

## STUDIES OF HABITATS, TERRITORY, AND NESTS OF THE EASTERN GOLDFINCH

BY WALTER P. NICKELL

WITHIN the last 17 years (1933–1949), I have recorded 264 nests of the Eastern Goldfinch, *Spinus tristis tristis*, in two counties of Michigan. Three areas are represented: Camps Sherwood and Hilltop on the western shores of Walloon Lake, 10 miles from Petosky in Charlevoix County; Camp Ohiyesa on Fish Lake, near Clyde in northwestern Oakland County; and the Cranbrook area, largely within five miles of the Cranbrook Estate in Bloomfield Hills, southeastern Oakland County. All of the 16 nests found at Camp Ohiyesa were studied during the nesting seasons of 1933, 1934, and 1935. Five nests recorded from Camps Sherwood and Hilltop were examined during the nesting seasons of 1939, 1942, and 1949. Of the 243 nests studied in the Cranbrook area, 183 or more than two-thirds were recorded during concentrated field work through the nesting season of 1949. The remaining 60 nests were found as follows: one in 1942; 43 in 1943; seven in 1944; one in 1947; and eight in 1948. No nests were recorded from 1936–1938, 1940–1941, and 1945–1946 because of duties elsewhere during these nesting seasons.

*Acknowledgements.*—I wish to express my appreciation to Dr. Josselyn Van Tyne and Dr. Stanley A. Cain of the University of Michigan and to Dr. Robert T. Hatt of the Cranbrook Institute of Science for reading the manuscript and for their helpful criticisms and suggestions. Also I am indebted to Robert Hutchison and Harold Mahan for their great assistance in locating many nests.

### HABITATS

The Goldfinch is predominantly a bird of the open country. There is much evidence to indicate that it has extended its habitat over increasingly wider and more varied areas as the forests have been cleared by man's westward moving population. Undoubtedly, it is one of several species of birds which have found greater expanses of open territory quite suitable to their needs. In pre-colonial times, over most of the forested areas of eastern North America, the Goldfinch must have been dependent largely upon open situations created by swamps, lake shores, river banks, and such temporary areas as those laid waste by forest fires. Under such conditions it must have placed its nests near the tops of swamp shrubs or near the ends of horizontal branches at the edge of the forest, much as it does in similar

situations today. Although the largest concentrations of nesting Goldfinches are found in open swamp habitats (as they probably were before the settlement of the country) many nests are found in the shrubs of the adjacent uplands, often several hundreds of yards from swamp situations. As a result of the replacement of dense forests by more open shrub and small tree growth, more extensive areas have become suitable as habitats for the Goldfinch. Moreover, several species of shrubs and small trees which under primitive conditions were confined to swamps and forest edges have spread to these areas and are now being used as nest sites. Other situations made available as habitats for the Goldfinch through the agency of man are fencerows, tree and shrub fringes along roads, and abandoned farm and pasture lands. Old orchards, house sites, and, to some extent, landscaped estates and real estate subdivisions have their nesting populations of Goldfinches. Also, several food plants, not widely available previously, have spread extensively into these open situations; most of those of particular use to the Goldfinch belong to the composite family. Two introduced species which are of great importance in much of the Goldfinch's range in eastern North America are the Canada thistle, *Cirsium arvense*, and the dandelion, *Taraxacum officinale*. Both plants are used as food, while the thistle is also used as a lining material in a majority of the nests.

The Walloon Lake area in which the Goldfinch was found nesting represents a restricted type of habitat which appears to be limited in some of the requirements necessary to attract more than a few nesting pairs. Most of the territory is high, well-drained, and thickly covered with beech-maple, *Fagus grandifolia*-*Acer saccharum*, forests. The open fields adjacent to these areas are largely lacking in shrub or small tree growth. Most of the fields are used for hay so that only the unmown fringes along the lake shore are available for growing thistles and other composites which appear to be the favorite nesting and food materials of the Goldfinch. All nests found in this area were in trees at woods' edges, an old apple orchard, or at the edge of a recent planting of red and Scotch pine. The height of the nests averaged 18.8 feet above the ground, about three times the average height of nests recorded in southern Michigan. During seven seasons (1938-43 and 1949) of quite consistent search from late June until late August, only five nests of the Goldfinch were found in this area which is about one-fourth of a mile wide and more than two miles long. The scarcity of the Goldfinch in this area as compared with its great abundance in suitable areas in southern Michigan is striking, and probably involves factors of both climate and habitat which have not been shown yet in

studies of this species in the north. This area probably represents a type of habitat which, before it was partially cleared by man, was almost completely unsuitable for the Goldfinch.

