, than the first group, is present for a larger portion of the year. If the water of the lake is drained or is dried up too rapidly for a growth of vegetation and it leaves a broad belt of mud, still another group of birds is attracted to the ground to feed.

Sometimes the lake stage is omitted and in its place

silt and sand are deposited to a level above that of the water. When this happens or when the lake is gradually filled in so that the ground is dry, a dense growth of young and rapidly growing trees and other plants soon covers the ground. In their first seasons of growth, these plants provide suitable nesting sites for a few species of birds. If these plants are allowed to continue their growth, the character of the vegetation is changed within three or four years so that the birds which nested there at first can no longer find suitable locations for their homes and so they are forced to live in another locality.

From this stage, several factors control the development of the vegetation on the river flood-plain in such a way that the growth goes on at different rates. Therefore, a greater variety in available nest sites is produced so that a greater number of species and individuals remain to nest. If this land is allowed to remain in its place, the development of the covering of plants continues. As the development proceeds, the rate of change becomes slower until it is nearly imperceptible from one season to another. With some of the changes in the character of the plants, some new species of birds are added to the list of possible residents and at the same time a few species that have nested there are eliminated because they can no longer find suitable home sites. For example, Crows and Warbling Vireos do not usually nest in the bottomlands until the cottonwoods have reached a certain size which requires about fifteen years of rapid growth.

Other birds, as the Traill's Flycatcher do not nest after the trees have passed the thicket stage. Some other species, as the Yellow Warbler, nest in trees that are a little larger. In this way the nesting birds are added to or eliminated from the bird population. There is a gradual change in the group of nesting birds which corresponds to the change that takes place in the vegetation and which is caused chiefly by that change in the vegetation.

Natural changes or those changes which are set working by natural causes take place very slowly in other parts of this area so that only a very slight change is noticeable from year to year. The vegetation has reached a stage of climax on the bluff and in most of the creek bottom and so there is very little change in the bird life there that is due to natural changes in the vegetation. A tree may die and furnish opportunity for hole nesting birds to make homes. Other trees are blown over and a small opening is made in the timber. A new development of the cycle of plant growth on the bluff begins in these small places. In these clearings, there is an opportunity for new species of birds to find home sites for a few years.

Predatory animals and other factors cause some changes in the bird life that can be noted when the effect of the changing vegetation has ceased to be the most important cause of succession in birds. These other factors are also at work in the other parts of the area, but their effect is overshadowed by the greater effect of the plant changes.

The other great cause of avian succession in this area is the work of man. These works and their relation to birds have been discussed under the head of Relation to Culture. The works of man tend to cause an even greater irregularity in the succession than that which take place under natural conditions. These works introduce new factors so that there is a greater variety of environmental conditions, and a more varied and therefore larger bird population can be supported upon the ground than was possible under primitive conditions. With a greater utility of waste land and other resources, a point may be reached when the effect of man's work in this vicinity will be to eliminate nearly all of the native bird species.

At this time (1925) the area of this study probably has a larger bird population than it had when it was entirely in primitive conditions. A few large and conspicuous species are extinct, but many more are found now that were probably not present when the country was settled.

CHECK LIST OF BIRDS.

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1. Podilymbus podiceps (Linnaeus) 6. Pied-billed Grebe.
Podilymbus podiceps podiceps (Linnaeus).
2. Larus argentatus Pontoppidan 51. Herring Gull.
Larus argentatus argentatus Pontoppidan.
3. Larus delawarensis Ord. 54. Ring-billed Gull.
4. Larus franklini Richardson 59. Franklin's Gull.
5. Larus philadelphia (Ord.) 60. Bonaparte's Gull.
Chroicocephalus philadelphia (Ord.) The Auk, vol. 37, p. 278, 1920.
6. Sterna forsteri Nuttall 69. Forster's Tern.
7. Sterna antillarum (Lesson) 74. Least Tern.
Sterna albifrons antillarum (Lesson). The Auk, vol. 34, p. 199,
1917.
8. Hydrochelidon nigra surinamensis (Gmelin) 77. Black Tern.
Chlidonias nigra surinamensis (Gmelin). The Auk, vol. 37, p. 440,
1920.
9. Phalacrocorax auritus auritus (Lesson) 120. Double-crested
Cormorant.
10. Pelecanus erythrorhynchos Gmelin 125. White Pelican.
11. Mergus americanus Cassin 129. Merganser.
Mergus merganser americanus Cassin.
12. Mergus serrator Linnaeus 130. Red-breasted Merganser.
13. Anas platyrhynchos Linnaeus 132. Mallard.
Anas platyrhynchos platyrhynchos Linnaeus.
14. Anas rubripes Brewster 133. Black Duck.
Anas rubripes rubripes Brewster.
15. Chaulelasmus streperus (Linnaeus) 136. Gadwall.

16. *Nareca americana* (Gmelin) 137. Baldpate.
17. *Nettion carolinense* (Gmelin) 139. Green-winged Teal.
18. *Querquedula discors* (Linnaeus) 140. Blue-winged Teal.
19. *Spatula clypeata* (Linnaeus) 142. Shoveller.
20. *Dafila acuta* (Linnaeus) 143. Pintail.
Dafila acuta tzitzihoa (Vieillot). The Auk, vol. 34, p. 200, 1917.
21. *Aix sponsa* (Linnaeus) 144. Wood Duck.
22. *Marila americana* (Eyton) 146. Redhead.
Nyroca americana (Eyton). Proc. Indiana Acad. Sci., 1920, pp. 105-113 (1921).
23. *Marila affinis* (Eyton) 149. Lesser Scaup Duck.
Fulix affinis (Eyton) The Auk, vol. 38, p. 265, 1921.
24. *Marila collaris* (Donovan) 150. Ring-necked Duck.
Perissonetta collaris (Donovan) The Auk, vol. 39, p. 245, 1922.
25. *Chen hyperboreus hyperboreus* (Pallas) 169. Snow Goose.
26. *Branta canadensis canadensis* (Linnaeus) 172. Canada Goose.
27. *Botaurus lentiginosus* (Montagu) 190. Bittern.
28. *Ixobrychus exilis* (Gmelin) 191. Least Bittern.
Ixobrychus exilis exilis (Gmelin).
29. *Ardea herodias herodias* Linnaeus 194. Great Blue Heron.
30. *Florida caerulea* (Linnaeus) 200. Little Blue Heron.
Florida caerulea caerulea (Linnaeus).
31. *Butorides virescens virescens* (Linnaeus) 201. Green Heron.
32. *Nycticorax nycticorax naevius* (Boddaert) 202. Black-crown-night Heron.
33. *Rallus virginianus* Linnaeus 212. Virginia Rail.

- 34. *Porzana carolina* (Linnaeus) 214. Sora.
- 35. *Fulica americana* Gmelin 221. Coot.
- 36. *Steganopus tricolor* Vieillot 224. Wilson's Phalarope.
- 37. *Gallinago delicata* (Ord.) 230. Wilson's Snipe.
Capella gallinago delicata (Ord.) The Auk, vol. 38, p. 266, 1921.
- 38. *Macrorhamphus griseus scolopaceus* (Say) 232. Long-billed Dowitcher.
Limodromus griseus scolopaceus (Say). The Auk, vol. 37, p. 442, 1920.
- 39. *Micropalama himantopus* (Bonaparte) 233. Stilt Sandpiper.
- 40. *Pisobia maculata* (Vieillot) 239. Pectoral Sandpiper.
- 41. *Pisobia fusicollis* (Vieillot) 240. White-rumped Sandpiper.
- 42. *Pisobia minutilla* (Vieillot) 242. Least Sandpiper.
- 43. *Ereunetes pusillus* (Linnaeus) 246. Semipalmated Sandpiper.
- 44. *Limosa haemastica* (Linnaeus) 251. Hudsonian Godwit.
- 45. *Totanus melanoleucus* (Gmelin) 254. Greater Yellow-legs.
- 46. *Totanus flavipes* (Gmelin) 255. Yellow-legs.
- 47. *Helodromas solitarius solitarius* (Wilson) 256. Solitary Sandpiper.
Tringa solitaria solitaria Wilson. The Auk, vol. 37, p. 443, 1920.
- 48. *Catoptrophorus semipalmatus semipalmatus* (Gmelin) 258. Willet.
- 49. *Tryngites subruficollis* (Vieillot) 262. Buff-breasted Sandpiper.
- 50. *Actitis macularius* (Linnaeus) 263. Spotted Sandpiper.
Actitis macularia (Linnaeus).

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51. *Numenius americanus* Bechstein 264. Long-billed Curlew.
Numenius americanus americanus Bechstein.
 52. *Squatarola squatarola* (Linnaeus) 270. Black-bellied Plover.
Squatarola squatarola cynosurae Thayer and Bangs. The Auk, vol. 40, p. 516, 1923.
 53. *Oxyechus vociferus* (Linnaeus) 273. Killdeer.
Oxyechus vociferus vociferus (Linnaeus).
 54. *Aegialitis semipalmata* (Bonaparte) 274. Semipalmated Plover.
~~*Aegialitis semipalmatus*~~ (Bonaparte). The Auk, vol. 37, p. 444, 1920.
 55. *Colinus virginianus virginianus* (Linnaeus) 289. Bob-white.
 56. *Zenaidura macroura carolinensis* (Linnaeus) 316. Mourning Dove.
 57. *Cathartes aura septentrionalis* Wied. 325. Turkey Vulture.
 58. *Circus hudsonius* (Linnaeus) 331. Marsh Hawk.
Circus cyaneus hudsonius (Linnaeus). The Auk, vol 35, p. 206, 1918.
 59. *Accipiter velox* (Wilson) 332. Sharp-shinned Hawk.
 60. *Accipiter cooperi* (Bonaparte) 333. Cooper's Hawk.
Accipiter cooperii (Bonaparte).
 61. *Buteo borealis borealis* (Gmelin) 337. Red-tailed Hawk.
 62. *Buteo lineatus lineatus* (Gmelin) 339. Red-shouldered Hawk.
 63. *Buteo swainsoni* Bonaparte 342. Swainson's Hawk.
 64. *Buteo platypterus* (Vieillot) 343. Broad-winged Hawk.
Buteo platypterus platypterus (Vieillot).
 65. *Archibuteo lagopus sancti-johannis* (Gmelin) 347 a. Rough-legged Hawk.
 66. *Haliaeetus leucocephalus leucocephalus* (Linnaeus) 352. Bald Eagle.

67. *Falco sparverius sparverius* Linnaeus 360. Sparrow Hawk.
Cerchneis sparveria sparveria (Linnaeus). The Auk, vol. 34,
 p. 201, 1917.
68. *Pandion haliaetus carolinensis* (Gmelin) 364. Osprey.
69. *Asio wilsonianus* (Lesson) 366. Long-eared Owl.
Asio otus wilsonianus (Lesson).
70. *Asio flammeus* (Pontoppidan) 367. Short-eared Owl.
71. *Strix varia varia* Barton 368. Barred Owl.
72. *Otus asio asio* (Linnaeus) 373. Screech Owl.
Otus asio naevius Gmelin. The Auk, vol. 34, p. 201, 1917.
73. *Cryptoglaux acadica acadica* (Gmelin) 372. Saw-whet Owl.
74. *Bubo virginianus virginianus* (Gmelin) 375. Great Horned Owl.
75. *Coccyzus americanus americanus* (Linnaeus) 387. Yellow-billed Cuckoo.
76. *Coccyzus erythrophthalmus* (Wilson) 388. Black-billed Cuckoo.
77. *Ceryle alcyon* (Linnaeus) 390. Belted Kingfisher.
Stroptoceryle alcyon alcyon (Linnaeus). The Auk, vol. 34,
 p. 202, 1917.
78. *Dryobates villosus villosus* (Linnaeus) 393. Hairy Woodpecker.
79. *Dryobates pubescens medianus* (Swainson) 394c. Downy Woodpecker.
80. *Sphyrapicus varius varius* (Linnaeus) 402. Yellow-bellied Sapsucker.
81. *Melanerpes erythrocephalus* (Linnaeus) 406. Red-headed Woodpecker.

- Melanerpes erythrocephalus erythrocephalus* (Linnaeus).
82. *Centurus carolinus* (Linnaeus) 409. Red-bellied Woodpecker.
83. *Colaptes auratus luteus* Bangs 412a. Northern Flicker.
84. *Antrostomus vociferus vociferus* (Wilson) 417. Whip-poor-will.
- Setochalcis vocifera vocifera* (Wilson). The Auk, vol. 34, p. 203, 1917.
85. *Chordeiles virginianus virginianus* (Gmelin) 420. Nighthawk.
- Chordeiles minor minor* (Forster). The Auk, vol. 35, p. 208, 1918.
86. *Chaetura pelagica* (Linnaeus) 423. Chimney Swift.
87. *Archilochus colubris* (Linnaeus) 428. Ruby-throated Hummingbird.
88. *Tyrannus tyrannus* (Linnaeus) 444. Kingbird.
- Tyrannus tyrannus tyrannus* (Linnaeus).
89. *Myiarchus crinitus* (Linnaeus) 452. Crested Flycatcher.
- Myiarchus crinitus boreus* Bangs. Birds of Alabama, Howell, p. 187, 1924.
90. *Sayornis phoebe* (Latham) Phoebe. 456.
91. *Nuttallornis borealis* (Swainson) 459. Olive-sided Flycatcher.
92. *Myiochanes virens* (Linnaeus) 461. Wood Pewee.
93. *Empidonax virescens* (Vieillot) 465. Acadian Flycatcher.
94. *Empidonax traillii alnorum* Brewster 466a. Alder Flycatcher.
- Empidonax traillii traillii* (Audubon). The Auk, vol. 36, p. 268, 1919.
95. *Empidonax minimus* (W.H. & S.P. Baird) 467. Least Flycatcher.
96. *Otocoris alpestris praticola* Henshaw 474b. Prairie Horned Lark.

- 97. *Pica pica hudsonia* (Sabine) 475. Magpie.
- 98. *Cyanocitta cristata cristata* (Linnaeus) 477. Blue Jay.
Cyanocitta cristata bromia.
- 99. *Corvus brachyrhynchos brachyrhynchos* Brehm 488. Crow.
- 100. *Molothrus ater ater* (Boddaert) 495. Cowbird.
- 101. *Xanthocephalus xanthocephalus* (Bonaparte) 497. Yellow-headed Blackbird.
- 102. *Agelaius phoeniceus phoeniceus* (Linnaeus) 498. Red-winged Blackbird.
Agelaius phoeniceus predatorius (Wilson). *The Auk*, vol. 34, p. 204, 1917.
- 103. *Sturnella magna magna* (Linnaeus) 501. Meadowlark.
- 104. *Icterus spurius* (Linnaeus) 506. Orchard Oriole.
- 105. *Icterus galbula* (Linnaeus) 507. Baltimore Oriole.
- 106. *Euphagus carolinus* (Kuller) 509. Rusty Blackbird.
- 107. *Quiscalus quiscula aeneus* Ridgway 511b. Bronzed Grackle.
- 108. *Carpodacus purpureus purpureus* (Gmelin) 517. Purple Finch.
- 109. *Astragalinus tristis tristis* (Linnaeus) 529. Goldfinch.
- 110. *Spinus pinus* (Wilson) 533. Pine Siskin.
Spinus pinus pinus (Wilson).
- 111. *Passer domesticus domesticus* (Linnaeus) ***English Sparrow.
- 112. *Passerculus sandwichensis savanna* (Wilson) 542a. Savannah Sparrow.
- 113. *Ammodramus savannarum australis* Maynard 546. Grasshopper Sparrow.
- 114. *Passerherbulus lecontei* (Audubon) 548. Leconte's Sparrow.
Passerherbulus lecontei (Audubon).

- 115. *Chondestes grammacus grammacus* (Say) 552. Lark Sparrow.
- 116. *Zonotrichia querula* (Nuttall) 553. Harris's Sparrow.
- 117. *Zonotrichia leucophrys gambeli* (Nuttall) 554a. Gambel's Sparrow.
- 118. *Zonotrichia albicollis* (Gmelin) 558. White-throated Sparrow.
- 119. *Spizella monticola monticola* (Gmelin) 559. Tree Sparrow.
Spizella arborea arborea (Wilson). The Auk, vol. 57, p. 281, 1920.
- 120. *Spizella passerina passerina* (Bechstein) 560. Chipping Sparrow.
- 121. *Spizella pallida* (Swainson) 561. Clay-colored Sparrow.
- 122. *Spizella pusilla pusilla* (Wilson) 563. Field Sparrow.
- 123. *Junco hyemalis hyemalis* (Linnaeus) 567. Slate-colored Junco.
- 124. *Melospiza melodia melodia* (Wilson) 581. Song Sparrow.
- 125. *Melospiza lincolni lincolni* (Audubon) 583. Lincoln's Sparrow.
- 1 *Melospiza lincolni lincolni* (Audubon).
- 126. *Melospiza georgiana* (Latham) 584. Swamp Sparrow.
- 127. *Passerella iliaca iliaca* (Merrem) 585. Fox Sparrow.
- 128. *Pipilo erythrophthalmus erythrophthalmus* (Linnaeus) 587. Towhee.
- 129. *Cardinalis cardinalis cardinalis* (Linnaeus) 593. Cardinal.
Richmondia cardinalis cardinalis (Linnaeus). The Auk, vol. 35, p. 500, 1918.
- 130. *Zamelodia ludoviciana* (Linnaeus) 595. Rose-breasted Crossbill.
Hedymeles ludoviciana (Linnaeus). The Auk, vol. 40, p. 523, 1923.

- 131. *Passerina cyanea* (Linnaeus) 598. Indigo Bunting.
- 132. *Spiza americana* (Gmelin) 604. Dickcissel.
- 133. *Piranga erythromelas* Vieillot 608. Scarlet Tanager.
Piranga olivacea (Gmelin). The Auk, vol. 37, p. 282, 1920.
- 134. *Piranga rubra rubra* (Linnaeus) 610. Summer Tanager.
- 135. *Progne subis subis* (Linnaeus) 611. Purple Martin.
- 136. *Petrochelidon lunifrons lunifrons* (Say) 612. Cliff Swallow.
Petrochelidon albifrons albifrons (Rafinesque). The Auk, vol. 34, p. 205, 1917.
- 137. *Hirundo erythrogastra* Boddaert 613. Barn Swallow.
Hirundo rustica erythrogastris Boddaert. The Auk, vol. 35, p. 212, 1918.
- 138. *Iridoprocne bicolor* (Vieillot) 614. Tree Swallow.
- 139. *Riparia riparia* (Linnaeus) 616. Bank Swallow.
Riparia riparia riparia (Linnaeus).
- 140. *Stelgidopteryx serripennis* (Audubon) 617. Rough-winged Swallow.
Stelgidopteryx serripennis serripennis (Audubon).
- 141. *Bombycilla cedrorum* Vieillot 619. Cedar Waxwing.
- 142. *Lanius ludovicianus migrans* W. Palmer 622e. Migrant Shrike.
- 143. *Vireosylva olivacea* (Linnaeus) 624. Red-eyed Vireo.
- 144. *Vireosylva philadelphia* Cassin 626. Philadelphia Vireo.
- 145. *Vireosylva gilva gilva* (Vieillot) 627. Warbling Vireo.
- 146. *Lanivireo flavifrons* (Vieillot) 628. Yellow-throated Vireo.
- 147. *Lanivireo solitarius solitarius* (Wilson) 629. Blue-headed Vireo.

- 148. *Vireo griseus griseus* (Boddaert) 631. White-eyed Vireo.
- 149. *Vireo belli belli* Audubon 633. Bell's Vireo.
- 150. *Mniotilta varia* (Linnaeus) 636. Black and White Warbler.
- 151. *Protonotaria citrea* (Boddaert) 637. Prothonotary Warbler.
- 152. *Helmitheros vermivorus* (Gmelin) 639. Worm-eating Warbler.
- 153. *Vermivora pinus* (Linnaeus) 641. Blue-winged Warbler.
- 154. *Vermivora rubricapilla rubricapilla* (Wilson) 645.

Nashville Warbler.

Vermivora ruficapilla ruficapilla. (Wilson).

- 155. *Vermivora celata celata* (Say) 646. Orange-crowned Warbler.
- 156. *Vermivora peregrina* (Wilson) 647. Tennessee Warbler.
- 157. *Compothlypis americana usnea* Brewster 648a. Northern Parula Warbler.

Compothlypis americana ramalinae

- 158. *Dendroica aestiva aestiva* (Gmelin) 652. Yellow Warbler.
- 159. *Dendroica coronata* (Linnaeus) 655. Myrtle Warbler.

Dendroica coronata coronata (Linnaeus).

- 160. *Dendroica magnolia* (Wilson) 657. Magnolia Warbler.
- 161. *Dendroica caerulea* (Wilson) 658. Carulean Warbler.
- 162. *Dendroica striata* (J.R.Forster) 661. Black-poll Warbler.
- 163. *Dendroica fusca* (Muller) 662. Blackbarnian Warbler.
- 164. *Dendroica nirens* (Gmelin) 667. Black-throated Green Warbler.

Warbler.

- 165. *Dendroica vigorsii* (Audubon) 671. Pine Warbler.

Dendroica pinus pinus (Wilson). The Auk, vol. 38, p. 280, 1921.

- 166. *Seiurus aurocapillus* (Linnaeus) 674. Ovenbird.

Seiurus aurocapillus aurocapillus (Linnaeus).

167. *Seiurus noveboracensis notabilis* Ridgway 675a. Grinnell's Water-Thrush.
168. *Seiurus moticilla* (Vieillot) 676. Louisiana Water-Thrush.
169. *Oporornis formosus* (Wilson) 677. Kentucky Warbler.
170. *Oporornis philadelphia* (Wilson) 679. Mourning Warbler.
171. *Geothlypis trichas trichas* (Linnaeus) 681. Maryland Yellow-throat.
- Geothlypis trichas brachydactyla* (Swainson). *The Auk*, vol. 35, p. 212, 1918.
172. *Icteria virens virens* (Linnaeus) 683. Yellow-breasted Chat.
173. *Wilsonia pusilla pusilla* (Wilson) 685. Wilson's Warbler.
174. *Wilsonia canadensis* (Linnaeus) 686. Canada Warbler.
175. *Setophaga ruticilla* (Linnaeus) 687. Redstart.
176. *Mimus polyglottos polyglottos* (Linnaeus) 703. Mockingbird.
177. *Dumetella carolinensis* (Linnaeus) 704. Catbird.
178. *Toxostoma rufum* (Linnaeus) 705. Brown Thrasher.
Toxostoma rufa rufa (Linnaeus).
179. *Thruothorus ludovicianus ludovicianus* (Latham) 718. Carolina Wren.
180. *Troglodytes aedon parkmani* Audubon 721a. Western House Wren.
Troglodytes aedon parkmanii Audubon.
181. *Tannus hiemalis hiemalis* (Vieillot) 722. Winter Wren.
Tannus troglodytes hiemalis (Vieillot). *The Auk*, vol. 37, p. 218, 1920.
182. *Cistothorus stellaris* (Haumann) 724. Short-billed Marsh Wren.

183. *Telmatodytes palustris iliacus* Ridgway 725d. Prairie Marsh Wren.
184. *Certhia familiaris americana* Bonaparte 726. Brown Creeper.
185. *Sitta carolinensis carolinensis* Latham 727. White breasted Nuthatch.
Sitta carolinensis cooki
186. *Sitta canadensis* Linnaeus 728. Red-breasted Nuthatch.
187. *Baeolophus bicolor* (Linnaeus) 731. Tufted Titmouse.
188. *Penthestes atricapillus atricapillus* (Linnaeus) 735. Chickadee.
189. *Penthestes atricapillus septentrionalis* (Harris) 735a. Long-tailed Chickadee.
190. *Regulus satrapa satrapa* Lichtenstein 748. Golden-crowned Kinglet.
Regulus regulus satrapa Lichtenstein. The Auk, vol. 35, p. 214, 1918.
191. *Regulus calendula calendula* (Linnaeus) 749. Ruby-crowned Kinglet.
Corthylio calendula calendula (Linnaeus). The Auk, vol. 34, p. 205, 1917.
192. *Polioptila caerulea caerulea* (Linnaeus) 751. Blue-gray Gnatcatcher.
193. *Hylocichla ustulata mustolina* (Gmelin) 755. Wood Thrush.
194. *Hylocichla ustulata aliciae aliciae* (Baird) 757. Gray-cheeked Thrush.
Hylocichla minima aliciae (Baird). The Auk, vol. 37, p. 238, 1920.
195. *Hylocichla ustulata swainsoni* (Tschudi) 758a. Olive-backed Thrush.

- 196. *Hylocichla guttata pallasii* (Cabanis) 759b. Hermit Thrush.
Hylocichla guttata faxoni Bangs and Penard. *The Auk*, vol. 38,
 p. 433, 1921.
- 197. *Planesticus migratorius migratorius* (Linnaeus) 761. Robin.
Turdus migratorius migratorius Linnaeus. *Proc. Biol. Soc.*
 Wash., vol. 34, p. 105, 1921.
- 198. *Sialia sialis sialis* (Linnaeus) 766. Bluebird.

DISCUSSION OF SPECIES.

Podilymbus podiceps. (Linnaeus) Pied-billed Grebe. (5.5)

The Pied-billed Grebe was generally found feeding and resting in the open water of the lake although on two occasions birds of this species were seen among scattered growths of Typha. Usually a single bird was seen; the largest number found together at one time being three. Two different times, grebes were found in flocks of Coot.

This bird was found in the spring from April 21 until May 13 and in the fall from August 25 until November 18.

Larus argentatus. Pontoppidan. Herring Gull. (8)

During the migrations, this gull stopped to feed in the shallow water and on the mud at the edge of the lake. It was often seen resting on small sand bars in the river, on ice in the lake, or at the edge of the lake.

In early spring, this bird was usually seen singly or in small groups. April 1, 1923, about fifty were standing in the shallow water of the lake. A flock of about twenty-five came in and stopped, balancing themselves with outstretched wings for a moment after lighting. On the afternoon of April 6, 1923, a loose flock was seen flying down the river near the west bank. When flying, these birds almost always kept over the water.

The first record for this bird in 1923 is February 18. The first 1924 record is February 22. The latest spring record is May 3, 1924.

Larus delawarensis. Ord. Ring-billed Gull. (3.5)

April 14, 15, and 28, 1923, a few of these birds were flying over the lake or standing in the shallow water. June 10 and 12, 1923, one stayed at the edge of a small pool in the center of the lake bed. A bird in immature plumage was shot on the river by duck hunters on November 3, 1923. The bird was given to the Museum of the University of Kansas.

Larus franklini. Richardson. Franklin's Gull. (2.5)

On May 9 and 17, 1924, large flocks of Franklin's Gull were feeding in long line back of plows in fields near the river. Several flocks were flying north over the lake on April 21 and May 18, 1924. On this late date, they flew so high that they were almost out of sight and they called as they flew over. Duck hunters shot one out of a flock on the river on November 16, 1923.

Larus philadelphia. (Ord.) Bonaparte's Gull. (.5)

Duck hunters shot two Bonaparte's Gulls in a small flock that was flying down the river early in the morning of November 9, 1924.

Sterna forsteri. Nuttall. Forster's Tern. (2)

Two males were collected from a flock that was feeding over Roundy Lake on August 25, 1921. The terns were still common on the lake on August 27.

A small flock of Forster's Terns was resting on a fence and in the shallow water at the edge of Doniphan Lake on May 4, 1924.

Sterna antillarum. (Lesson). Least Tern. (21).

A few of these birds were present during the early part of each summer. Throughout August of 1922, they were seen daily, but in August of 1923 only a few were seen.

Least Terns were most often seen feeding at small pools cut off from the river, over the river, or over the lake. Several were watched that were feeding over the lake on August 9, 1922. They were securing small fish about two inches long by diving from a height of about fifteen feet, and carrying them toward the river. Single birds arrived and left at frequent intervals.

On August 14, young terns appeared at the lake and attempted to catch fish. The adults were busy feeding the young. While being fed, each young tern settled on the surface of the water and the adult approached and gave it food, but did not itself light. Adults fed young as late as August 23.

When young birds were numerous during the last part of August, they were often seen sitting on the mud at the edge of the lake and among feeding sandpipers.

From the direction that adults carried food from the lake, it was suspected that they had nests on some of the sand-bars of the river in the summer of 1922 and that the nests were chiefly east of the lake. There was little evidence that they nested in the vicinity in 1923.

There was little tendency for these birds to form compact flocks except when resting on the mud.

The earliest summer record is June 4, 1923, when two or three were circling over the river and catching fish. In 1922, they were last seen on September 7; in 1923, September 4 is the latest record.

Hydrochelidon nigra surinamensis. (Gmelin). Black Tern (15).

Usually not more than half a dozen Black Terns were seen in one day. The largest number seen in one day was on June 3, 1923 when over one hundred were flying over the edge of Doniphan Lake.

These birds were less restrictive in their choice of feeding grounds than were the other species of terns. They fed over the river, over the lake, on the mud at the edge of the lake, and once (May 17, 1924) they were seen following a plow in a field south of the lake and picking insects from the ground.

The Black Tern used logs, fence posts, and the mud around the lake for resting places. Sometimes, when they flew over the water they stayed within two feet of the surface and at other times they flew very high. Several times they were seen sailing over the water with set wings.

The earliest date of occurrence in the spring is May 3, 1924. One was seen in immature plumage on June 23, 1922. As late as June 28, 1923, several were seen flying over the lake. In the fall of 1922 they were seen from August 9 until September 7. The only fall record for 1923 is August 25 when three were feeding over a pool along the river. The only 1924 fall record is for September 3 when one was seen feeding over the lake.

Phalacrocorax auritus auritus. (Lesson). Double-crested Cormorant. (1).

Two Double-crested Cormorants were swimming in Doniphan Lake on May 8, 1924 and one on May 18, 1924.

Pelecanus erythrorhynchos Gmelin. White Pelican. (5)

A flock was seen resting on a sand-bar in the river on April 21, 1924. On May 8, 9, and 10, 1924, a small flock was seen in almost the same place in the river. They were standing in the water and close together. Another flock was noted on a sand-bar in the river on May 17, 1924. A flock was seen circling and flying north over the bluffs on April 8, 1923.

Pelicans were seen flying south in the fall on September 10 and 24 and October 7, 1922 and September 10, 1923.

Mergus americanus Cassin. Merganser. (3.5)

The Merganser was generally seen in pairs, swimming in the icy water of the river although on two occasions it was seen on the lake. A female was shot on the river on November 18, 1922 by Mr. Frank Whittaker. This is the earliest fall record. March 3, 1923, when several pairs were feeding on the lake, is the latest spring record.

Mergus serrator. Linnaeus. Red-breasted Merganser. (.5)

Two Red-breasted Mergansers were killed on the river by duck hunters on November 17, 1923. The head of one was examined and preserved.

Anas platyrhynchos. Linnaeus. Mallard. (23.5)

The number of Mallards present on the area varied from a few to several thousands, depending upon the time of year

and the favorableness of the season.

On December 2, 1922, a male was flushed from beneath a small bush that was hanging over the water on the creek one half mile above the bridge. It rose from the water and flew a few feet where it settled on a small pool. It repeatedly dived and swam back and forth for nearly half an hour until it was killed. It was killed just before dark.

Mallards were seen feeding at various times on the lake, on the creek, in pools on the bar, and on the river.

On June 12, 1922 three were flushed on the north side of the lake that may have been young just able to fly. They were in a small pond that was cut off from the rest of the lake.

The flocks that were on the lake on February 22, 1924 were divided into pairs. Throughout the spring, the pairs of Mallard on the lake appeared to stay together. Most of the small flocks that were seen in the summer were made up entirely of males.

In the spring migrations of both 1923 and 1924, the largest number was seen during March. It was seen as late as June 7, 1923 and May 17, 1924.

On March 15, 1924 a flock that was flying up the edge of the river valley, turned when it came to the creek and flew up the creek valley as far as it could be seen.

Anas rubripes: Brewster. Black Duck. (1.5)

November 3, 1923, a female was killed by duck hunters on the river two miles south. Another was killed at the same place on the next day. Several were reported killed on the

lake earlier in the season. Those that were examined had feet of the same color as those of the Mallard.

Chaulelasmus streperus. (Linnaeus). Gadwall. (1)

A female was killed by duck hunters on the lake on November 4, 1923. On March 29, 1924 three were feeding in the northwest part of the lake.

Mareca americana. (Gmelin). Baldpate. (1)

One was killed on the river by hunters on October 27, 1922. Another was seen swimming, with Mallards in a small near the bluff and north of the lake, on March 29, 1924.

Nettion carolinense. (Gmelin). Green-winged Teal. (6)

The Green-winged Teal fed in the shallow water at the edges of the lake during the migration seasons. It was generally present in small flocks.

The earliest spring record for this duck is March 3, 1923 and the latest spring record is April 21, 1924. Some were killed on the lake on October 29, 1923 and November 29, 1924.

Querquedula discors. (Linnaeus). Blue-winged Teal. (21.5)

The Blue-winged Teal was one of the most common ducks during the seasons of migration. During each season, it was found in small flocks that stayed to feed on the lake and on the sloughs on the bar. On the lake it fed in the shallow water, on the mud around the edge, and in the growth of Typha. September 12, 1923, several single birds were flushed from the large patch of Polygonum that was growing in the lake.

After the middle of April, flocks of this bird tended

to break up into pairs.

This duck was found from April 2 until June 2, 1923 and from April 5 until May 30, 1924. In the fall, it was one of the first ducks to arrive. It was present in the fall of 1922 from August 21, when a flock of about twenty was feeding on the lake, until October 29. In 1923, it was observed as late as November 18.

Spatula clypeata. (Linnaeus). Shoveller. (11).

The Shoveller was usually seen in small numbers feeding in the shallow water at the edge of the lake or on the mud nearby. March 3, 1923, several pairs were feeding on the lake in water deep enough that they had to tip to reach the bottom.

All these ducks that were seen in the spring were mated. The Shoveller was present from March 3 until May 13, 1923 and from March 29 until May 30, 1924. It was recorded on November 7 and 9, 1924.

Drifila acuta. (Linnaeus). Pintail. (12)

Pintail stopped in large numbers to feed in the shallow parts of the lake. Often when the lake was covered with ice in the spring, flocks of this duck were seen standing on the ice, as on March 15, 1924. There was some open water in the lake.

On the morning of February 22, 1924, there were several hundred on the lake and they kept coming in in small flocks. These flocks tended to break up into pairs consisting of a male and a female. There was often as many as a dozen pairs in the air at one time. In the flight, the male generally

followed the female.

The dates of occurrence in the spring are between January 29 and June 3, 1923 and between February 22 and May 3, 1924. Fall records are September 24 and October 29, 1922.

Aix sponsa. (Linnaeus). Wood Duck. (12.5)

The wood duck was seen more often and in greater numbers in 1922 and 1922 than in 1923 and 1924. During August 1922, small groups were often seen flying down the river in the evening. At other times they were feeding in small groups or singly in the weeds or patches of Nelumbo in the lake.

A large flock was seen on the lake on August 25, 26, and 27, 1921. On June 14, 1922, a group of six that was flying over the lake settled on the water. From August 5 until September 24, 1922, small flocks were seen frequently on the lake and on the river. Dates on which this duck was found in 1923 are August 23 and September 5, 8, and 12. On October 11, 1924, a small flock was seen on the lake.

Marila americana. (Eyton). Redhead. (.5)

On the afternoon of April 21, 1924, a pair was swimming alone on the lake. Later they joined a small flock of Marila affinis. These birds were tame and allowed a close approach.

Marila affinis. (Eyton). Lesser Scaup Duck. (6.5)

A female Lesser Scaup Duck that was shot April 7, 1923 on a pool below a spring had its stomach filled with shells of small snails. These birds were usually found in small flocks on the lake. They were most often found in the deeper

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parts of the lake although at times they were found in the shallow water. One was killed on the river on November 17, 1923.

Dates of migration are between April 7 and June 3, 1923; November 4 and 17, 1923; and February 22 and May 29, 1924.

Marila collaris. (Donovan). Ring-necked Duck. (.5)

A Ring-necked Duck was killed on the lake on November 17, 1923.

Chen hyperboreus hyperboreus. (Ballas). Snow Goose. (.5)

A flock of about thirty birds that was flying down the river in a loose, irregular line on March 3, 1923 was identified as belonging to this form.

Branta canadensis canadensis. (Linnaeus). Canada Goose. (3)

March 3, 1923, three large flocks were seen on the river. One flock of about one hundred and fifty settled on a large sand-bar in the river. April 2, 1923, ten birds were seen flying up the river in a loose line. They flew very fast with the strong wind. On February 3, 1924, a flock of 23 was seen flying northwest up the creek valley. On March 1, 1924, a small flock was flying northwest early in the morning. Some were heard calling overhead at night on March 28, 1924.

A flock of twenty-five stayed in the vicinity for nearly a week in the middle of March, 1925. They stayed on sand-bars in the river during the day and just before dark they flew out each evening to a large wheat field on a hill where they stayed until morning when they returned to the river.

A flock was flying down the river November 9, 1924.

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Botaurus lentiginosus. (Montagu). Bittern. (4)

Single birds were flushed from Polygonum, Nelumbo, and other plants at the edge of the lake on these dates; September 4 and 10, 1922, September 8 and 12, 1923, and October 6, 1923.

Ixobrychus exilis. (Gmelin). Least Bittern. (1.5)

A Least Bittern was flushed from a small patch of Typha in the south part of the lake in the middle of the forenoon on June 13, 1922. On August 12, 1922, one was shot at six a.m. It was perched in the edge of the Typha in the lake and on a stem about eight inches from the water. Several were flushed in shallow water in patches of Typha on the north side of the lake on May 30, 1924.

