EFFECTS OF A TORNADO ON BIRD LIFE[1]

BY H. ELLIOTT MCCLURE

Plate 20

AT 3 A. M., July 9, 1940, a tornado of moderate violence struck Portsmouth, Iowa, a town with a population of about 300 and with an area of about 100 acres. During the afternoon of July 10, observations of damage were made, and the area was visited each week thereafter until September 25.

The town is situated on the southeast slope of a long hill. At the base of the hill is a business district, above which the residential district extends to the brow of the hill. At the northwest corner of the town, on the brow of the hill, are situated three brick structures: a school, church, and parsonage.

The storm approached from the northwest, but its vortex was slightly to the south of Portsmouth. As tornado winds in the northern hemisphere whirl counterclockwise, damaging winds blew here from the southeast, while in a town five miles south they blew from the northwest. Because of the shape of the hill, the wind leveled store buildings of the business district, damaged the residences less severely, and struck the brick structures on the hilltop, severely damaging the church. Although every home was affected by the storm, none was destroyed, no one was killed, and only a few people were injured. Severe wind blew for half an hour and was followed by hail and a two-hour torrential rain of five inches.

The town supported many fruit trees but few large shade trees before the storm, and the only evergreens were those of a spruce and pine windbreak to the north and west of the school and church. During the storm all deciduous trees were damaged and stripped of leaves, giving the area an appearance of winter. Grass was beaten down by heavy hail, vegetables in gardens were pulled up, flower gardens stripped, and fruit thrown from trees. The ground was covered with a heavy vegetable detritus. A survey of over 200 trees showed that the percentage of damage to leaf and limb structure was as follows: soft maple (*Acer saccharinum*), 90; apple (*Pyrus malus*), 90; catalpa (*Catalpa catalpa*), 90; Chinese elm (*Ulmus* sp.), 90; walnut (*Juglans niger*), 90; ash (*Fraxinus* sp.), 80; mulberry (*Morus rubra*), 80; box

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elder (*Acer negundo*), 70; honey locust (*Gleditsia tricanthos*), 70; American elm (*Ulmus americana*), 70; silver poplar (*Populus alba*), 50; arbor vita (*Thuya occidentalis*), 20; red pine (*Pinus resinosa*), 10; Norway spruce (*Picea abies*), 10; and blue spruce (*Picea* sp.), 10. Evergreens withstood the storm much better than did deciduous trees. Ten per cent of the town's trees had been blown down.

The most striking phenomenon noted after the storm was the stillness and the complete absence of bird voices. A city park covered about one acre (Plate 20, upper figs.), and there was a playground with an area of an acre and a half behind the church and school, including the evergreen windbreak. These two areas were thoroughly searched and the following dead animals found: Mourning Dove (*Zenaidura macroura*), 91; Eastern Robin (*Turdus m. migratorius*), 71; Bronzed Grackle (*Quiscalus versicolor*), 9; Northern Blue Jay (*Cyanocitta c. cristata*), 9; English Sparrow (*Passer domesticus*), 8; Northern Flicker (*Colaptes auratus luteus*), 7; Baltimore Oriole (*Icterus galbula*), 6; Eastern Kingbird (*Tyrannus tyrannus*), 5; Eastern Screech Owl (*Otus asio naevius*), 3; Red-headed Woodpecker (*Melanerpes erythrocephalus*), 2; Chimney Swift (*Chaetura pelagica*), 1; Brown Thrasher (*Toxostoma rufum*), 1; Black-billed Cuckoo (*Coccyzus erythrophthalmus*), 1; Catbird (*Dumetella carolinensis*), 1; Northern Downy Woodpecker (*Dryobates pubescens medianus*), 1; toad (*Bufo americanus*), 2; northern red bat (*Lasiurus borealis*), 1; cottontail rabbit (*Sylvilagus floridanus*), 1; and fox squirrel (*Sciurus niger*), 1. (Some of the storm's casualties are shown in Plate 20, bottom fig.)