The Camp Ohiyesa territory illustrates a group of diversified habitats, only part of which appear to meet the best needs of the Goldfinch. About three-fourths of the mile-square, almost level area is covered with second-growth oak-hickory forests, with thick spruce-tamarack bogs, and with two lakes. Tree growth reaches close to the water's edge around most of the lakes' shorelines so that little room is left for open swamp shrubs in which the Goldfinch nests abundantly in many parts of southern Michigan. The other fourth of the territory is occupied by old pastures, two old apple orchards, and a large leather-leaf, *Chamaedaphne calyculata*, bog encompassing a few scattered black spruce trees, *Picea mariana*. Only limited "edge" portions scattered over the area may be considered suitable habitat for the Goldfinch. Two small sections of open swamp, in which scattered tamaracks, hardhack, buttonbush, and swamp birch were growing, yielded nests. Two other small sections at the edges of oak woods furnished locations for the other nests found. Only 16 nests were found in this area during seven nesting seasons (1930-36) from late June to September. That nesting Goldfinches were not plentiful is indicated here by the fact that I spent two or three hours daily on field trips with nature study groups, a good portion of the time occupied in searching for nests of these and other species. The trees and shrubs in which nests were found in this area were of species different from those used in the Walloon Lake area, and mostly different from species used in the Cranbrook area. The average nest height was 12.2 feet, or about twice the average for the more heavily populated parts of the Cranbrook area. This area, like the Walloon Lake area, appears to be a marginal habitat for the Goldfinch due to a limited number of nest sites and sparsity of food plants of preferred types.

The Cranbrook area exhibits three different types of habitats in which the Goldfinch nests. One of these types (the forest edges and adjacent open fields) is similar to those found in the Walloon Lake and Camp Ohiyesa areas. The nests found in this habitat were usually in tufts of small twigs near the ends of horizontal branches and were much higher than the other sites measured in the Cranbrook area. Twelve nests in this habitat averaged 12.3 feet above the ground.

Another type of habitat found in this area is made up of shrubby fields in dry situations, both hilly and level. These fields are either adjacent to lakes or swamps or up to several hundred yards away from them. Scattered growths of the hawthorns, paniced dogwood,

elms, staghorn sumac, wild plum, wild cherries, ninebark, tartarian honeysuckle, *Lonicera tatarica*, and blackberry briars, *Rubus* spp., compose the predominant woody plants. The herbaceous plants of most use as food and nesting materials of the Goldfinch included burdock, *Arctium Lappa*, bull thistle, *Cirsium pumilum*, Canada thistle, common dandelion, wild lettuces, *Lactuca* spp., common milkweed, *Asclepias syriaca*, and chickory, *Cichorium Intybus*. This type of habitat is one which has developed within about the last 100 years since the land was cleared, farmed, and abandoned. Abandonment permitted the spread of several species of shrubs and trees into open situations. The most important of these are the hawthorns, panicked dogwood, and American and slippery elms. Sixty nests in this habitat averaged 5.2 feet above the ground.

The third and most important habitat of the Goldfinch, as judged by numbers and distributional density of nests, is the open, low situation which may be wet or dry during the nesting season. The predominant types of shrubs found in these territories are panicked dogwood, red osier dogwood, silky dogwood, several species of shrub willows, elder, hardhack, buttonbush, and poison sumac, *Rhus vernix*. Scattered trees at the marsh borders include red maple, slippery elm, quaking aspen, bur oak, and swamp white oak. The herbaceous plants of importance as food and nesting materials include broad-leaved and narrow-leaved cattails, *Typha latifolia* and *angustifolia*, swamp thistle, *Cirsium muticum*, swamp milkweed, *Asclepias incarnata*, and nodding bur marigold, *Bidens cernua*. One hundred and eighteen nests in this habitat averaged five feet above the ground.

#### TERRITORY

Evidently, one of the prime considerations in the selection of territory is the availability of suitable nesting places. Probably of equal importance is the proximity of food plants such as thistles, wild lettuce, and others. I have never found the nest of a Goldfinch very far from an adequate supply of thistle seed. Several areas of 10 to 40 acres in extent, even after careful search, yielded no nest of the Goldfinch at the height of the nesting season. These areas, both swamps and dry uplands, had been heavily pastured for several years and were entirely lacking in thistle growth. Every other requisite for nesting territory was apparently present. Conversely, I have rarely found an abundance of thistles without finding the nests of one or more pairs of the Goldfinch within a distance determined by the presence of suitable nest sites. In no case was a feeding area found to be more than 200 or 300 yards from the nesting territory and in most instances within

100 yards or less. These findings do not coincide with Margaret Drum's statement (1939: 71-72) that the feeding area may be a mile or more from the nesting site. However, the Goldfinches studied by Drum occupied a more northern and consequently different type of habitat in which both nesting territory and food were somewhat different from habitats in which my studies were made. During every season in which I have studied the Goldfinch, I have noted greater densities of its nests where food and nesting sites were abundant and more isolated territories where both of these requisites were less plentiful or more scattered. Stokes (1950: 114) has observed that "there seems to be a relationship between food supply, nest sites and population density."