Ardea herodias herodias. Linnaeus. Great Blue Heron. (39.5)

Great Blue Herons were often seen standing in or feeding at the lake. They were found in patches of Typha, Polygonum, Nelumbo; in the open water, and on the mud-flats. Sometimes they were seen on sand-bars in the river or at the edges of pools cut off from the river. A few times in late summer, they were found feeding along the creek.

Usually not more than half a dozen of these birds were seen in a single day.

Although individuals of this heron were present during the entire summer, they were not found actually nesting. May 6, 1923, three single birds were seen flying to the river from a westerly direction over the bluff one half mile south. They arrived about ten minutes apart and may have been coming from a nesting ground.

On March 30, 1923, one was seen in the center of the lake at sunrise and another was feeding there in water about eight inches deep at about ten o'clock. It flew a short distance and after lighting, it reached into the water for a fish which it swallowed. This was accompanied by some rather violent jerks of the neck. After a few minutes, the bird moved and captured another small fish. This fish was thrown into the air and caught three or four times and then swallowed head first. The heron left after about ten minutes.

The latest fall record for this bird is October 29, 1922. The earliest spring record is March 29, 1924. In 1923, it was first seen on March 30.

These herons were often heard calling on the lake, especially in late summer and early fall.

Florida caerulea. (Linnaeus). Little Blue Heron. (1)

September 2, 1924, a single bird in white plumage was seen walking at the edge of Doniphan Lake. On September 3, 1924, a loose flock of about twelve in the white plumage was feeding on the mud and in the shallow water at the edge of Roundy Lake.

Butorides virescens virescens. (Linnaeus). Green Heron. (36.5).

As a rule, only one or two Green Herons were seen in one day, but in August and early September they became more plentiful and groups of a dozen or more birds were often seen. One such group was seen standing in water about three inches deep in the lake on August 14, 1922. Some were wading in the edge of the Typha and even climbing among the stems of that

plant. The birds squawked as they moved about. When a shot gun was fired nearby, the birds did not fly and they appeared to be not disturbed. Sometimes these herons rested on the mud at the edge of the water, sometimes on piles of drift along the river or creek, and sometimes in the willow and cottonwood trees on the bar.

This heron fed at the edge of the lake, often in patches of the various kinds of vegetation, along the creek, along the river, and in pools on the bar.

The only nest seen was found on June 5, 1923. It was in the top of a small cottonwood on the bar near the mouth of the creek. It was about one hundred yards from the river. The nest was near the main trunk of the tree and was about twenty feet from the ground. There were eggs in the nest, but the number could not be determined. The sitting bird left when the nest was approached and returned in about fifteen minutes. Weeds under the nest were covered with excreta.

April 29, 1923, is the earliest spring record for this bird and September 24, 1922 is the latest record of its occurrence in the fall.

Nycticorax nycticorax naevius. (Boddaert). Black-crowned Night Heron. (7.5)

This heron was flushed from the tops of cottonwoods along the river and from the exposed mud-flats around the edges of the lake. It was found more often in trees than the other herons and when flying it was usually at higher altitudes than the others. It appeared to be more wild than the

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others and it squawked more than they did.

Several were seen on the lake on August 25, 1921. On June 19, 1922, four in immature plumage flew from the Typha at the edge of the lake to the trees nearby. In the fall of 1922, this bird was seen on August 11, 23, and 31, and September 4, 7, and 10. In 1923, it was found on May 13 and June 5, 6, and 10. In 1924, it was found on April 21 and ^{May} 30.

This bird was usually present in small flocks that numbered less than eight and which were compact.

Rallus virginianus. Linnaeus. Virginia Rail. (1.5)

On September 10, 1923, a female was found in a weedy pasture on the Whittaker farm. It was crippled, but was able to run. There was a telephone wire on one side of the pasture which the bird may have hit in flying over. On September 3, 1924, one was flushed in Typha at the edge of the lake.

Porzana carolina. (Linnaeus). Sora. (4)

The Sora was flushed in Typha and Nelumbo at the edge of the lake. Dates of occurrence in spring are between May 8 and 17 and in the fall between August 28 and September 12.

Fulica americana. Gmelin. Coot. (16.5)

The number of Coot present at one time varied from a few to several hundred. It was found in the open water of the lake, on the mud at the edge, and in the Nelumbo and Typha. Usually the flocks were not very compact. When they were feeding, they often dived and picked up food from the bottom. A large flock that was feeding on the mud at the edge of the lake on May 17, 1924 ran into the water when it was approached.

In the spring these birds were often heard calling and they were rather tame. In the fall when many were shot by duck hunters, they became very wild and hard to approach.

In 1922, a group of seven was present on the lake as late as June 19 when they were seen swimming in the edge of patches of Typha.

April 4, 1924 is the earliest spring record for this bird and November 30, 1923 is the latest date of its occurrence in the fall. The earliest fall record is September 5, 1923.

Steganopus tricolor Vieillot. Wilson's Phalarope. (1.5).

A few of these birds were feeding with sandpipers at the edge of Doniphan Lake on May 11, 13, and 20, 1923 and on May 8, 1924.

Gallinago delicata. (Ord). Wilson's Snipe. (5)

This bird was found in small numbers, usually less than four and it preferred those portions of the edge of the lake that were grown up with vegetation. It was also found at the edge of pools on the bar below springs and along sloughs.

Spring records are between April 2 (1923) and May 8 (1924). It was found in the fall on October 29, 1922 and on November 8, 1924, when one was seen at the edge of a pool in the creek.

Macrorhamphus ariseus scolopaceus. (Say). Long-billed Dowitcher. (1)

A single bird was feeding at the edge of the lake on September 4, 1922. Two birds, at the edge of Doniphan Lake

May 18, 1924, were approached within fifty feet.

Micropalama himantopus. (Bonaparte). Stilt Sandpiper. (.5)

One was shot out of a small flock in the shallow water at the edge of Doniphan Lake on May 18, 1924.

Pisobia maculata. (Vieillot). Pectoral Sandpiper. (18)

The Pectoral Sandpiper was found in flocks varying in size from two or three birds up to several hundred which fed in the shallow water and on the mud at the edge of the lake.

In the spring of 1923, this sandpiper was present from March 30 until June 7. In the fall of 1922 it was present from August 10 until October 8.

Pisobia fuscicollis. (Vieillot). White-rumped Sandpiper. (5)

This bird was feeding with other sandpipers at the edge of the lake on August 22, 28, and 31, and September 7, 1922; June 7, 1923; and May 18, 1924.

Pisobia minutilla. (Vieillot). Least Sandpiper. (13.5)

This sandpiper fed on the mud around the lake in larger numbers than any of the other species of sandpipers. Records of its occurrence in spring are between May 3 (1924) and June 7 (1923). In the fall of 1922, it was present between August 9 and September 10.

Ereunetes pusillus. (Linnaeus). Semipalmated Sandpiper. (4).

The Semipalmated Sandpiper was found in about the same places and at about the same time as the Least Sandpiper.

Limosa haemastica. (Linnaeus). Hudsonian Godwit. (1)

On May 13, 1923, a flock of nine was wading along the west side of Doniphan Lake in water about four inches deep.

Another that was crippled stayed by itself on the mud, but not in the water. When it was approached within ten yards, it would fly out over the water and sail back to shore. A small pool of blood was left after each stop. Once it squatted on the ground until it was approached closely. The flock separated at one time and a part flew a short distance along the edge of the water.

On May 17, 1924, two stopped with other Limicolae on the north edge of the lake.

Totanus melanoleucus. (Gmelin). Greater Yellowlegs. (2)

The Greater Yellow-legs was found on the lake on September 4 and 7, 1922; April 14, 1923; and April 21, 1923. Only a few individuals were seen at each time.

Totanus flavipes. (Gmelin). Yellow-legs. (18.5)

The Yellow-legs fed at the lake both in the shallow water and on the mud at the edge. On April 21, 1924, some were seen feeding on the mud-flats along the river.

On April 28, 1923, these birds made much more noise and were much more restless than they had been two weeks before.

On August 14, 1922, a large flock flew in to the lake and settled at about six o'clock in the evening.

Usually several small flocks fed on the lake at one time. March 30, 1923 is the earliest spring record and June 3, 1923 is the latest spring record. In the fall this bird was seen between August 10 (1922) and October 11 (1924). None were seen in the fall of 1923.

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Helodromas solitarius solitarius. (Wilson). Solitary Sand-
piper. (8)

Although not so many individuals of this species were noted as of the other species of sandpipers, they were found in a greater variety of situations. Usually single birds were found alone. They were most often found at the edge of the lake. On August 2, 1922, one was feeding along the creek above the bridge. It flew down the creek when it was disturbed. On September 4, 1922, one was feeding at the edge of a Nelumbo patch on the lake. One was flushed at the edge of a small opening in Typha on August 21, 1923. One was seen on the mud at the edge of a pool, cut off from the river, near the mouth of the creek on September 8, 1923. Two were seen at the marshy place below the spring one half mile south on April 28, 1923. May 17, 1924, is the latest date of occurrence in the spring.

Catoptrophorus semipalmatus semipalmatus. (Gmelin). Willet(1).

A male flew in to the lake at five o'clock on the afternoon of August 22, 1922 and settled in water about three inches deep. It bathed in the water and then was shot. The bird allowed a close enough approach to be shot with number ten shot.

On May 18, 1924, one was seen on the mud at the edge of Doniphan Lake that was crippled. It would not allow a close approach, but it staggered when it attempted to run or to start flight. It flew out over the water and returned to the shore several times.

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Tryngites subruficollis. (Vieillot). Buff-breasted Sandpiper.

(.5)

On August 27, 1921, two were shot out of a group of four at the edge of Doniphan Lake. They were feeding farther away from the water than were the other kinds of sandpipers. Both the birds that were collected were males.

Actitis macularius. (Linnaeus). Spotted Sandpiper. (18.5)

This sandpiper fed along the creek, along the river at the edges of pools on the bar, and among patches of Nelumbo. Individuals were frequently seen resting on boxes and logs in the lake. On August 23, 1921, some were seen feeding on the tops of leaves of Nelumbo that were floating in the lake.

Spotted Sandpipers were found throughout the summer, although they were more plentiful during the seasons of migrations. The earliest record is May 3, 1924 and the latest fall record is September 10, 1922.

Numenius americanus Bechstein. Long-billed Curlew. (.5)

A Long-billed Curlew was seen with sandpipers at the edge of Doniphan Lake on the morning of May 8, 1924. It was approached to within fifty yards.

Squatarola squatarola. (Linnaeus). Black-bellied Plover. (2.5).

An adult came to the lake on August 21, 1922. It ran through water about two inches deep, with a peculiar jerking motion. It called several times and flew away towards the river with some Yellow-legs. On August 23, one was seen in about the same place. On August 28, three were feeding on the north side of the lake. About half the time, they were on the

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on the shore about fifty yards from the water and the rest of the time they were in water about three inches deep. They were very shy and difficult to approach. After about three hours of stalking, one was killed. The two remaining birds left toward the river. Two birds were seen at the lake on August 31, but they were very shy.

One was seen in water three inches deep at the edge of Doniphan Lake on June 3, 1923. It did not fly far when it was disturbed and it called only once or twice.

Oxyechus vociferus. (Linnaeus). Killdeer. (16)

The Killdeer was often seen with other waders feeding on the mud around the lake. These birds usually kept a little farther back from the water than did the other waders. The groups of Killdeer were usually not large, the largest flocks being found in the fall and being composed of about a dozen birds.

Spring records for this bird are between March 15 and June 23. Fall records are between August 13 and October 30.

Aegialitis semipalmata. (Bonaparte) Semipalmated Plover. (7).

This bird was found feeding around the edge of the lake either near the edge of the water or at a little distance back from the shore.

Dates of occurrence in the spring are between May 3 (1924) and June 7 (1923). Fall migration dates are between August 11 (1922) and September 7 (1922) This bird was not seen during the other fall migrations.

Colinus virginianus virginianus. (Linnaeus). Bob-white. (17.5)

The Bob-white was not numerous. Never, were more than one covey or one or two pairs seen in a single day and although it was probably present throughout the year, none were seen in either November or February.

This bird fed in weed patches and deserted fields along the sides of the hills, along the roads, and in the timber on the bluff. Sometimes it was found in the willows on the bar. In the mornings, it was often heard calling along the creek or on the bar and more frequently between May and September.

A pair was flushed from an unfinished nest on June 10, 1922. The nest was in the heavy growth of grass on the top of the south bank of the first ravine south on the bluff. It was nearly finished and opened to the south.

All that were seen between the first of October and the first of May were in coveys that were made up of from eight to twenty birds. During the rest of the year, it was seen alone or in pairs and was most often noted along the roadsides.

Zenaidura macroura carolinensis. (Linnaeus). Mourning Dove (84.5).

Several Mourning Doves were seen daily throughout the year except during the winter when they were present in much smaller numbers. They fed in all parts of the area where they could find food. Most of their food was obtained from the ground or from plants that produced seeds near the ground. The Mourning Dove was often seen gleaning food from the roads, from barnlots, from weed patches, from pastures, from mud-flats near the lake, from granaries, from fields, and from

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open places both on the bluff and on the bar. Mourning Doves rested upon dead or leafless limbs of trees, on buildings, and bridges, and on telephone wires. When moving from one place to another, these birds were often seen flying high above the tops of the trees.

On April 22, 1924, a pair was seen building a nest in an osage orange tree along a road east of the center of the area. On May 3, 1924, an adult was brooding an egg in a nest ten feet from the ground on a horizontal limb of a box elder in a yard.

A pair was watched that was working on a nest at eight a.m. on May 6, 1923. The nest was in a tree in a yard and was on a horizontal limb twelve feet from the ground. The female stayed on the nest while the male made trips to the ground at the edge of an orchard about fifty feet away to get material. Each trip required from ten to sixty seconds. When returning with material, the bird did not fly directly to the nest, but first stopped in some other part of the tree, usually at the end of a dead limb and about ten feet from the nest. After about ten seconds, it would fly to within one foot of the nest. Instead of lighting directly on the nest, the bird usually settled on the back of its mate and then lowered its head, bringing the material for the nest near to and below the head of the female. The female then took the straw or sticks in her bill and arranged them in the nest. She turned after each trip so that the nest was built evenly all the way round. A few times, the male laid the material directly

on the nest. He always left immediately after the female took the sticks. No trace of this nest could be found on May 13.

On May 19, 1923, a pair was building a nest twelve feet from the ground in an osage orange along the road. One bird was on the nest and one carried material. The same pair was working on this nest on the next day.

A nest with two eggs was found in an apple tree in an orchard on June 7, 1923. It was twelve feet from the ground. As the brooding adult left the nest, it flew low, but did not touch the ground.

An adult was brooding on a nest fifteen feet from the ground in an elm on June 8, 1922.

A Mourning Dove was seen on a nest with two eggs that was on a leaning willow stump in the north part of the lake on June 19, 1922. The nest was two feet above the water and about one hundred yards from the shore. Whether or not the young were successful in reaching the shore was not determined.

A partially completed nest was found nine feet from the ground on the main trunk of a redbud that was leaning at a forty-five degree angle. The tree was on the lower part of the bluff. An adult was on the nest, but it flew to a small limb near the ground and about fifteen feet away when it was approached.

An adult was brooding on a nest twenty-two feet from the ground and four feet from the end of a limb of a walnut

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in a yard on June 23, 1923. On June 26 another adult was found brooding on a nest forty feet from the ground and near the end of a branch of honey locust twenty-five yards away.

A single adult was gathering material from the ground in a yard and carrying it to a limb eleven feet from the ground in a peach tree in an orchard in the morning of June 24, 1923. The same bird was carrying material and working on this nest on June 26.

A nest was found thirty feet from the ground and four feet from the end of a limb of a large elm along a road on June 30, 1923. An adult was brooding at seven-thirty a.m. and another adult was perched on a limb three feet away.

On July 1, 1923, a nest was seen in a maple in a yard which also contained nests of the Blue Jay and of the Baltimore Oriole. This nest was thirty feet from the ground and was on a limb that was nearly forty-five degrees from the horizontal.

The latest nest record is July 18, 1923, when a nest was found thirty feet from the ground and three feet from the main trunk of a hackberry in the E.V. Rounry yard. An adult was brooding.

These birds were often found in groups of three, especially in early fall. Larger flocks were noted in late summer, as when several small flocks were seen along a road on August 28, 1923. On August 29, 1923, some flocks were feeding in the wheat stubble on the hills north of the lake. Occasionally during the winter, flocks numbering from twelve to

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fifteen were found feeding in weed patches along the edge of the bar or along the creek in sheltered places.

Cathartes aura septentrionalis. Wied. Turkey Vulture. (38)

From one to twelve Turkey Vultures were seen almost daily in the summer, soaring over the bluffs or over the river valley. They were not often seen except when flying. Once, one was seen resting on some drift on a sand-bar in the river. At one time, one was seen perched in a cottonwood tree on the bar and on another occasion one was seen in the top of a medium sized dead tree near the top of the bluff.

On June 6, 1923, a nest was found in a hole in the top ledge of limestone of the bluff and three-fourths of a mile south. The hole was two feet across at the opening and was ten feet deep. Its floor sloped down at an angle of about forty-five degrees with the horizontal. The opening was shaded by small shrubs and larger trees. In the morning when the nest was found, the adult scrambled back to the far corner of the hole. It was too dark inside to distinguish objects in the nest. In the afternoon when a flashlight was used, the adult refused to leave the nest. When small pieces of rock were thrown into the hole, the bird moved a little and one young could be seen and apparently three eggs. These may have been parts of eggs. The shells appeared to be dark brown and no spots could be seen. The young bird was white and downy. A large amount of dark brown semi-solid food material with a very disagreeable odor was regurgitated by the brooding bird when it was disturbed.

April 5, 1924, is the earliest spring record for the Turkey Vulture and September 24, 1922 is the latest fall record. ¹¹⁶
Circus hudsonius. (Linnaeus). Marsh Hawk. (12)

Usually only a single Marsh Hawk was seen at one time, but pairs were seen together on a few occasions. The status of this bird may be shown best by a summary of its occurrence by months.

On January 24, 1923, one was chased over the river and into the willows by a Crow. One was seen on each of the three days following. On February 18, 1923, two were flushed from the thick growth of small willows between the lake and the river. They flew up the river together. One was seen flying over the bar on February 5, 1924. Marsh Hawks were seen flying over the bar on March 3 and 31, 1923. One or two Crows were seen flying at the bird seen on the latter date. April dates are 1 in 1923 and 19 and 21 in 1924. None were seen in May. On June 13, 1922, one was flying north over the willows in the afternoon. On June 21 a female was flying low over the willows and on June 22, one was flushed in the tall grass between the lake and the river. There are no July records. On August 10, 1922, one that was hunting around the lake scared away a small flock of sandpipers. An adult was flying over the willows near the mouth of the creek on August 14, 1922. On August 23, 1923, one in the reddish phase flew low over the bar near the river. There are five records for September. On September 8, 1923, one flew low over the lake and was chased by a whole flock of swallows late in the afternoon. One flew

low over the willows on October 7, 1922. There are no records for either November or December.

Accipiter velox. (Wilson). Sharp-shinned Hawk. (.5)

One was flushed from the ground along the marshy place at the foot of the bluff one quarter of a mile south on May 12, 1923. It flew into the willows on the bar where it stopped. Another flew over the bar on February 14, 1925.

Accipiter cooperi. (Bonaparte). Cooper's Hawk. (15.5).

Single Cooper's Hawks were usually seen flying over the tops of the trees on the bluff or on the bar or low over the fields. On August 25, 1921, one was shot in a tree about half way to the top of the bluff one half mile south.

On June 7, 1922, a female was brooding five downy young in a nest thirty feet from the ground in a red oak tree at the side of the road one quarter of a mile south. The nest was in a fork of the main trunk of the tree which was six inches in diameter. While the tree was being climbed, the adult made three swoops to within a few feet and called several times. The next day, the female was seen going to the nest at six o'clock in the evening. She was seen in a nearby tree on the tenth. On June 18, an adult circled around the nest. The white, downy feathers of the young could be plainly seen from the ground. A male was carrying food in the direction of the nest on June 21. On June 26, the five young whose feathers were now about half grown were shot out of the nest. Their stomachs were filled with the remains of two chickens of a size which would probably weigh about half a pound.

A nest was found fifteen feet from the ground in an oak tree in a ravine on the Whittaker farm on June 11, 1922. It held five bluish green eggs. They were fresh. The female was not on the nest in the morning, but was incubating at five o'clock in the evening.

A Cooper's Hawk was seen flying high over the willows on January 26, 1923. One flew into the trees near the house on the Whittaker farm on February 3, 1924. On April 14, 1923, one was flying west over the lake which caused a small flock of Yellow-legs to rise and call, but it flew on without stopping. On April 15, one was chasing a Red-tailed Hawk over the bluff south. Late fall dates for this bird are November 17 and 18, 1923. One that had not been dead long was found on the bank of the lake on November 30, 1922.

Buteo borealis borealis. (Gmelin). Red-tailed Hawk. (32)

In the summer not more than one or two of these birds were seen in one day, but in winter and the seasons of migrations they became more numerous and several were often seen at one time. They were most often seen flying over the bluff and the bar. Sometimes they were found resting in the tops of tall trees. On May 10, 1924, one was flying through the trees and near the ground on the bluff. On April 15, 1923, one was chased out of the timber on the bluff by a Cooper's Hawk.

A Red-tailed Hawk flew from a nest in a tree near the top of the hill one quarter of a mile northeast of the E.V. Roundy house on March 31, 1923. At first the bird stopped in

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a nearby tree and called several times, then it moved on to other trees and finally circled overhead several times, but it did not leave the vicinity. Two hours later when it was approached, the female left the nest directly. The nest was twenty-five feet from the ground in the top of an oak tree that was one foot in diameter. On April 1, when the tree was climbed, the nest contained three eggs. The female stayed nearby and called while the nest was being examined. On April 7, the nest had one whole egg with a large hole in the side, and one egg with a larger hole lay on the ground. No hawks were near. The material in the nest was disarranged.

A nest was found in the timber one quarter of a mile north of the nest that was found in 1923 on March 20, 1925. The female called from a nearby tree, but was not seen on the nest which appeared to be nearly finished. Some new material was seen hanging over the edge.

A female was brooding on a nest in the top of a tree in the bottom of the ravine one half mile south on the bluff on March 18, 1925. The bird left the nest and flew overhead and called when persons passed through the timber near the nest tree.

On June 4, 1923, two young of this species were seen with one adult in the timber on the bluff one half mile south. The young were able to fly. The adult was calling in the vicinity.

Some of these birds were seen in every month of the year.

Buteo lineatus lineatus. (Gmelin). Red-shouldered Hawk. (13)

Red-shouldered Hawks were more common in August and September than at other times of the year. They were seen flying over the bluff or perched in trees on the bluff or on the bar.

A female that was shot along the road one mile south on August 16, 1922 had a small frog and parts of several large insects in its stomach. Another was taken on September 2, 1922. Its stomach was empty.

This hawk was present in other seasons of the year on May 6 and 12, 1923; July 6, 17, and 18, 1923; and November 18, 1923.

Buteo swainsoni. Bonaparte. Swainson's Hawk. (.5)

Two Swainson's Hawks soared over the bluff one half mile south most of the afternoon of April 1, 1923.

Buteo platypterus. (Vieillot). Broad-winged Hawk. (8)

The few records of this species are between April 21, 1924 and May 10, 1924, and August 5, 1923 and September 1, 1923. It was usually found resting in trees on the bar or along the foot of the bluff.

Archibuteo lagopus sancti-johannis. (Gmelin). Rough-legged Hawk. (1.5)

One was seen feeding over a field. It was flying from one hundred to one hundred and fifty feet above the ground and was frequently poisoning. Once it dropped straight to the ground, but rose again in a few seconds.

On October 21, 1923, one was circling high over the bar. On December 1, 1922, one was perched in the top of a tree in a

small patch of timber on a hill one half mile west.

Haliaeetus leucocephalus leucocephalus. (Linnaeus) Bald

Eagle. (2)

On January 29, 1923, Crows chased a Bald Eagle over the bluff toward the lake where it stopped in a tree. Crows flew after one on February 17 and 18, 1923. On March 3, 1923, calling Crows surrounded two that were in a tree on top of the bluff near the lake. They flew short distances along the bluff, but they were always followed by the Crows.

Falco sparverius sparverius. Linnaeus. Sparrow Hawk. (1.5)

An immature bird of this species was shot from the top of a small tree on the Whittaker farm on September 5, 1922. On September 10, 1923, one was seen on the telephone wires along the road two miles west. On September 1, 1924, one was seen along the road one mile west.

Pandion haliaetus carolinensis. (Gmelin). Osprey. (.5)

On August 11, 1922, one was flying high over the lake. It was moving south and towards the river.

Asio wilsonianus. (Lesson). Long-eared Owl. (.5)

On March 30, 1924, a nest was found twelve feet from the ground in a one year old Crow's nest that was in a cottonwood on the bar. The tree was eight inches in diameter at the base. One owl was on the nest and another was in a willow tree about twenty feet away. When the bird on the nest was approached, it stood up and spread out its wings and fluffed out its feathers. It flew off a distance of about twenty yards and called for a few minutes and left. There were five

fresh eggs in the nest.

Asio flammeus. (Pontoppidan). Short-eared Owl. (3)

A scattered flock of about twenty Short-eared Owls was found south of the lake and about one quarter of a mile from the river on December 2, 1922. The grass was about eighteen inches high and the willow trees were scattered. Others were found at the same place on January 25 and 26, 1923 and on March 3, 1923. Pellets were collected from this place and their contents were examined. They contained many skulls of Microtus oehrogaster, Peromyscus, Reithrodontomys megalotis dychei, Mus musculus musculus, Cryptotis parva, Blarina brevicauda, one Cardinalis cardinalis cardinalis, some Agelaius phoeniceus, and some small Fringillidae.

Strix varia varia. Barton. Barred Owl. (2)

A Barred Owl was flushed from a tree on the lower part of the bluff northwest of the lake on October 21, 1923. It flew across a small clearing and stopped in a cottonwood where it was watched for about fifteen minutes. About an hour later, the bird was again flushed from a tree on the lower part of the bluff. One was flushed from the same place on November 4, 1923. It flew north along the lower part of the bluff. The Crows found the owl a few seconds after it moved and began coming and calling.

Cryptoglaux acadica acadica. (Gmelin). Saw-whet Owl. (.5)

A female Saw-whet Owl was shot on March 30, 1923. It was sitting on a small branch of a willow, about four feet from the ground, and was close to and on the southeast side of the

main trunk. The tree was on the bar and twenty-five yards from the bluff. It was one quarter of a mile south. In the bird's stomach, were the remains of a mouse. The bird was shot at four o'clock in the afternoon.

Otus asio asio. (Linnaeus). Screech Owl. (23)

The Screech Owl was present throughout the year and was frequently heard calling at night.

One in the gray color-phase was killed in the R.V. Roundy barn in January 1924. On February 1, 1924, one was seen at a hole ten feet from the ground in a small tree below the road one quarter of a mile south. A group of smaller birds that were calling surrounded it. It was gray. One was found in the top of an old house northwest of the lake on April 14, 1923. Scattered pellets on the floor showed that it had been using the roost for several days. On April 22, 1924, one was flushed from a clump of roots under an overhanging creek bank one half mile west. Several which probably made up a family group called and flew about a yard on May 10, 1924. There were several holes in this yard that would probably have been suitable nesting places for this bird. On May 13, 1923, one was found perched on a leafy branch in the top of a large elm tree along a road. One was seen on the same branch on May 19, one week later. On the afternoon of June 15, 1923, one was flushed from the center of a thicket of dogwood and grapevine along the lower edge of the bluff. On August 27, 1923, one was flushed from the top of a tree along the lower part of the bluff.

Bubo virginianus virginianus. (Gmelin). Great Horned Owl. (2).

Although this bird should have been found throughout the year, and it probably was present, there are records for only seven months of the year. A Great Horned Owl was found sitting on an open nest with eggs in the spring of 1922 by Mr. Charles Regnary. The bird was shot.

Coccyzus americanus americanus. (Linnaeus). Yellow-billed Cuckoo. (62.5)

The Yellow-billed Cuckoo, although a very common summer resident in this locality, was not seen in as large numbers as some other birds that were not so common. It is shy and solitary and was more often heard calling than it was seen. It fed in the tops of the trees on the bluff, along the creek, and in the willows on the bar. A large number of nests were found and accounts of some are given to show the range in the nesting habits of this bird in this locality.

The earliest nest that was found was not complete on June 9, 1922.

On June 12, 1923, a nest was found ten feet from the ground on a horizontal limb of an elm tree on the lower part of the bluff near the mouth of the creek. It held two eggs. Ten yards farther south, there was another nest with two eggs which was ten feet from the ground in a redbud tree. This nest was more bulky than the other. An adult carried a dead leaf to the nest in the redbud. Both nests were partly shaded by larger trees. On the thirteenth, the nest in the elm tree contained broken shells and there was no bird on the

other nest. On this date, an adult was found sitting on a nest seven feet from the ground in a grapevine that was growing over a horizontal limb of small partly dead elm tree at the lower edge of the bluff. The bird left the nest, which contained two eggs, when it was approached within ten feet.

On June 16, 1922, a nest was found four feet from the water in a fork of a willow among the stumps in the north part of the lake. No bird was on the nest which held three eggs.

An adult was flushed from a nest with three eggs that was seven feet from the ground in a leaning pawpaw on the side of the bluff on June 25, 1923. The bird flew to the ground when the tree was shaken.

A nest was found on June 27, 1923 on a horizontal fork of a lower limb of a walnut and seven feet from the ground. The tree was near the top of the bluff northwest of the lake and was ten yards from the edge of the timber. In the nest, were three young with black quills and one egg. An adult came about one minute after the nest was found, but after seeing an intruder, it stayed in a tree about fifty feet away and called.

On June 29, 1923, a nest was found six feet from the ground in a rose bush that was growing over a small walnut near the top of the bluff. An adult was brooding four eggs. When disturbed, it flew to a tree fifteen feet away, and then drooping and shaking its wings as if they were broken, it flew on farther.

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On June 30, 1923, a nest was found in a box elder along a road by a cornfield. The nest was eight and one half feet from the ground in twigs near a horizontal limb one inch in diameter. An adult, that was brooding three eggs, left when the limb was shaken. Another adult that was in the tree left when the tree was approached within thirty feet. On the same date, a nest was found eight and one half feet from the ground in an osage orange along a road. The nest was a little to one side of a horizontal limb and was partly shaded. An adult that was brooding four eggs flew off slowly when an intruder stood under the nest.

On July 3, 1923, a nest was found five feet from the ground in an oak sprout along the road one half mile south. An adult was brooding two young with black quills and one egg. It left when approached within three feet. One of the young birds opened its mouth for food. On July 9, this nest was empty and its floor was covered with scales from the young. Another nest was found on July 3 that was in a dogwood one hundred yards north of this one. It was five feet from the ground and there were two eggs. No bird was near. On July 9, there were four eggs, but no bird was seen.

On July 14, 1923, a nest was found four feet from the ground in a crotch of a redbud six feet high in a sprout field southeast of the lake. The nest was made of sticks and held four eggs. An adult was brooding. The sprout was surrounded by a thick growth of vegetation.

A nest five and one half feet from the ground in a grape-

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vine that was running over an ironwood was found on July 15, 1923. There were five eggs in the nest. The sitting bird left when the vine was touched.

On July 18, 1923, a nest was found four and one half feet from the ground in sumac in a hog pasture on a hill. An adult was on the nest which held two eggs and three young, one of which had its eyes open, one had its eyes partly opened, and one had its eyes shut. This nest was two inches deep on the outside.

A nest was found seven feet from the ground in a small willow between the creek and a cornfield on the bar. The nest had three eggs. The sitting adult left when approached within fifteen feet.

An adult was sitting closely on two eggs in a nest six feet from the ground that was found in a rough-leaved dogwood on the bluff on August 28, 1922. On September 2, there were young in the nest. The parent stayed on the nest until it was touched and then flew only a short distance. It appeared to be not excited. The adult was on the nest on September 6. On September 10, the nest was empty.

On September 9, 1923, an adult was brooding on a nest in the top of a medium sized oak tree one half mile south. The nest was twenty feet from the ground.

In all, thirty nests of this species were found in the two seasons.

During the migrations, especially in the fall, this cuckoo was frequently found feeding with groups of the smaller

transients. This bird was late in arriving in the spring and was not seen before May 19, 1923 and May 17, 1924. In the fall, the last one was seen on October 12, 1924.

Coccyzus erythrophthalmus. (Wilson). Black-billed Cuckoo. (3).

On May 19, 1923, a Black-billed Cuckoo was shot in the top of a small tree on the lower part of the bluff. One was seen near the ground in the willows on June 7 and one on June 10, 1923. On June 23, 1923, one was seen along the lower part of the bluff one half mile south that was carrying something in its mouth. On August 23, 1923, one was seen resting in the top of a small tree on the lower part of the bluff near the lake. It flew low over the bar after about fifteen minutes. On September 4, 1924, one was shot on the lower part of the bluff near the lake. It had a part of a cicada in its mouth.

Ceryle alcyon. (Linnaeus). Belted Kingfisher. (25)

Rarely were more than one or two kingfishers seen in a single day. This bird was often seen feeding at the lake. It was found perched on snags on the lake, along the creek, and at pools on the bar below springs. It usually called as it flew up or down the creek. On April 20, 1924, one called and stopped in a tree along the creek where there were some holes in the bank in which it may have nested.

One was seen on March 30, 1923 and one on March 29, 1924.

There is one record for March 21, 1925. The latest fall record is October 8, 1922.

Dryobates villosus villosus. (Linnaeus). Hairy Woodpecker (39.5).

From one or two to half a dozen Hairy Woodpeckers were

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seen on each day that they were observed. In the summer months they fed in the trees on the bluff, along the creek, and on the bar. During the winter months, a good share of this bird's time was spent in weed patches with small seed-eating birds where it obtained food in addition to that it got from the trees and the tree trunks.

Two birds were making trips with food to a tree on the north side of the creek and one hundred yards above the bridge on April 29, 1923. They took turns going into a hole twenty feet from the ground and on the southwest side of the tree trunk. Once, one waited for the arrival of the other before leaving, but usually each was in the hole for a short time only. They made trips from 11:30 until noon.

One was found feeding in the shed east of the bridge on February 5, 1924.

Dryobates pubescens medianus. (Swainson). Downy Woodpecker. (89).

Several of these woodpeckers were seen almost every day that records were kept. They fed over the whole area where there was enough vegetation to insure a food supply. In the fall and winter, they were nearly always prominent in the small flocks of birds that moved through the timber and the weed patches hunting for food. The call of this bird and the sound which it made picking for food was always an indicator that a feeding flock was present during the winter.

On January 28, 1923, one was seen going to roost in a hole in a tree in a yard at five in the afternoon. It flew out after the limb was struck several times with a pipe.

One was digging a hole in a large elm along a road on May 4, 1924. On May 12, 1924, a pair was seen on a dead willow along the creek near the bridge. The female was working on a nest twenty-five feet from the ground and on the southeast side of the trunk. The male approached the female and both flew to a nearby tree where mating took place and the female returned to work at the nest. On May 19, one of the pair entered the nest three times within half an hour.

Young birds called loudly in a nest eight feet from the ground in an apple tree in the orchard on June 3, 1923. An adult carried food to them. On June 4, a bird flew out of a hole in an apple tree thirty-six steps away from this nest. On this date, a nest was found in a dead stump in the bottom of a ravine which contained young. The nest hole was fifteen feet from the ground. Both parents came and called very nervously in the vicinity.

A nest was found on June 7, 1923, that was seven feet from the ground in a willow stump on the north side of the lake. Young birds inside the stump called loudly and the parents called excitedly from nearby stumps. The young were still in the nest on June 12.

A group, probably made up of the birds of a family, was found feeding along the bluff as early as June 26, 1923.

Sphyrapicus varius varius. (Linnaeus). Yellow-bellied Sapsucker. (.5)

One was watched that was feeding on a tree trunk on the bluff on March 18, 1925. It chased other birds that came near.

Melanerpes erythrocephalus. (Linnaeus) Red-headed Woodpecker.

(68.5)

Red-headed Woodpeckers were more restricted in their local distribution than were the other species of woodpeckers and so they were present in fewer numbers than were the other species. In summer, they were found feeding in the larger leafy and dead or dying trees. In winter, the few that were present lived chiefly on acorns which were produced in abundance. One that was killed on the Whittaker farm on October 25, 1924, was carrying acorns. These woodpeckers were often found in the large dead trees at the edges of openings in the timber. These trees were used as perches from which the birds made short flights into the air to catch flying-insects. One was seen taking corn from a crib on July 1, 1923. It was commonly found on telephone poles along the roads.

An adult was flushed from a hole in a dead tree along a road on June 6, 1923. On June 8, a pair was feeding young in a hole in another tree. The parents were feeding young in this nest on June 28 and 30. On July 9, they were feeding the young in a tree across the road from the nest. On July 11, these young were seen as far as two hundred yards from the nest tree. On August 21, 1922, an adult was feeding young in a nest twenty-five feet from the ground in a dead tree along a road.

The regular summer residents were present between March 21 and September 24. Dates of winter occurrence are January 24 and February 17, 1923 and October 25, 1924.