Where English Sparrows had been roosting in trees, they suffered heavily, for 108 were found under six cherry trees. Those birds sustaining the fewest losses were the species that had their nests or roosts inside of trees or buildings. These included Red-headed Woodpeckers, English Sparrows, House Wrens (*Troglodytes aedon*), Chimney Swifts, and Barn Swallows (*Hirundo erythrogaster*). Several Red-headed Woodpeckers survived the storm, but all Flickers were killed. Why all of the Flickers were destroyed and not all of the Red-headed Woodpeckers was unexplained. All home owners that I interviewed mentioned picking up dead birds about their lawns but nearly all were too confused by other damage to remember how many. Based upon the number of birds found in park and school grounds, 323 in less than 3 acres, and upon observations throughout town, the average loss appeared to be about 10 birds per acre, or a probable total of 1000. On the day following the storm only 87 living birds were seen. These were: English Sparrow 50, Mourning Dove 10, Robin 2, Kingbird 1, Red-headed Woodpecker 1, Chimney Swift 20, and House Wren 3.

In this region of Iowa, Robins and Mourning Doves are of nearly equal abundance but they suffered losses of different proportions. The Robin population was practically eliminated while Mourning Doves survived the storm in greater numbers. Birds of lower population densities were extirpated.

By July 24, new leaves had sprouted from the uninjured parts of the trees. They were one-third open on box elder, ash, soft maple, mulberry, American elm, and Chinese elm; one-half open on birch (*Betula* sp.); one-quarter open on catalpa; and one-eighth open on walnut. At the end of the month, leaves on nearly all of the trees were almost fully expanded. On August 7, catalpa was in bloom and the remainder of the trees were as fully leafed as possible after their injuries. The upper two figures of Plate 20 show the city park immediately after the storm and a month later. Several severe wind and rain storms occurred during the two weeks following the tornado. Following these was an extended period of rain so that newly planted flowers made remarkable growth. By August 14, flower gardens were in as full bloom as they had been in the spring.

Red-headed Woodpeckers that had nests in those trees that were not destroyed continued rearing their young and increased in abundance until August 21. After this date they and their young migrated from the area. Following the storm the most abundant birds were English Sparrows. They built new nests and continued with their breeding. By the end of September they were present in large bands. House Wrens, with their houses in protected places, were not killed; and they continued nesting until the first week of September, when they left the vicinity. What percentage of Chimney Swifts was killed by rain and hail falling into chimneys was not determined, but a number of them were present until the middle of August. A small band of pigeons was seen each week.

Throughout the area surrounding Portsmouth, destruction of trees with suitable nest sites appeared to be complete. Until new leaves sprouted on the deciduous trees, the group of evergreens bordering the playground was the only available nest cover in an area of nearly a square mile. A few of the remaining birds in this area came to town in order to nest or roost among these trees. On the day following the storm only two Robins were noted alive, and one had an injured wing. It remained in town throughout the rest of the summer. Only three pairs of Robins came to the area and built nests, two of which were placed in crotches in box elders; another was built on the limb of an ash. All of these nesting attempts were successful in rearing fledglings, and young and their parents were seen together during August. By

(*Top Figure*) CITY PARK OF PORTSMOUTH, IOWA, FOLLOWING THE TORNADO OF JULY 9, 1940. (*Middle Figure*) A MONTH LATER. (*Bottom Figure*) DEAD BIRDS AND A RABBIT COLLECTED FROM THE SCHOOL PLAYGROUND AFTER THE TORNADO.

September 18, the Robin population was augmented by a small migratory flock.

