

from different portions of the woods or from separate groves; all in the same order and about five hundred yards apart. They flew for some distance, probably half a mile, before the individuals on the left swung ahead and led their respective troops. There were not less than twenty-five hundred birds, probably more. At night they retired to the above mentioned timber in one long irregular train; but it is my belief that each flock retained its individuality throughout the day. This large concourse of birds probably represented a small portion of Chester, Delaware and Montgomery Counties; it being highly improbable that there were any migrants from the North or from the mountains of the bordering counties, owing to the almost entire absence of sheltered roosts of evergreen trees. During the colder, and stormiest period of the Winter, these flocks retired to the scattered groves of conifers and cedars of the three counties, usually breaking up in smaller companies, from necessity.

NIDIFICATION.

SITUATION.—The Crow usually chooses a tree situated as deep in the woods as possible, or in some quiet little grove of tall trees, where it can nest free from molestation and yet be near to its chosen feeding ground. The number and variety of eligible situations, the individuality of the bird, the *degree* of hostility prevailing in its neighborhood and the consequent measure of activity displayed by its enemies, having a large share in influencing the selection of a nesting site. Now and then a pair bubbling over with boldness or over confidence in man, will build in an isolated tree, usually but not invariably an evergreen, in the middle of a field or in an apple orchard. Mr. Frederick M. Dille collected a set of eggs from a tall cottonwood, in the midst of a dense grove, on Clear creek, directly on the outskirts of the city of Denver. He says: "I was greatly surprised at finding a pair of Crows breeding in such close proximity to a large city; but the birds were very quiet and retiring, as if they realized the delicacy of their situation." Mr. W. N. Clute, Binghamton, N. Y., cites two instances of this species nesting within the city limits. Dr. William Bringham, Philadelphia, Pa., takes note of a pair building in Logan Square, on one side of which stands the Academy of Natural Sciences, on another a grand Cathedral, etc., every front being built around, and the square much frequented. At a later date, the same gentleman informs me that he has *heard* of a nest established among the trees of Independence Square, right in the heart of the oldest portion of

the city. It would surprise me little to learn that this was correct and that this saucy bird had raised its young within touch of the "Cradle of Liberty."

Mr. A. H. Norton, Westbrook, Maine, writes: "The first nests that I have found each season, have been built in trees at the border of an opening or grove, where the snow has disappeared. The point of the compass not, as might seem probable, having influence. The Southern exposure receives the sun's action, but the wind and water frequently are as rapid in melting the snow from northern or north-western exposures. The bird seems to like the sunshine (or society) and avoids the deeper woods." Mr. Henry W. Carriger, Sonoma, Cal., has found the nesting sites extremely variable, finding them in deep woods, groves, and along sloughs. He writes: "Previous to 1891, about ten pairs nested in a grove of young white oaks, but in 1892 not a nest was to be found there. The birds had gone, for some unknown cause, to a large grain-field, about four hundred yards distant, where they built their nests in large white oaks." Mr. Edmund Heller, Riversid , Cal., states that the Crows in that vicinity nest only on the bottom lands, never in the canons nor on the mesa. Large tracts in that section are without their quota of birds. Mr. Samuel L. Bacon, Erie, Pa., writes: "My observations lead me to believe that if unmolested, a pair of Crows will nest in the same vicinity for many years if not for a lifetime. To corroborate this belief, I will say that a pair of Crows (presumably the same pair) have nested for the past four years in one piece of woods, and these four nests are within two hundred feet of each other. In these woods, which covers about three acres, there are the remains of at least ten other nests, and I feel sure they were built by the same pair." Mr. C. W. Crandall has usually found them breeding in low woods, with parts swampy or containing a small pond, on Long Island, N. Y. He also gives some notable situations: One nest fifty feet from a habitation, in a gigantic elm, at the roadside, another, one hundred feet from group of houses; another not more than thirty feet from a railroad in constant use; another, one hundred feet from a nest of Red-shouldered Hawk. Mr. Lionel F. Bowers, Columbia, Pa., and Mr. Arthur H. Norton, Westbrook, Me., have found their nests situated in the midst of Black-crowned Night Heron colonies. I have found them close to the nests of the Cooper's and Broad-winged Hawks, which they will rob if left uncovered for any length of time; and also in one instance, within a few yards of a Grey Squirrel's nest.