Centurus carolinus. (Linnaeus). Red-bellied Woodpecker. (65)

This woodpecker was found in small numbers almost daily throughout the year. It was most often seen in the timber along the bluff and near the creek. Yards and orchards were frequented regularly. Although most of the feeding was done in these places, the bird was seen a few times feeding in irregular places. On June 8, 1923, a pair was seen gathering food from the ground in a road. On February 7, 1924, one was eating corn at a crib in a yard. One flew into a mulberry tree along the bluff on July 7, 1923, and picked off two ripe berries which it ate. It picked one of the berries while on the wing. One was feeding on dogwood berries on the lower part of the bluff on September 8, 1923.

A Red-bellied Woodpecker was calling in a hole twelve feet from the ground in a willow stump along the creek on April 21, 1924. It left when the stump was hit. On April 29, 1923, one flew to a hole in the top of a tall dead stump on the north side of the creek above the bridge. Another bird left and for about ten minutes the arrival stayed on the side of the stump. Then it went inside and stayed with its head out for about ten minutes. On May 12, an adult came and entered this hole. After a few minutes, another came and the first left. It returned after about five minutes, and after it stuck its head into the hole, the other bird left. This bird entered and remained for as long as the hole was watched; about fifteen minutes. On May 19, 1923, a parent was feeding young at this nest. It entered the nest hole with food three

times within eight minutes. Each trip it went in a different direction to get the food. An adult carried food to this nest on June 3, 1923 and on June 8.

A parent was feeding young in a hole in a living elm in a ravine along the bluff one quarter mile south on June 15, 1922. A family of young just out of the nest was being fed near there on June 21.

Parents were seen feeding young just able to fly on June 6, 1922 and on June 25, 1923. This family was seen in an orchard and was composed of birds that were able to fly, but which had trouble in getting a foothold.

A Red-headed Woodpecker flew after a Red-bellied Woodpecker and chased it out of one of the large dead trees along the road on September 4, 1923.

Colaptes auratus luteus. Bangs. Northern Flicker. (38)

The Northern Flicker was present in small numbers, but it was not ^{sufficiently} numerous to be found daily. Individuals were found feeding in the timber along the bluff, on the bar, along the creek, and in the yards. A few times, it was seen on the ground or on dead stumps. On September 4, 1923, one was seen going to roost in a hole in the side of a building in Doniphan. The loud call of this bird was often heard on the bluff.

One flew out of a hole thirty feet from the ground in a dead stump at the edge of the lake on June 10, 1923. On June 12, a bird flew out of the same stump when it was hit with a stick. This stump was blown into the water by a storm on the twenty-seventh of June.

Although this bird was present throughout the year, it was found in greater numbers during the seasons of migration. Flocks were seen moving south during the fall. A flock of over a dozen birds was in the Roundy yard at six o'clock in the morning of September 24, 1922. On October 7, 1922, a large flock was moving loosely down the river. They stopped in cottonwood and other trees. A flock was scattered in the tops of the trees and moving south on the lower part of the bluff on October 11, 1924. On February 17, 1923, a flock of fifteen or twenty was feeding half way to the top of the bluff.

Antrostomus vociferus vociferus. (Wilson). Whip-poor-will. (46.5)

These birds were heard calling in every direction in the timber at night during the summer. Once, May 3, 1924, one was heard calling in the daytime. This was at nine in the morning. Occasionally, one or two were flushed from the ground in thick growths on the bluff. On August 26, 1921, one was shot just after dark as it flew from a medium sized tree on the lower part of the bluff. An immature bird was shot out of a tree on the side of the bluff. It was perched crosswise on a limb twenty-five feet from the ground.

On June 16, 1923, two egg shells were found on the ground among growths of dogwood on the bar north of the lake.

A Whip-poor-will was flushed from one egg on the ground twenty-five yards from the edge of the timber on the bluff west of the lake on June 14, 1923. The bird flew about thirty feet and settled on the ground. Then it flew on a few

feet and stopped on a limb of brush and perched lengthwise. It then flew in a circle toward the edge of the timber. The timber was rather open underneath, there being few weeds and saplings. Elm, walnut, and oak trees were growing near. The egg was light with a few splotches. On June 21, there were two eggs. The adult fluttered away, moving only about two feet at a time and acting as if its wings were broken. The adult was sitting on the eggs on June 28. It flew off and went to a small piece of brush about ten yards away where it sat with drooping wings. The eggs were still there on July 3 or nineteen days after the first one was found, but on July 6 a diligent search showed no trace of either eggs or young.

April 18, 1924, was the earliest date on which these birds were heard calling and September 10, 1923 is the latest date on which they were heard in the fall.

Chordeiles virginianus virginianus. (Gmelin). Nighthawk. (7)

Nighthawks were found only during migrations. They were nearly always found in flocks that flew in a southwesterly direction over the lake and fed as they moved over the water. Even when not flying over the lake, they usually moved in the same direction i.e. southwest. In the afternoon of August 27, 1921, one was shot from a horizontal limb in a large tree in a yard. Most of the moving birds were seen in the evening or late afternoon.

The only record for spring is May 17, 1924, when one bird was seen. In the fall it was found from August 23 until September 23.

Chaetura pelagica. (Linnaeus). Chimney Swift. (59)

Chimney Swifts were found flying over the tops of the trees on the bluff and on the bar, over the lake, and over sets of farm buildings. Only a small number was present except during the migrations.

Young birds nearly ready to leave the nest were seen in a chimney in the E.V.Roundy house on July 18, 1923. The nest was eight feet below the top of the chimney. Adults were flying overhead.

April 22, 1924 is the earliest date of occurrence in the spring and October 11, 1924 is the latest fall record.

Archilochus colubris. (Linnaeus) Ruby-throated Hummingbird. (445.5)

Hummingbirds were not conspicuous and so they were not seen every day, but they were common during the summer and became much more so in the late summer and early fall migrations. In summer these birds fed at flowers in gardens and on the bluff. In the late part of the season, they moved over more territory and were found more often in fields and on the bar.. In August and early September, they spent a great part of their time on the bar feeding around jewel-weed which blooms at that season. A part of their time was spent in resting on dead twigs and in flying after one another. On August 14, 1922, one was seen flying through a cornfield. One was hovering at the end of a water pipe at a spring and drinking on September 6, 1922. These birds were usually found alone, the largest group found together at one time being three.

This was on August 10, 1922. They were feeding in the willows.

The short, squeaky call note of this bird was heard several times.

All the hummingbird's nests except one were on the bluff. That one was in a tree in the creek bottom timber.

.On June 10, 1922, a nest was found saddled on a horizontal twig three eighths of an inch in diameter at the end of a branch of a large oak tree at the side of the road one quarter of a mile south. It was twelve feet from the ground. A female spent most of an hour on nearby twigs. On June 17, the nest was empty. On June 24, the female was sitting on the nest. On June 26, no bird was in sight and the nest with the two eggs was removed by cutting the twig which supported it. On August 5, a nest was found on another twig two feet away from the location of the first. This second nest appeared to be smaller than the first one had been. No bird was near.

On June 4, 1923, a female was building a nest fifteen feet from the ground in an ironwood in the timber along the creek just above the bridge. The limb was three-fourths of an inch in diameter. The nest was found at two-thirty. The bird worked until two-forty when it stopped and was not again seen until three when it resumed nest building. From twenty seconds to two minutes were required for each trip to gather material and about twenty seconds were spent at the nest on each trip. The bird, with new material to be added, stood at the edge of the nest and added the material to the outside and to the limb, drawing the bill from one

side to the other in the process. At least a part of the material was gathered from trees while the bird was on the wing.

On June 18, 1923, a nest was being built twenty feet from the ground on a branch, of a hickory tree, that was one fourth inch in diameter. The nest was eight feet from the main trunk. The tree was on the top shelf of the bluff and about three eighths of a mile south. After bringing coarse material for three trips, and placing it on the top and at the edge of the nest, the bird brought a finer material which it drew from the limb over the outside toward the edge of the nest. Then it brought more coarse material. There were a few rest periods which the bird spent on nearby dead twigs. The material was gathered from near the ground and while the bird was on the wing. Another nest was found twenty-five feet from the ground in an oak tree on the side of the bluff on that day. A female visited it once.

An adult was seen brooding on a nest on a horizontal limb of an oak tree on the side of the bluff. The nest was eighteen feet from the ground on a branch three eighths of an inch in diameter. The female left the nest once to fly after a Tufted Titmouse that came near.

A nest was found saddled on a tripple horizontal fork of a hickory on the side of the bluff on July 2, 1923. A bird went to the nest once, then left and after sitting on a dead limb for a few minutes, it returned to the nest and began brooding. One brooding adult left its nest several times

to chase a Kentucky Warbler out of its nest tree.

On July 14, 1923, a nest was found twelve feet from the ground and two feet from the end of a limb of an oak tree on the bluff west of the lake. The female left the nest when it was approached, but it stayed in the vicinity for several minutes.

The season of summer residence of the Ruby-throated Hummingbird extended from May 19, 1923 until September 15, 1923. In 1922, the last was seen on September 7.

Tyrannus tyrannus. (Linnaeus). Kingbird. (44.5)

A few Kingbirds were present all summer on the ground studied, but they were much more common during the seasons of migrations. In summer they were found along roads, in trees at the edge of the timber on the bluff, in yards, and along creeks. They fed most often in places where flying-insects were abundant. On August 18, 1923, seven were feeding from the top of a dead tree at the edge of a cornfield. They singly made trips, some of them over one hundred yards, over the cornfield where they caught insects. In the latter part of August and the first part of September 1923, a flock stayed in the dogwood trees along the lower part of the bluff one quarter of a mile south and fed on the ripened berries. During the fall season of migration, this bird was seen daily in trees and bushes along the river, creek, and lake. From these perches the birds flew out over the water to catch insects.

Kingbirds were found occasionally on telephone wires

along the roads and on wire fences. On May 17, 1924, one was feeding from a dead stick in a patch of Typha in the lake. On August 30, 1923, several were flying over the lake and stopped in the thick growth of weeds in the water. On May 8, 1924, two flocks of about ten each were found in a field along a road.

The Kingbird did not commonly nest within the limits of this area, but a few nests were located nearby under similar conditions. On June 17, 1922, a nest was found twelve feet from the ground in an apple tree on the Whittaker farm. One adult was brooding two eggs and one was perched on top of the tree. On June 23, 1922, two nests were found about twelve feet from the ground in sycamore trees at the edge of Doniphan Lake. One was on a horizontal limb and eight feet from the main trunk and one was in a crotch near the main trunk.

May 6, 1923 is the earliest spring record and September 10, 1923 is the latest date of occurrence in the fall. The latest record in 1922 is September 10.

Myiarchus crinitus. (Linnaeus). Crested Flycatcher. (37.5)

A few pairs of Crested Flycatchers nested each summer along the bluff in the timber. They fed along the bluff, in the willows on the bar, and in the timber along the creek. They were frequently found perched in tops of dead trees.

Although there was no actual nesting record, there is some evidence that these birds nested in holes in trees on the bluff. On June 13, 1923, a pair was watched at a stump in which there was a hole. Each called and in turn and hovered

before the other with rapidly moving wings.

The period of summer residence for this bird extended between April 29, 1923 and September 15, 1923. In 1922, they were not found after September 4. Crested Flycatchers in small numbers the flocks of small transients which fed together in the early part of the fall migration.

Sayornis phoebe. Latham). Phoebe. (31)

The Phoebe is rather restrictive in its choice of habitat. As there were not suitable locations for a large number, only a few pairs remained to nest. These stayed in the vicinity of buildings, especially those that were not used a great deal, bridges, and a few cut-banks that were suitable. Near these places, they perched on branches or other supports and waited for suitable insect food to come near.

On April 15, 1923, a pair was building a nest on top of a stringer in a hog shed. Only one bird brought material to the nest. It gathered sticks from the ground and carried them into the shed from different directions. This bird's mate stayed within one hundred yards. After four or five trips to the nest, the bird flew to a nearby box elder tree to feed. It hovered near and picked off insects from the twigs and buds. The air was too cool for many flying insects, the temperature being forty degrees. An adult was on the nest on April 28 and on May 13. On May 19, the nest was empty. A nest in this shed in the 1924 season had four eggs on May 11. A bird was near, but not on the nest.

A nest was found four feet from the ground on a wall of

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rock along the creek on April 22, 1924. It had five eggs. The rock projected out over the nest.

On April 28, 1923, a nest was found on the side of a vertical bank of soil along the creek. The lower part of the nest was made chiefly of mud and it was lined with moss. There were three eggs. This nest was on a level with and was five feet away from one in a similar position that had been built and used during the previous season. On May 12, there were four eggs in this nest.

A nest with three eggs was found in an old deserted house one half mile southwest on June 5, 1923. It had three eggs, but no birds were near. A bird was brooding on June 13. On June 27, the nest was empty.

A Phoebe was catching insects at a small pool in a ravine on July 10, 1923. The insects were on the surface. This was one of the hottest days of the year.

A small flock was perched in the willows and catching insects over the water in the northeast part of the lake on August 23, 1922.

During the migrations, this bird was often seen in the tops of the trees along the bluff in flocks of other migrating birds. It was most numerous in those situations during the last part of August.

In 1923 this bird was first seen on March 30. In 1924, the earliest record is March 29. The first was seen in 1925 on March 19. The latest fall record is for September 24, 1922.

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Nuttallornis borealis. (Swainson). Olive-sided Flycatcher. (2)

This flycatcher was found on only four dates, they being in the fall migration. On August 27, 1921, one was shot out of the top of a tree on the side of the bluff. Its loud call attracted attention to the bird. On September 3, 1924, one of two young birds was shot in the top of a large dead tree in the yard. One was feeding from the top of a dead tree along a road on the bluff on September 8, 1923 and one was seen in the same kind of a location on September 11, 1923.

Myiochanes virens. (Linnaeus). Wood Pewee. (47.5)

A few individuals of the Wood Pewee were seen daily in the summer. They were distributed uniformly over the timber on the bluff and along the creek. Most of their activity took place in the tops of the larger trees. The locations of these birds were most easily determined by their distinctive call note.

On June 21, 1922, a nest was found on a fork of a horizontal limb of an oak tree and twenty feet from the ground. One bird was perched on top of the tree and another flew out from the nest and together they flew after a Blue Jay and chased it from the vicinity of the nest.

A nest was found on June 25, 1923, near the end of a limb of a large sycamore at the edge of the bar near the bridge. It was twenty-two feet above the ground. An adult, that was on the nest, left and flew to a nearby cottonwood on the bar. The bird was still sitting on the nest on June 30.

A Wood Pewee chased a Blue Jay away from an oak tree on

the bluff in which there was a nest twenty feet from the ground on June 28, 1923.

Adults were calling from a sycamore tree along the creek in which there was a nest thirty feet from the ground on a limb one half inch in diameter which sloped upward at an angle of more than forty-five degrees. The nest was fifteen feet from the main trunk and four feet from the end of the limb. It was partially shaded. No trees were growing near the nest tree. There were downy young in the nest.

The latest record for 1922 is August 30. The latest record in 1923 is August 27. The earliest record for 1923 is May 19; for 1924, the earliest record is May 18.

Empidonax virescens. (Vieillot). Acadian Flycatcher. (5).

A few pairs of this bird were summer residents of this area. It was found on the lower parts of the bluff and in the ravines.

A nest was found along the lower edge of the bluff on June 14, 1922. It was hanging near the end of a branch of the elder and five feet from the ground. There were three eggs in the nest. In the lower part of the nest and covered with some of the material of the nest, there was an egg of the Cowbird. The eggs and the female were collected on June 15. The eggs were slightly incubated.

On June 26, 1923, a nest was found hanging in the end of a branch of an oak and six feet from the ground. The tree was on the side of a ravine and was twenty yards from the edge of the timber near the top of the bluff. The nest was

two feet from the end of the limb and fifteen feet from the main trunk. It was made almost entirely of the dried staminate flowers of oak. Some of these hung by the ends and gave the nest a ragged appearance. There were two young with white down on their feather tracts and with their eyes closed. One adult was brooding and one was calling from nearby. The bird on the nest left when it was approached within ten feet.

The only record for the migration season is August 29, 1922, when one was shot on the side of the bluff.

Empidonax traillii alnorum. Brewster. Alder Flycatcher. (4.5)

One was found in the willows north of Doniphan Lake on June 7, 1921. Dates on which this bird were taken are August 22, 1921; August 25, 1922; August 21, 1921; August 31, 1922, September 1, 9, and 10, 1922; April 28, 1923; and May 19, 1923. It was usually found with other small transients in willows on the bar and in the smaller trees on the bluff.

Empidonax minimus. (W.H.&S.F. Baird). Least Flycatcher. (8.5)

The Least Flycatcher was fairly common during the migrations. It was found with small transients on the lower part of the bluff, along the creek, and on the bar. It was usually feeding or calling near the ground. Several were collected. The records are between April 28 and May 20, 1923 and May 8 and 17, 1924. Fall records are between August 23 and September 4, 1922.

Otocoris alpestris praticola. Henshaw. Prairie Horned Lark.

(2)

The Prairie Horned Lark is a resident on the cleared

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portions of the hills back away from the river. It was rarely found within the bounds of the area studied. On April 8, 1923, Mr. Frank Whittaker reported that he had found, during the previous week, on the ground in a wheat field on his farm, a nest with five eggs. His description of the nest, eggs, and bird agreed with that of this species. The location and the season make it almost certain that he found the nest of this species.

Two were seen along a road one mile west on June 22, 1922.

Pica pica hudsonica. (Sabine). Magpie. (.5)

A Magpie was killed on the Whittaker farm in January 1922. The bird was mounted and is the property of a man named Byer who lives in Troy, Kansas. For several days, before the bird was killed, it was seen flying up and down creeks on the farm with flocks of Crows.

Cyanocitta cristata cristata. (Linnaeus). Blue Jay. (93.5)

Several Blue Jays were seen daily throughout the year, but they were much more conspicuous and more easy to locate in the winter. In the summer, they were found scattered over the bluffs and along the creeks wherever there was timber and occasionally one or two were seen in the willows on the bar. This bird was frequent in trees around houses and farm buildings. During the winter, this bird was found along the bluff and the creek, but it fed on or near the ground most of the time. It was often seen high in the air, flying from one part of the area to another. The loud call of this bird was

heard for long distances over the bluff and across the valley.

Although a few nested on the bluff away from houses, all the nests, that were located, were in large trees in yards or very near farm buildings. The nests were much closer together near the buildings than they could have been in other parts of the timber, according to the number of birds that were resident, so that it is evident that they made a definite choice for those suitable nesting sites that were near a human habitation.

April 20, 1924, a pair was building a nest twenty feet from the ground in a maple tree in a yard and near a farm house. One bird brought material and gave it to the other and that bird placed it on the nest. Another bird carried material to a nest on a horizontal limb of a large elm along a road. The nest was twenty-five feet from the ground. On May 8, two more nests were located in the same yard. An adult was working on a nest in a large maple and twenty-five feet from the ground and an adult was brooding on the other which was also twenty-five feet from the ground, in an elm tree. On May 17 another adult was brooding on a nest in another elm along the road. This nest was thirty feet from the ground and on a limb which sloped at a forty-five degree angle from the horizontal. All five of these nests were within a radius of one hundred yards and all were occupied at the same time.

A Blue Jay was carrying straw to a large elm, April 28, 1923.

A nest was seen in the yard mentioned above on June 3, 1923. It was twelve feet from the ground on a limb of elm that sloped at an angle of sixty degrees from the horizontal. The tree was within fifteen feet of a house. No birds were seen near. An adult was on the nest on June 4. On June 5, at 1 p.m., a bird brought food to the one on the nest and then left. One chased a Robin out of this tree on June 15. That was the third time that that pair of Blue Jays had been seen in a clash with Robins in that season. The parents were feeding young in this nest by June 22. There were three young in the nest on July 3. The wing feathers of one were projecting one fourth inch beyond the quills. In another, the feathers were still in sheaths. Two of the young opened their mouths for food when they were disturbed. The backs of the young birds were covered with a dark down. The nest was made of sticks and was lined with rootlets. After a few minutes, one of the parents came and called excitedly. On July 8, the young birds called loudly while they were being fed. More than one was fed at each trip of a parent to the nest. On July 9, the young were seen standing in the nest and exercising their wings. On July 10, the young crawled out of the nest at least a foot. Just after a hard rain on July 11, they crawled out of the nest and were flapping their wings. A large pilot snake was seen crawling up the tree. After an attempt to knock the snake out of the tree with rocks failed, a trip was made into the tree after it, but it had already reached the nest and had the head of one of the young birds

in its mouth. The bird called two or three times. After it was pried out of the snake's mouth, it fell to the ground dead. When the snake was dropped to the ground, it at first started to crawl toward the dead, young bird, but changed its course and crawled rapidly away. One of the other young fell out of the nest half an hour later. After it was dried, it was thrown into the tree where it clung to one of the branches. Later it crawled along the limb, but it fell to the ground and hopped away into the weeds. Neither parent was near during all this time. All the young were thoroughly wet after the rain. The remaining young bird was hopping in the tree near the nest on the morning of July 12. The parents were present in the morning, but the nest was empty in the afternoon and no trace of the family was seen afterward.

On June 14, 1923, a nest was found thirty feet from the ground in a maple that was thirty-six steps away from the tree in which the last described nest was located and which was in the same yard. An adult was calling excitedly and a young bird just out of the nest was perched on a small limb of the same tree and five feet from the ground. The tail of the young bird had not yet grown out. Its color was lighter than that of the adult.

A nest was found in a box-elder in the same yard on June 16, 1922.

The earliest indication of flocking in this species in summer was on July 13, 1923, when a group of four was flying together down the creek above the bridge. Two of the group

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stopped in the tops of large trees and began calling while the other two kept on their way. On July 14, a larger flock was calling loudly from the trees along the creek. Small flocks were found until about the first of April when they began to break up into pairs in preparation for the coming nesting season.

This was one of the most quarrelsome species of birds in the area and it was often either attacking other species or being the object of attack. The Robin, Wood Pewee, Blue-gray Gnatcatcher, Red-eyed Vireo, and some other species showed at various times a tendency to be unfriendly with the Blue Jay.

Corvus brachyrhynchos brachyrhynchos. Brehm. Crow. (98.5)

The Crow is one of the dominant birds of the area. Some were found almost every day of the work. The number present varied, from a few scattered pairs to flocks of several thousand, according to the time of year. This is one of the most conspicuous species present and its presence could nearly always be determined with a few minutes observation.

Crows fed on the bluff, in fields, on the bar, on newly formed sand-bars in the river, and at the lake. Especially in the winter, large flocks were to be found at all times of the day in some part of the lake or perched in the nearby trees on the bar. They walked on the mud at the edge of the water and when the water was low or was frozen, they scattered over the ice and picked up various kinds of plant and animal food.

On March 30, 1923, one was seen flying over the lake. It paused in the center and lighted in the shallow water. It moved a short distance and picked up an object from the water which it carried to the shore and began eating. It was driven from its meal and left a gar pike (Lepisosteus platostomus) which was about eight inches long. Another Crow picked up some small object in the water which it carried to shore and began eating in the same way. Two other attempts to catch fish that were made by Crows flying across the lake were failures.

The large crop of Nelumbo seeds that was produced each year furnished an easily obtained food supply for the flocks of wintering Crows. The stalks which bore the ripened seeds did not usually fall below the surface of the shallow water in which the plant grew and it was easy for a Crow to pull off one of the heads full of seeds and carry it to some place on the shore to eat the nuts. Sometimes the seeds were not carried away to be eaten, but they were pulled out, cracked, and eaten where they were found. Empty shells of the seeds of this plant and empty heads were found scattered over the bar and bluff near the lake. From the first of December until the first of April, this plant furnished one of the important sources of food for the wintering Crows. Of course, several other kinds of food were available at the lake and nearby on the bluff and on the bar, but they were usually present in lesser abundance..

On January 27, 1923, a large flock of Crows was feeding

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in a burned field one half mile west. Another flock was feeding on the ground in the willows near the lake where the leaves and weeds had been burned. On January 28, 1923, one was feeding on a rabbit that had been used to bait a trap.

About two hundred Crows were feeding all day of March 30, 1923 on a ten acre cleared field that was being plowed on the bar. The field was being plowed in one "land" from the outside to the center. The feeding Crows were watched when three-fourths of the field had been plowed. They were scattered entirely around the field and were chiefly on the inside furrow or the last one that had been plowed. Those birds in front of the plow moved ahead and those behind kept close so that practically all of the exposed dirt was searched over by the feeding birds. In one trip of rapid walking around one of the open furrows, thirteen white grubs, three beetles (Lachnosterna), one pupa of a beetle, and another kind of insect larva were picked up and a like number of earthworms were seen. This was probably very much less than the amount eaten by the Crows in each furrow. The total amount of animal life eaten in this field in a day must have been large. The birds were continually arriving and leaving, but the number feeding did not change greatly. The near freezing temperatures might have killed the grubs if the Crows had not been present. These birds were much more tame in this field than in other parts of the bar.

A stomach of a Crow that was shot on January 26, 1923, contained one part insects (Homiptera) and thirty-three parts

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corn. The stomach of one shot on January 27, 1923, contained eight parts corn, one part insects, and a few spiders. One that was collected on January 28, 1923, had in its stomach the equivalent of six grains of corn and one grain of wheat. At the time when these birds were collected, practically all of the corn from the vicinity in which they were feeding had been gathered and they could scarcely have obtained any except that which had been left in the field and which was waste. The contents of four other stomachs that were taken from birds that were killed in the winter were much the same as these except that two of them contained remains of seeds of Nelumbo lutea.

Not a single instance of damage by the feeding of Crows was noted in this area during the time of observation, and the facts obtained show that within this area and at the time of these observations the Crow was almost entirely beneficial.

A large flock was feeding on the carcass of a dead pig that was on the bar on February 6, 1924.

On winter days, Crows were often found perched in trees on the bar or on the bluff where they were usually in small flocks that were calling. Although there were no winter roosts within this area, Crows were seen flying up the creek valley nearly every morning in winter and flying down the valley toward the east nearly every evening. Usually they flew over the river and a little north of east.

On March 2, 1924, one was chasing another into the air

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and was calling. The flocks were not so condensed, and the birds called more than they had at other times in the winter.

At one place on the bar on March 31, 1923, a Crow gave a call note of alarm. Immediately, several hundred others assembled from every side, but after flying overhead and calling for a few minutes, they left. Fifty yards away a nest was found that appeared to be one of the season, but unfinished. Another nest was found on the bar on the south side of the creek. An adult called and left. On April 1, 1923, a nest was found thirty-five yards away from the nest south of the creek and another was found fifty yards away from them. Another bunch of new material was found in a nearby tree. All of the nests were in cottonwood trees and were unoccupied. All the Crows noted at this time seemed to be restless and to be preparing to nest. Often, pairs would leave a flock to fly after one another. On April 7, another nest was found in the group on the bar south of the creek. It was twelve feet from the ground in a cottonwood tree, and contained one egg. One of the nests was empty, one had three eggs, and another had five eggs. The Crows flew away without calling much. One bird was sitting on one of the nests on April 28.

On April 20, 1924, a brooding adult left a nest twenty-five feet from the ground in a medium sized elm along the creek above the bridge. The bird did not fly until the tree was hit.

A family of young Crows, just able to fly, was found with a pair of calling adults in the timber near the bluff on May

29,1924. A family of young birds was leaving a nest on the ¹⁵⁵ bar that was fifteen feet from the ground on June 8,1922.

A nest was found twenty feet from the ground in an oak tree in a ravine on the Whittaker farm on June 11,1922. It was one hundred yards from a Cooper's Hawk's nest. There were three or four young birds without feathers in the nest. No adults were seen nearby in the morning or in the evening.

Large flocks of Crows were usually found on the area from early fall until early spring. When moving from one place to another, the flocks did not usually move together, but they moved in smaller groups that followed one another.

On February 17,1923, a mounted Great Horned Owl was placed in a tree near an old house on the bluff north of the lake. At three-thirty, or one hour after the skin was placed in the tree, the Crows discovered it and began calling. Within five minutes, twenty-five or thirty were calling in the nearby trees. At three-thirty-six, one of the birds was shot. Most of the others left. After one minute, they began to return. Then they left, except three, which stayed for five minutes. They may have noticed a movement in the building or they may have discovered the fraud. Whenever an owl or a hawk was flushed, it was usually discovered and surrounded by a flock of calling Crows within a few minutes.

A much larger number of Crows was present during the winter and the seasons of migrations than during the summer when they were usually scattered.

Molothrus ater ater. (Boddaert). Cowbird. (45)

The Cowbird was found almost daily during the summer. It was usually found singly or in small groups of three or four. It was found in the willows on the bar, along the creek, and in the trees on the bluff, as well as on the ground in fields and pastures where it was often associated with feeding herds of stock.

Females were often seen in the summer, crawling through the branches of trees on the bluff and on the bar and searching every limb for nests of other birds, where they might lay their eggs. Some of the species in whose nests Cowbird eggs were found or that were seen feeding young Cowbirds are;

- Empidonax virescens, Spiza americana, Cyanea passerina, Vireo-
- sylva olivacea, Icteria virens virens, Geothlypis trichas
- trichas, Thryothorus ludovicianus ludovicianus, Hylocichla
- mustelina, and Cardinalis cardinalis cardinalis.

The latest record of a young bird is August 31, 1923, when one was being fed by a Cardinal. Young were being fed by a Carolina Wren on June 17, 1923.

During the seasons of migration, these birds were found mixed in the flocks of other kinds of Icteridae that flew over during the day and fed in the fields. The earliest record is April 1, 1923, and the last fall record is November 4, 1923, when some were seen in flocks of grackles.

Xanthocephalus xanthocephalus. (Bonaparte). Yellow-headed Blackbird. (1)

On May 4, 1924, a Yellow-headed Blackbird was seen along

a slough near the lake on the bar and one was in a small tree near Doniphan Lake. There were several in the Typha in the lake on May 17.

One nest was found in Typha in the lake on May 30, 1924. It was in a clump of stems and was two feet from the water. There was no bird on the nest which held the shells of some broken eggs of this blackbird.

Agelaius phoeniceus phoeniceus. (Linnaeus). Red-winged Blackbird. (63)

Not enough specimens of this species have been collected to determine the seasonal occurrence of each of the four subspecies that are found at some time in the year at this location.

In summer, this bird was common in suitable parts of the area, and in the seasons of migration it was very common in flocks. Part of the time in the winter, one or more subspecies were common.

In summer, this bird was found in colonies around the lake, in the willows near the mouth of the creek, and at the marshy places below springs on the bar. At other times it was more general in its distribution, being found in trees along the bluff, on the bar, or in yards, and sometimes on telephone wires along roads. Once, a flock was resting on piles of drift that were on the bar. On March 30, 1923, one was feeding on the ground in a burned-over clover field. On February 3, 1924, about four hundred came to a weed patch on the bar near the creek. They came in flocks of about fifty and

from a few seconds to several minutes apart. All settled together. After a few minutes, they flew to the tops of cottonwood trees nearby and then left in small flocks which flew towards the east. Nearly all were females. On March 29, 1924, some large flocks fed on the ground and in cornfields on the bar.

In the evening of March 1, 1924, this bird was going to roost in the patches of Typha in the lake. Small flocks kept moving from one part of the lake to another, until it was too dark to see across the lake. Some stopped in the Typha in the evening of September 12, 1923. A few times, it was seen stopping in patches of Nelumbo in the lake.

This blackbird was rather closely restricted to the immediate vicinity of its nesting ground in the summer. Few were seen away from there.

On May 29, 1924, three nests with four eggs, one nest with three eggs, and several unfinished nests were found in the Typha growing out of the water south of the lake. The nests were from two to three feet from the ground. Adults were calling near all of them, but only one female was seen on a nest. On May 30, three nests with four eggs, one nest with three eggs, and one nest with one egg were found in the Typha that was growing in the water of the lake. Some females were seen gathering material and several nests were found that were just started as well as several that were nearly finished. Those nests which were nearly finished were wet. Several of the nests were within sight of others and two

were as near together as twelve feet. The nests were from six inches to two and one half feet above the water. Adults came and called when the nests were approached, but they were not very noisy.

A nest was found on June 5, 1923, five and one half feet from the ground in a willow ten feet high that was growing one hundred yards from the bluff on the bar near the spring one half mile south. A female was sitting on four eggs. Another nest with four eggs was found in a willow near the mouth of the creek. It was six feet from the ground.

A nest was found two feet from the ground in Typha in a marshy place on the bar on June 9, 1922. A female was brooding.

On June 12, 1922, a nest was found with five young that was four feet from the water in a willow at the edge of the lake. A nest containing three eggs was found in Typha in the lake on June 14, 1922.

On June 27, 1923, a female was seen at the edge of the lake carrying a straw and another was seen carrying an excreta sac which it dropped.

The earliest date on which flocks of this bird were seen in the summer is July 17, 1923. In the early spring, it was found in flocks as late as April 22, 1924. During the seasons of migration, it often joined with other members of its family especially the Bronzed Grackle in large flocks which fed over the country together in the daytime and went to roost together in the evening. Just before dark, these

flocks were often seen flying east down the creek valley in the fall. Several small flocks sought protection from the cold in thickets of willows on the bar on March 4, 1923.

After the nesting season, these birds were moulting and were not often seen except singly until about the middle of September. On September 5, 1923, most of those that were seen flying across the lake were tail-less.

Sturnella magna magna. (Linnaeus). Meadowlark. (4.5)

Since there was an almost total lack of conditions that resembled prairie within this area, there were few Meadowlarks. Most of them that were seen, were in the upland fields and pastures. Some were seen along the roads within one half mile.

On October 7, 1922, one was flushed on the flat and nearly bare ground on the south side of the lake. Another was found in almost the same location on November 18, 1923. This individual was ~~silent~~, but it was light in color and appeared to be the subspecies neglecta.

A Meadowlark was carrying nesting material in a small blue grass pasture one mile north on June 20, 1922.

Icterus spurius. (Linnaeus). Orchard Oriole. (30.5)

A few individuals of this bird were seen almost daily during the entire summer season. It was found in the trees along the bluff, along the creek, on the bar, and in yards around the houses. During the early fall migrations, it was found feeding with small transients in the weed patches along the creek. Two young males perched in the tops of

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clumps of Typha in the south part of the lake on June 27, 1923. They sang and after a few seconds, flew on toward the river. This bird often chose a perch near the top of a tree from which to sing.

A pair was seen feeding a young bird just out of the nest in the E.V. Roundy yard on June 19, 1922. On July 3, 1923, one carried a straw to a nest in the top of a cottonwood at the edge of the bar near the creek. A pair was seen mating in the top of a medium sized tree in the E.V. Roundy yard on June 4. A nest was found thirteen feet from the ground in the top of a willow on the south side of Doniphan Lake on June 7, 1923. A female flew off the nest. After five minutes, the male came and perched in a nearby tree. On June 26, 1923, a female brought straw and weaved it into the beginning of a nest in the end of a hackberry limb in the E.V. Roundy yard. The nest was fifteen feet from the ground.

Young birds were seen leaving a nest on July 16, 1923.

A small flock was feeding in weeds along the creek on September 13, 1923.

The first arrival in the spring was noted on May 6, 1923. In the fall none were seen after September 15, 1923.

Icterus galbula. (Linnaeus). Baltimore Oriole. (52)

The Baltimore Oriole was found daily in the summer and usually several were seen each day. It was most common in the large trees around the farm buildings, but it was also found along the bluff and in the trees on the bar. In the fall, it sometimes fed in weed patches along the creek.

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A female was working on a nest ten feet from the ground in the end of a drooping branch of a maple in a yard on June 4, 1923. A male was singing nearby. An incomplete nest was found in the top of a willow tree on the bar on June 6, 1922. A pair of orioles chased a Blue Jay away from the vicinity and the male sang in a nearby tree.

A male was feeding young in a nest at the end of a drooping limb of a large elm in a yard on June 14, 1922. On June 17, 1922, a nest with young was found thirty-five feet from the ground in the top of an oak tree in the timber on the side of a hill north of the lake. Both adults brought food to the young which called loudly. A nest with young birds was found in a yard on June 26, 1922. It was twelve feet from the ground. Young were found in nests as late as July 18, 1923.

Several of these birds that were seen together in an oak tree on the bluff on June 29, 1923, may have been the young of a single family. Small flocks were seen in the tops of trees along the bluff and with other transients on May 10, 1924 and on May 12, 1923. They stayed in compact flocks. In the fall, this species was often a conspicuous part of the feeding and migrating flocks of small birds. On August 27, 1923, this bird was the most common transient in the flock which was feeding in the tops of the trees along the lower part of the bluff and one quarter of a mile south. These birds were calling and keeping close together as they fed.

May 6, 1923 is the earliest record for the spring. The

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latest fall record is September 6, 1923. In 1922 it was last seen on September 2.

Euphagus carolinus. (Muller). Rusty Blackbird. (2.5).

One of two Rusty Blackbirds was shot in a small tree along the lower part of the bluff on April 7, 1923. On November 4, 1923, flocks were seen with other blackbirds in the tops of cottonwood trees along the lower part of the bluff north of the lake. It was seen on November 17 and 18, 1923. On December 1, 1922, one flew from the top of the EVV. Roundy barn to a corn crib.

Quiscalus quiscula aeneus. Ridgway. Bronzed Grackle. (19.5).

In summer, the Bronzed Grackle was infrequently seen within the area studied. It was abundant during the seasons of migration and sometimes flocks of several thousand were seen. A few were occasionally seen in winter.