The only other bird noted continuing its nesting activity following the storm was the Mourning Dove. Ten living doves had been seen the day after the storm. One week later there were two active dove nests. Two weeks after the storm, on July 24, there were 13 active nests, indicating a population of at least 26 doves. Evidently 16 had migrated into town from surrounding areas. Heavy storms destroyed many of these nests so that by August 7 there were only seven active. Evidence appears to indicate that those pairs with nest failures left the vicinity, for no more than seven active nests were present for the rest of the breeding season. During the three months, two nests were used twice; the last young left them in the latter part of September. The number of active nests found each week was as follows: July 17, 2; July 24, 13; July 31, 9; Aug. 7, 7; Aug. 14, 7; Aug. 21, 7; Aug. 28, 7; Sept. 4, 6; Sept. 11, 4; Sept. 18, 4; and Sept. 25, 1. Twenty-four nests were used 26 times. Eleven, or 42 per cent, of these nesting attempts were successful, and 15 young were raised. Twelve, or 50 per cent, of the nests were built in deciduous trees, and 12 in evergreens. Eight were built in box elder, seven in Norway spruce, two in ash, two in white pine (*Pinus strobus*), and one each in catalpa, juniper (*Juniperus virginiana*), mulberry, arbor vitae, and red pine.

The paucity of birds in a tornado-stricken area, even after several weeks, was shown by a census of an undisturbed ten acres at Lewis, Iowa, fifty miles south of Portsmouth. On August 23 the bird population in Lewis was nearly normal, having been affected by no severe storms. The number of birds seen was as follows: English Sparrow, many; Mourning Dove, 50; Eastern Robin, 25; Bronzed Grackle, 6; Northern Blue Jay, 10; Northern Flicker, 5; Baltimore Oriole, 3; Eastern Kingbird, 2; Red-headed Woodpecker, 15; Brown Thrasher, 1; Catbird, 1; Northern Downy Woodpecker, 2; Eastern House Wren, 2; Starling (*Sturnus vulgaris*), 2; and Yellow-billed Cuckoo (*Coccyzus americanus*), 3. The number of birds seen at Portsmouth on August 21 was: English Sparrow, 200; Mourning Dove, 16; Eastern Robin, 5; Northern Flicker, 1; Red-headed Woodpecker, 11; House Wren, 4; Barn Swallow, 10; Starling, 1; and Nighthawk (*Chordeiles minor*), 6. At Lewis, excluding English Sparrows, 127 birds were counted on the ten acres; while at Portsmouth, excluding sparrows, only 53 were noted in 100 acres. The species of trees present in the two towns were the same and each had about the same number of trees per acre. Because of the similarity in habitats it was possible to compare the relative number of birds. Portsmouth in August supported an avian fauna of a density only four per cent of that of Lewis.

Owing to my removal to central Nebraska the year following the storm, I was unable to make further observations to determine the rate at which the habitat was refilled.

SUMMARY

In western Iowa, the small town of Portsmouth was struck by a tornado at 3 A. M. on July 9, 1940. An estimated 1000 birds were killed in the town's area of 100 acres, and, following the storm, 87 were found alive. The storm apparently killed over 90 per cent of the birds in the path of its vortex.

Birds least affected by the wind and torrential rain were those roosting in buildings or nesting in tree hollows. Only seven species appeared to have survived.

In the following summer months, Mourning Doves, Robins, Red-headed Woodpeckers, House Wrens, and English Sparrows continued their nesting activities.

During the last week of August, the bird population in an undisturbed similar habitat at Lewis, Iowa, was compared with that of Portsmouth. Excluding English Sparrows, which were numerous in both areas, the bird population per acre averaged 12.7 at Lewis and 0.53 at Portsmouth; that at Portsmouth was still only four per cent of normal.

These observations revealed the remarkable stability of established breeding-bird populations. The void created by a tornado was not filled by an influx of birds from undisturbed areas a few miles away.

Ord, Nebraska

COMMUNITY SELECTION BY BIRDS ON THE HELDERBERG PLATEAU OF NEW YORK

BY S. CHARLES KENDEIGH

INTRODUCTION

A QUESTION that repeatedly arises in the ecological analysis of an avifauna is why various species are either restricted to, or are more common in, certain communities than in others. On a broad geographic scale, barring physical barriers of one sort or another, species are often limited by climatic conditions which they are unable to tolerate (Kendeigh, 1934). When the boundaries of a species' range agree with those of an ecological community, this may be due to coincidence in limits of tolerance to extremes in environmental conditions by species and community, or it may be due to some obligatory relation