The trees usually selected for nesting sites in the Eastern states, are the white pine, *Pinus strobus*; red oak, *Quercus rubra*; chestnut, *Castanea sativa americana*; white spruce, *Abies alba*; white oak, *Q. alba*;

pitch pine, *P. rigida*; scrub pine, *P. banksiana*; hemlock, *Tsuga canadensis*; balsam fir, *Picea balsamea*; double spruce, *A. nigra*; white elm, *Ulmus americana*; red or swamp maple, *Acer rubrum*; tulip poplar, *Liriodendron tulipifera*; and gray or canoe birch, *Betula papyrifera*. Middle states: chestnut, *C. S. americana*; black oak, *Q. c. tinctoria*; white oak, *Q. alba*; hickory, *Carya tomentosa*; shellbark, *C. alba*; pitch pine, *P. rigida*; white pine, *P. strobus*; chestnut oak, *Q. prinus*; red or swamp-maple, *A. rubrum*; red cedar, *Juniperus virginiana*; hemlock *T. canadensis*; beech, *F. ferruginea*; tulip poplar, *L. tulipifera*; white elm, *U. americana*; sugar maple, *A. saccharinum*; white cedar, *Chamaecyparis sphaeroidea*; occasionally white ash, *Fraxinus americana*; wild red cherry, *Prunus pennsylvanica*; wild black cherry, *P. serotina*; flowering dogwood, *Cornus florida*; American holly, *Ilex opaca*; apple, *Pyrus malus*; yellow birch, *B. lutea*; black birch, *B. lenta*; and white birch, *B. a. populifolia*. Southern states: yellow or long leaved pine, *Pinus palustris*; short leaved pine, *P. mitis*; white or spruce pine, *P. glabra*; pitch pine, *P. australis*; cypress, *Taxodium distichum*; live oak, *Q. virens*; beech, *F. ferruginea*; swamp maple, *A. rubrum*; red cedar, *J. virginiana*; elm, *U. americana*; tulip poplar, *L. tulipifera*; pecan, *Carya olivaeformis*; and hackberry, *Celtis occidentalis*. Western states: Spanish oak, *Q. falcata*; white oak, *Q. alba*; red maple, *A. rubrum*; Sycamore, *Platanus occidentalis*; cottonwood populus, *monilifera*; beech, *F. ferruginea*; poplar, *L. tulipifera*; white walnut, *Juglans cinerea*; white elm, *U. americana*; tamarack, *Larix americana* or *L. occidentalis*; ash, *Fraxinus americana* and *F. quadrangulata*. California: live oak, *Q. chrysolepis*; white oak, *Q. alba*; willow, *Salix* (?); cottonwood, *P. monilifera*; ash, *F. oregana*; and alder, *Negundo aceroides* (?).

POSITION.—The nest is usually placed in the upright fork or crotch of a tree, not seldom on a horizontal branch, at no great distance from the pole or main stem. Mr. C. W. Crandall discovered a nest on Long Island, N. Y., in a most peculiar and unique position. In his own words: "Looking from the brow of a hill some thirty feet high, I discovered a nest situated in the fork of a chestnut tree, which was at the base of the hill, the nest being placed forty-five feet up. The parent bird was sitting, and strange to say, was entirely visible from where I stood. Thinking this was very peculiar, I resolved to investigate. Upon climbing to the nest, I found that by some means, probably a heavy wind, it had become dislodged and had turned almost completely on its side, the eggs just being held in by the rim of the nest. The bird had to sit with one side against the *bottom* of the nest, with the other side exposed."

HEIGHT.—The distance from the ground at which the nest is placed, varies from four to over one hundred feet. Where the birds are unmolested, they build remarkably near the ground for so large and naturally suspicious a bird. Where they are persecuted and continually hunted, the instinct of self-preservation, with which they are most certainly highly endowed, prompts them to build in practically inaccessible trees, in many cases. Such trees as shellbark hickory, sycamore, large crooked black oaks, trees over-looking precipices or deep water, are often very difficult to climb, and the Crows often build their nests at a great height in these trees. Where the bird chooses an uninhabited island, an unfrequented swamp or the deep woods for breeding purposes, the nest is usually placed much nearer the ground than it would otherwise be. On the whole, mankind exercises more influence over this than is generally known. The average height throughout the country is about forty-five feet. Minnesota, North Dakota, Manitoba are but thinly settled, and the average height from the ground is found to be only twenty feet. The soil of the Eastern states is in a high state of cultivation, and the New England farmer looks with an unkindly eye at the depredations of this black-feathered bird. His search for food is interpreted as a raid which must be resisted by force of arms; hence the bird becomes shyer and builds as high up as it is possible to do. The data before me gives an average of sixty feet above the ground.

CONSTRUCTION. Mr. Lynds Jones, Oberlin, Ohio, says: "The time taken in building the nest varies with the weather, and that is seldom constant in March or April. I have known a nest to have been begun and completed within a week, in fair weather. But the birds are not constantly at work; theirs is a very short working day of not over four hours. In bad weather I have known a nest to be three weeks in building." The following interesting table has been deducted from the very full notes furnished me by Mr. Harvey C. Campbell, Lansingburg, N. Y. It is to be understood that in the dates given for *second* sets, in all cases where the eggs were incubated, allowance has been made to give the dates of fresh and completed sets. With numbers 1, 3, and 4 the *actual* dates on which they were taken are given, and it is by no means certain that the last egg was deposited on these dates; quite probable a day had intervened.