Most of these birds that were seen were flying over. Sometimes they stopped in the tops of trees in yards or along the bluff to rest. In the evening of November 3, 1923, several large flocks were flying south along the bluff to a place about two miles south where they were gathering for the night. Just before dark on October 20, 1923, small flocks of from one hundred to two hundred formed an almost continuous line flying over the lake from the southeast to the willows on the north edge of the lake. They kept moving back and forth in flocks from the edge of the water to the trees. The noise that the flock made could be heard plainly on the bluff west of the lake. Large pine trees near houses were

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favorite resting places for this bird.

Three were feeding in leaves on the ground on the bluff near the lake on January 24, 1923. One appeared to have a broken wing.

One that seen in a yard at six thirty in the morning of June 13, 1922, was eating corn at a sheller.

The nearest nest of this species that was found was twenty feet from the ground in the top of a box elder along the creek near Doniphan. An adult flew to the nest on June 17, 1923. Another adult was carrying food near the same creek.

Several good sized flocks were seen flying down the river on October 28, 1922. They appeared to be following the west bank. Just before dark on that day, a flock, stretching in a thin line from the west bluff out over the river as far as could be seen with a four power glass, flew up the river. It was flying at a considerable height. On November 8 and 9, 1924, several flocks were seen flying up the creek valley in the morning and down the valley and east over the river in the late afternoon and evening.

The greater number of this species was present in the spring during the last of March and the first of April and in the fall from early in September until late in November, but small numbers were present throughout the year.

Carpodacus purpureus purpureus. (Gmelin). Purple Finch. (9.5)

Purple Finches were present in groups of two or three or flocks of twenty or thirty. They fed in winter in the weed patches along the creek, on the bar, and in the trees and near the ground on the lower part of the bluff. Flocks were often

found resting and singing in the willows on the bar and in small trees on the lower part of the bluff.

This bird was found from October 20, 1923, the earliest fall record, until May 6, 1923, the latest record for the spring. None were seen in December.

Astragalinus tristis tristis. (Linnaeus). Goldfinch. (82)

Goldfinches were seen almost daily.. In the summer, this bird was found in pairs and at other times of the year it was in small flocks. It fed at the edge of the timber, along the roads, in weeds and willows on the bar, in timber along the creek and on the bluff, in patches of Typha at the lake, in fields, and in yards. Weed patches were the favorite feeding grounds in winter.

Individuals were several times found bathing in pools in the creek.

No nests were located although pairs were seen together throughout the summer.

In the fall migration, these birds joined the flocks of feeding birds that were present on the bar and along the creek. In the spring they were found with transients singing and feeding in the tops of the trees as they were coming into leaf.

Spinus pinus. (Wilson). Pine Siskin. (8.5)

The Pine Siskin was present during the winter in flocks which were usually not large. It fed with other sparrows in the weeds and trees on the bar, along the lower part of the bluff, and along the creek. Many times, it was with Purple

Finches or other kinds of small winter residents.

Records are in the winter months between November 3 and March 16.

Passer domesticus. (Linnaeus). English Sparrow. (99.5)

This sparrow was conspicuous and was seen daily because it was always present in the vicinity of farm buildings. In other parts of the habitat, it was not present throughout the year. It was most numerous in yards and around buildings in the summer and in the winter it joined the flocks of native sparrows to feed in patches of weeds along the creek. Compact flocks were often found in brush piles on the bar in the winter. Many were feeding in a millet patch on August 23, 1923.

The English Sparrow nested in holes and nooks about buildings and bridges and in holes in trees in yards. Birds were carrying nesting material as late as July 19, 1923. On July 4, 1923, a nest was found that was built on a nest of a Robin that was in an apple tree in an orchard. It contained one egg.

Passerculus sandwichensis savanna. (Wilson). Savannah Sparrow.

(1)5)

This bird was found only three times. One was shot in the top of a small tree on the lower part of the bluff on April 8, 1923. Other records are for birds in the willows on the bar on April 21 and 22, 1924.

Ammodramus savannarum australis. Maynard. Grasshopper Spar-

row. (2)

This sparrow was found in summer in fields on the Whittaker farm. One was shot in an alfalfa field on September 5, 1922.

Passerherbulus lecontei. (Audubon). Leconte's Sparrow. (1.5)

Single birds of this species were seen in weeds at the side of a road on April 1 and 7, 1923. One was shot in grass in a marshy place on the bar north of the lake on April 17, 1923.

Chondestes grammacus grammacus. (Say). Lark Sparrow. (4.5)

A few single Lark Sparrows were found in pastures and fields and along roads. An adult was brooding four young in a nest on the ground in a weed patch at the top of a vertical bank on the Whittaker farm on June 9, 1922.

One was seen in the brush along the creek above the bridge on May 8, 1924. Another was seen in a sandy field at the edge of Doniphan Lake on May 13, 1923. The only fall record is for September 3, 1922.

Zonotrichia querula. (Nuttall). Harris's Sparrow. (14.5).

The Harris's Sparrow was found during the winter in small scattered flocks in brushy and weedy places on the bar, on the bluff, and along the creek. Piles of brush on the recently cleared ground on the bar and on the bluff were favorite places of refuge for small groups of these birds. On March 30, 1923, one was feeding on the ground in a burned over clover field.

In the spring, this sparrow was present between January 25 and May 13, 1923 and between February 7 and May 8, 1924.

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Fall dates are between October 20 and December 2, 1923 and October 28 and 29, 1922.

Zonotrichia leucophrys gambeli. (Nuttall). Gambel's Sparrow.

(.5)

One was shot at the top of the creek bank on the bar on May 4, 1924. Another was seen in a brush pile on the bar on March 21, 1925.

Zonotrichia albicollis. (Gmelin). White-throated Sparrow.

(8.5)

The White-throated Sparrow was usually found in small groups of from two to half a dozen. It fed in weed patches along the lower part of the bluff, along the creek, and in brushy places on the bar. It was sometimes found with Harris's Sparrow.

The records of occurrence in the spring are between April 8 and May 13, 1923 and April 5 and May 3, 1924. In the fall, this bird was found between October 6 and November 3, 1923.

Spizella monticola monticola. (Gmelin). Tree Sparrow. (22)

The Tree Sparrow was one of the most common winter residents of the area. It was found in considerable numbers daily throughout the winter and it was usually present in loose flocks that were feeding. It fed in weeds on the bar and on the bluff and in Typha near the lake.

October 21, 1923 and April 14, 1923 are the earliest and latest dates of the winter occurrence of the Tree Sparrow in this area.

Spizella passerina passerina. (Bechstein). Chipping Sparrow. (1).⁶⁹

Although one or two pairs of Chipping Sparrows probably nested within the limits of the area studied, no nests were found and individuals were seen on only four times. On April 22, 1924, a pair was seen in trees in a yard. One was shot in an Alfalfa field on May 12, 1923. One was singing in the top of a tree in a yard on June 11, 1922. Another was singing in the top of a tree in a yard on June 28, 1922.

Spizella pallida. (Swainson). Clay-colored Sparrow. (.5).

One was shot that was singing in brush and shrubbery along a road on April 20, 1924.

Spizella pusilla pusilla. (Wilson). Field Sparrow. (34)

Several pairs of Field Sparrows nested in suitable parts of this vicinity. This bird was found in brushy fields, in openings in the timber on the bluff and on the bar, in brush at the edge of timber, and in clearings along the creek. It was more often heard singing than it was seen. It was heard singing as late as September 6, 1923.

On June 14, 1923, a nest was found one and one half feet from the ground in a clump of coral berry in the edge of a pasture on top of the bluff. It contained one egg. Another was found three feet from the ground on a horizontal limb of an oak sprout eight feet high on July 18, 1923. It was shaded and contained two eggs.

April 7, 1923 is the earliest record of spring arrival except one that was seen on March 19, 1925. October 11, 1924 is the latest fall record.

Junco hyemalis hyemalis. (Linnaeus). Slate-colored Junco. (30).

Throughout the winter, this bird fed in large groups in weeds and brush on the bar, on the bluff, and along the creek. Although it was nearly always on or near the ground, it was sometimes found in the tops of the trees. It was sometimes found in brush piles.

In the winter, juncos were often flushed in the evening after they had gone to roost in holes in banks along the roads or on the bluff. They seemed to prefer places that were protected from the wind and where there was a ground cover of loose leaves. Sometimes, they were found at night in the tops of shocks of corn in the fields. On January 12, 1923, some were seen going to roost as early as four-thirty in the afternoon.

This species contributed the largest numbers of individuals to the large flocks of seed-eating winter resident birds.

Juncos were often heard singing from perches in trees before they left in the spring.

The earliest date of arrival in the fall is September 24, 1922. In the spring, it was found as late as April 22, 1924.

Melospiza melodia melodia. (Wilson). Song Sparrow. (26.5)

Several individuals of this species were seen on each day of work in the winter. They were found scattered singly or in small groups that fed near the ground on the bar and on the bluff. They preferred the vicinity of the lake and were often flushed from thickets of Typha or from weed

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patches near the water. These growths may have been used for their protective value as hiding places more than for feeding. Birds that were flushed while feeding nearby nearly always flew hurriedly to these thickets.

Singing birds were heard in both the fall and spring.

October 7, 1922 is the earliest fall record and May 12, 1923 is the latest record of the presence of this bird in the spring. Most of the Song Sparrows left before the middle of April in both years.

Melospiza lincolni lincolni. (Audubon). Lincoln's Sparrow. (13).

The Lincoln's Sparrow was found singly or in small groups of two or three near the ground in brushy growths on the bar and in the timber on the bluff. It was also found in fields and along roads. Some were seen in the wet grassy places on the bar and in the growths of Typha around the lake which were good hiding places.

In the fall of 1922, this bird was seen on September 24, October 8 and 28, and December 1. In the spring of 1923, it was found on March 30, April 14, 28, and 29, and May 5, 6, 12, and 19. November 3 is the only fall date for 1923. In the spring of 1924, the bird was seen on February 8 and from April 19 until May 17.

Melospiza georgiana. (Latham). Swamp Sparrow. (8)

Not more than two or three individuals of this species were seen in a single day. During the migrations, it was found chiefly in the Typha and grass in wet places around the lake and on the bar. It was found a few times in weeds

on the bar, around the edges of fields, or along the creek. On April 8, 1923, one was caught in a trap that was baited with bacon and set among Typha below a spring along the bluff.

The fall dates of migration are between October 20 (1923) and December 1 (1922). The spring dates are between March 3 (1923) and May 12 (1923), with the larger number of them in April.

Passerella iliaca iliaca. (Merrem). Fox Sparrow. (12.5)

Small flocks of the Fox Sparrow were frequently found in the winter and especially when it was migrating. It fed with other seed-eaters in the weed patches on the bar and on the bluff and was usually in the drier portions of the area. Although most of their feeding was on the ground, flocks of this species were frequently seen moving through the tops of the trees. They sought protection in the piles of brush that were left in clearings over the winter.

October 21, 1923 is the first date of occurrence in the fall. There are no December records. In the spring, the Fox Sparrow was seen as late as April 14 (1923).

Pipilo erythrophthalmus erythrophthalmus. (Linnaeus). Towhee. (21.5)

A few pairs of the Towhee were present at all seasons of the year, but it was never conspicuous or numerous. It was found in all the months except January, September, and December; when it was probably overlooked.

This bird fed singly or in pairs on or near the ground in brushy places on the bar, along the creek, and especially

along the lower edge of the bluff.

A male was heard singing in a small tree along the creek on May 18, 1924 and another was singing on the lower part of the bluff on June 15, 1923. Others were singing in this location on June 20 and 21, 1922.

No nests were located. Two young birds of the season were seen near the ground in the willows on the bar on July 19, 1923.

Cardinalis cardinalis cardinalis. (Linnaeus). Cardinal. (100).

The Cardinal was the most numerous and most evenly distributed species of bird within the area. This is the only species that was found every day that observations were made. From ten to fifty or even more of these birds were always found in a day's work.

During the summer, they fed over the whole area where the covering of vegetation was suitable for them to find a food supply. In the winter, Cardinals joined the other seed-eaters and fed in the weed patches on the bar and along the creek. Of course, some were found in other parts of the area, but the larger number spent most of their time in those places where the food was more plentiful and where there was greater protection from the weather.

On the night of December 2, 1922, several were flushed that were roosting in brush piles and small bushy trees and vines on the side of the bluff. On March 29, 1923, one was going to roost in the evening in the tangle of roots under an overhanging bank along the creek.

The loud whistle of this bird was heard on clear days in all parts of the year. It was heard on some of the coldest days of the winter and on some of the hottest days of the summer. On March 4, 1923, two males were singing in trees on the bluff that were less than fifty yards apart. Two were singing from the tops of oak trees one hundred yards apart on the side of the bluff on April 7, 1923.

One was bathing in a pool in the creek near the bridge on June 7, 1923.

Evidence of the approaching nesting season was noted in the activity of this bird early in the spring. On April 8, 1923, two males were chasing the same female through the tops of trees on the bluff. By the fourteenth, the birds were less conspicuous than they had been and they were found in pairs that were scattered over the bluff and the bar.

A female was brooding on a nest in roots under an overhanging bank along the creek on April 20, 1924. The nest was seven feet above the level of the creek bed. It contained three eggs. On April 28, 1923, a female flew from an empty and unfinished nest in roots four feet below the top of another overhanging bank on the creek. A nest with one egg was found in a vertically hanging grape vine over the creek one half mile west on May 8, 1924. The nest was seven feet above the water in the creek.

A nest was found four feet from the ground in some brush on the lower part of the bluff on May 11, 1924. It contained two eggs of the Cardinal and one of the Cowbird.

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On the ground nearby, there was another egg of the Cardinal that was broken. A female was nearby.

On May 12, 1923, a nest was found in a leafless sapling on a slope of a ravine on the bluff. In it were two eggs which had holes in their sides one fourth inch by three eighths inch in diameter. Each was about half empty. Otherwise, the nest appeared to be undisturbed. It was six feet from the ground. This is an example of the dangers which come to nests that are placed in too conspicuous places. On the same day, a female was found sitting on a nest five and one half feet from the ground in a grape vine under a leaning tree on the lower part of the bluff. Another female was brooding three eggs in a nest three feet from the ground in a small scrubby tree on the lower part of the bluff.

On May 26, 1923, a female was sitting on four eggs in a nest in a rose bush along the bluff near the lake. The nest was five feet from the ground. The brooding female did not fly until it was approached closely enough to be touched. It then called very nervously.

A nest was found three feet from the ground in a willow near Doniphan Lake on June 3, 1923. There was one egg in the nest, but no bird was in sight.

A brooding female flew from a nest six feet from the ground in the top of a fallen cottonwood which had its leaves on June 7, 1923. The tree was on the bar northeast of the lake.

On June 8, 1922, a nest was found four feet from the

ground in a clump of elder near a creek. Of the three eggs that had been in the nest the day before, only one was left. The others were probably thrown out by cattle walking through the brush. Another bird was carrying straw and starting a nest three feet from the ground in an elm sprout at the side of a road. On June 13, there was one egg in the nest. A female was brooding young in the nest on June 28.

A nest was found on June 9, 1922, that was six feet from the ground in a box elder on the side of a pasture ravine on the Whittaker farm. It contained four eggs, one of which was a Cowbird's egg. A female was sitting in another nest in an osage orange tree, on the same farm, which was six feet from the ground and had three eggs.

A female was sitting on an empty nest six feet from the ground in a shrub covered with a grape vine that was growing on the side of the bluff on June 10, 1922. On June 16, there were two eggs in the nest. On June 10, 1923, a female was brooding two young with wing quills that were in a nest in coral berry four feet from the ground and along the lower edge of the bluff. The female flew off when the bush was touched and called nervously from a nearby bush. On June 13, the wing feathers of these birds were beginning to break through the sheaths.

A female was brooding on a nest seven feet from the ground in a grape vine that was growing on a horizontal limb of a small *nyctanthe* that was growing at the lower edge of the bluff. The bird left the nest when the vine was

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touched.

On June 14, 1923, a nest was found three feet from the ground in a leaning dogwood on top of the bluff. The nest was made of leaves, grasses, stems, and grape vine strippings. There were three young with wing feathers showing one fourth on inch beyond their sheaths. They called when they were disturbed, but later became quiet. One of them opened its mouth which was red inside. A male with a caterpillar in its mouth called anxiously nearby. A pair of chats came and called.

A female was sitting on a nest nine feet from the ground in ivy that was growing on the trunk of a cottonwood at the edge of a clearing on the bar near the lake on June 19, 1922.

On June 24, 1922, a female was building a nest ten feet from the ground in a willow one hundred yards from the lower edge of the bluff and on the bar.

A pilot snake was taken out of a nest in a grape vine which was growing on a large willow along the creek above the bridge on July 4, 1923. The nest was ten feet from the ground. Both parents called excitedly from nearby.

On July 6, 1923, a female was flushed from a nest eleven feet from the ground in a grape vine growing over a mulberry on the lower part of the bluff near the lake. The nest was near the top of the tree. A male called nearby. Another female was working on a nest twelve feet from the ground on a leaning horizontal limb of a small tree in the bottom of a

ravine north of the lake on July 10, 1923, one of the hottest days of the summer. A male that was in the same tree left with the female. Work on the nest had just started.

A pair was building a nest in a drooping limb of an elm tree along the creek on July 13, 1923. The nest was nine feet from the ground and was shaded by the rest of the tree. The female gathered the material from the ground and from among the roots of fallen trees on the opposite side of the creek and from one hundred to two hundred yards away, and carried it directly to the nest. On each trip, the male followed fifteen or twenty feet behind the female and stopped ten or twenty feet beyond where the female stopped. This was between ten-thirty and eleven-thirty in the morning.

A pair called nervously near a nest five feet from the ground in a leafless willow on the bar on July 17, 1923. The nest was made of fine twigs and was fastened to the main trunk by small branches. It contained one egg.

A nest with three eggs was found six feet from the ground in a hickory sprout ten feet high at the edge of the timber on top of the bluff on July 19, 1923. It was on a horizontal limb and was unshaded. A female was brooding three eggs.

The latest nest that was found with eggs was found on August 25, 1923. It was five and one half feet from the ground in an oak sprout at the side of a road and had two eggs. It was shaded. The brooding female left when approached within ten feet and called excitedly.

A pair was feeding a young Cowbird on the bluff on August 31, 1923. A young Cardinal just out of the nest was seen on September 13, 1923.

Cardinals were frequently found in flocks during the winter. These flocks were made up of birds of both sexes and were rather compact. They moved through the tops of the trees or fed with other sparrows along the creek, on the bluff, or on the bar. In March, these flocks broke up into pairs that began to prepare for the coming nesting season.

Zamelodia ludoviciana. (Linnaeus). Rose-breasted Grosbeak.

(33)

The Rose-breasted Grosbeak was represented during the nesting season by only a few pairs of adults. It was found in orchards, in trees around farm buildings, along the bluff, and in trees along the creek. In the season of migration, they became more numerous and were found with other transients on the bar and on other parts of the area. These birds usually fed in the tops of the trees and when singing, the males chose perches in the tops of living or dead trees.

A nest was located seventeen feet from the ground in the top of an apple tree in an orchard on June 13, 1923. It was in a crotch of an upright limb and was made almost entirely of tendrils of grape. Three several day old young that were covered with light gray down were in the nest. A male called very nervously and flew about the tree when the nest was disturbed. No female was seen. A pair of Robins came to the vicinity of the nest and called.

A dead female was hanging from the edge of a nest ten feet from the ground in a box elder along a creek at Doniphan on June 17, 1923.

First records for this species in the spring are May 5, 1923 and May 4, 1924. In the fall it was seen as late as September 10, 1922 and September 15, 1923. Small groups of feeding transients were seen together as early in the fall as August 24, 1923, when they were in trees along the creek. Usually, this species did not form compact flocks, but was scattered among the larger flocks of other small transients.
Passerina cyanea. (Linnaeus) Indigo Bunting. (65.5)

The Indigo Bunting was one of the most numerous summer resident birds of the area. It was uniformly distributed over the terrestrial part of the habitat and especially chose those places where the covering of vegetation was composed of brushy shrubs. It preferred the edges of clearings, roadsides, the weedy boundaries of fields, and overgrown fields of weeds and sprouts. Although usually near the ground, it was sometimes found in the tops of trees.

A female was seen carrying straw in an opening in the timber near the top of the bluff on June 4, 1923. Mating pairs were seen on June 8 and 12, 1923.

A female was brooding three eggs and one egg of the Cowbird in a nest two feet from the ground in coral berry along a fence on June 13, 1923. There was a thick growth of nettles four feet high around the nest.

A nest with four young about half grown was found in a

small bush along a road on the bluff on June 16, 1922. On the same day, another nest was found in coral berry along the same road. It was one foot from the ground and held two young about the same age as those in the other nest. The parents were very shy and did not come near the nest for over half an hour except once when the female flew over it. A loosely built nest that was nearly hidden by leaves was found five and one half feet from the ground in the top of a dogwood on the bar north of the lake on June 16, 1923. A female that was sitting on three eggs and one of the Cowbird did not leave until she was almost touched. Both birds called excitedly.

On June 19, 1922, a female was brooding three eggs and one Cowbird's egg in a nest nine feet from the ground in a crotch of the main trunk of a young cottonwood. The nest was on the bar and twenty-five yards from the lower edge of the bluff.

A female was calling near a nest one and one half feet from the ground in a small elder in a sprout field on top of the bluff on June 26, 1923. In the nest were four young and one Cowbird's egg. The nest was shaded.

A nest was found six feet from the ground in a grape vine on the bluff on June 28, 1923. A female that was brooding three eggs flew off and called when approached.

On July 7, 1923, a nest was found three feet from the ground in the edge of the willows on the bar. It was in a small sycamore sprout and contained two young and one young

Cowbird. The Cowbird was about twice as large as the young bunting and was very much more active. The nest was twisted out of shape.

Four nests were found in weeds on the bar on July 17, 1923. One was three feet from the ground at the side of a cow path through wild hemp about five feet high and growing in a dense thicket. There were two eggs in this nest. Another was four feet from the ground and was fastened between two stalks of hemp. It contained two eggs that were nearly white and which had a few spots of brown pigment near the larger end. The spots were small. The brooding female left when approached within ten feet. The third nest was twenty-five yards from the second and was four feet from the ground. It was fastened between three stalks of hemp. The female was brooding three light eggs. She left when approached within five feet. The fourth nest was three feet from the ground in a thistle. It hung between two leaves. There were four small young in this nest. The female came with food after several minutes. Both parents called in the vicinity.

A female was carrying a caterpillar in the edge of the timber on top of the bluff on July 19, 1923.

A nest was found August 18, 1923, that was five feet from the ground in a clump of weeds near the creek on the bar. The brooding female would not leave the four eggs in the nest until she was almost touched. Then she flew near the ground and fluttered as if with broken wings. There were young birds in this nest on August 30.

A nest was found four feet from the ground in sumac along a road on August 23, 1922. It contained four young whose wing feathers had sheaths that were nearly ready to break. On August 23, 1923, a female with some young just able to fly was found in the center of a corn field on the bar. The parent called nervously. The young perched on the stalks of corn and about half way to the top.

Records of arrival in spring are May 6, 1923 and May 8, 1924. The latest fall records are October 8, 1922 and October 7, 1923.

Spiza americana. (Gmelin). Dickcissel. (36.5)

Several pairs of this species nested in suitable parts of the area. It was usually found in summer in weedy fields and openings on the bar and on the bluff. It was also found in brushy places in pastures, along roads, and in the border of brush at the edge of timber especially on the top, of the bluff.

This bird was often heard singing at night as well as in the daytime. It usually sang from a low perch.

A nest was located two feet from the ground in an elder in a pasture on the Whittaker farm on June 9, 1922. It contained three young and one egg.

On June 12, 1923, a nest was found one foot from the ground in a blackberry bush that was three feet high and growing in the strip of weeds and shrubs between a wheat field and the timber on top of the bluff. The nest was little shaded and contained five eggs and one Cowbird's egg.

The female on the nest flew off when disturbed and called with the male for a few seconds. Then both left.

A female was brooding four eggs in a nest four feet feet from the ground in an elder in a brushy field on top of the bluff on June 13, 1923. The sitting bird called once or twice and left. The nest was partially shaded by a bush at the edge of the clump.

On June 22, 1923, a male with a young bird just able to fly was in a thick growth of sweet clover in a hog pasture on top of the bluff. An adult with young was found in the tops of trees on the lower part of the bluff on July 9, 1923.

On July 14, 1923, a nest was found three and one half feet from the ground in the crotch of an elder growing at the side of a road. The bush which was about five feet high shaded the nest. There were four young with down. The parents were perched on a telephone wire overhead. The female brought food and approached the nest after about five minutes. The male was singing. It left to fight with another male about twenty yards away.

A pair was found on July 19, 1923, with young just able to fly. They were in weeds along the creek. A young bird flew from a nest three feet from the ground in a thistle near the creek on the bar on August 23, 1923. A young bird was killed in the woods along a slough on the bar on August 31, 1922.

April 28, 1923 is the earliest record for arrival in the spring. None were found after September 7, 1922 and after September 13, 1923.

Piranga erythromelas. Vieillot. Scarlet Tanager. (6.5)

A few pairs of this tanager were summer residents within this area. All of them were found on the bluff and they spent nearly all their time in the tops of the trees there.

Four different males were heard singing on one section of the bluff one quarter of a mile long on May 6, 1924. On May 12, 1923, a pair was seen on the bluff. A second male approached and was chased away by the first which then returned to the female. On July 14, 1923, a male was singing in a tree over the road near the creek. Its song was so low that it could scarcely be heard on the ground directly under the tree.

On June 15, 1922, a nest was found twenty feet from the ground in a shellbark hickory on the lower part of the bluff one half mile south. The nest was small and was placed on a horizontal limb one and one half inches in diameter. The female was sitting very closely and did not leave the nest when sticks were thrown into the tree or when other noises were made. Finally, she was driven off by kicking the base of the tree. She flew a short distance to another tree and called nervously.

May 6, 1923 is the earliest spring record for this bird.

Piranga rubra rubra. (Linnaeus). Summer Tanager. (9.5)

The Summer Tanager was represented in summer in this area by only a small number of nesting pairs. This bird was inconspicuous and was not frequently seen. It was found in trees in farm yards, along the creek, and on the bluff.

On June 16, 1922, a pair was seen four or five times flying about a yard and especially in a box elder in which there was a nest of the Blue Jay. On June 18, the female was seen carrying material to this tree where she was building a nest on a horizontal limb ten feet from the ground. She kept calling all day. The male was not seen. The female was working on the nest on June 19. On June 21 and 22, she was heard calling in the yard, but was not seen near the nest. On June 23, both adults were near the nest. The female was sitting on the nest most of the day and once the male was seen giving her food about ten feet away from the nest. On June 25, there were three eggs in the nest.

A nest was found on a horizontal limb in the top of an oak tree on the bluff west of the lake on June 21, 1923. When the tree was hit, the female flew off the nest and to a nearby tree where she called for several minutes.

On July 15, 1923, a nest was found fourteen feet from the ground in the end of an oak limb along a road near the creek. The nest was one and one half feet from the end of the limb and twenty feet from the main trunk. The brooding female flew off the nest when the limb was hit with a stick, but she stayed in the vicinity and called. The nest was less than half way to the top of the tree.

The earliest record of arrival is April 28, 1923.

Progne subis subis. (Linnaeus). Purple Martin. (30)

A few migrating martins were seen in the spring. In the early summer, a few stragglers were seen flying over, but

later they came to the lake to feed and rest so that in some days of the fall there were many thousands on the lake at one time. They fed on the flying insects that were found over the water and which they caught while on the wing. They were usually in flocks of other swallows.

Although none nested within the area, martins were common all summer in all the nearby towns.

On September 23, 1922, this species was the most abundant swallow feeding over the lake. They were scattered and flying close to the water until six o'clock in the evening when they rose and began flying in a dense flock. The north edge of the flock was above the south edge of the lake. It appeared to thin out in other directions. It was at least half a mile long and not quite so wide. The birds could be seen distinctly and were estimated to be about one hundred yards from the ground. The flock kept moving and the birds continued to mill until six-thirty. At this time, they started to fly down to the cat-tails below in a compact, dense, and swift moving single column of birds which "poured" straight down to the thicket of cat-tail. After about one third of the flock had gone down, the downward flight was stopped for about one minute. Then it continued until about half the remaining birds had gone down. Then the downward flight was again halted for about a minute after which all the rest of the birds went to roost in the Typha in the same manner. Firing a shot gun caused no movement or excitement among the birds. Walking among the roosting birds caused them to rise a little

and fly on ahead a few steps, but they would not leave. By this time it was too dark to see them distinctly.

Another peculiar flight habit of these birds was noted which may throw some light on the origin of this complex evening flight. Often while these and other swallows were feeding near the surface of the water in the daytime, small hawks would fly in and attempt to catch one of the birds. Whenever a hawk came, all the swallows would gather into a compact flock which would rise and fly after the hawk until it retired. Then the birds would return to the lake and begin feeding in the usual manner. The flight which takes place before the birds go to roost at night may have been used so often to escape hawks that it became a habit and is used even when there is no hawk present.

The earliest spring record for the Purple Martin is April 19, 1924. September 23, 1922, is the latest that it was seen in the fall.

Petrochelidon lunifrons lunifrons. (Say). Cliff Swallow. (12.5).

This swallow was most often seen feeding with others of the family over the water at the lake during the spring and especially the fall migration seasons. It was nearly always much more numerous in the fall. Usually not so many of this species was present as of the other swallows.

Some were flying over the edge of the river three fourths of a mile south on May 10, 1924. The only other spring record is for May 29, 1924, when some were feeding over the lake. In the fall it was present from August 24 until September 12, 1923.

Hirundo erythrogastra Boddaert. Barn Swallow. (58)

The Barn Swallow nested in barns and other buildings in the vicinity. In summer, it was seen in small groups flying over fields and even over the timber and sometimes it fed over the water of the lake. Its numbers on the lake increased throughout the summer from the middle of June until the middle of September. This bird rested on telephone wires along the roads, on willow snags around the lake, and on the stems of Nelumbo in the lake. Some were seen on the mud south of the lake on September 7, 1922.

On June 9, 1922, a nest was found on the side of a stringer in the barn on the Whittaker farm. It contained young. A bird started to build a nest in a small hog shed on the E.V. Roundy farm early in the morning of June 8, 1923. It carried mud from a wet place below a nearby spring. The nest was never completed.

A great many Barn Swallows were feeding over the lake on October 7, 1922. The flock was compact and flew against the strong north wind until it reached the north side of the lake in its feeding. Then the whole flock would quickly fly to the south side of the lake and slowly work back to the north. New individuals continually arrived. Once, the flock was disturbed by a hawk.

On October 11, 1924, many small flocks were noted flying south over the lake. When they reached the north side of the lake, they came down to the surface of the water and continued their flight across to the south side where they rose

again and flew on to the south. Some small flocks were seen flying south high over fields on the bluff on October 12, 1924.

On August 30, 1923 and September 10, 1922, this was the most numerous swallow of those feeding over the lake.

The first record for 1923 is April 28; for 1924 is April 21. In 1922, the last fall record is October 7. In 1924, the last fall record is October 12.

Iridoprocne bicolor. (Vieillot) Tree Swallow. (36.5).

Thousands of Tree Swallows were sometimes present in the seasons of migration. Of these, a few pairs remained to nest where conditions were favorable. When feeding, this bird was usually found over the water of the lake. Sometimes it fed on the mud at the edge of the water, as on September 7, 1922. A few times, it was seen feeding over fields on top of the bluff or over the willows on the bar. On June 10, 1922, one was seen flying over the creek. Flocks of this species rested on telephone wires along the roads and in the dead willows in the lake.

This bird was found nesting in the summers of 1922, and 1923, and 1924. This is probably the farthest south nesting record for this species in the Missouri Valley and also probably the only Kansas nesting record.

On June 7, 1922, a nest was found in a hole in a leaning willow stump fifty yards from the edge of the water on the south side of Doniphan Lake. The hole was six feet from the ground. The nest was lined with chicken feathers. A female

flew out of the nest to a nearby stump where a male came and they mated.

A pair was seen mating on a dead willow on the north edge of the lake on May 30, 1924.

A pair of adults was feeding young in a nest three feet above the water in a hole in a willow stump in the north part of the lake on June 12, 1922. On each trip, the parent at the nest did not leave until the other one arrived.

On June 15, 1922, another nest with young which were being fed by adults was found in another willow stump near the one found on June 12. Another nest was found in a hole in a stump that was two feet above the water. This nest was built of fine strips of bark covered with chicken feathers from one to four inches long. A side of the stump was torn away and the nest with the five white eggs which it contained was taken out. An adult returned to the stump and attempted to find the nest. It stayed at the stump for over half an hour. Parents were still feeding young in nests in the willow stumps on June 16.

The presence of water near the nest site seems to be a necessary condition for the nesting of this bird since in the season of 1923, when the lake was nearly dry, it did not nest there, but was found nesting at Doniphan Lake four miles away where there was water. In the spring of 1924, there was water in the lake and the Tree Swallow again nested there in the same stumps as in 1922.

Small flocks that were flying south over the lake on October 11, 1924 flew low over the water to feed.

The earliest spring record for this species is April 5, 1924, when one was flying close to the water in the center of the lake. The latest fall record is October 21, 1923.

Riparia riparia. (Linnaeus). Bank Swallow. (17)

A small number of Bank Swallows was present during the summer. It became much more numerous in the fall. It fed over the water of the lake, over the river, and over the creek. It was found a few times with other swallows on telephone wires along roads.

The earliest spring record is May 10, 1924. The latest was seen in the fall on September 10 of both 1922 and 1923.

Stelgidopteryx serripennis. (Audubon). Rough-winged Swallow. (37).

A few individuals were seen frequently during the summer and they helped make up the large flocks of migrating swallows in the spring and fall. This bird fed over the lake, over the river, over fields and pastures, over the bluff, and especially in summer over the water in the creek.

The Rough-winged Swallow rested on telephone wires and fences along the roads, on drift in the river, and in trees and on snags at the edge of the lake and creek.

One was seen flying out of a hole in a vertical bank along the creek on June 15, 1922. One was hovering at the entrance of a hole in the bank of the creek on May 18, 1924.

In 1923, the first was seen on April 15. The earliest

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spring record in 1924 is April 19. The latest fall record is October 20, 1923.

Bombycilla cedrorum. Vieillot. Cedar Waxwing. (7)

The Cedar Waxwing was found in groups of from one or two to about one hundred individuals. It was usually found in the tops of the trees on the bluff or on the bar.

The stomach of one, that was killed on August 23, 1922, contained a snail and a berry of some wild fruit. Some were feeding on hackberries on March 3, 1923.

This bird was found very irregularly. It was recorded on these dates; January 29, 1923, March 3 and 30, 1923, April 29, 1923, May 6, 12, and 19, 1923 and 8 and 12, 1924, June 5, 1923, August 23, 1922, September 7, 1923, and November 30, 1923.

Lanius ludovicianus migrans. W. Palmer. Migrant Shrike. (5)

Migrant Shrikes were not found within the area in summer, although the bird nested along the roads through the surrounding farm land. It was usually found in osage orange or other thickets along the roads or perched on telephone wires. A group of five or six was seen on the wires along a road two miles west on July 14, 1923.

There are only two records for the seasons of migration. On March 30, 1923, one was eating insects on the ground in a field that was being plowed and on which Crows were feeding. On September 2, 1922, one was shot in the brush on the lower part of the bluff at six o'clock in the morning.

Vireosylva olivacea. (Linnaeus). Red-eyed Vireo. (58.5)

Red-eyed Vireos were evenly distributed during the

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summer over the bluff, along the creek, and on the older portions of the bar. This bird was usually found in the tops of the trees. It was heard singing throughout the summer.

A nest was found five feet from the ground in a dogwood along a fence on the bar north of the lake on June 7, 1923. It was made of coarse material and contained three eggs and one Cowbird's egg. Two adults were perched nearby. Another nest was found on the same day seven feet from the ground in a tall maple on the bar east of the lake. It was hanging from a fork of a horizontal limb three eighths of an inch in diameter and was made of paper and strips of the inner bark of a tree. It contained three eggs. The adult called two or three times from a nearby perch. On June 16, the adult stayed on the nest until it was almost touched. In the nest were one young and two eggs.

On June 28, 1923, a nest was found five and one half feet from the ground in the end of a branch of an oak on the bluff west of the lake. The brooding bird slipped off the nest quietly. In the nest were four eggs and one egg of the Cowbird. On July 6 a young Cowbird was trampling two young vireos in this nest. There was an unhatched egg in the nest.

An adult was feeding two young Cowbirds just out of the nest on August 22, 1923.

A bird was building a nest nine feet from the ground in a box elder on the lower part of the bluff northwest of the lake on June 19, 1922.

Some young birds were calling loudly in a nest fifteen

feet from the ground in a tree along the creek on August 23, 1922. ¹⁹²⁵

In the fall, this bird was one of the most numerous in the flocks of migrating birds which fed in the brush along the lower part of the bluff and in the willows on the bar. Dates of first occurrence in the spring are May 6, 1923 and May 3, 1924. Late fall records are September 10, 1922 and September 14, 1923.

Vireosylva philadelphica. Cassin. Philadelphia Vireo. (1).

One was collected in the willows on the bar with other vireo and warbler transients on September 2, 1922. Another was shot in nearly the same location on September 24, 1922.

I know of no other records for this species in Kansas and of no other fall records for it in the Kansas City region.

Vireosylva gilva gilva. (Vieillot). Warbling Vireo. (29.5).

This vireo was found in considerable numbers in both spring and fall, but only a few pairs stayed through the summer.

In summer it was usually found on the bar near the lake or in groves of medium sized cottonwood trees. In the summer of 1923, a pair stayed in a group of cottonwood trees near the bridge all summer, but their nest was not located. It was sometimes found in apple trees in orchards.