		MO.	DA.	
No. 1.	} 1st set.	April	19	} 15 days.
		May	4	
No. 2.	} 1st set.	April	17	} 14 days.
		May	1	
No. 3.	} 1st set.	April	17	} 14 days.
		May	1	

		MO.	DA.	
No. 4.	1st set.	April	20	} 15 days.
	2nd set.	May	5	
No. 5.	1st set.	April	23	} 14 days.
	2nd set.	May	7	

We learn from this table that it requires about fourteen days for the Crow, after it has been robbed, to choose a nesting site, construct its nest, and deposit the second set of eggs. Allowing six days for the female to deposit her eggs, the nest must have been constructed within eight days, and probably within six days.

COMPOSITION.—The composition of the nest varies somewhat, of course, with the local surroundings, as well as with the individual builder's experience and "taste" as to the proper material for building. They rarely use a deserted squirrel's nest. The typical nest is composed of coarse sticks, strips of bark, clods of earth, dead leaves; lined with hog bristles, strips of grape vine bark; the inner bark of chestnut or oak, cow hair, or horse hair. Occasionally the body of the nest will contain moss, grass, rootlets, corn stalks, cloth (often from some dilapidated "scare crow"), corn husks, weed stalks, pieces of rope, dried cow and horse manure, feathers, pieces of matting, sheep's wool, twine, or seaweed. The lining is sometimes made up of strips of cedar or juniper bark, dead leaves, sheep's wool, feathers, or skunk's hair. Quite often in some localities, especially in the Eastern states, pine needles are used for lining; while in many other localities, where the surroundings will permit the use of this material, it is not used at all. Much binder twine is made use of in the West. Rev. P. B. Peabody, Owatonna, Minn., writes: "It has apparently become as indispensable a nesting material to the Crow as snake-skins are to the Crested Flycatcher." While Mr. Lynds Jones has the following to say regarding this interesting subject: "First, the foundation of dry sticks, into the bottom or side of which some light colored dry grass is introduced—which is invariably the Crows' 'ear mark.' Felted on this is a layer of leaves, then a layer of grape vine or linder bark, and finally a layer of some soft animal material; in Iowa it is cattle hair, in Ohio it is often wool. In Iowa we now often find nests well supplied with binder twine." In relation to the great strength and durability of the nest in connection with the composition, I can do no better than quote from the notes of Mr. Frederick M. Dille, Denver, Colo.: "I find their nests to be perfect models of strength and durability as compared with other large nests. Not so broad as a Hawk's nest, but deep and well proportioned. So deep and rounded at the bottom that one or two of the eggs will be on top of the others, but well bedded down with some of the lining, so as to avoid all chances of breakage. Made of coarse twigs and

small sticks of the cottonwood, the nest well stuck together by a generous supply of mud or adobe clay, and further strengthened by its situation in some suitable fork of the tree. In this open country of ours, where we have great winds that sweep the trees clear of any other nests, we find that those of the Crow survive them all; and as this species rarely uses an old nest twice over, they provide a great many structures for the Long-eared Owl, Sparrow Hawk, Cooper's Hawk, and sometimes the Great-horned Owl. (The Long-eared Owl prefers a Crow's nest to that of a Magpie's. They do not mind the exposure and sunlight, and they do appreciate the depth which allows them to conceal their stature while incubating.) The principal material used for lining is cattle hair, which in some nests plainly indicates that it was pulled from the hide of some dead 'steer' lying conveniently near on the plains. I have also found nests lined from the scrapings of horse hair from a curry comb; these were probably picked up at favorable moments from around the barn of some isolated ranch. It is well matted against the sides, with a generous supply in the bottom." I would also add the Broad-winged Hawk to the list of birds using old nests of the Crow.

Mr. John A. Bryant writes the following: "Last June I found a nest built in a tall cottonwood standing alone. It was placed on a horizontal limb, midway from tip to trunk, built entirely of green leaves and twigs. The leaves still had a greenish cast, although shriveled, twisted, and brittle. No doubt it was built from the branches blown off by a recent storm. This was about the middle of June. The builders had doubtless been driven from some other locality." I would add that the green leaves were most probably used for greater protection against some foe, possibly man. In this instance the birds showed an instinct almost akin to reasoning, or it is at least a remarkable incident. In North Carolina the nesting material differs somewhat from that already given, as might be expected. Cypress bark, moss, sticks, layer of earth, roots, pea and potato vines; lined with grape vine bark, moss, or hair. The California bird differs in the lining of her nest, more often using the covering of soap root, strips of redwood bark, moss, wild cotton, or cow hair, than anything else.