While migrating, it fed with other vireos and warblers on the bluff, along the creek, and in the weeds and trees on the bar.

It was first seen in 1923 on May 5 and in 1924 on May 3.

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The last was seen in 1922 on September 10 and in 1923 on September 15.

Lanivireo flavifrons. (Vieillot). Yellow-throated Vireo. (3).

One was shot in the timber on the bluff on April 29, 1923. A pair was singing on the lower part of the bluff on May 3, 1924. On July 14, 1923, one was singing in the tops of trees on the bluff west of the north edge of the lake. One was collected on the bluff on August 23, 1921. Another was seen in the willows on the bar with other transients on September 2, 1922.

Lanivireo solitarius solitarius. (Wilson). Blue-headed Vireo. (4.5)

One was shot in a tree on the bluff on May 6, 1923.

One was shot that was feeding in brush on the bluff on August 29, 1922. Others were feeding in weeds and willows on the bar, along the creek, and on the bluff on September 2, 10, and 24, 1922; September 7, 14, and 15, 1923; and October 7, 1923. Generally only one or two were found and they were in flocks of small transients.

Vireo griseus griseus. (Boddaert). White-eyed Vireo. (29.5).

This vireo was found in the brush along the lower edge of the bluff, at the edge of the timber on top of the bluff, and in small clearings in the timber throughout the summer. About fifteen pairs nested within the area. This bird was nearly always found near the ground, even when singing.

On June 12, 1922, a pair of adults was seen with food near a large rock on the west edge of the lake. The nest could

not be found although a diligent search was made. On April 8, 1923, the nest was found in a bush of coral berry and two feet from the ground.

A pair with food in their mouths was calling excitedly in some brush in the timber on the bluff and about half way to the top on June 29, 1923. The nest was located one and one half feet from the ground in the end of a branch of an elm eight feet high. It was partially shaded. Bits of rotted wood were fastened to the outside of the nest in which there was a young Cowbird whose wing feathers were one fourth inch beyond their sheaths. The adults stayed near the nest and called and sang, sometimes on limbs as high as twenty feet. On July 6, adults were found feeding a young Cowbird on the bluff one hundred yards west of this nest. The nest was empty. On the outside it measured three and one half inches deep and two and one quarter inches wide. Inside measurements were two and one half inches deep and one and three fourths inches wide. It was lined with fine grasses.

In the fall and in the spring this bird fed with other small transients in the willows on the bar and in the brush on the bluff.

The earliest spring record is May 6, 1923 and the latest fall record is September 13, 1923.

Vireo belli belli. Audubon. Bell's Vireo. (45)

The Bell's Vireo is a very characteristic bird of the growths of willow thickets that are formed on the newly formed bars along the Missouri River. The type specimen of this

species was collected in the bottomlands across the Missouri from where this work was done (Harris 1919.p.313.).

In summer this vireo was found in willows on the bar, along fences of osage orange in the farm land, and in the fields of sprouts on the top of the bluff. During the migrations, it joined other small transients that fed on the bar and the lower part of the bluff.

On June 5, 1923, a nest was found five feet from the ground in a small cottonwood east of the mouth of the creek on the bar. It was made of coarse material and contained four eggs. The brooding bird flew off the nest when disturbed and began singing in the tree in which the nest was located.

A nest was found two and one half feet from the ground in a dogwood three feet high near the east edge of the willows north of the lake on June 7, 1923. It was made chiefly of cottony material with some leaves on the outside and some fine plant material on the inside. The adult, which was brooding three eggs, slipped off the nest quietly, but returned after about two minutes and called. Then it sang.

Three nests were located on June 8, 1923. One was on a lower branch of a dogwood five feet high that was growing east of the lake. It was three feet from the ground and was shaded by other shrubs and trees. There were four eggs in the nest. The brooding bird left when approached within twenty feet. It did not call very much. Another nest was in the top of a slender willow five feet high which was

surrounded by willows ten to twelve feet high and some weeds. The nest was made of grass leaves and was grayish in color. On the outside, it measured two and three fourths inches deep and two and one half inches wide. There were four sparsely spotted eggs. No bird was seen on the nest, but one was calling nervously thirty feet away. The third nest was one hundred yards from the second one and was five feet from the ground in a willow seven feet high. It was hanging from a fork of a branch at a forty-five degree angle and was reddish in color. There were three eggs in the nest, but no bird was seen near.

On June 9, 1922, an empty nest was found five feet from the ground in the end of a branch of osage orange along a lane on the Whittaker farm. No birds were seen. An adult was brooding three eggs in this nest on June 17. The bird left when the nest was approached within two feet.

A nest was found one and one half inches from the main trunk of a willow and four and one half feet from the ground on June 10, 1923. The tree was ten feet high and was growing on a line between the willows and the Typha on the south side of the lake. There were three eggs in the nest. A bird was singing nearby, but none was on the nest. Another bird was seen building a nest two and one half feet from the ground in a small brushy willow fifty yards from the edge of the willows southwest of the lake.

The earliest spring record is May 3, 1924. The last record for 1922 is September 5, the last 1923 record is September 6.

Mniotilta varia. (Linnaeus). Black and White Warbler. (12).

The Black and White Warbler was usually found scattered in small groups of two or three which fed on the main trunk and branches of trees on the bluff and about ten feet from the ground in the willows on the bar.

Only two birds were seen in the summer months. A male was feeding on the trunks of trees in a ravine on the bluff on June 10, 1922. Another bird was seen flying through some oak timber on the side of the bluff north of the lake on June 17, 1922.

In the spring, transients were present between April 28 (1923) and May 20 (1923). Migrants were more numerous in the fall and were found through a longer period of time. They were seen almost daily with other fall transients. The records are between August 23 (1921 and 1922) and September 15 (1923)

Protonotaria citrea. (Boddaert). Prothonotary Warbler. (16).

A small colony of less than a dozen pairs of this warbler nested in holes in willow snags on the north side of the lake. During the nesting season, these birds were rarely found in any other part of the area. Here they flew back and forth from stump to stump singing, feeding, and carrying on other activities of their daily life.

On June 12, 1923, a nest was found four feet from the ground in a willow stump five feet high, at the edge of an open place on the northeast side of the lake. The nest was made of grasses and was built up to within two inches of the

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opening. The female, that was brooding four eggs, flew off and sang. A male was singing. The opening of the nest hole was irregular and was large. It was two and one half inches wide and six inches high in its greatest dimensions. The stump was at the edge of the lake bed, but there was no water in sight.

Another nest was found one hundred yards away in a hole six feet from the ground in a stump eight feet high. The opening was two inches in diameter and the nest was three and one half inches below. The nest contained eggs, but the number could not be determined. A female, that was on the nest, flew off when the stump was hit with a stick and attempted the broken wing ruse until it was about thirty feet away when it flew and began calling much more excitedly than the bird at the last nest. There was grass and Polygonum growing around the stump, but there was no water in sight.

A third nest was five and one half feet from the ground in a nearly dead willow stump seven feet high that was growing north of the lake. The opening of the nest hole was one and one half inches in diameter. The nest was three and one half inches below the opening and it contained at least four eggs. There was a dense growth of Polygonum three feet high around the stump. The brooding female flew off the nest and attempted the broken wing ruse. Both parents called excitedly. There was a chickadee's nest in a similar stump fifteen yards away.

In 1922 there was standing-water around the stumps in

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which the nests were found in 1923. The number of nesting birds appeared to be about the same for both seasons. On June 16, 1922, a nest was found five feet above the water in a hole in a willow stump in the north part of the lake. The nest was made of grass and was two inches below the opening. There were three eggs in the nest. Both the male and the female stayed near. On June 19, both parents were feeding young birds in this nest.

After the end of the short nesting season in June, very few of these birds were seen until the migration started in August. A female was seen along the edge of the river near the mouth of the creek on June 29, 1923. None were seen in July. In the fall migration, it was found from August 3 until September 10 in 1922. At this time of year, it fed with other warblers on the bluff and on the bar, but was not found on the nesting ground. It was also found on the bluff and on the bar during the spring migration. The earliest record for the spring is May 5, 1923.

Helmitheros vermivorus (Gmelin). Worm-eating Warbler. (1).

One was singing in the tops of the trees in a ravine on the bluff in the middle of the morning of the morning of July 11, 1923. One was shot with other transients in the tall weeds in the edge of the willows on the bar on September 10, 1922.

Vermivora pinus. (Linnaeus). Blue-winged Warbler. (2)

One was singing in the tops of trees half way to the top of the bluff one half mile south on June 16, 1923. It moved

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around within one hundred and fifty yards of where it was first heard.

One was found on the lower part of the bluff on August 18, 1923. Another was taken on the bluff on August 26, 1921. One was shot in the willows on September 4, 1922.

Vermivora rubricapilla rubricapilla. (Wilson). Nashville Warbler. (9.5)

This warbler was found during the migrations, sometimes in considerable numbers, as on September 13, 1923 when it was the most common small transient noted. It fed in the tops of the shrubs and the smaller trees on the bluff and in the trees and weeds on the bar and along the creek.

Not so many were seen in the spring as in the fall. May 6 and 12, 1923 are the only dates and only one bird was seen on each of these. In the fall, the first was found on August 27, 1921; August 24, 1922; and August 23, 1923. It was present until September 24, 1922.

Vermivora celata celata. (Say). Orange-crowned Warbler. (4.5).

This warbler was found in the trees on the bluff on April 28, 1923; May 5, 6, and 12, 1923; May 10, 1924; October 6 and 7, 1923; and October 12, 1924. It was usually seen on the lower part of the bluff.

Vermivora peregrina. (Wilson). Tennessee Warbler. (3.5)

The Tennessee Warbler fed with other migrating warblers in woods and willows on the bar and along the creek and in the trees on the bluff. Usually not many individuals were seen in a single day.

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Spring records are between May 6 and 19, 1923. In the fall, it was found on August 31, 1923; October 8, 1922; and October 11, 1924.

Compothlypis americana usnea. Brewster. Northern Parula Warbler. (17)

A few pairs of this bird stayed all summer stayed all summer to nest along the lower portions of the bluff where they were heard singing in the tops of the large and medium sized trees. They also fed among the branches of these trees. On June 28, 1922, an adult male was seen feeding young just able to fly in willows on the bar along the lower edge of the bluff near the mouth of the creek.

During the migrations, this bird was found on the brushy lower part of the bluff and on the bar with other warblers, but chiefly on the bluff. The earliest record for the spring is April 19, 1924. The last one was seen in the fall on September 13, 1923.

Dendroica aestiva aestiva. (Gmelin). Yellow Warbler. (18).

This is another warbler that was represented in the area in summer by a few nesting pairs. During the nesting season, it was restricted almost entirely to the growth of willows and cottonwoods on the bar. They fed and nested in the tops of these trees.

On June 7, 1923, a nest was found eight feet from the ground in a willow on the south side of Doniphan Lake. The brooding female returned to the nest, which had five eggs, about five minutes after she was flushed from it. The male

stayed nearby, but did not move very nervously. The nest was in the same tree with and five feet below a nest of the Orchard Oriole.

A nest was found five feet from the ground in a crotch of a willow twelve feet high on the bar southeast of the lake on June 8, 1923. The nest was made of grayish material and was closely woven. The outside diameter was larger at the center than at the rim. Inside, there were five eggs. A pair of adults was seen near, but not on the nest. On June 10 the female was on the nest. The male came and called when she was frightened off the nest.

During the migrations, this bird was found with other transients on the bluff and along the creek. A few were seen in trees in yards. The first spring record is for April 28, 1923. None were seen in the fall later than September 5, 1922. On August 28, 1923, one was seen alone along an osage orange fence six miles northwest.

Dendroica coronata. (Linnaeus). Myrtle Warbler. (8.5).

This warbler was found in small flocks in trees in yards, along the bluff, along the creek, and on the bar during both the spring and fall migrations.

The records for spring are between April 21 (1924) and May 20 (1923). Fall records are from October 20 (1923) to November 8 (1924).

Dendroica magnolia. (Wilson). Magnolia Warbler. (1).

One was shot out of a flock of migrating warblers in trees on the lower part of the bluff on May 19, 1923. Another

was shot near the same location on May 20, 1923.

Dendroica caerulea. (Wilson). Caerulean Warbler. (1).

One was seen in a tree in a ravine on the bluff on June 13, 1922. Another was singing in the middle branches of a medium sized tree along a road on the lower part of the bluff on June 26, 1922.

Dendroica striata. (J.R. Forster). Black-poll Warbler. (.5)

One was collected from a small flock of migrating warblers that was feeding in the trees in a farm yard on the evening of August 27, 1923.

Dendroica fusca. (Muller). Blackburnian Warbler. (.5)

One was shot in a medium sized tree on the lower part of the bluff on September 3, 1923.

Dendroica virens. (Gmelin). Black-throated Green Warbler. (1).

One was taken in the top of a tree along the creek above the bridge on August 28, 1923 and another was found in a flock of migrating warblers along the creek on September 13, 1923.

Dendroica vigorsii. (Audubon). Pine Warbler. (.5)

One was shot out of a flock of other warblers in the top of a tree along the creek above the bridge on September 13, 1923.

Seiurus aurocapillus. (Linnaeus). Ovenbird. (3).

In the spring and fall, the Ovenbird was found near the ground on the lower part of the bluff and on the bar with small transients. No evidence of its nesting was found. One was singing near the ground on the lower part of the

bluff on May 4, 1924. The only other spring record is for May 20, 1923. Fall dates of occurrence are between August 9 (1922) and September 14 (1923). On the last date, several were seen in willows on the bar.

Seiurus noveboracensis notabilis. Ridgway. Grinnell's Water Thrush. (8.5).

Grinnell's Water Thrush was found singly at the edge of the lake and along a slough on the bar and at the edge of a pool below a spring. Sometimes it was found in patches of Nelumbo or of Typha growing in moist or wet soil at the edge of the lake.

On May 6, 1923, one flew into a yard from the bar and called once or twice. Then it flew back among the trees on the bar where it was lost. Spring records are between this date and May 19 (1923). One was seen at a spring north of the lake on May 11, 1923. Two were seen along the creek above the bridge on May 18, 1924.

In the fall, this bird was more restricted to the vicinity of the lake. Migration records are between August 21 and September 4, 1922.

Seiurus moticilla. (Vieillot). Louisiana Water Thrush. (.5).

A pair was seen along a branch of the creek one half mile west on April 20, 1924.

Oporornis formosus. (Wilson). Kentucky Warbler. (27.5)

Kentucky Warblers were rather unevenly distributed over the bluff and along the creek during the nesting season. They were found in those places where the undergrowth was dense

or where there was a canopy of shade overhead. These birds spent most of their time on the ground. Nesting pairs became very nervous when their territory was entered and would often call excitedly when certain sections of the timber were disturbed.

One was seen bathing in water below a spring on June 14, 1922. On May 6, 1923, several were flying and chasing each other on a side of a ravine on the bluff. Some of them sang from trees.

On June 30, 1923, a nest was found on the ground between two weedstalks seven inches apart. It was made of sticks and leaves and was lined with finer material. Both parents were carrying food in the morning, but the nest was not found until four thirty in the afternoon. The brooding female ran out on the ground with drooping wings when she was approached within two feet. She ran about ten feet and then flew. During the hour and a half that the search was being made, the male was within twenty yards of the nest and was calling excitedly. Once he brought food, but ate it himself. He stayed in the trees and twenty or more feet from the ground. The male was chased away from one small tree several times by a brooding female which had a nest there. These birds used two call notes one of which was much more harsh than the other. In the nest were two young with their wing feathers still in sheaths. The yellow color underneath still showed plainly. On July 2 the nest and young birds were gone and one of the supporting weeds was broken. The parents were still in the

vicinity, but they were not nearly so nervous as they had been two days previously.

In the spring and fall, this warbler joined other members of the family in migrating flocks that moved and fed over the bluff, along the creek, and on the bar.

The first spring record is for April 29, 1923. In the fall it was found as late as September 14, 1923.

Oporornis philadelphia. (Wilson). Mourning Warbler. (8).

During the years when this study was made, the Mourning Warbler was much more common at this point on the Missouri River than it has been found by observers in other parts of the valley in other years. Because of its reported scarcity in other parts of the valley, all the records are given here.

On May 19, 1923, at least twenty-five, most of them males, were seen near the ground in the willows on the bar and along the lower edge of the bluff. On May 20, 1923, it was the most numerous of migrating warblers. It was found on May 10, 17, 29, and 30, 1924. Fall dates are August 23 and 24, 1921; August 29 and 31, 1922; September 2, 4, 7, and 10, 1922; and September 13 and 14, 1923. The bird taken on August 29, 1922, was bathing at a spring on the bluff. Others were found near the ground on the bar and on the bluff.

Geothlypis trichas trichas (Linnaeus). Maryland Yellowthroat. (23).

A few pairs of this bird nested on the ground studied. It was found in weedy and grassy growths near water on the bar and along the creek. One was found at the edge of the

timber on top of the bluff on July 6, 1923.

On June 7, 1923, a nest was found in sedges north of the lake. It was built on dead plants six inches from the ground and was partly shaded. The top was open. The female that was brooding five eggs flew silently away when she was flushed.

Another nest was found in sedges on the bar north of the lake on June 12, 1923. This nest was one foot above the ground. It contained three young with feathers, one unhatched egg, and one Cowbird's egg. Both parents were seen nearby with food, but they would not go near the nest for about half an hour. The female stayed about twice as far away as the male and both called excitedly. The young were out of the nest on June 16. The Cowbird's egg was still in the nest and the male was calling nearby.

A nest was found in grass, growing two and one half feet high, northeast of the lake where there was a scattered growth of Typha on June 12, 1923. The ground had been burned over during the preceding winter. The female was brooding five eggs. She did not flush from the nest until she was almost touched.

In the migration season, this species joined other warblers on the bar and on the bluff, but it was nearly always found near the ground. The earliest spring record is May 3, 1924. September 14, 1923, is the latest fall record.

Icteria virens virens. (Linnaeus). Yellow-breasted Chat. (34).

Chats were found daily throughout the summer. They were found wherever there were thick tangles of undergrowth in

the timber on the bluff, on the bar, in pastures, in cleared land, and in timber along the creek. Usually they kept near the ground and were hard to locate except by their call.

Several times in the summer, this bird was found bathing at a spring or in water below a spring. On May 12, 1923, one sang as it flew from the bar to the bluff and accompanied the song by a peculiar jerking of the tail.

A nest was found on June 5, 1923 that was two and one half feet from the ground in a willow about four feet high on the south side of the lake. One bird was sitting on three eggs and another was sitting in the top of a small tree ten yards away.

On June 8, 1923, a nest was found two and one half feet from the ground in a fork of a willow five feet high that was south of the lake. The nest was made of grass and was nearly as coarse as a Red-winged Blackbird's nest. It was about four inches in diameter in outside measurements. There were three eggs. The brooding bird did not leave the nest until it was approached within five feet.

A nest was found two and one half feet from the ground in a rose bush in a clearing on the bar north of the lake that had grown up with Equisetum three feet high on June 12, 1923. The nest was partially shaded by the rose bush, but not by trees. There were four young in the nest the largest of which had a V-shaped patch of down which ran from the top of the wings. The brooding adult flew off the nest when approached within thirty feet and called in the vicinity.

On June 12, 1923, a nest was found two and one half feet from the ground in a clump of coral berry in an opening on the bluff one quarter of a mile south. No bird was seen, but there was one egg in the nest and one Cowbird's egg. There were no more eggs on June 13. On June 18 there were three chat's eggs and one Cowbird's egg and an adult was sitting on them which left when approached within three feet. There were young birds in the nest on June 28, 1923. Neither parent was seen near the nest on July 2, but one of the young birds opened its mouth for food. The nest was empty on July 10.

On June 13, 1923, a nest was found three and one half feet from the ground in a dogwood growing in an unplowed field on top of the bluff. In the nest were three just hatched young and one egg. Neither parent was seen.

A nest was found with four eggs that was five and one half feet from the ground in the top of a small grape vine on the side of a cottonwood fifteen feet high on June 16, 1923. It was in the Equisetum north of the lake on the bar. The outside of the nest was made of leaves and coarse stems. The brooding bird left when approached within eight feet and called from a distance. On the same day, another nest was found with four eggs in a grape vine on a small dead willow stump on the bar north of the lake. The brooding bird left this nest silently and flew near the ground when approached within ten feet.

A nest was found in a field of sprouts on top of the hill west of the lake on June 29, 1923. It was four feet from

the ground and contained five eggs. Both parents came and called like Catbirds.

The latest nest was found on July 19, 1923. It was three feet from the ground in a thistle in a patch of weeds between the willows and a corn field on the bar. The nest was partly shaded and contained four eggs. The brooding female left the nest when approached within five feet. A male was singing nearby.

A chat was seen in a hedge fence along a road near the creek on September 6, 1923. Two were seen in willows on the bar on September 5, 1922. One was shot in some weeds along a slough on the bar on August 31, 1922. A female that was shot on August 27, 1921, had eaten a large number of poke-berries. These are the only records for the fall migration of this bird. Very few were seen in July or August.

May 6, 1923, is the earliest record for the spring.

Wilsonia pusilla pusilla. (Wilson). Wilson's Warbler. (11.5).

Wilson's Warbler was found frequently in migrations and was present in varying numbers from one or two up to about fifty which is the number found on September 6, 1922, when this was the most common warbler.

It was found feeding and moving through the tops of the trees on the bluff, on the bar, and along the creek, usually within ten feet of the ground. In the spring, it preferred the bluff for a feeding ground and in the fall it preferred the willows and growths of weeds on the bar and along the creek.

In the spring, this warbler was found between May 10

(1924) and May 19 (1923). The period of migration extended over a longer period in the fall and the birds were found from August 23 (1921) and August 25 (1922) until September 10 (1922) and September 14 (1923).

Wilsonia canadensis. (Linnaeus). Canada Warbler. (2).

A Canada Warbler was seen in low bushes on the bluff north of the lake on May 20, 1923.

Two were collected near a spring along the lower edge of the bluff on August 23, 1921. On August 24, 1921, one was taken in the willows on the bar. One was shot in a thick growth of willows on the bar on August 27, 1923. Weeds were growing thick under the trees.

Setophaga ruticilla. (Linnaeus). Redstart. (19).

Several pairs of Redstarts stayed all summer along the bluff and on the bar, but no nests were found. They fed and sang in the tree tops, especially along roads on the bluff, throughout the month of June. On July 6, 1923, one flew to an oak sprout in a field on top of the bluff.

On August 30, 1922, one became entangled in a spider web in some bushes on the lower part of the bluff and was struggling to free itself when a gun was fired nearby which caused it to put forth greater exertions and so gain its freedom.

During the seasons of migration, this bird was found on the bluff and in weeds and willows on the bar and along the creek. In the spring, it arrived in April (April 28, 1923). It was most numerous from the middle of August until the middle of September. On September 10, 1922, this was the most abun-

dant transient warbler that was feeding on the bar. Most of them were feeding about fifteen feet from the ground. September 15, 1923 is the latest fall record for the Redstart.

Mimus polyglottos polyglottos. (Linnaeus). Mockingbird. (1).

One was seen along a road eight miles away on June 24, 1922 and there is one record for August 23, 1921.

Dumetella carolinensis. (Linnaeus). Catbird. (38).

The Catbird was not found over the whole area in summer, but it was common in those portions where the amount and character of the cover of plants was suited to their habits. In summer, it was found along the creek, in orchards, in thickets on the bar and on the bluff, and in fields of sprouts. It was frequently seen on or near the ground in farm yards.

One was seen carrying a ripe cherry near Doniphan Lake on June 23, 1922. Another was eating a large insect in the creek bed on July 18, 1923.

A nest was found six feet from the ground in a small elm on the creek bank on June 10, 1922. The nest was well shaded and contained one egg.

On June 7, 1923, a nest was found four feet from the ground on the side of a willow tree at the edge of Doniphan Lake. The nest contained one egg. An adult was calling nearby.

On June 22, 1923, a nest was found three feet from the ground in a gooseberry bush in a small pasture between the house and the creek. The nest was empty. Remains of a young bird with wing feathers one half inch beyond their sheaths

lay on the ground. They had been partly eaten by some animal.

A bird was seen carrying nesting material on June 25, 1923. The nest was found on July 5. It was nine feet from the ground in the center of an apple tree in an orchard. An adult was brooding three eggs. Both birds of the pair called nearby.

In the spring and fall, Catbirds joined other small birds to feed on the bluff, on the bar, and along the creek. The first in the spring was seen on May 6, 1923. October 7, 1922 is the latest record in the fall.

Toxostoma rufum. (Linnaeus). Brown Thrasher. (31.5).

The Brown Thrasher was found in thick growths of shrubbery along the roads, along the creek, on the bluff, and on the bar. It usually fed and spent most of its time in the brush near the ground, but it sometimes selected a perch on the highest branch of a tall tree from which to sing.

On May 29, 1924, a nest was found four feet from the ground in a gooseberry bush in a small brushy pasture between a house and the creek. No bird was seen near, but there were two eggs in the nest.

An adult was brooding three eggs in a nest six feet from the ground in a vine growing over a dead stump on the lower part of the bluff on June 13, 1923. There were young in the nest on June 26. One parent was on the nest and the other was nearby. This nest was empty on July 5. Another nest was found on July 5 that was seven and one half feet from the ground on a leaning trunk of a small dogwood fifteen yards west of the empty nest. There were two eggs in this

nest and a pair of adults called nearby.

On June 20, 1922, a nest was found five feet from the ground in osage prange along a road. It contained three eggs. A pair of adults was near.

A bird was brooding four eggs in a nest six feet from the ground in a plum thicket near Doniphan Lake on June 22, 1922. It did not leave until the nest was touched.

An empty nest was found four feet from the ground between two cottonwood trees on the bar on June 28, 1923. A pair of adults was seen near, one of which had a caterpillar in its mouth. On July 4, the nest contained one egg. An adult was brooding on July 6.

On June 30, 1923, a nest was found five feet from the ground in the brushy top of a dead, fallen apple tree in a dogwood thicket at the edge of a small clearing on the bluff. An adult which was brooding four eggs did not move until the bush was touched. It then called from a nearby perch.

A nest was found three feet from the ground in an oak sprout five feet high in a pasture on top of the bluff on July 18, 1923. A parent was brooding two just hatched young and one egg. The nest was rather shallow. It was surrounded by sprouts and sweet clover.

Brown Thrashers were found scattered through flocks of smaller transients in the fall. The earliest spring record is April 14, 1923. In the fall, none were seen after October 7, 1922.

Thryothorus ludovicianus ludovicianus (Latham). Carolina Wren. (89).

The Carolina Wren was present throughout the year in all parts of the area that are timbered. It chose especially those places where the undergrowth was thick or where there were piles of brush, logs, or of some other kinds of trash. It usually fed near the ground and was found in pairs or singly. This bird sang throughout the winter.

A female was building a nest in a hole in a bank at the edge of a small opening in the timber on the bluff on April 28, 1923. She made about one trip a minute after material which she got from a place about ten yards away. She went to the nest by the same route each time. The male was singing in the top of a small tree twenty feet away. It left when disturbed and returned six minutes later. On May 12, there was one wren's egg and one Cowbird's egg in the nest. An adult was brooding.

Another nest was found in a hole in a bank on April 28, 1923. This one was at the side of the road near the creek and contained young which the parents were feeding. The nest was empty on May 5, 1923.

On May 13, 1923, a nest was found in a hole in a cut at the side of a road near the E.V. Roundy house. The hole was about a foot deep and did not run straight. An adult was sitting closely upon four eggs. By May 19, two of the eggs had hatched and on May 20 three were hatched. On April 21, 1924, an adult was flushed from a nest in the same hole. There

were young birds in the nest on May 3 and 8, but the nest was empty on May 17.

A nest was found in a hollow stump nine inches high and eight inches in diameter on the bluff on June 21, 1922. The nest was roofed over and was made of moss, leaves, and grass. In the nest were four young and one egg. The brooding bird left immediately when disturbed and did not return for five minutes. Then she left again and returned in another five minutes. No sound was made by the parent bird. Only one adult was seen.

On August 28, 1923, a nest was found in a washed out hole in a vertical bank on the creek. It was ten feet above the bed of the creek and six feet below the top of the bank. The nest contained partly feathered young. One parent brought food, called a few times, and left.

Empty nests were found on top of stumps, in bridges, and in the tops of sheds. One was seen feeding two young Cowbirds on June 17, 1922. Family groups were frequently seen along the bluff at various times during the summer.

Troglodytes aedon parkmani. Audubon. Western House Wren. (49.5).

Several pairs of this wren spent the summer around the various groups of farm buildings on the area. A few were found on the bar, in orchards, and along the creek during the summer. The birds stayed close to their nesting sites.

A pair was seen at the opening of a tin can nest that was nailed on the side of a garage on May 6, 1923. Parents were feeding young birds in this nest on June 13 and 14.

Two were singing in the dead willow stumps northeast of the lake on June 12, 1923. A partly built nest was found in a hole in one of the stumps. It was five and one half feet from the ground.

Adults were feeding young in a cornice in the north end of Geary school house on June 14, 1923.

On June 17, 1923, one was cleaning out material from a hole in a dead limb ten feet from the ground in a box elder in a yard. This was at five-thirty in the evening. The bird was taking out feathers and sticks and dropping them to the ground near the hole. Once, it became entangled in a straw, but its extra exertions caused it to free itself.

One flew into a hole in a partially dead apple tree that was twelve feet from the E.V. Roundy house and eight feet from the ground on July 7, 1923. The bird would not leave the nest when the tree was hit. Another was singing in the same tree.

On July 11, 1923, one was sitting on five eggs in a crevice in a porch. Later in the season, the young birds from this nest were killed by a cat.

In the fall this bird joined small transients in the weeds on the bar, along the creek, and on the bluff. Then it was found singly or in small groups and it fed near the ground.

April 19, 1924 is the earliest record and October 11, 1924 is the latest record in the fall. Birds that were seen in the fall were not plentiful and they were usually silent.

Nannus hiemalis hiemalis. (Vieillot). Winter Wren. (2.5).

One was seen in a thick growth of grass and Typha along the north edge of the lake in the morning of March 3, 1923. It was very restless and stayed near the ground. On February 5, 1924, two were seen along the road on the bluff one quarter of a mile south. Another was found in the same location on November 17, 1923. On October 24, 1924, one was found on the lower part of the bluff north of the lake. It was shot and in its stomach were found parts of seeds and small insects.

Cistothorus stellaris. (Naumann). Short-billed Marsh Wren. (.5).

One that was singing was shot in the grass and weeds south of the willow snags north of the lake bed on May 12, 1923. It was close to the ground.

Telmatodytes palustris iliacus. Ridgway. Prairie Marsh Wren. (8).

Several pairs of this wren spent the summer in the growth of Typha latifolia that grew in and around the lake. It was more common in the fall.

On May 30, 1924, several empty nests were found in Typha in the lake and the birds were singing nearby.

On June 12, 1923, one was found in weeds along a fence north of the lake on the bar and on dry ground.

On August 21, 1922, an adult and young which had no tail were found in the Typha south of the lake. On August 28, 1922, a young bird with tail feathers about half grown was shot south of the lake. Singing birds were seen on September 10, 1922.

In the spring this bird was found in the marshy wet places below the springs on the bar. The first spring record is April 28, 1923. None were seen in the fall later than October 8, 1922.

Certhia familiaris americana. Bonaparte. Brown Creeper. (11).

Brown Creepers were found feeding on the trunks of trees on the bluff, on the bar, along the creek, in orchards, and in yards throughout the winter. They were found singly or in small groups which were usually scattered and with larger groups of other kinds of winter feeders that moved through the timber.

On November 3, 1923, one moved over a log, a fence, post, and the trunk of a tree in turn. Some that were feeding on January 31, 1924 spent about half their time on the ground.

This bird was noted in the fall on October 28, 1922; October 21, 1923; and October 24, 1924. The latest spring record is April 15, 1923.

Sitta carolinensis carolinensis. Latham. White-breasted Nuthatch. (10).

Although this bird was probably present throughout the year, it was most numerous during the winter months when it was found in the timber along the creek and on the bar. A few were seen on the bar in willows. It was found singly or in small groups of less than four individuals and was nearly always located by its call. Some that were found along the creek on November 17, 1923, spread their wings and tails and called when near each other.

Sitta canadensis. Linnaeus. Red-breasted Nuthatch. (3).

This nuthatch was found feeding with flocks of sparrows in weeds on the bar and along the creek and in trees along the creek in the winter. Usually from one to three were seen on each occasion.

Three were seen together on November 3, 1923. Others were seen on January 12, 1924; February 1 and 4, 1924; March 16, 1924; and April 20, 1924.

Baeolophus bicolor. (Linnaeus). Tufted Titmouse. (90).

The Tufted Titmouse was found wherever there were trees in the area. Pairs were evenly distributed during the nesting season. Several were found in nearly every day's work. It fed throughout the branches of the trees. On April 14, 1923, one brought a moth to a limb of a small tree and after holding it for a few seconds fed it to another.

A family of young was found with their parents along the creek on June 15, 1922. An adult was feeding young in a natural cavity of a tree at the edge of the E.V. Roundy yard on May 19, 1923. The nest was four feet from the ground.

On June 16, 1923, a nest was found five and one half feet from the ground in a hole in an oak tree ten inches in diameter on the bluff. The brooding adult did not fly out when the tree was pounded, but left when its mate called from nearby. There were five eggs in the nest. The hole was six inches in diameter and was filled with leaves and fur up to the bottom of the opening. The opening was irregular and was ten inches high by two inches wide. The nest was empty on June 28.

A nest was found in a natural cavity in a redbud near the top of the bluff west of the lake on June 28, 1923. The trunk of the tree was six inches in diameter and the hole was three inches in diameter. The top of the nest was seven inches below the bottom of the opening. There were five young with wing quills one eighth of an inch long. One of them opened its mouth for food. Both parents called in a nearby tree. The nest was empty on July 6.

A pair was carrying nesting material on April 19, 1924. They were flying along the creek.

In August and September, these birds joined the flocks of small transients which fed in the timber. Flocks of variable size, but not large were to be found throughout the winter until the warm weather of early spring when the pairs were again distributed through the timber.

Penthestes atricapillus atricapillus. (Linnaeus). Chickadee. (98.5).

The Chickadee was one of the most common birds of the area, being found nearly every day that records were kept. This bird was found over all types of the land where there was sufficient vegetation. It fed in the trees and shrubs in the timber and even in the brush and weeds near the ground.

On April 14, 1923, a pair was carrying material from a hole in the under side of a limb in a tree on the bank of the creek. The birds always perched on a nearby weed before entering the hole. Each trip they carried the material to a different place before dropping it. Sometimes both were in

the hole at the same time. An adult was flushed from the nest on May 12. Both birds called nervously.

A Chickadee made several trips to a hole in a stump on the lower part of the bluff on April 15, 1923. Each trip it came out and dropped something from its bill. Several feathers were lying on the ground scattered around the stump. On April 28 an adult could be seen on a nest in the hole, but it would not flush from the stump. On May 12 the adult flew off the nest when a finger was poked into the hole and with its mate called nervously.

A pair was working at a dead stump on an elm along a road on May 13, 1923. They were flying alternately to a hole ten feet from the ground. One was heard picking at wood on the inside. After picking a few seconds, it flew with some pieces of wood in its bill which it dropped from a nearby branch. This was repeated several times. A pair was seen carrying material to a hole in the top of a fence post along a road on May 19, 1923.

A nest with five young nearly ready to fly was found in a hole five feet from the ground on June 7, 1923. It was in a willow stump on the bar on the north side of the lake. The nest was made chiefly of rabbit fur. An adult came with a caterpillar in its mouth and called.

An adult was brooding at least three eggs in a nest in a dead willow stump on the north side of the lake on June 8, 1923. When the stump was hit with a stick, the bird flew off and called excitedly. On June 12, the sitting bird flew off

this nest when it was approached within ten feet.

A pair was seen feeding young in a nest in a hole fifteen feet from the ground in a dead cottonwood stump along a road on the bluff on June 9, 1922.

In the fall and the winter, Chickadees joined flocks of small birds that fed through the timber in the trees and in the weeds. They were nearly always a part of these flocks and were not often seen, except with other birds, in those seasons.

Penthestes atricapillus septentrionalis. (Harris). Long-tailed Chickadee.

Two chickadees that were collected on February 18, 1923 belonged to this form.

Regulus satrapa satrapa. Lichtenstein. Golden-crowned Kinglet. (13).

The Golden-crowned Kinglet was found singly or in small groups on the bluff, on the bar, and along the creek during the winter. It fed among the branches of the trees and in the weeds near the ground. On January 31, 1924, one was feeding on the ground at the edge of a pool of the creek. One was feeding in bunches of grass along the creek on January 15, 1924. In especially stormy weather these birds preferred to stay in the branches of coniferous trees where there was more protection from the wind.

October 20, 1923 is the earliest fall date and April 7, 1923 is the last record in the spring.

Regulus calendula calendula. (Linnaeus). Ruby-crowned Kinglet.
(13.5).

This kinglet was found in about the same types of habitat as its near relative, but it was present in a little greater numbers and at slightly different seasons.

Although this species nests much farther north than does the other, it arrives earlier in the fall and leaves later in the spring and it was not found in this region in the winter. Fall records are between September 14 (1923) and October 22 (1922). In the spring, it was found from March 30 (1923) until May 12 (1923).

Poliioptila caerulea caerulea. (Linnaeus). Blue-gray Gnatcatcher.
(40.5).

This bird was found commonly in the timber on the bluff in the summer. It usually feeds in the tops of the trees and the higher shrubs.

On June 4, 1923, a nest was found in a walnut tree along a road on the bluff. Material was being added to the outside of the nest that had just been started on a limb twenty feet from the ground. Both the adults scolded vigorously when a Red-eyed Vireo came near and continued to do so until the vireo left. Another nest that was nearly finished was found two thirds of the way to the top of an oak along a road on the same day. Both birds of the pair were calling in the tree.

A sitting bird flew off a nest twenty-five feet from the ground in an elm tree along a road on June 6, 1923.

A pair was building a nest two feet below the top of an oak tree twenty feet high on June 12, 1923. The tree was on the bluff. The nest was on top of a limb five eighths of an inch in diameter. Both birds brought material and added it to the nest. Each stood in the center of the nest and added the new material to the outside, drawing the bill upwards from the branch. The birds called occasionally while working on the nest.

One was seen carrying nest material on June 14, 1922. On June 14, 1922, one tried to chase a hawk out of a tree on the bluff. One flew after a Blue Jay on the bluff on June 26, 1923.

During the season of migration, this bird was also found along the creek and on the bar in the trees. The earliest spring record is April 19, 1924. In the fall of 1922, it was seen until September 1 and in the fall of 1923, it was found as late as September 15.

Hyllocichla mustelina. (Gmelin). Wood Thrush. (48).

Wood Thrushes were seen daily throughout the summer and were distributed over the parts of the area more suitable for nesting. They were usually found feeding on or near the ground in the timber where the shade was rather dense either on the bar, along the creek, or on parts of the bluff. Early morning and late evening were the times of day in which there was greatest song activity. They usually sang from low perches, but sometimes selected the tops of trees and even the tops of dead trees where they were rather conspicuous for

their evening song.

On June 4, 1923, a nest was found nine feet from the ground on a lower limb of a linden tree on the bluff. The outside of the nest was made chiefly of leaves. The sitting adult did not leave until it was touched with a stick. Another nest was found twelve feet from the ground in a small elm tree in a shaded ravine on the bluff. The bird left when the tree was shaken.

A nest was found twelve feet from the ground in a lower limb of a large elm tree on the lower part of the bluff on June 12, 1923. The brooding bird clucked as it left the nest when the limb was hit. Another nest was found on a lower limb of an elm tree along the lower edge of the bluff on the same day. This one was twenty feet from the ground and was two thirds of the way to the top of the tree. The brooding bird left the nest, but stayed nearby and called from limbs that were fifteen or twenty feet from the ground.

A bird was seen carrying food on June 16, 1923. A pair was seen feeding young on the lower part of the bluff on June 26, 1923. Another pair was found with young birds just out of the nest on the bluff on June 29, 1923. Adults were seen feeding young Cowbirds on June 30 and July 5, 1923.

On July 4, 1923, a nest was being built six and one half feet from the ground in a dogwood on the side of a ravine on the bluff.

On July 14, 1923, a nest was found eight feet from the ground on a lower horizontal limb of an oak tree on the side

of a hill and along a road. An adult was brooding. On July 19, the nest contained two Thrush's eggs and two Cowbird's eggs.

An adult was flushed from a nest next to the main trunk of a willow and eight feet from the ground on August 2, 1922. The nest was fifty feet from the creek on the bar and was fifty yards below the bridge.

An adult was brooding three eggs in a nest seven feet from the ground in a dogwood half way to the top of a ravine on the bluff on August 9, 1922. The bird left the nest reluctantly and fluttered nearby. The nest was shaded. Another bird that was near kept up a low chucking.

During the migrations, this thrush was often found singly with small birds that were feeding near the ground on the bar or on the bluff. The earliest record is for May 3, 1924. None were seen later than September 15, 1923.

Hylocichla aliciae aliciae. (Baird). Gray-cheeked Thrush. (1.5).

Gray-cheeked Thrushes were collected near the ground on the lower part of the bluff on May 12, 13, and 20, 1923.

Hylocichla ustulata swainsoni. (Tschudi). Olive-backed Thrush. (2.5).

All the records for this bird are of transients that were seen near the ground on the lower part of the bluff from May 3, 1924 to May 30, 1924 and from May 6 to 20, 1923.

Hylocichla guttata pallasii. (Cabanis). Hermit Thrush. (.5).

A Hermit Thrush was seen on the lower part of the bluff on April 6, 1925.

Planesticus migratorius migratorius. (Linnaeus). Robin.(68.5).

Several pairs of Robins were found in summer in farm yards and in orchards near houses. A few were found in timber along the creeks. Few were present during the winter and they were usually in sheltered places in the timber on the bluff or along the creek.

Some flocks were seen feeding on hackberries on February 17 and 18,1923. On March 30,1923,about fifty were feeding on the ground in a burned over clover field. One picked a berry from a rose bush on the lower part of the bluff on March 31,1923. One was feeding on the ground in a plowed field near the creek on April 14,1923. A Robin was feeding on the ground in a freshly cut alfalfa field on July 5,1923. Some were eating poke berries on November 4,1923 and on February 7,1924,one was feeding on sumac that was growing at the side of the road.

On February 17,1923,a flock was found roosting in the tops of some rather exposed small trees along the lower edge of the bluff. Robins were often seen perched in the tops of tall trees. From these perches they called and sang.

An adult was sitting on four eggs in a nest twelve feet from the ground in the center of a box elder tree in a yard on May 13,1923. When it was disturbed,the bird called loudly. Another came and both appeared to be very nervous. One of the pair was standing on the edge of the nest on May 19.

A Robin was seen carrying straw to start a nest in a maple tree in a yard on June 7,1922. The nest was nearly

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finished by evening. On June 8, 1923, a bird was building a nest in the top of a maple tree in the yard. It brought some of the material from the opposite side of the creek at least one hundred and fifty yards away.

One adult was feeding another on June 16, 1923.

Although they were present throughout the year, there was a noticeable movement of Robins in the migration seasons. They flocked with the small transients that fed on the bar and on the bluff. Flocks were frequently seen flying high down the creek valley or in some other direction in the evening of days in winter or in the migration season.

Sialia sialis sialis. (Linnaeus). Bluebird. (48.5).

Bluebirds were found in summer in orchards, in small clearings on the bluff, on the bar, in pastures where there were trees, and along roads and fences between fields. Nesting pairs were scattered, because they required a suitable cavity in which to place their nests. A pair was seen in the center of a corn field in which the corn was three inches high on June 12, 1923. A large flock was found in a pasture on July 14, 1923. Some were feeding on the ground. Some were in living and dead trees, and some were perched on the tops of fence posts. The number of individuals present in the winter was smaller. They were usually found then in small groups of four or five.

On April 1, 1923, one brought a large insect to a female which was on a limb of a stump along a road. The female took the insect and the pair flew across the road. A nest

was built in the stump, but it was never used.

A pair was seen at a hole in a partially buried tree trunk in the creek bottom on April 14, 1923. The female was in the hole most of the time while the male was perched on a weed two feet away or at the entrance of the nest hole. Both left and returned to the tree several times. The male was calling. On April 28, the female was brooding and would not leave the nest when the trunk was pounded. The male sat on top of a tree fifty yards away. On April 29, the female left the nest when it was approached within six feet. The male was seen carrying a caterpillar near the nest on May 12, 1923.

A family of young just out of the nest was found with their parents along a slough on the bar on May 30, 1924.

A female was sitting on five eggs in a nest in a post along a road on June 17, 1922. The nest hole was six feet from the ground. Another nest was found in a post near Doniphan Lake on June 7, 1923. This one was three feet from the ground and it contained tree eggs.

A nest was found in an apple stump near a road on the lower part of the bluff on June 11, 1923. The nest was seven feet from the ground. A female flew out of the hole when the stump was hit. The nest was four inches below the opening, but its contents could not be determined. On June 22, the pair was feeding young in the nest. Young birds were heard calling in the nest on June 28. On June 30, the nest was empty.

A nest was found on July 1, 1923, that was four feet from

the ground in a fence post between a pasture along a creek and a corn field. The nest was made of grasses and was four inches below the opening. It contained four eggs. There was a bird near, but none on the nest.

Small flocks of the size of family groups were found together from the time the first young birds left the nest in summer until they were separated into pairs in the following spring.

SUMMARY OF NESTS.

1.Green Hreon	6-5-23	S.Pop.	Populus.	20	eggs.
2.Bob-white	6-10-22	Bluff.	Grass.		inc.
3Mourning Dove	6-8-22	Yard.	Ulmus.	15	?
4.Do.	6-17-22	Road.	Maclura.		?
5.Do.	6-19-22	Yard.	Juglans	12	?
6.Do.	6-19-22	S.Pop.	Salix	2	2 eggs.
7.Do.	5-6-23	Yard.		12	inc.
8.Do.	5-19-23	Road.	Maclura.	12	inc.
9.Do.	6-7-23	Orch.	Pyrus	12	2 eggs.
10.Do.	6-17-23	T.creek.	Ulmus.	15	?
11.Do.	6-22-23	Bluff.	Cercis.	9	inc.
12.Do.	6-23-23	Yard.	Juglans.	22	?
13.Do.	6-23-23	Bluff.	Ulmus.	6	2 eggs.
14.Do.	6-24-23	Orch.	Prunus.	11	inc.
15.Do.	6-26-23	Yard.	Ulmus.	12	?
16.Do.	6-26-23	Yard.	Gledit.	40	?
17.Do.	6-30-23	Yard.	Ulmus.	30	?
18.Do.	7-1-23	Yard.	Acer.	30	?
19.Do.	7-5-23	Bluff.	Quercus.	15	inc.
20.Do.	7-7-23	Orch.	Pyrus.	7	?
21.Do.	7-16-23	Yard.	Ulmus.	13	?
22.Do.	7-18-23	Yard.	Celtis.	30	?
23.Do.	4-22-24	Road.	Maclura.	12	inc.
24.Do.	5-3-24	Yard.	Acer.	10	1 egg.
25.T.Vulture	6-6-23	Bluff.	Rock.		Young.

26. Cooper's Hawk.	6-7-22. Bluff.	Quercus.	30	5 young.
27. Do.	6-11-22 Bluff.	Quercus.	15	5 eggs.
28. Red-t. Hawk.	3-31-23 Bluff.	Quercus.	25	3 eggs.
29. Long-e. Owl.	3-30-24 S. Pop.	Populus.	12	5 eggs.
30. Y+b. Cuckoo	6-16-22 S. Pop.	Salix.	4	3 eggs.
31. Do.	6-28-22 S. Pop.	Populus.	15	?
32. Do.	8-9-22 Bluff.	Cercis.	12	?
33. Do.	8-14-22 Bluff.		10	eggs.
34. Do.	8-28-22 Bluff.	Cornus.	6	2 eggs.
35. Do.	6-12-23 Bluff.	Ulmus.	10	2 eggs.
36. Do.	6-12-23 Bluff.	Cercis.	10	2 eggs.
37. Do.	6-12-23 Bluff.	Ulmus.	7	2 eggs.
38. Do.	6-13-23 Bluff.	Vitis.	8	?
39. Do.	6-14-23 Bluff.	Cercis.	6	2 eggs.
40. Do.	6-22-23 Bluff.	Acer.	10	?
41. Do.	6-25-23 Bluff.	Vitis.	7	3 eggs.
42. Do.	6-27-23 Bluff.	Juglans.	7	1 e. 3 yg.
43. Do.	6-29-23 Bluff.	Rosa.	6	4 eggs.
44. Do.	6-30-23 Road.	Acer	8	3 eggs.
45. Do.	6-30-23 Road.	Maclura.	8	3 eggs.
46. Do.	6-30-23 Bluff.	Vitis.	10	?
47. Do.	7-3-23 Bluff.	Quercus.	4	1 e. 2 yg.
48. Do.	7-3-23 Bluff.	Cornus.	5	2 eggs.
49. Do.	7-6-23 Sprout.	Cercis.	5	2 eggs.
50. Do.	7-11-23 Bluff.	Quercus.	10	?
51. Do.	7-14-23 Sprout.	Cercis.	4	4 eggs.
52. Do.	7-15-23 Creek.	Vitis.	5	5 eggs.

53.Y.-b.Cuckoo.	7-18-23	Pasture	Rhus	4	2 e.3 yg.
54.Do.	7-19-23	S.Pop.	Salix.	7	3 eggs.
55.Do.	8-29-23	Bluff.	Cercis.	12	?
56.Do.	9-9-25	Bluff.	Quercus	20	?
57.Hairy Wood.	4-29-23	T.creek.	stump.	20	yg.
58.Downy Wood.	6-8-22	Orchard.	hole.	5	yg.
59.Do.	5-12-23	T.creek.	hole.	25	inc.
60.Do.	6-3-23	Orchard.	hole.	8	yg.
61.Do.	6-4-23	Bluff.	hole	15	yg.
62.Do.	6-7-23	S.Pop.	hole.	7	yg.
63.Red-h.Wood.	6-25-22	Bluff.	hole.		yg.
64.Do.	8-21-23	Bluff.	hole.	25	yg.
65.Do.	6-8-23	Bluff	hole.		yg.
66.Do.	6-26-23	Bluff.	hole.		yg.
67.Do.	7-10-23	T.creek.	hole.	30	yg.
68.Red-b.Wood.	4-29-23	T.creek.	hole.		?
69.N.Flicker.	6-10-23	Bluff.	hole.	40	?
70.Whip-p.-will.	6-14-23	Bluff.	ground		1 egg.
71.Chimney Swift.	7-16-23	House.	chimney.		3 yg.
72.Do.	7-18-23	House.	chimney.		young.
73.R.t.Hummingbird	6-16-22	Bluff.	Quercus.	12	inc.
74.Do.	8-3-22	Bluff.	Quercus.	10	?
75.Do.	8-5-22	Bluff.	Quercus.	12	?
76.Do.	6-4-25	T.creek.	Ostrya.	15	inc.
77.Do.	6-18-23	Bluff.	Quercus.	25	?
78.Do.	6-18-23	Bluff.	Hicoria.	20	inc.
79.Do.	6-29-23	Bluff.	Quercus.	18	?
80.Do.	6-30-23	Bluff.	Hicoria.	20	?

81. R.t. Hummingbird	7-2-23	Bluff.	Quercus	25	?
82. Do.	7-14-23	Bluff.	Quercus.	12	?
83. Kingbird	6-17-22	Orchard	Pyrus.	12	2 eggs.
84. Do.	6-23-22	S. Pop.	Platanus.	12	?
85. Do.	6-23-22	SS. Pop.	Platanus.	12	?
86. Phoebe.	4-15-23	Build.	shed.	8	inc.
87. Do.	4-28-23	Creek	bank.	5	3 eggs.
88. Do.	6-5-23	Build.	house.	6	3 eggs.
89. Do.	4-22-24	Creek.	bank.	4	5 eggs.
90. Do.	5-11-24	Build.	shed.	8	4 eggs.
91. W. Pewee.	6-21-22	Bluff.	Quercus	20	?
92. Do.	6-25-23	S. Pop.	Platanus	22	?
93. Do.	6-28-23	Bluff.	Quercus	20	?
94. Do.	7-13-23	T. creek.	Platanus	30	young.
95. Acad. Flycatch.	6-14-22	Bluff	Sambucus	5	3 eggs.
96. Do.	6-26-23	Bluff	Quercus	6	2 yg.
97. Blue Jay	6-16-22	Yard	Acer	30	?
98. Do.	6-3-23	Yard	Ulmus	12	?
99. Do.	6-14-23	Yard	Acer	30	yg.
100. Do.	4-20-24	Yard	Acer	20	inc.
101. Do.	4-20-24	Yard	Ulmus	25	inc.
102. Do.	5-8-24	Yard	Acer	25	inc.
103. Do.	5-8-24	Yard	Ulmus	25	?
104. Do.	5-17-24	Yard	Ulmus	30	?
105. Crow	6-8-22	S. Pop.	Populus	15	young.
106. Do.	6-11-22	Bluff	Quercus	20	young.
107. Do.	3-31-23	S. Pop.	Populus	15	inc.

108.Crow	3-31-23	S.Pop.	Populus	12	inc.	139
109.Do.	4-1-23	S.Pop.	Populus.	15	inc.	
110.Do.	4-7-23	S.Pop.	Populus	12	1 egg.	
111.Do.	4-20-24	T.creek	Ulmus	25	?	
112.Y.-h.Blackbird	5-30-24	Typha	Typha	3	eggs.	
113.R.-w.Blackbird	6-9-22	Typha	Typha	2	4 eggs.	
114.Do.	6-12-22	S.Pop.	Salix	4	5 yg.	
115.Do.	6-14-22	Typha	Typha		3 eggs.	
116.Do.	6-5-23	S.Pop.	Salix	5	4 eggs.	
117.Do.	6-8-23	S.Pop.	Salix	6	4 eggs.	
118.Do.	5-29-24	Typha	Typha	3	4 eggs.	
119.Do.	5-29-24	Typha	Typha	3	4 eggs.	
120.Do.	5-29-24	Typha	Typha	3	4 eggs.	
121.Do.	5-29-24	Typha	Typha	3	3 eggs.	
122.Do.	5-30-24	Typha	Typha	2	4 eggs.	
123.Do.	5-30-24	Typha	Typha	2	4 eggs.	
124.Do.	5-30-24	Typha	typha	1	4 eggs.	
125.Do.	5-30-24	Typha	Typha	2	3 eggs.	
126.Do.	5-30-24	Typha	Typha	2	1 egg.	
127.Or.Oriole	6-23-22	Yard		20	young.	
128.Do.	6-3-23	S.Pop.	Populus	20	inc.	
129.Do.	6-7-23	S.Pop.	Salix.	13	?	
130.Do.	6-26-23	Yard	Celtis	15	inc.	
131.Do.	7-16-23	Yard	Ulmus	7	young.	
132.Balt.Oriole	6-9-22	S.Pop.	Salix	20	?	
133.Do.	6-14-22	Yard	Ulmus	10	young.	
134.Do.	6-17-22	Bluff	Quercus	35	young.	

135. Bait. Oriole	6-26-22	Yard	Juglans	12	young.
136. Do.	6-4-23	Yard	Acer	10	inc.
137. Do.	6-22-23	Yard	Juglans	30	?
138. Do.	6-23-23	Yard	Juglans		inc.
139. Br. Grackle.	6-17-23	T. creek	Acer	20	?
140. Lark Sp.	6-9-22	Pasture	ground		4 yg.
141. Field Sp.	6-14-22	Pasture	Symphor.	1	1 egg.
142. Do.	7-18-23	Sprout	Quercus	3	2 eggs.
143. Cardinal	6-8-22	Pasture	Sambucus	4	1 egg.
144. Do.	6-8-22	Road	Ulmus	3	inc.
145. Do.	6-9-22	Pasture	Acer	6	3 eggs.
146. Do.	6-9-22	Road	Maclura	6	3 eggs.
147. Do.	6-10-22	Bluff		6	inc.
148. Do.	6-12-22	Bluff		6	4 eggs.
149. Do.	6-17-22	T. creek	Ulmus	6	3 eggs.
150. Do.	6-19-22	S. Pop.	Rhus	9	?
151. Do.	6-24-22	S. Pop.	Salix	10	inc.
152. Do.	4-28-23	Creek	roots		inc.
153. Do.	5-12-23	Bluff		6	2 eggs.
154. Do.	5-12-23	Bluff	Vitis	5	3 eggs.
155. Do.	5-12-23	Bluff		3	2 eggs.
156. Do.	5-13-23	Road	brush		2 eggs.
157. Do.	5-19-23	Bluff	brush	5	inc.
158. Do.	5-20-23	Bluff	Rosa	5	4 eggs.
159. Do.	6-3-23	S. Pop.	Salix	3	1 egg.
160. Do.	6-7-23	S. Pop.	Populus	6	?
161. Do.	6-8-23	Bluff	Vitis	4	1 egg.

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162. Cardinal	6-10-23 Bluff	Sambucus	4	3 eggs.
163. Do.	6-10-23 Bluff	Symphor.	4	2 yg.
164. Do.	6-13-23 Bluff	Ulmus	3	1 egg.
165. Do.	6-14-23 Bluff	Cornus	3	3 yg.
166. Do.	6-30-23 Bluff	Cornus	6	2 eggs.
167. Do.	7-4-23 T. creek.	Vitis	10	?
168. Do.	7-4-23 Bluff	Sambucus	5	1 egg.
169. Do.	7-6-23 Bluff	Morus	11	?
170. Do.	7-10-23 Bluff		12	inc.
171. Do.	7-11-23 Bluff	Cercis	3	2 eggs.
172. Do.	7-12-23 S. Pop.	Salix	8	?
173. Do.	7-13-23 T. creek	Ulmus	9	inc.
174. Do.	7-13-23 Road	Sambucus	6	2 eggs.
175. Do.	7-17-23 S. Pop.	Salix	5	1 egg.
176. Do.	7-19-23 Sprout	Hicoria	6	3 eggs.
177. Do.	8-25-23 Road	Quercus	5	2 eggs.
178. Do.	4-20-24 Creek	roots	7	3 eggs.
179. Do.	5-8-24 Creek	Vitis	7	1 egg.
180. Do.	5-11-24 Bluff		4	3 eggs.
181. R.-b. Grosbeak	6-13-23 Orchard	Pyrus	17	3 yg.
182. Do.	6-17-23 T. creek	Acer	10	1?
183. Ind. Bunting	6-15-22 Road	Symphor.	2	4 yg.
184. Do.	6-16-22 Road	Symphor.	1	2 yg.
185. Do.	6-19-22 S. Pop.	Populus	9	3 eggs.
186. Do.	8-23-22 Road	Sambucus	4	4 yg.
187. Do.	6-8-23 S. Pop.	Salix	4	?
188. Do.	6-10-23 S. Pop.	Salix	4	1 egg.

189. Ind. Bunting	6-13-23	Road	Symphor.	2	3 eggs.
190. Do.	6-16-23	S. Pop.	Cornus	5	3 eggs.
191. Do.	6-26-23	Sprout	Sambucus	1	4 yg.
192. Do.	6-28-23	Bluff	Vitis	6	3 eggs.
193. Do.	7-2-23	Road	weed	2	1 egg.
194. Do.	7-7-23	S. Pop.	Platanus	3	3 yg.
195. Do.	7-14-23	Road	Symphor.	2	1 egg.
196. Do.	7-17-23	S. Pop.	weed	3	2 eggs.
197. Do.	7-17-23	S. Pop.	weed	4	2 eggs.
198. DO.	7-17-23	S. Pop.	weed	4	4 eggs.
199. Do.	7-17-23	S. Pop.	weed	3	4 yg.
200. Do.	8-18-23	S. Pop.	weed	5	4 eggs.
201. Dickcissel	6-9-22	Pasture	Sambucus	2	1 e. 3 yg.
202. DO.	6-12-23	T. edge	Rubus	1	5 eggs.
203. Do.	6-13-23	Sprout	Sambucus	4	4 eggs.
204. Do.	7-14-23	Road	Sambucus	3	4 yg.
205. Do.	7-18-23	Sprout	Juglans	4	3 eggs.
206. Do.	8-23-23	S. Pop.	weed	3	yg.
207. Sea. Tanager	6-15-22	Bluff	Hicoria	20	?
208. Sum. Tanager	6-25-22	Yard	Acer	10	3 eggs.
209. Do.	6-21-23	Bluff	Quercus		?
210. Do.	7-15-23	T. creek	Quercus	14	?
211. Barn Swallow	6-9-22	Build.	barn	8	young.
212. Do.	6-8-23	Build.	shed	6	inc.
213. Tree Swallow	6-12-22	S. Pop.	Salix	3	young.
214. Do.	6-13-22	S. Pop.	Salix		young.
215. Do.	6-13-22	S. Pop.	Salix	2	5 eggs.

216. Tree Swallow	6-7-23	S. Pop.	Salix	6	inc.
217. R.-w. Swallow	5-18-24	Creek	bank		?
218. R.-e. Vireo	6-19-22	Bluff	Acer	9	inc.
219. Do.	8-23-21	T. creek		15	young
220. Do.	6-8-23	S. Pop.	Acer	7	3 eggs.
221. Do.	6-7-23	S. Pop.	Cornus	5	3 eggs.
222. Do.	6-28-23	Bluff	Quercus	5	4 eggs.
223. Do.	7-3-23	Bluff	Hicoria	8	1 e. 1 yg.
224. W.-e. Vireo	6-29-23	Bluff	Ulmus	1	1 yg.
225. Bell's Vireo	6-17-22	Road	Maclura	5	3 eggs.
226. Do.	6-5-23	S. Pop.	Populus	5	4 eggs.
227. Do.	6-7-23	S. Pop.	Cornus	2	4 eggs.
228. Do.	6-8-23	S. Pop.	Cornus	3	4 eggs.
229. Do.	6-8-23	S. Pop.	Salix	5	4 eggs.
230. Do.	6-8-23	S. Pop.	Salix	3	3 eggs.
231. Do.	6-10-23	S. Pop.	Salix	4	3 eggs.
232. Do.	6-10-23	S. Pop.	Salix	2	inc.
233. Prothon. War.	6-16-22	S. Pop.	Salix	5	3 eggs.
234. Do.	6-23-22	S. Pop.	Platanus		vac.
235. Do.	6-12-23	S. Pop.	Salix	4	4 eggs.
236. Do.	6-12-23	S. Pop.	Salix	6	eggs.
237. Do.	6-12-23	S. Pop.	Salix	5	4 eggs.
238. Yellow War.	6-7-23	S. Pop.	Salix	8	5 eggs.
239. Do.	6-8-23	S. Pop.	Salix	5	5 eggs.
240. Kentuck. War.	6-30-23	Bluff	ground		2 yg.
241. Maryland Yel.	6-7-23	S. Pop.	sedge	$\frac{1}{2}$	5 eggs.
242. Do.	6-12-23	Slough	sedge	1	1 e. 3 yg.
243. Do.	6-12-23	Typha	grass	$\frac{1}{2}$	5 Eggs.

244.Y.-b.Chat	6-5-23	S.Pop.	Salix	2	3 eggs.
245.Do.	6-8-23	S.Pop.	Salix	2	3 eggs.
246.Do.	6-12-23	S.Pop.	Rosa	2	4 yg.
247.Do.	6-13-23	Sprout	Cornus	3	1 e.3 yg.
248.Do.	6-13-23	Bluff	Symphor.	2	eggs.
249.Do.	6-12-23	Bluff	Symphor.	2	1 egg.
250.Do.	6-16-23	S.Pop.	Vitis	5	4 eggs.
251.Do.	6-16-23	S.Pop.	Vitis	3	4 eggs.
252.Do.	6-29-23	Sprout	Cercis	4	5 eggs.
253.Do.	7-19-23	S.Pop.	weed	3	4 eggs.
254.Catbird	6-10-22	T.creek	Ulmus	6	1 egg.
255.Do.	6-7-23	S.Pop.	Salix	4	1 egg.
256.Do.	6-22-23	Pasture	Ribes	3	young.
257.Do.	7-3-23	Orchard	Pyrus	9	3 eggs.
258.Do.	7-16-23	Yard	Juniper	7	1 egg.
259.Br.Thrasher	6-20-22	Road	Maclura	5	4 eggs.
260.Do.	6-23-22	S.Pop.	Prunus	6	4 eggs.
261.Do.	6-13-23	Bluff	Vitis	6	3 eggs.
262.Do.	6-28-23	S.Pop.	Populus	4	vac.
263.Do.	6-30-23	Bluff	Cornus	5	4 eggs.
264.Do.	7-5-23	Bluff	Cornus	7	2 eggs.
265.Do.	7-18-23	Sprout	Quercus	3	1 e.2 yg.
266.Do.	5-29-24	Pasture	Ribes	4	2 eggs.
267.Carolina Wren	6-21-22	Bluff	stump	1	1e.4 yg.
268.Do.	4-28-23	Bluff	ground		inc.
269.Do.	4-28-23	Road	ground		yg.
270.Do.	5-13-23	Road	ground		4 eggs.

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271.	Carolina Wren	6-26-23	Build.	shed	10	1 egg.
272.	Do.	8-28-23	Creek	bank	10	young.
273.	Do.	4-21-24	Road	ground		?
274.	W.H.Wren	6-9-22	Build	tin can	7	?
275.	Do.	6-12-23	S.Pop.	hole	5	inc.
276.	Do.	6-13-23	Build	tin can	7	young.
277.	Do.	6-14-23	Build.	cornice	12	young.
278.	Do.	7-4-23	Yard	Pyrus	8	?
279.	Do.	7-11-23	Build.	porch	7	5 eggs.
280.	P.--marsh Wren	5-30-24	Typha	Typha	2	inc.
281.	Tufted Titmouse	5-19-23	Yard	hole	4	young.
282.	Do.	6-16-23	Bluff	hole	5	5 eggs.
283.	Do.	6-28-23	Bluff	hole	4	5 yg.
284.	Chickadee	6-9-22	Bluff	hole	15	young.
285.	Do.	4-14-23	T?creek	hole		inc.
286.	Do.	4-15-23	Bluff	hole	5	inc.
287.	Do.	6-7-23	S.Pop.	hole	5	5 yg.
288.	Do.	6-8-23	S.Pop.	hole	5	3 eggs.
289.	B.-g.Gnatcatch.	6-19-22	Bluff	Quercus	25	?
290.	Do.	6-4-23	Bluff	Juglans	20	inc.
291.	Do.	6-4-23	Bluff	Quercus		inc.
292.	Do.	6-12-23	Bluff	Quercus	18	inc.
293.	Wood Thrush	6-26-23	Bluff	Ulmus	12	?
294.	Do.	8-2-22	S.Pop.	Salix	15	?
295.	Do.	8-9-22	Bluff	Cornus	7	?
296.	Do.	6-4-23	Bluff	Tilia	9	?
297.	Do.	6-4-23	Bluff	Ulmus	12	?

298. Wood Thrush	6-12-23	Bluff	Ulmus	12	?
299. Do.	6-12-23	Bluff	Ulmus	25	?
300. Do.	7-4-23	Bluff	Cornus	6	inc.
301. Do.	7-14-23	Bluff	Quercus	8	2 eggs.
302. Robin	6-7-22	Yard	Acer		inc.
303. Do.	5-13-23	Yard	Acer	12	4 eggs.
304. Do.	6-7-23	Orchard	Pyrus	13	?
305. Do.	6-8-23	Yard	Acer	25	inc.
306. Do.	6-17-23	T. creek	Acer	15	?
307. Do.	7-16-23	Yard	Juglans	20	young.
308. Do.	7-16-23	Pasture	Ulmus	20	?
309. Bluebird	6-17-22	Road	post	6	5 eggs.
310. Do.	6-20-22	T. creek	hole	25	?
311. Do.	4-14-23	T. creek	hole	3	?
312. Do.	6-7-23	S. Pop.	post	3	3 eggs.
313. Do.	6-11-23	Bluff	hole	7	?
314. Do.	7-1-23	Pasture	post	4	4 eggs.
315. Do.	7-16-23	Build.	tin can	6	3 eggs.

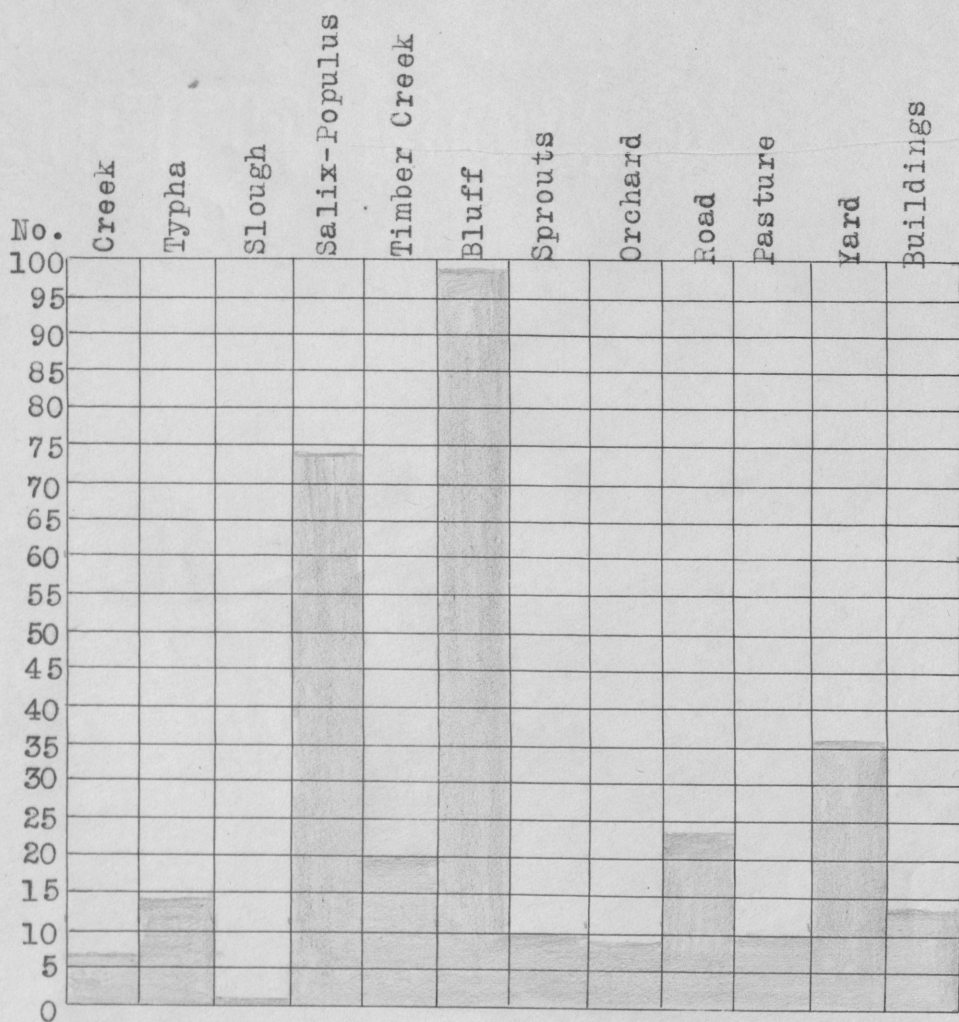


CHART SHOWING HABITAT DISTRIBUTION OF NESTS.

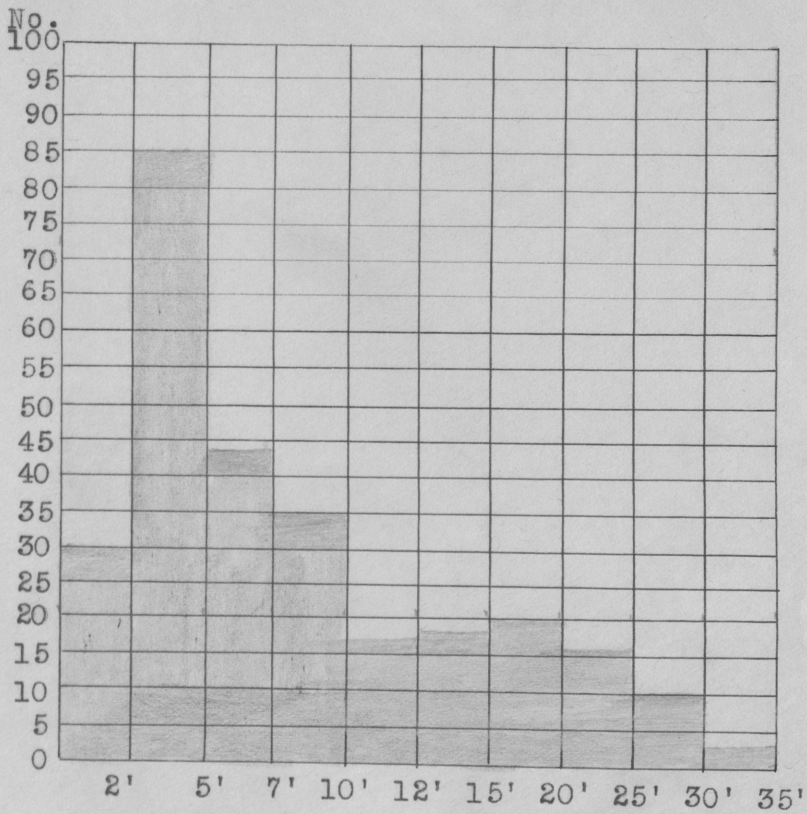


CHART SHOWING HEIGHT OF NESTS FOUND, 1922-23.