It is found that the Crow does not vary in the material used, in any one locality, to any great extent; yet there is considerable difference in the construction or the "workmanship," as it has been called. It would seem that the older birds, having the most experience, would construct the better nest. However this may be, some individuals construct more substantial nests than others. When a pair of Crows have been disturbed in their nidification, and are forced to rebuild several times, the result

would naturally be a frail, hastily put together affair; scanty in both material and labor expended. Such a structure came under my notice on May 29, 1887, in a dark, swampy thicket of a mixed growth of trees and saplings, and abounding in greenbriers; at the extremity of a branch of a small, wide-spreading beech tree, fifteen feet above a stagnant pool of water, I found the nest, a mere platform of slender twigs laid together in the manner of a Cuckoo's nest, but without such extra embellishments as pieces of green leaves, tree blossoms, etc., usually found in the latter's domicile. It contained two eggs, and three young birds just hatched. The parent birds successfully reared their brood of three young, and would surely have increased the number to five, had I not arrived just in time to save the two unspotted eggs, which are now included in my large series of sets of this species.

Little attention has been paid to the composition of nests in relation to the seasonal or climatic conditions. This is surprising, considering the many interesting facts which might be brought to light in furtherance of some nicely laid hypothesis. The nest is the direct result of the bird's ingenuity, bounded only by its instinct and surroundings. My notes bearing on this subject were collected during a decade of years, and are sufficiently numerous and accurate to enable me to make the following deductions: Nests built during March and the first week in April, do not differ in external material from the typical nest, but in addition to the strips of soft lining of tree bark and rarely grape vine or cedar bark, *all* nests examined contained an inner lining of some animal substance, of which horse hair constitutes about 50 per cent., hog bristles 40 per cent., and sheep's wool, feathers, and cow hair the remaining 10 per cent. Nests built during the last week in April and during May, are lined with strips of tree and grape vine bark, 63 per cent. containing no other lining, 37 per cent. containing in addition to the above lining, hog bristles; no other animal substance being noted in late nests. While the Crow shows a marked tendency, during the height of the nest-building season, toward gathering indiscriminately whatever comes handiest for lining, the evident knowledge displayed by the early breeders in choosing the warmest material at hand; and the late builders in lining their nests with what is undoubtedly the coolest, speaks highly for the intelligence of the bird. That this does not apply to certain individuals alone, (which may habitually nest early or late as the case may be), is proven by notes at hand of those that have built their second nest after the first had been destroyed. While the bulk of the nest may be the same, they do not place animal material in the lining of the second nest, although the first nest usually contains it. No doubt exceptions will be found to this rule, but I have found it to hold good in all cases under my observation.

MEASUREMENTS.—Full and reliable data on the measurements of the nest are, with a few exceptions, a minus quantity. Few observers think it worth while to take notes of this kind, and the wide latitude taken by those who have recorded the proportions of the nest, renders it extremely difficult to arrive at a safe average. Outside of New York and Pennsylvania, the notes are not sufficiently numerous to give an average of value.

	OUTSIDE.		INSIDE.	
	DIAMETER.	DEPTH.	DIAMETER.	DEPTH.
Average	16.80	10.65	7.35	4.15
Largest	24.00	20.00	9.00	5.00
Smallest	12.00	7.00	6.00	3.00

The above is deducted from data collected in New York and Pennsylvania, and all measurements are given in inches and hundredths of an inch. While the inside measurements do not differ materially between early and late nests, the external measurements do to some extent. The early builder constructs a slightly larger and much more compact nest than the bird building late in the season, *i. e.*, last week in April and first week in May.

EGGS.

TIME BETWEEN COMPLETION OF NEST AND DEPOSITION OF FIRST EGG.—Little or no light has been thrown on this, Mr. Ellis F. Hadley, Dayton, Oregon, asserts that a month intervenes, I have found that the female, if hard pushed, will deposit her first egg as soon as the nest is completed; at other times, often from four to eight days passed before the first egg was laid.

DEPOSITION OF FULL CLUTCH.—Mr. Lynds Jones has found that if the female be hard pushed, as is often the case when the nest is long in building, the eggs are laid each day until the set is completed, otherwise often a day intervenes, when she is not so pushed. Mr. Victor Dewein, Peoria, Ill., has found that in some cases it takes eleven days to lay a full complement of five eggs. I would say that ordinarily a full clutch is deposited in as many days as there are eggs in the set, in South-eastern Pennsylvania.

NUMBER OF EGGS IN A SET.—It has only been of recent date that the "number of eggs in a set" has received much attention; and many of our most eminent ornithologists and oologists have gotten themselves at once into deep water, when they set down arbitrary figures without suf-