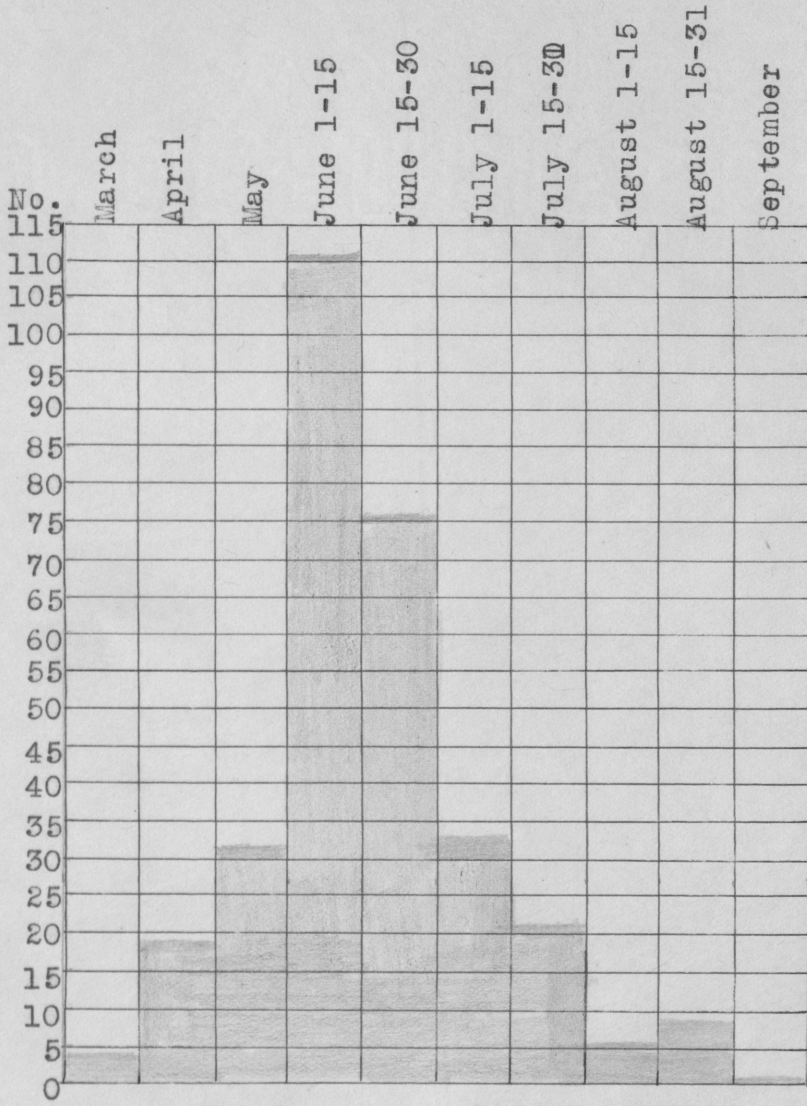


CHART SHOWING SEASONAL DISTRIBUTION OF NESTS.

TABLE OF OCCURRENCE OF EACH SPECIES BY MONTHS AND BY HABITAT DIVISIONS.

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout.	Orch.	Road	Past.	Field	Yard	Build.	
Pied-billed Grebe-----				*	*			*	*	*	*			*															
Herring Gull-----		*	*	*	*	*							*	*	*														
Ring-billed Gull-----				*	*	*							*	*	*														
Franklin's Gull-----				*	*						*	*	*	*												*			
Bonaparte's Gull-----											*	*	*	*															
Forster's Tern-----					*			*						*															
Least Tern-----						*	*	*	*				*	*	*														
Black Tern-----					*	*		*	*				*	*	*														
Double-crested Cormorant-----					*									*															
White Pelican-----				*	*			*	*				*	*															
Merganser-----	*	*	*	*							*	*	*	*	*														
Red-breasted Merganser-----											*	*	*	*	*														
Mallard-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*														
Black Duck-----										*	*	*	*	*															
Gadwall-----			*							*	*	*	*	*															
Baldpate-----			*						*	*	*	*	*	*			*												

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	Past.	Field	Yard	Build
Green-winged Teal-----			*	*						*	*				*														
Blue-winged Teal-----				*	*	*		*	*	*	*				*	*		*											
Shoveller-----			*	*	*						*				*	*													
Pintail-----	*	*	*	*	*	*			*	*					*														
Wood Duck-----						*		*	*	*			*		*	*													
Redhead-----				*											*	*													
Lesser Scaup Duck-----		*	*	*	*	*					*				*	*													
Ring-necked Duck-----											*				*	*													
Snow Goose-----			*										*		*														
Canada Goose-----	*	*	*								*		*		*														
Bittern-----									*	*						*													
Least Bittern-----					*	*		*									*												
Great Blue Heron-----		*	*	*	*	*	*	*	*	*			*	*	*	*	*	*											
Little Blue Heron-----									*	*					*	*	*	*											
Green Heron-----			*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*								
Black-crowned Night Heron-----			*	*	*	*	*	*	*	*					*	*	*	*	*	*	*								

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L shore	Typha	Slough	S.Pop.	T.creek	Bluff.	T.edge	Sprout	Orch.	Road	Past.	Field	Yard	Build.
Virginia Rail-----									*																				
Sora -----					*			*	*									*											
Coot-----				*	*	*			*	*	*				*	*	*	*											
Wilson's Phalarope-----					*	*			*	*						*	*	*											
Wilson's Snipe-----				*	*	*			*	*	*			*		*	*	*											
Long-billed Dowitcher-----					*	*		*	*							*	*	*											
Stilt Sandpiper-----					*	*			*	*						*	*	*											
Pectoral Sandpiper-----		*	*	*	*	*		*	*	*					*	*	*	*											
White-rumped Sandpiper-----				*	*	*		*	*	*						*	*	*											
Least Sandpiper-----				*	*	*		*	*	*						*	*	*											
Semipalmated Sandpiper-----				*	*	*		*	*	*						*	*	*											
Hudsonian Godwit-----				*	*	*		*	*	*						*	*	*											
Greater Yellow-legs-----			*	*	*			*	*	*					*	*	*	*											
Yellow-legs-----	*	*	*	*	*		*	*	*	*					*	*	*	*											
Solitary Sandpiper-----		*	*	*	*		*	*	*	*				*	*	*	*	*											
Willet-----				*	*		*	*	*	*				*	*	*	*	*											

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	Past.	Field	Yard	Build.
Buff-breasted Sandpiper-----									*							*													
Spotted Sandpiper-----						*	*	*	*					*	*	*	*	*											
Long-billed Curlew-----						*										*	*												
Black-bellied Plover-----						*		*	*						*	*	*												
Killdeer-----			*	*	*	*	*	*	*	*						*	*	*											
Semipalmated Plover-----					*	*	*	*	*						*	*	*												
Bob-white-----	*		*	*	*	*	*	*	*	*		*							*	*	*				*				
Mourning Dove-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Turkey Vulture-----				*	*	*	*	*	*										*	*	*	*							
Marsh Hawk-----	*	*	*	*		*	*	*	*	*									*	*	*	*							
Sharp-shinned Hawk-----		*		*														*	*	*	*								
Cooper's Hawk-----	*	*	*	*	*	*	*	*	*	*	*	*		*					*	*	*	*							
Red-tailed Hawk-----	*	*	*	*	*	*	*	*	*	*	*	*	*						*	*	*	*	*	*	*	*	*	*	*
Red-shouldered Hawk-----				*		*	*	*	*	*	*	*							*	*	*	*	*	*	*	*	*	*	*
Swainson's Hawk-----			*																*	*	*	*	*	*	*	*	*	*	*
Broad-winged Hawk-----								*	*										*	*	*	*	*	*	*	*	*	*	*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	S. edge	Sprout	Orch.	Road	Past.	Field	Yard	Build.
Rough-legged Hawk-----	*									*											*						*		
Bald Eagle-----	*	*	*																		*								
Sparrow Hawk-----									*																*	*			
Osprey-----								*						*															
Long-eared Owl-----				*															*										
Short-eared Owl-----	*		*										*								*								
Barred Owl-----									*	*									*	*	*								
Saw-whet Owl-----			*																*	*	*								
Screech Owl-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*					*	*	*	*		*			*	*	*
Great Horned Owl-----				*	*	*	*	*	*	*	*	*	*						*	*	*	*							
Yellow-billed Cuckoo-----				*	*	*	*	*	*	*	*	*			*	*	*	*	*	*	*	*	*		*		*	*	*
Black-billed Cuckoo-----				*	*	*	*	*	*	*	*	*						*	*	*	*	*	*			*		*	*
Belted Kingfisher-----			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*						
Hairy Woodpecker-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Downy Woodpecker-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Red-headed Woodpecker-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orech.	Road	Past.	Field	Yard	Build.
Red-bellied Woodpecker-----	*	*	*	*	*	*	*	*	*	*	*	*								*	*	*					*	*	
Northern Flicker-----	*	*	*	*	*	*	*	*	*	*	*	*							*	*	*	*			*		*	*	
Whip-poor-will-----				*	*	*	*	*	*											*	*	*							
Nighthawk-----					*	*	*	*	*	*					*						*	*					*	*	
Chimney Swift-----				*	*	*	*	*	*	*					*				*	*	*	*					*	*	
Ruby-throated Hummingbird-----					*	*	*	*	*	*									*	*	*	*		*			*	*	
Kingbird-----					*	*	*	*	*	*			*	*	*				*	*	*	*	*			*	*	*	
Crested Flycatcher-----				*	*	*	*	*	*	*									*	*	*	*					*	*	
Phoebe-----			*	*	*	*	*	*	*	*					*			*	*	*	*	*		*			*	*	
Olive-sided Flycatcher-----					*	*	*	*	*	*									*	*	*	*					*	*	
Wood Pewee-----					*	*	*	*	*	*									*	*	*	*					*	*	
Acadian Flycatcher-----					*	*	*	*	*	*									*	*	*	*					*	*	
Alder Flycatcher-----				*	*	*	*	*	*	*									*	*	*	*					*	*	
Least Flycatcher-----				*	*	*	*	*	*	*									*	*	*	*					*	*	
Prairie Horned Lark-----	*			*	*	*																		*		*			
Maggie-----	*																		*	*	*	*					*	*	

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	Past.	Field	Yard	Build.
Blue Jay-----	*	*	*	*	*	*	*	*	*	*	*	*							*	*	*			*					
Crow-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*			*	*	*	*	*
Cowbird-----			*	*	*	*	*	*	*	*	*	*							*	*	*			*	*	*	*	*	*
Yellow-headed Blackbird-----					*									*	*	*	*	*						*	*	*	*	*	*
Red-winged Blackbird-----	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*		*	*	*	*	*	*
Meadowlark-----						*	*	*	*	*	*	*		*	*	*	*	*	*	*	*			*	*	*	*	*	*
Orchard Oriole-----					*	*	*	*	*	*	*	*					*	*	*	*	*			*	*	*	*	*	*
Baltimore Oriole-----					*	*	*	*	*	*	*	*					*	*	*	*	*			*	*	*	*	*	*
Rusty Blackbird-----				*							*	*					*	*	*	*	*			*	*	*	*	*	*
Bronzed Grackle-----	*		*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*	*	*		*	*	*	*	*	*
Purple Finch-----	*	*	*	*	*				*	*	*	*						*	*	*	*			*	*	*	*	*	*
Goldfinch-----	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*	*
Pine Siskin-----	*	*	*								*	*						*	*	*	*			*	*	*	*	*	*
English Sparrow-----	*	*	*	*	*	*	*	*	*	*	*	*	*					*	*	*	*	*	*	*	*	*	*	*	*
Savannah Sparrow-----			*															*	*	*	*			*	*	*	*	*	*
Grasshopper Sparrow-----						*		*											*	*	*			*	*	*	*	*	*

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	Past.	Field	Yard	Build.
Leconte's Sparrow-----				*														*											
Lark Sparrow-----					*	*	*		*																*	*	*		
Harris's Sparrow-----	*	*	*	*	*					*	*	*							*	*	*				*	*		*	
Gambel's Sparrow-----					*	*													*	*	*								*
White-throated Sparrow-----				*	*					*	*								*	*	*								
Tree Sparrow-----	*	*	*	*	*					*	*	*				*	*	*	*	*	*			*					
Chipping Sparrow-----				*	*	*																					*	*	
Clay-colored Sparrow-----				*	*																				*				
Field Sparrow-----			*	*	*	*	*	*	*	*	*								*	*	*	*	*	*	*	*	*	*	*
Slate-colored Junco-----	*	*	*	*					*	*	*	*							*	*	*	*	*	*	*	*	*	*	*
Song Sparrow-----	*	*	*	*	*				*	*	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*
Lincoln's Sparrow-----		*	*	*	*				*	*	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*
Swamp Sparrow-----			*	*	*				*	*	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*
Fox Sparrow-----	*	*	*	*					*	*	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*
Towhee-----	*	*	*	*	*	*	*	*	*	*	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*
Cardinal-----	*	*	*	*	*	*	*	*	*	*	*	*				*	*	*	*	*	*	*	*	*	*	*	*	*	*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	Past.	Field	Yard	Build.
Rose-breasted Grosbeak-----					*	*	*	*	*										*	*	*						*	*	
Indigo Bunting-----						*	*	*	*	*									*	*	*	*	*	*			*	*	
Dickcissel-----				*	*	*	*	*	*										*	*	*	*	*	*	*	*	*	*	
Scarlet Tanager-----					*	*	*	*	*											*	*	*	*	*	*	*	*	*	
Summer Tanager-----					*	*	*	*	*											*	*	*	*	*	*	*	*	*	
Purple Martin-----				*	*	*	*	*	*					*			*			*	*	*	*	*	*	*	*	*	
Cliff Swallow-----					*	*	*	*	*				*											*	*	*	*	*	
Barn Swallow-----				*	*	*	*	*	*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Tree Swallow-----				*	*	*	*	*	*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Bank Swallow-----					*	*	*	*	*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Rough-winged Swallow-----				*	*	*	*	*	*				*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Cedar Waxwing-----	*		*	*	*	*	*	*	*		*								*	*	*	*	*	*	*	*	*	*	
Migrant Shrike-----		*			*	*	*	*	*										*	*	*	*	*	*	*	*	*	*	
Red-eyed Vireo-----					*	*	*	*	*										*	*	*	*	*	*	*	*	*	*	
Philadelphia Vireo-----					*	*	*	*	*										*	*	*	*	*	*	*	*	*	*	
Warbling Vireo-----					*	*	*	*	*										*	*	*	*	*	*	*	*	*	*	

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	Past.	Field	ard	Build.
Yellow-throated Vireo-----	*	*					*	*	*										*	*	*								
Blue-headed Vireo-----					*			*	*	*									*	*	*								
White-eyed Vireo-----				*	*	*	*	*	*	*									*	*	*	*							
Bell's Vireo-----				*	*	X	*	*	*	*									*	*	*	*	*	*	*	*			
Black and White Warbler-----	*	*	*	*	*	*		*	*	*							*	*	*	*	*	*						*	*
Prothonotary Warbler-----				*	*	*		*	*	*				*					*	*	*	*						*	*
Worm-eating Warbler-----						*		*	*	*								*	*	*	*	*							
Blue-winged Warbler-----					*			*	*	*								*	*	*	*	*							
Nashville Warbler-----				*				*	*	*								*	*	*	*	*							
Orange-crowned Warbler-----	*	*	*	*						*								*	*	*	*	*							
Tennessees Warbler-----			*	*				*	*	*								*	*	*	*	*							
NORTHERN Parula Warbler-----	*	*	*	*	*	*	*	*	*	*								*	*	*	*	*							
Yellow Warbler-----	*	*	*	*	*	*	*	*	*	*								*	*	*	*	*		*				*	*
Myrtle Warbler-----	*	*								*	*							*	*	*	*	*					*	*	
Magnolia Warbler-----				*															*	*	*	*							
Caerulean Warbler-----					*														*	*	*	*							

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	Past.	Field	* yard	Build.
Black-poll Warbler-----								*																					
Blackburnian Warbler-----									*												*								
Black-throated Green Warbler--								*	*												*								
Pine Warbler-----									*												*								
Ovenbird-----					*			*	*										*		*								
Grinnell's Water Thrush-----					*			*	*					*	*	*	*	*	*									*	
Louisiana Water Thrush-----				*									*																
Kentucky Warbler-----				*	*	*	*	*	*					*				*	*	*	*	*							
Mourning Warbler-----					*			*	*								*	*	*	*	*	*							
Northern Yellow-throat-----					*	*	*	*	*								*	*	*	*	*	*			*				
Yellow-breasted Chat-----					*	*	*	*	*								*	*	*	*	*	*	*		*	*			
Wilson's Warbler-----					*			*	*									*	*	*	*	*							
Canada Warbler-----					*			*	*									*	*	*	*	*							
Redstart-----				*	*	*	*	*	*									*	*	*	*	*	*						
Mockingbird-----					*	*	*	*	*										*	*	*	*	*		*				
Catbird-----					*	*	*	*	*	*									*	*	*	*	*		*		*		

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River Creek	Lake	Lake s.	Typha Slough	S.Pop.	T.creek.	Bluff	T.edge	Sprout Oreh.	Road	Past. Field	Yard	Build.
Brown Thrasher-----				*	*	*	*	*	*	*															
Carolina Wren-----	*	*	*	*	*	*	*	*	*	*	*	*					*	*	*	*					*
Western House Wren-----				*	*	*	*	*	*	*	*						*	*	*	*				*	*
Winter Wren-----		*	*							*	*				*				*		*	*			
Short-billed Marsh Wren-----					*											*			*						
Prairie Marsh Wren-----				*	*	*	*	*	*	*	*				*	*			*						
Brown Creeper-----	*	*	*	*	*	*		*	*	*	*	*							*		*	*		*	*
White-breasted Nuthatch-----	*	*	*	*			*	*	*	*	*	*				*	*		*					*	*
Red-breasted Nuthatch-----	*	*	*	*						*	*	*				*	*		*					*	*
Tufted Titmouse-----	*	*	*	*	*	*	*	*	*	*	*	*				*	*		*		*	*		*	*
Chickadee-----	*	*	*	*	*	*	*	*	*	*	*	*				*	*		*		*	*		*	*
Golden-crowned Kinglet-----	*	*	*							*	*	*				*	*		*					*	*
Ruby-crowned Kinglet-----		*	*						*	*	*	*				*	*		*					*	*
Blue-gray Gnatcatcher-----			*	*	*	*	*	*	*	*	*	*				*	*		*		*	*		*	*
Wood Thrush-----				*	*	*	*	*	*	*	*	*				*	*		*		*	*		*	*
Gray-cheeked Thrush-----				*	*	*	*	*	*	*	*	*				*	*		*		*	*		*	*

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	River	Creek	Lake	L. shore	Typha	Slough	S. Pop.	T. creek	Bluff	T. edge	Sprout	Orch.	Road	past.	Field	Yard	Build.
Olive-backed Thrush-----					*																*								
Hermit Thrush-----				*																	*								
Robin-----	*	*	*	*	*	*	*	*	*	*	*	*							*	*	*		*			*	*	*	
Bluebird-----	*	*	*	*	*	*	*	*	*	*	*	*							*	*	*	*		*	*	*	*	*	*

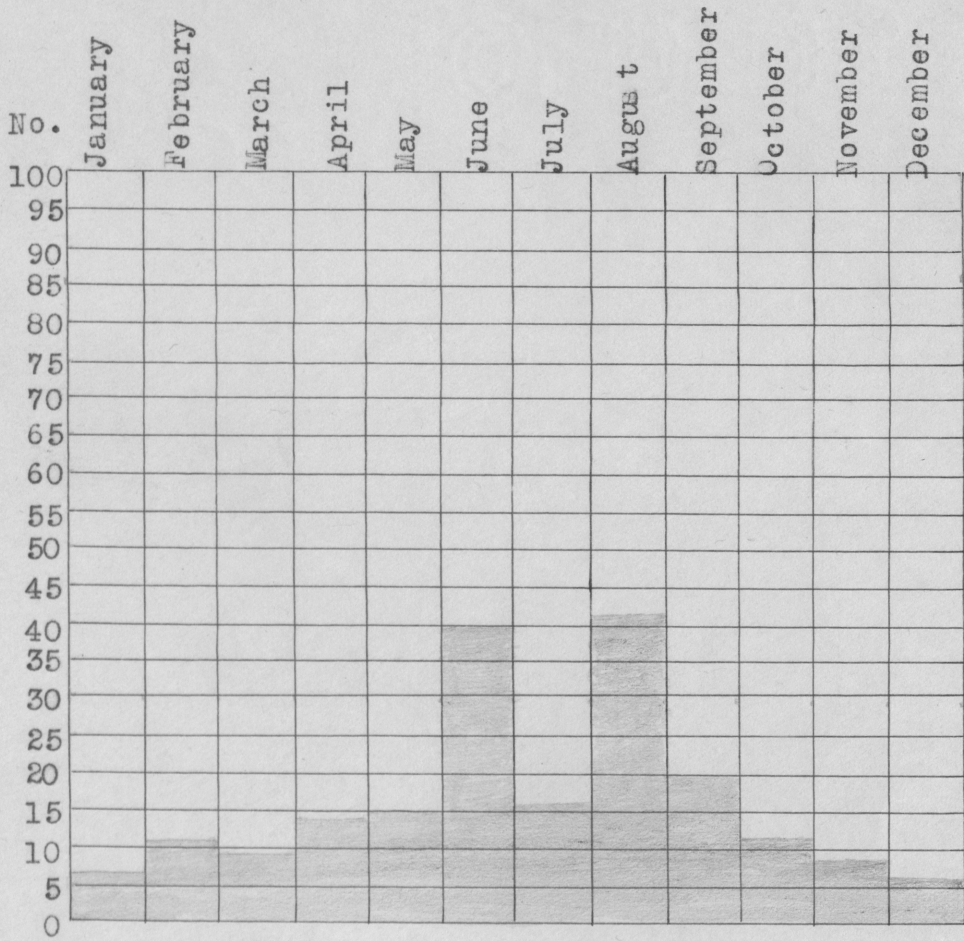


CHART SHOWING THE DISTRIBUTION OF FIELD DAYS BY MONTHS.

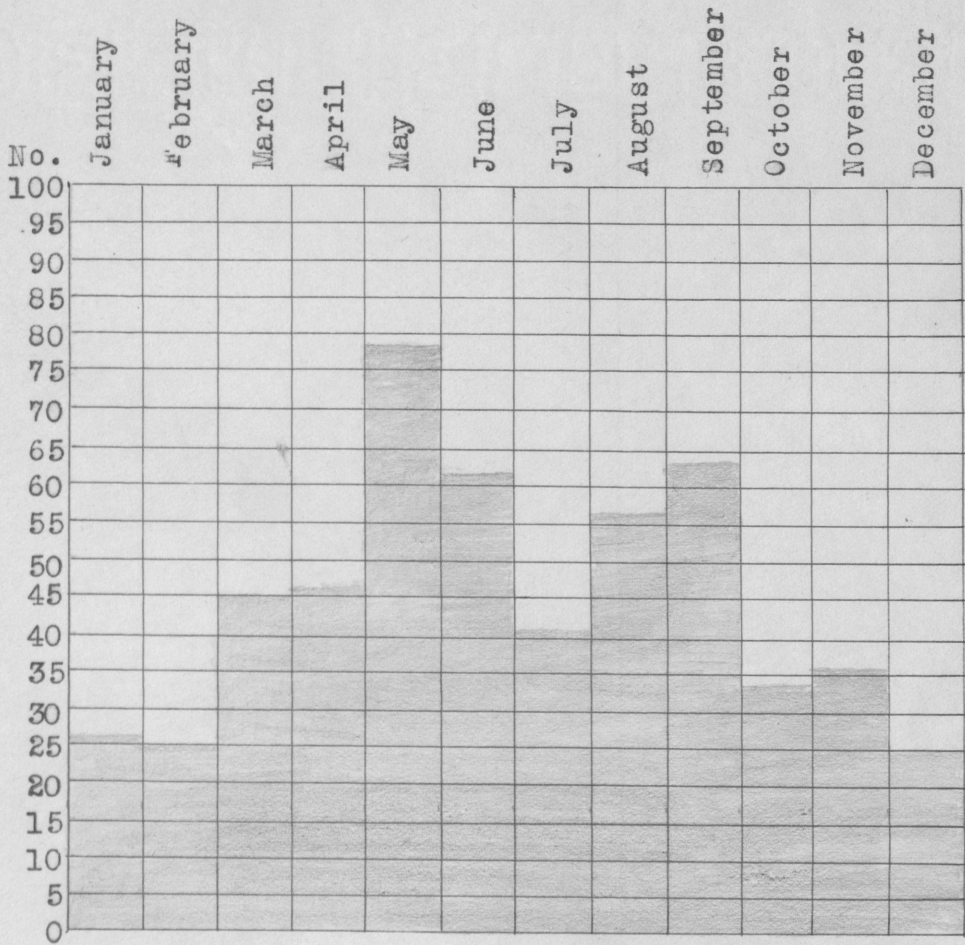


CHART SHOWING HIGHEST NUMBER OF SPECIES RECORDED

IN ONE DAY OF EACH MONTH.

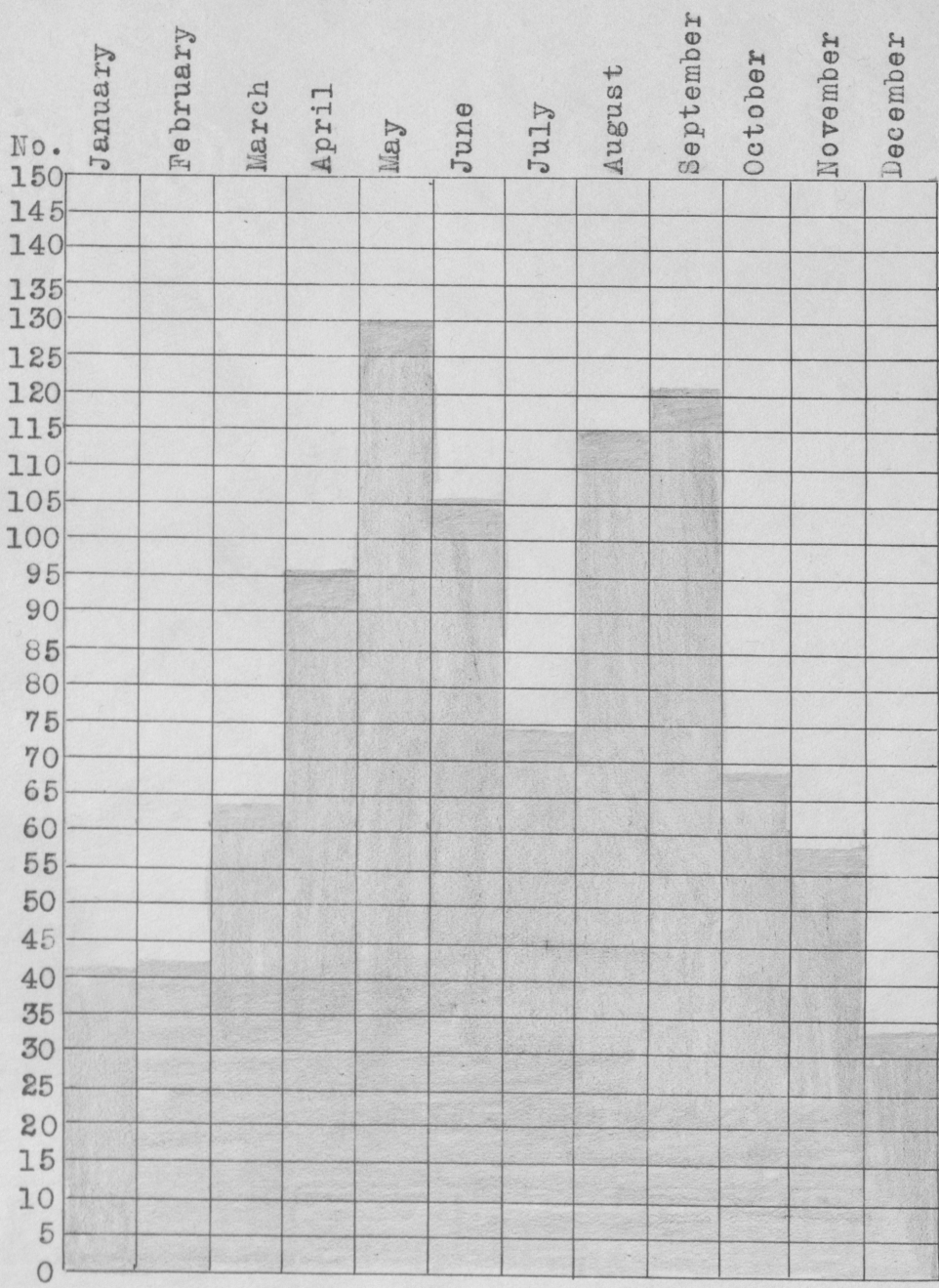


CHART SHOWING NUMBER OF SPECIES PRESENT EACH MONTH.

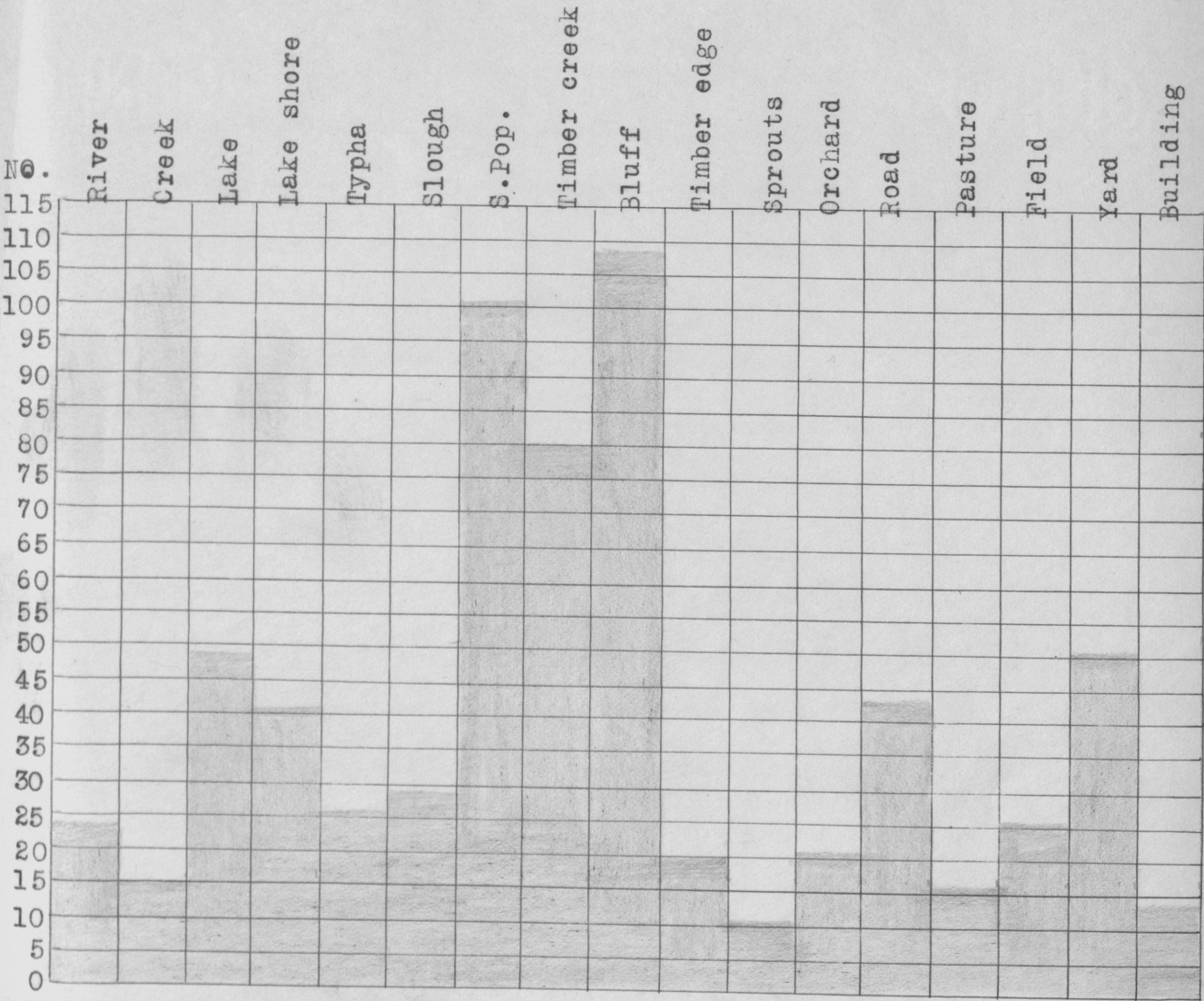


CHART SHOWING THE NUMBER OF SPECIES OCCURRING IN EACH DIVISION
OF THE HABITAT.

LIST OF SPECIES ARRANGED IN ORDER OF ABUNDANCE WITH PER CENT
OF FREQUENCY FOR EACH.

1. Cardinal	-----100. 7
2. English Sparrow	-----99.5
3. Crow	-----98.5
4. Chickadee	-----98.5
5. Blue Jay	-----93.5
6. Tufted Titmouse	-----90.
7. Carolina Wren	-----89.
8. Downy Woodpecker	-----89.
9. Mourning Dove	-----84.5
10. Goldfinch	-----82.
11. Robin	-----68.5
12. Red-headed Woodpecker	-----68.5
13. Indigo Bunting	-----65.5
14. Red-bellied Woodpecker	-----65.
15. Red-winged Blackbird	-----63.
16. Yellow-billed Cuckoo	-----62.5
17. Chimney Swift	-----59.
18. Red-eyed Vireo	-----58.5
19. Baltimore Oriole	-----52.
20. Western House Wren	-----49.5
21. Wood Thrush	-----48.
22. Wood Pewee	-----47.5
23. Whip-poor-will	-----46.5
24. Ruby-throated Hummingbird	-----45.5
25. Cowbird	-----45.

26. Bell's Vireo-----	45.
27. Kingbird-----	44.5
28. Bluebird-----	43.5
29. Blue-gray Gnatcatcher-----	40.5
30. Hairy Woodpecker-----	39.5
31. Great Blue Heron-----	39.5
32. Barn Swallow-----	38.
33. Northern Flicker-----	38.
34. Catbird-----	38.
35. Turkey Vulture-----	38.
36. Crested Flycatcher-----	37.5
37. Rough-winged Swallow-----	37.
38. Dickcissel-----	36.5
39. Tree Swallow-----	36.5
40. Green Heron-----	35.5
41. Yellow-breasted Chat-----	34.
42. Field Sparrow-----	34.
43. Rose-breasted Grosbeak-----	33.
44. Red-tailed Hawk-----	32.
45. Brown Thrasher-----	31.5
46. Phoebe-----	31.
47. Orchard Oriole-----	30.5
48. White-eyed Vireo-----	29.5
49. Warbling Vireo-----	29.5
50. Purple Martin-----	30.
51. Slate-colored Junco-----	30.
52. Kentucky Warbler-----	27.5

53. Song Sparrow-----	26.5
54. Belted Kingfisher-----	25.
55. Mallard-----	23.5
56. Screech Owl-----	23.
57. Northern Yellow-throat-----	23.
58. Tree Sparrow-----	22.
59. Towhee-----	21.5
60. Blue-winged Teal-----	21.5
61. Least Tern-----	21.
62. Bronzed Grackle-----	19.5
63. Redstart-----	19.
64. Spotted Sandpiper-----	18.5
65. Yellow-legs-----	18.5
66. Yellow Warbler-----	18.
67. Pectoral Sandpiper-----	18.
68. Bob-white-----	17.5
69. Bank Swallow-----	17.
70. Northern Parula Warbler-----	17.
71. Coot-----	16.5
72. Prothonotary Warbler-----	16.
73. Killdeer-----	16.
74. Cooper's Hawk-----	15.5
75. Black Tern-----	15.
76. Harris's Sparrow-----	14.5
77. Ruby-crowned Kinglet-----	13.5
78. Least Sandpiper-----	13.5
79. Red-shouldered Hawk-----	13.

80. Golden-crowned Kinglet-----	13.
81. Lincoln's Sparrow-----	13.
82. Fox Sparrow-----	12.5
83. Cliff Swallow-----	12.5
84. Wood Duck-----	12.5
85. Black and White Warbler-----	12.
86. Marsh Hawk-----	12.
87. Pintail-----	12.
88. Wilson's Warbler-----	11.5
89. Brown Creeper-----	11.
90. Shoveller-----	11.
91. White-breasted Nuthatch-----	10.
92. Purple Finch-----	9.5
93. Nashville Warbler-----	9.5
94. Summer Tanager-----	9.5
95. White-throated Sparrow-----	8.5
96. Least Flycatcher-----	8.5
97. Myrtle Warbler-----	8.5
98. Pine Siskin-----	8.5
99. Grinnell's Water-Thrush-----	8.5
100. Prairie Marsh Wren-----	8.
101. Mourning Warbler-----	8.
102. Herring Gull-----	8.
103. Solitary Sandpiper-----	8.
104. Swamp Sparrow-----	8.
105. Broad-winged Hawk-----	8.
106. Black-crowned Night Heron-----	7.5

107. Cedar Waxwing-----7.

108. Nighthawk-----7.

109. Semipalmated Plover-----7.

110. Scarlet Tanager-----6.5

111. Lesser Scaup Duck-----6.5

112. Green-winged Teal-----6.

113. Acadian Flycatcher-----5.

114. Migrant Shrike-----5.

115. White Pelican-----5.

116. Pied-billed Grebe-----5.

117. Wilson's Snipe-----5.

118. Meadowlark-----4.5

119. Vesper Sparrow-----4.5

120. Orange-crowned Warbler-----4.5

121. Blue-headed Vireo-----4.5

122. Alder Flycatcher-----4.5

123. Semipalmated Sandpiper-----4.

124. Sora-----4.

125. Bittern-----4.

126. Merganser-----3.5

127. Tennessee Warbler-----3.5

128. Ring-billed Gull-----3.5

129. Canada Goose-----3.

130. Red-breasted Nuthatch-----3.

131. Ovenbird-----3.

132. Black-billed Cuckoo-----3.

133. White-rumped Sandpiper-----3.

134. Yellow-throated Vireo-----3.-

135. Short-eared Owl-----3.

136. Olive-backed Thrush-----2.5.

137. Rusty Blackbird-----2.5

138. Winter Wren-----2.5

139. Black-bellied Plover-----2.5

140. Franklin's Gull-----2.5

141. Prairie Horned Lark-----2.

142. Grasshopper Sparrow-----2.

143. Greater Yellow-legs-----2.

144. Forster's Tern-----2.

145. Great Horned Owl-----2.

146. Barred Owl-----2.

147. Blue-winged Warbler-----2.

148. Olive-sided Flycatcher-----2.

149. Bald Eagle-----2.

150. Canada Warbler-----2.

151. Black Duck-----1.5

152. Rough-legged Hawk-----1.5

153. Gray-cheeked Thrush-----1.5

154. Sparrow-Hawk-----1.5

155. Virginia Rail-----1.5

156. Least Bittern-----1.5

157. Leconte's Sparrow-----1.5

158. Wilson's Phalarope-----1.5

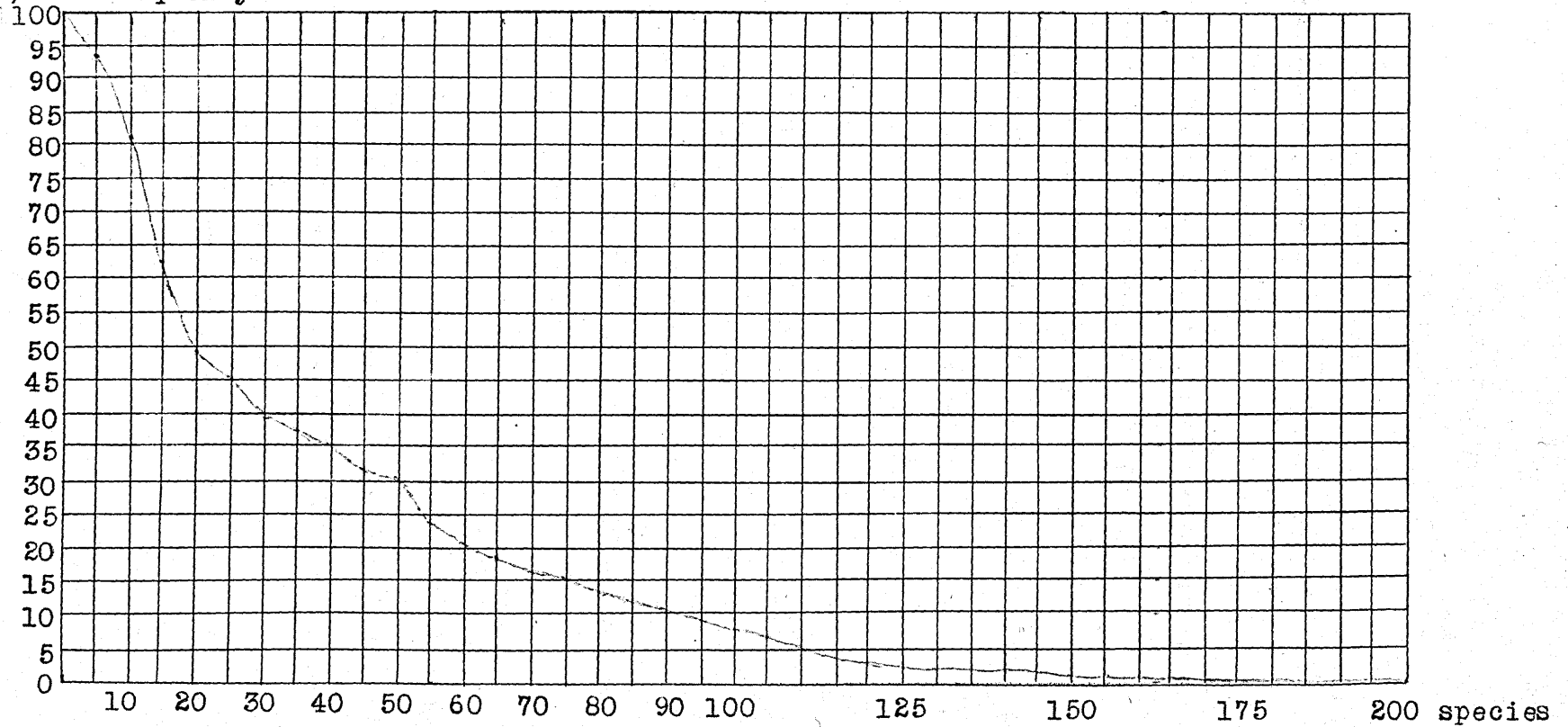
159. Baldpate-----1.

160. Gadwall-----1.

161.	Yellow-headed Blackbird-----	1.
162.	Little Blue Heron-----	1.
163.	Chipping Sparrow-----	1.
164.	Black-throated Green Warbler-----	1.
165.	Caerulean Warbler-----	1.
166.	Worm-eating Warbler-----	1.
167.	Mockingbird-----	1.
168.	Double-crested Cormorant-----	1.
169.	Hudsonian Godwit-----	1.
170.	Willet-----	1.
171.	Long-billed Dowitcher-----	1.
172.	Philadelphia Vireo-----	1.
173.	Savannah Sparrow-----	1.
174.	Short-billed Marsh Wren-----	.5
175.	Swainson's Hawk-----	.5
176.	Black-poll Warbler-----	.5
177.	Blackburnian Warbler-----	.5
178.	Pine Warbler-----	.5
179.	Ring-necked Duck-----	.5
180.	Red-breasted Merganser-----	.5
181.	Redhead-----	.5
182.	Gambel's Sparrow-----	.5
183.	Long-eared Owl-----	.5
184.	Clay-colored Sparrow-----	.5
185.	Louisiana Water-Thrush-----	.5
186.	Bonaparte's Gull-----	.5
187.	Osprey-----	.5
188.	Sharp-shinned Hawk-----	.5

189. Buff-breasted Sandpiper----- .5
190. Long-billed Curlew----- .5
191. Stilt Sandpiper----- .5
192. Saw-whet Owl----- .5
193. Yellow-bellied Sapsucker----- .5
194. Hermit Thrush----- .5

% of frequency.



Graph showing the relative abundance of the species recorded.

CHECK LIST.

AMPHIBIANS.

- Bufo woodhousei Girard. Toad.
- Hyla versicolor LeConte. Common tree toad
- Acris gryllus (LeConte). Cricket frog.
- Pseudacris triseriata (Wied). Swamp cricket frog.
- Rana pipiens Schreber. Leopard frog.
- Rana catesbeiana Shaw. Bullfrog.
- Gastrophryne carolinensis (Holbrook) Narrow-mouthed toad.

REPTILES.

- Plestiodon fasciatus (Linnaeus). Blue-tailed skink.
- Carphophis amoenus (Say) Ground snake.
- Diadophis punctatus (Linnaeus) Ring-neck snake.
- Coluber constrictor flaviventris Say. Blue-racer.
- Elaphe laeta (Baird & Girard).
- Elaphe obsoleta obsoleta (Say). Pilot blacksnake.
- Pituophis sayi (Schlegel).
- Lampropeltis triangulum (Lacepede) Milk snake.
- Natrix sipedon sipedon (Linnaeus) Common water snake.
- Storeria dekayi (Holbrook). Dekay's snake; brown snake.
- Thamnophis sirtalis parietalis (Say) Common garter snake.
- Thamnophis proximus. (Say).
- Agkistrodon mokasen Beauvois. Copperhead.
- Crotalus horridus Linnaeus. Common rattlesnake.
- Chelydra serpentina (Linnaeus). Common snapper.
- Pseudemys elegans (Wied).
- Amyda spinifer (LeSueur). Soft-shell turtle.

AMPHIBIANS.

Bufo woodhousei Girard.

Toads were found commonly in the moist parts of the area throughout the summer. Early in the morning or late in the evening, individuals were often seen near houses under which they rested during the day to emerge and hunt for insects at night. An open pit that was made in constructing an ice house was a favorite resort for this animal and several spent the whole summer of 1923 there. They were found in small holes and crevices of the vertical banks.

On April 19, 1924, a medium sized toad was taken from a garter snake that was on the bank of the creek above the bridge and which had almost swallowed the toad.

Two males were seen at the edge of the water on the west side of the lake on April 25, 1925. A small toad was taken on the bluff near the lake on May 3, 1924.

Thousands of young and just emerged toads were seen along a path near the lake on July 6, 1923. They were about half an inch long. One or two were disturbed at nearly every step.

The latest fall record is October 11, 1924, when one was seen at the side of the road on the bluff.

Hyla versicolor LeConte. Common tree toad.

Several were heard calling on the bar and on the bluff and especially near the lake on April 25, 1925.

One was taken from a weed one foot high on the bar near the lower edge of the bluff on May 3, 1924. Another was found on small brush near the top of the bluff on July 19, 1923.

Acris gryllus (LeConte). Cricket frog.

This species was the most abundant amphibian within the limits of this area. It was found most abundantly at the edge of bodies of water in all parts of the area in spring, although some were found on the shores of the lake through the summer and until late in the fall.

On February 2, 1924, several were found in the creek above the bridge. They were in the water above some old ice and below a top layer of new ice. All the frogs were stiff and floating and apparently they were dead.

In the warm water of the springs and just below the springs, a few frogs of this species were found throughout the winter.

In the spring the number of individuals present at the edge of the water began to decrease after the first of May.

Pseudacris triseriata (Wied).

One was taken from the edge of the water in a marshy place below a spring on April 4, 1925.

Rana pipiens Schreber. Leopard frog.

The leopard frog was found commonly wherever there was water either in standing pools or in running streams.

One was seen at the edge of a pool in the creek on March 1, 1924. Others were seen in the same pool hiding among the leaves on the bottom on November 17, 1923. On November 29, when there was nearly half an inch of ice on the pool, the frogs moved stiffly on the bottom and under the edges of stones. One was caught in a net in weeds in the bottom of the

lake on March 2, 1924.

On April 6, 1924, one was seen near the edge of the lake that was so filled with air that it could not go under the water although it made an effort to do so.

Eggs were found in the lake and in the creek on April 19, 1924.

Rana catesbeiana Shaw. Bullfrog.

Bullfrogs were found in pools of the creek and in cut-off pools of the river, but they were much more common in the lake.

On January 22, 1924, hundreds of tadpoles of this species were swimming at the surface of holes where the ice had been removed from the center of the lake. This was the most active animal in the water at that time.

Gastrophryne carolinensis (Holbrook) Narrow-mouthed toad.

A narrow-mouthed toad was found on the area in the summer of 1923.

REPTILES.

Plestiodon fasciatus (Linnaeus). Blue-tailed skink.

This skink was found all over the bluff. When disturbed, it usually ran under stones, leaves, or logs, or climbed over stumps and trunks of trees. The earliest record of activity for this animal is April 6, 1924, when one was found on the bluff near the lake.

Young were seen under logs as early as June 12, 1923.

On May 6, 1923, two were seen on a large rock on the bluff which were holding one another by the mouth and moving back

and forth across the rock. When they were disturbed, they separated and ran into holes in the rock.

One was found hibernating in a pile of sawdust late in the winter of 1924.

Carphophis amoenus (Say) Ground snake.

One that was about one foot long was found on wet leaves on the ground near a spring on the lower part of the bluff on June 27, 1922.

Diadophis punctatus (Linnaeus) Ring-neck snake.

Two adults were found under boards in June of 1923. One was in a barnlot and the other was at the edge of a field near the creek.

Several young were found in a hole in the ground at the side of a road by road workers on September 1, 1923.

Coluber constrictor flaviventris Say Blue racer.

This snake was found on the bluff, on the bar, and in fields. It was frequently found in trees. One was coiled in a Phoebe's nest in an old building on the bluff on July 7, 1923.

Elaphe laeta (Baird & Girard).

One was found in a small tree on the bluff on June 14, 1923. One was found later in the season in the top of a hay barn. It may have been brought in from the field in a load of hay.

Elaphe obsoleta obsoleta (Say) Pilot blacksnake.

The pilot blacksnake was found all summer in all parts of the area. It was often seen in trees and in holes in trees.

This was one of the most numerous as well as one of the larger snakes of this region and was probably the most destructive to bird life. Individuals were found in the nests of the Cardinal and Of the Blue Jay.

Pituophis sayi (Schlegel)

A large bullsnake was eating young rabbits in a nest on the lower part of the bluff on April 25, 1925. A few were seen along roads and on the bar in June of 1923.

Lampropeltis triangulum (Lacepede) Milk snake.

One was found in a hole in the ground at the side of a road by road workers on September 1, 1923.

Natrix sipedon sipedon (Linnaeus) Common water snake.

This snake was found at the edge of the water of the river, creek, and lake. During flood seasons, it was frequently seen on drift at the edge of the river. One was found under a board at the edge of Doniphan Lake on May 18, 1924.

Storeria dekayi (Holbrook) Dekay's snake; brown snake.

One was found under a board near the mouth of the creek on the bar on April 7, 1923. Another was found near the water of the creek on April 21, 1924. It was fourteen inches long. One was found on the side of the bluff on November 15, 1923, and another was seen in a small hole in the creek bank on December 2, 1922.

Thamnophis sirtalis parietalis (Say) Common garter snake.

This snake was usually found near the water of the creek or of the lake. One was seen eating a half grown toad on April 19, 1924. On January 31, 1924, one was seen in a spring

along the lower part of the bluff. When it was disturbed, it crawled back into a crack of a rock. Another was seen in the water of a spring on February 23, 1924. A few were seen in trees near the water.

Thamnophis proximus (Say)

This species was found near the water and sometimes on the drier ground near the top of the bluff. It was frequently found near the ground in the smaller trees.

One was seen on the lower part of the bluff on April 6, 1924. On November 30, 1922, one that was about two feet long was found in a spring.

Agkistrodon mokasen Beauvois Copperhead.

Individuals were seen among the rocks on the bluff and near the lake on April 14, 1923 and April 19, 1924. On July 2, 1923, one was found under a pile of slabs in the E.V. Roundy yard.

Crotalus horridus (Linnaeus) Common rattlesnake.

A rattlesnake was found half way to the top of the bluff north of the lake on May 3, 1924. One was shot from a limb of a tree on the lower part of the bluff that was fifteen feet from the ground on May 20, 1923. On June 12, 1923, one about three feet long was found coiled in a patch of sumac near the top of the bluff. A small one was killed in a tree six feet from the ground and near the creek on June 13, 1923. One that was freshly shed was killed in a chicken coop just after dark on June 25, 1922. One was killed near the river on the bar on June 26, 1922.

Chelydra serpentina (Linnaeus) Common snapper.

On March 29, 1924, a large adult that was in the water above the bridge of the creek was too cold to move rapidly. When it was placed on its back, it did not right itself. There were several leeches on the under side.

A small snapper about ten inches long was crawling in the road on April 25, 1925. On May 19, 1923, one was crawling over the mud at the edge of the lake and toward the shore. In the afternoon, one was seen crawling up the creek in shallow water. Its head was under water part of the time, but its back was showing all the time.

A female that was caught on June 4 was filled with eggs. It was in the creek. On July 12, 1923, a young turtle about one and one half inches long was seen in a small puddle of water along a road. Its gullet was filled with the remains of a cricket frog.

On September 1, 1924, two large snappers in a pool in the creek were swimming near the surface in the center and were fighting. Each tried to catch hold of the other in its jaws. Finally one went down and in a few minutes the other retired below the surface.

A rather sluggish adult that was worn and appeared to be very old was seen crawling on the bar near the bluff and at least a quarter of a mile from any water on October 29, 1922. On December 1, one was found dead near this location which was probably the same animal.

Pseudemys elegans (Wied).

On January 22, 1925, two were taken from a hole in the ice of the lake. They were about ten inches long. Both were killed.

A female was picked up in a pasture near the creek on June 15, 1923 which contained eggs without shells.

Amyda apinifer (LeSueur) Soft-shell turtle.

Individuals were caught swimming under water in the creek on the bar on April 20 and 21, 1924.

CHECK LIST.

- Didelphis virginiana virginiana* Kerr.
Scalopus aquaticus machrincoides Jackson.
Cryptotis parva (Say).
Blarina brevicauda brevicauda (Say).
Nycteris borealis borealis (Müller).
Procyon lotor lotor (Linnaeus).
Mustela longicauda longicauda Bonaparte.
Mustela vison letifera Hollister.
Spilogale interrupta (Rafinesque).
Mephitis mesomelas varians Gray.
Vulpes fulva (Desmarest).
Canis latrans Say.
Marmota monax monax (Linnaeus).
Citellus franklinii (Sabine).
Citellus tridecemlineatus badius (Bangs).
Tamias striatus griseus Mearns.
Sciurus carolinensis carolinensis Gmelin.
Sciurus niger rufiventer (Geoffroy).
Glaucomys volans volans (Linnaeus).
Geomys bursarius (Shaw).
Reithrodontomys megalotis dychei (Allen).
Peromyscus maniculatus bairdii (Hoy and Kennicott).
Peromyscus leucopus noveboracensis (Fischer).
Microtus ochrogaster (Wagner).
Pitymys nemoralis (Bailey).
Ondatra zibethica zibethica (Linnaeus)

Rattus norvegicus (Erxleben).

Mus musculus musculus Linnaeus.

Zapus hudsonius hudsonius (Zimmermann).

Lepus californicus melanotis (Mearns).

Sylvilagus floridanus mearnsii (Allen).

Miller's List of North American Recent Mammals, 1923
is the authority that was used for the above names and their
arrangement in this paper.

MAMMALS.

Didelphis virginiana virginiana Kerr.

The opossum was found commonly throughout the timbered parts of the area. Tracks were often found at the edge of the water of the creek. Individuals were often seen along roads after dark. Many were caught in traps each winter for their fur. The traps were usually set in holes in banks along the creek or on the bluff.

On June 7, 1922, a dead female was found on the bridge over the creek which had been run over by an automobile. Some young that were with the adult were still alive when it was found.

A female that was caught on December 2, 1922 measured 595:250:55:38.

Scalopus aquaticus machrinoides Jackson.

Freshly made tunnels of the mole were found at all times of the year when the ground was not frozen. They were found on the bar, on the bluff, and in the fields.

A dead mole was found along a road on June 6, 1922. On June 7, 1923, one came to the surface near a house and was captured. One was found dead in a path on the bluff on October 7, 1923.

On April 26, 1925, Mr. L. Whittaker, a farmer who lives two miles away, reported that on April 24 a nest of four young moles had been found at the bottom of a post hole on his farm. The hole was about two feet deep. The nest was made of finely chewed material. The young were between three and four inches long.

Cryptotis parva (Say).

Only two individuals of this species were caught on the area. A male was caught in a trap that was set in a tunnel below the surface in a partial clearing on top of the bluff which was grown up with blackberries and other undergrowth. Bacon was used as bait. This animal was caught on April 8, 1923. It measured 85:15:10. On November 28, 1924, a female was caught in a trap that was baited with oatmeal and set in a runway in a weedy field near the top of the bluff. It measured 72:17:10.

Ninety-nine pairs of lower jaws of this animal were found in pellets of the Short-eared Owl that were picked up on the bar south of the lake.

Blarina brevicauda brevicauda (Say)

A female was caught in a tunnel just below the surface in an old roadway half way to the top of the bluff on June 17, 1922. It measured 113:25:15. Another female was taken in a similar runway under a brushpile on the side of the bluff on November 27, 1924. It measured 103:21:14.

Six pairs of lower jaws were found in Short-eared Owl pellets that were found on the bar south of the lake.

Nycteris borealis borealis (Muller).

Bats were seen flying nearly every evening in summer. They became especially numerous in the late part of the summer when more insects were flying at night. All that were collected belonged to this form.

On June 30, 1923, a male was found hanging on the under side

of a leaf of sumac on the lower part of the bluff. On June 23, 1922, a female with three young one half grown was shot that was hanging on the under side of a sycamore leaf in a tree near Doniphan Lake. The young were attached to the parent. One that was shot on June 16, 1922, was flying in circles and about fifteen feet from the ground. One was found ten feet from the ground on a leaf in a redbud tree on the lower part of the bluff on July 2, 1923.

A female that was shot on August 21, 1921, measured 110:46:9:10.

Procyon lotor lotor (Linnaeus)

Tracks of the raccoon were found except in the colder parts of the year at the edge of the water of the lake and along the creek. Logs near the lake and on the bluff were often found that were covered with the excreta of this animal.

Skeletons of several dead raccoons were found on the lower part of the bluff near the lake and on the mud at the edge of the water.

On May 6, 1923, a nest with young was found by Mr. S.G. Roundy. It was in a hole in the roots of a large walnut tree. The tree was on the side of a ravine on the bluff. The parent was in the hole with the young. One of the little animals was removed from the nest and was injured so that it died. All the others were later removed by the parent. The dead one was seven inches long. Its eyes were still closed. There were traces of rings on its tail.

On June 3, 1923, an adult was startled along the bluff near the lake. It ran through the leaves about fifty yards to a hole in the rocks that was about one foot in diameter and which showed evidence of use.

A medium sized raccoon was found in a used nest of the Crow that was twenty feet from the ground in a willow tree on the bar on June 8, 1923. When the animal was punched out of the nest with a long pole, it ran about ten feet up a small branch of the tree where it clung for about ten minutes and then crawled back to the nest and curled up to resume its sleep.

A hen was taken from an old stove in a farmyard on the night of June 11, 1923 and tracks that led away indicated that it had been taken by a raccoon.

A young raccoon that weighed two pounds was found at the base of a vertical bank along the creek above the bridge on June 22, 1923. When first discovered, it gave a rattling scream. When it was approached more closely, it raised itself upon its toes and barked sharply, and then turned and crawled behind a large loose piece of dirt and attempted to hide. It was placed in a sack where it made no move and appeared to be little excited. The animal was placed in a cage and fed bread that was soaked in milk which it ate readily. On June 24, the door of the cage was pried open and the young raccoon escaped.

Several skins of this animal were taken in the area each winter by dogs and traps.

Mustela longicauda longicauda Bonaparte.

A weasel was seen at seven o'clock in the morning of June 29, 1923. It was at the side of a road near a hogshed where house mice were very abundant and may have come there to feed upon them. It ran into the weeds of a fence row and then was seen fifty yards away along the fence. Then, it jumped back into the weeds and was seen no more.

Mustela vison letifera Hollister.

Mink tracks were seen leading to a hole in the side of a muskrat house in the lake on January 12, 1924. The opening of the hole was about three inches in diameter and was above the level of the ice. The hole ran upwards and at least four feet into the house. A wing of a Mallard was lying on the ice near the opening.

A mink was caught in a trap that was set under water in a slough on the E.V. Roundy place in the spring of 1924. Two were caught by trappers on the lake in the fall of 1924. They took them in traps that were set at entrances to holes in muskrat houses that were above the ice. One was trapped on the lake during the last week of November in 1922.

On September 23, 1922, tracks of mink were seen in several places on the mud at the edge of the lake. They led past piles of duck feathers in several places.

Spilogale interrupta (Rafinesque).

One was seen dead in a road on June 23, 1922. Another was caught in a trap that was set near a straw pile about the first of December in 1922.

Mephitis mesomelas varians Gray.

Skunks were frequently found in holes all over the area. In winter, they were trapped and caught with dogs for their fur.

One was seen walking along a road on June 3, 1923. On June 23, 1923, at six o'clock in the evening an adult female with five young was seen in a road at the lower edge of the bluff. The group went into a field of sudan grass at the side of the road. When they were approached closely, the female left her young and started across the road, but she halted and returned to within ten feet of the intruder. Finally, she went into the weeds at the side of the road. The young which were about one foot long ejected scent in a stream about three or four feet long. The adult was very thin.

On December 3, 1924, a narrow-striped skunk was seen at noon in a roadway at the edge of a path of timber on top of the bluff. It started moving when disturbed and walked slowly in a half circle to a den that was fifty yards away in the timber where it went down one of the holes. Traps that were set there on the following day caught nothing.

Vulpes fulva (Desmarest).

One was dug out of a hole in the side of the bluff one mile south in June of 1922. It later escaped. Residents reported that this animal was frequently seen.

Canis latrans Say.

Coyotes were frequently heard howling on the bar and in

the fields of the upland. It was reported that some dens which contained young were dug out on the bar after it was formed.

Marmota monax monax (Linnaeus)

The woodchuck was common everywhere in the area. It did a considerable amount of damage to gardens and to field crops. This animal caused the destruction of many bridges by burrowing near them and causing washouts to start that grew until the bridge was carried away or had to be repaired.

One was seen out of its hole as early as January 25, 1923. In warm winters, they were active throughout the winter. One that was caught on March 3, 1923, measured 630:120:93.5:31. It was a male.

About the first of April of each year, all the occupied holes that were found appeared to have been recently cleaned or at least they had freshly dug dirt at their openings.

On May 18, 1924, a woodchuck was seen voluntarily and slowly walking across the creek at a place where the running water was about three inches deep.

On May 20, 1923, four young were found playing on the lower part of the bluff. Three of them ran slowly to a hole in the first ledge of rocks. The other "froze" near a large rock where it was shot. It was a female and measured 370:105:73.

An adult was seen clinging four feet from the ground on the side of a cottonwood eight inches in diameter that was on the bar. It was in a fork of a small limb. When approached

within four feet, the animal jumped to the ground and ran about one hundred yards through the weeds in an irregular course until it became entangled and was killed. There were several shot in the skin of the head of this animal. It was a male and measured 576:142:78:21.

A young woodchuck was surprised while feeding at the edge of the timber near the top of the bluff on June 21, 1923. Still holding a leaf in its mouth, it ran up a small tree trunk seven inches in diameter and out on a limb six feet from the ground. Then it jumped to the ground and ran into the timber.

On July 3, 1923, a young woodchuck that was walking through the weeds on the lower part of the bluff, stopped when three feet away and stood still for about five minutes. Then it retraced its steps a few feet and came back in a circle to within five feet and began eating stems and leaves of some weeds. When a slight movement was made, the animal ran off through the weeds.

While sitting still and watching birds on September 12, 1923, a woodchuck came walking through the timber on the lower part of the bluff and walked to an upright oak tree about ten inches in diameter and without hurrying climbed straight up the trunk about twelve feet where it clung for a few seconds. Then it backed down the trunk about half way to the ground and after a short pause, turned and crawled head first down the trunk to the ground and walked rapidly away through the timber, but it did not run as though frightened. It did

not appear to notice the intruder at any time.

Dogs frequently found woodchucks away from their holes and killed them. When two dogs hunted together, they were nearly always able to kill any woodchuck that they might find.

Citellus franklinii (Sabine)

This spermophile was reported to occur in the small pastures and fields on the farms of the upland back of the bluffs.

Citellus tridcemlineatus badius (Bangs)

This species was common in the fields and pastures of the farms in the upland.

Tamias striatus griseus Mearns.

Seven individuals of this species were found in this area during this work. It was usually seen running over logs, rocks, or stumps on the bluff and especially in the ravines and lower portions. One was seen seven feet from the ground in an oak tree on June 4, 1923.

A male that was shot on the lower part of the bluff on October 12, 1924, measured 239:90:35:14. The earliest record for one active in the spring is March 25, 1925.

Sciurus carolinensis carolinensis Gmelin.

A few gray squirrels were resident in the area. They were usually seen in medium sized trees on the bluff.

Sciurus niger rufiventer (Geoffroy)

Fox squirrels were found commonly in all parts of the area that were covered with timber. They lived in holes in

the trees and in nests that were built in the open. On sunny days in the winter, these animals were frequently seen sunning themselves on the limbs of trees.

Mating activity was noted on March 29, 1924. On April 20, 1924, a young squirrel about seven inches long was taken from a nest in a willow tree on the bar. Workmen took several other young from nests on the bar during the week before this. A young squirrel about one third grown was seen in the top of a small tree along a road on May 12, 1923.

A squirrel was seen walking slowly across the creek at a place where the water was three inches deep on May 20, 1923.

Squirrels did some damage in the fall by carrying off corn which they ate.

A pair was killed by a dog on the bluff on November 27, 1924. The male measured 475:212:65:27 and the female measured 512:240:67:28.

Glaucomys volans volans (Linnaeus).

Three flying squirrels were taken from a nest in a hollow redbud in a ravine on a farm one mile from the river on March 8, 1925. The nest was two feet below the top of the hollow which opened four feet from the ground. The three animals ran into a sack that was held over the opening. Later, two of them escaped. The third was made into a skin. It was a male and measured 221:90:31:17.

A flying squirrel was killed in a shed in Doniphan during the first week of May 1924.

Geomys bursarius (Shaw).

Pocket gophers were common in the fields throughout the area. They were most active just before the ground was frozen in the fall. A few were found in small clearings on the bluff.

On July 2, 1923, a gopher was pulling stalks of sweet clover into a hole and cutting them into pieces about two inches long. This was at four thirty in the afternoon.

Reithrodontomys megalotis dychei (Allen).

A female was caught on January 25, 1923 in a trap that was baited with oatmeal and set in a path in the willows on the bar. It measured 141:65:16. Another female that was running in a weedy field on top of the bluff on November 26, 1924, was running over the ground in the afternoon. It contained five embryos and measured 130:59:15:10.

A male was caught in a trap that was set in runways in which a specimen of Microtus was caught on December 2, 1922. It measured 132:65:16:9. A male that was caught in a runway through blue grass in a fence row around a pasture on December 14, 1924, measured 127:57:16:10.

Peromyscus maniculatus bairdii (Hoy and Kennicott).

A male that was caught in a corn shock on December 1, 1924, measured 147:60:18:11. Another male that was caught on December 14, 1924 along a fence row at the edge of a pasture measured 142:56:19:11. This one was in blue grass.

Peromyscus leucopus noveboracensis (Fischer).

This species was caught in traps that were set in the

timber on the bluff, and on the bar, and in the fields near that timber. Some were taken each winter in corn shocks near the timber.

On February 3, 1924, a female about half grown was caught in the willows on the bar and it had four embryos each about three millimeters long. On February 22, 1924, five females were caught which had four embryos each and one was taken which contained no embryos. All these were trapped in corn shocks with raisin bait. A female that was caught on April 8, 1923, contained four young embryos.

A young mouse about one third grown was found in a Red-winged Blackbird's nest one and one half feet from the ground in weeds south of the lake on June 27, 1923. On July 1, 1923, a male was found in a hole in a stump in which Bluebirds had nested earlier in the season.

The largest male was caught on January 26, 1923 and measured 192:92. The largest female was caught on April 8, 1923 and measured 194:75.5:22.5:15.

Microtus ochrogaster (Wagner)

Colonies of the prairie vole were found in fields and waste ground where the cover of grass and weeds was sufficiently dense to furnish protection for them. Each set of runways was deserted after a few month's use,

In winter, this animal went to the shocks of corn and other grain and lived until spring. Here they fed chiefly upon the grain. When traps were set in these shocks, the animals that were caught were nearly always eaten up and sometimes even the traps were chewed and partly eaten. This

behavior may indicate that some important element in the food of this animal was lacking in the winter diet in the corn shocks.

Two that were about one third grown were caught in corn shocks on April 8, 1923. A female with young was plowed out of a field on June 16, 1922. Two that were about half grown were caught on the bar on December 2, 1922.

The largest female that was caught measured 161:41:21:11 and the largest male measured 150:32:19.5:9.

Pitymys nemoralis (Bailey)

On February 22, 1924, a male, a female without embryos, a female with two small embryos, and a female with three small embryos were trapped in corn shocks near timber on the bluff.

On February 15, 1925, a colony of this animal was found in a clearing above a road on the bluff. There were many runways at and below the surface. There was some brush and weeds on the ground, but the covering was not thick. Fifteen were caught in fifteen traps that were set for two nights. On March 9, 1925, a male and two females were caught in the same runways. One female had two embryos each eight millimeters long and the other had two that were each thirty-one millimeters long.

Two were caught in tunnels that were below the surface on the lower part of the bluff on April 8, 1923. Another female was taken in a nest in a corn shock. Three suckling young were clinging to this animal.

Several were trapped in corn shocks on November 27, 28, and 29, 1924. One was taken in a thick growth of blue grass

at the head of a ravine on December 14, 1924.

The largest female that was caught measured 154:25:20:9 and the largest male measured 145:22:19:10.

Ondatra zibethica zibethica (Linnaeus).

On January 12, 1924, there were about two dozen houses in the lake. Some of the clearings around the houses were twenty yards in diameter. The weeds had been cut from one to two inches above the surface. Some of the houses were made of Nelumbo, some of Polygonum, some of Typha, and some of mixed kinds of material. The animals appeared to use whatever material was near at hand. Two or three of the houses were built around fence posts and one was at the end of a large log. Some were large and some were small. None of the snow on top of them was melted.

In January of 1925 a trapper said that he had counted thirty-five "nest houses" in the lake and that each had an average of five individuals. He caught one hundred and fifty and others caught fifty so that the total catch for the season was about two hundred. There were many other "feed houses" which were smaller. He caught two mink in holes in the houses during the winter. A skeleton of muskrat that was near the lake measured twenty-two inches long and the tail was eleven inches in length.

One was seen swimming in water in the creek on January 25, 1925. It was in water that was flowing one foot deep over old ice in the creek. The animal dived when it was disturbed.

On March 1, 1924, a muskrat was digging a hole in the

bank of the fish pond in the E.V.Roundy barn lot.

A male was trapped along the creek on December 1, 1922. It measured 485:150:80. Its tail was short and had apparently been frozen.

Rattus norvegicus (Erxleben).

The rat was a common pest in the vicinity of farm buildings and granaries. It was especially numerous in feedlots where corn was thrown out on the ground for stock.

Mus musculus musculus Linnaeus.

House mice were abundant in and around all farm buildings and in addition they spread to the fields surrounding the buildings. This was the first mammal to invade the shocks of corn and other grain in the fall and was probably the most abundant and did most damage there.

Zapus hudsonius hudsonius (Zimmermann).

An individual that was a little over half grown was caught in a trap that was set in a road through willows on the bar on June 23, 1922.

Lepus californicus melanotis (Mearns).

Jack rabbits were seen on four occasions during the work in this area. Most of them were in fields on the upland. On June 7, 1923, one was seen on the mud flat near Doniphan Lake.

Sylvilagus floridanus mearnsii (Allen).

Rabbits were common over all the area where there was enough cover to furnish protection. They stripped shrubs and small trees as far from the ground as they could reach.

Several young that were able to run around were seen on April 19, 1924. On April 25, 1925, a nest with six young was found among the rocks on the lower part of the bluff near the lake. The young were about four inches long. No parent was seen, but a large bullsnake blocked the opening of the nest and was swallowing one of the young and preventing the escape of the others. As soon as the snake was pulled away from the nest, the little rabbits scrambled out and over the rocks in all directions. The nest was made of fur.

On April 19, 1923, one was caught that was about six inches long and another that was about four inches long and was much less developed was brought in by a mother cat.

Young rabbits furnished the larger part of the food of cats and their broods of kittens in the spring and summer. Several empty nests were found in the last week of April and the first week of May of 1923. On June 3, 1923, several young that were about one third grown were seen.

The number of rabbits present at one time varied greatly during the period of this study. In some seasons, large numbers would be found in one day while in other seasons, a day's work might be done on the same ground without seeing a single individual. Several species of predatory birds and mammals obtained a large part of their food by capturing animals of this species.

GENERAL SUMMARY.

1. A study of the land vertebrates and relations of them to their environment was made in Doniphan County, Kansas in the period of time beginning in the fall of 1921 and ending in the spring of 1925.

2. The size of the area was made as small as possible and still include samples of all the types of vertebrate habitat found in this region.

3. The center of the area studied was near the mouth of Brush Creek on the Missouri River.

4. The area included level ground of the river flood-plain and the more rolling ground of the bluffs and upland.

5. For studying the birds, the habitat was divided into the following divisions: river, creek, lake, lake shore, Typha, slough, Salix-Populus, timber-creek, bluff, timber edge, sprouts, orchard, roads, pastures, cultivated field, yard, and buildings.

6. Plant genera that were found to have an important influence upon the birds of the area are; Acer, Ambrosia, Celtis, Cercis, Cornus, Hicoria, Juglans, Maclura, Malus, Morus, Nelumbo, Platanus, Polygonum, Populus, Prunus, Quercus, Rhus, Ribes, Rosa, Rubus, Salix, Sambucus, Symphoricarpos, Tilia, Typha, Ulmus, and Vitis.

7. Other environmental factors that were studied are; bare ground, banks, open water, buildings, bridges, posts, dead and hollow trees, stumps, and large animals.

8. The most important dangers that were found affecting birds during this study are; man, cat, snakes, other animals,

weather, and miscellaneous such as spider webs and telephone wires.

9. Settlement of the land has benefitted birds by making a larger supply of food, a greater variety of nesting situations, and an increased protection.

10. Settlement by man has been a disadvantage in that it destroyed some types of habitat, and it has introduced new enemies to bird life.

11. Evidence obtained indicated that in this area birds did little damage to agriculture and that they were of little benefit to crops.

12. There was a fluctuation in the number and variety of species present that corresponded the seasonal change.

13. Relations that were noted between species were food relations and flocking together for protection and to search for food.

14. The rate of avian succession corresponded to the rate of physiographic change. This change was more rapid in the ground in the flood-plain of the river.

15. For each of the one hundred and ninety-eight kinds of birds that were found, as much information as possible was obtained on these points; numbers, feeding, resting, song, home range, home site, nesting, flocking, migrating, and molting.

16. The largest number of nests was found in the first half of June as compared with other two-week periods of the summer.

17. Nearly one fourth of the nests that were found were

at a height between two and five feet from the ground.

18. The larger number of nests as well as the larger number of species was found on the bluff. The Salix-populus division of the habitat was the next largest in its bird population.

19. The months having the largest number of species present are in order; May, September, August, and June.

20. Only fifty species of birds of the one hundred and ninety eight recorded, were present more than thirty per cent of the time and only twenty species were present more than fifty per cent of the time in which observations were made. More than half the species recorded were found on less than ten per cent of the days that records were kept. The Cardinal is the only species of bird with a frequency per centage of one hundred.

21. Seven species of Amphibians and seventeen species of reptiles were found within the limits of this area.

22. Notes of the presence and activity of thirty-one species of mammals were obtained during the period of work on this ground.

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