Three Goldfinch nests found on August 13, 1949, in the Cranbrook area were grouped within a 50-yard radius in a dry swamp habitat. Two nests each contained five eggs under incubation. One nest held four 2-day young. About 75 yards distant at the swamp edge was a large patch of Canada thistle on which two males were feeding without any apparent conflict. Four nests, all found on August 24, 1949, in the same area, were mapped as forming an acute triangle 45 feet across the base with sides 200 feet long. The distances between three nests were 100 feet along one side of the triangle. Two nests were only 45 feet apart across the base of the triangular area. Three nests contained four, five, and two eggs, respectively, all under incubation. One nest was left unlined and was never used. Four nests were discovered on September 3, 1949, also in the Cranbrook area. Two nests held four 3-day young and five 5-day young, respectively. One nest contained three young, not yet dry, and two unhatched eggs. The young had flown from the other only a short time before, probably on this day, as judged by several soft droppings on the sides of the nest. All these nests were in swamp shrubs within an area about 60 yards across.

Concentrations of nests of the Goldfinch within small areas are undoubtedly less common than those more widely scattered over larger territories. However, my observations lead me to believe that the Goldfinch is a tolerant species in regard to territorial boundaries. My findings agree with those of Walkinshaw (1938: 3) and Nice (1939: 123) that the Goldfinch does not always appear to exhibit strong territorial behavior. However, Drum (1939: 75) and Stokes (1950: 112-113) found that territories were defended vigorously by males and sometimes by females. I believe it likely that abundance or scarcity of food, nesting materials, and nest sites are of greater importance in determining the number and proximity of nests of this

species within a given area than is territorial behavior. I have never observed any intraspecific conflict for either food or nest sites.

#### THE NESTING SEASON

Although the nesting season of the Goldfinch begins later than that of any other species in Michigan, this species may not always be the last to bring its young from the nest at the season's end. The Cardinal (*Richmondena cardinalis*), Mourning Dove (*Zenaidura macroura carolinensis*), and Cedar Waxwing (*Bombycilla cedrorum*) after interruptions or multiple nestings, sometimes have young in the nest after all Goldfinches are on the wing. The time of nesting of the Goldfinch appears to be correlated with the maturity of certain members of the composite family of plants, especially the thistles, whose seed are used as a plentiful food supply for both adults and young and whose down is often used for lining the nests. Based upon the earliest nests with eggs and the latest nests with young which I have recorded for all three areas represented, the nesting season of the Goldfinch began and ended as follows: Walloon Lake area, July 6 to September 1; Camp Ohiyesa area, July 10 to August 25; Cranbrook area, July 3 to September 25.

#### TYPES OF NEST SITES

The nest sites of the Goldfinch in this study have been divided into six main types (Table 1). The first and most important type is the upright fork with an average of four, more or less evenly spaced, vertical branches which are used as points of attachment on the sides and forming a cradle-like support for the nest (Plate 13, *left*). The second type is the upright fork also, but differs from the first in having all the branches arranged on one side, leaving the nest unsupported on the opposite side (Plate 14, *top*). The third type is formed of two parallel uprights between which the nest is built with no support underneath (Plate 13, *middle*). The fourth type of nest site is represented by tufts of small twigs growing in an upright position from horizontal branches (Plate 14, *middle*). Nests built in this type of situation rest in cradles of twigs as well as on the main branch and are attached to the upright twigs. The fifth type is represented by nests saddled over and around horizontal branches and fastened to small horizontal twigs or leaves (Plate 14, *bottom*). The sixth type is the rarest nest site I have recorded for the Goldfinch, being represented by only two nests. Nests are wedged between horizontal forks, held in place by overlapping of the nesting materials and by attachment on the two sides (Plate 13, *right*). The bottoms of the nests are

TABLE 1  
TYPES OF GOLDFINCH NEST SITES (ALL AREAS)

<i>Type</i>	<i>Number nests</i>	<i>Number points attached</i>
1 (120 nests)	4	7
	8	6
	17	5
	52	4
	37	3
	2	2
	<i>Average</i>	4
2 (10 nests)	2	5
	4	3
	4	2
		<i>Average</i>
3 (3 nests)	3	2
		<i>Average</i>
4 (6 nests)	1	5
	2	4
	1	3
	2	2
		<i>Average</i>
5 (6 nests)	4	2
	2	3
		<i>Average</i>
6 (2 nests)	2	2
		<i>Average (all types)</i>

unsupported, and in this respect resemble the semi-pensile nests of vireos. A search of the literature on the Goldfinch does not reveal any nest found in an artificial site or on the ground. My own records show one nest fastened to an upright wire and resting upon a cross wire in a tangle of bedstraw which had climbed a fence. I have never found a nest on the ground.

#### PLANTS USED AS NEST SITES

The Goldfinch uses a great variety of trees and shrubs and a few herbaceous plants for its nest sites. The species used vary considerably in different habitats and in different parts of the bird's range. Walkinshaw (1938: 4-5) lists 17 species of trees and shrubs which were used by the Goldfinch in five counties of southwestern Michigan and states that the two dogwoods, "*Cornus amomum* and *stolonifera* are the favorite nesting shrubs in Michigan . . ." These species occupy fifth and third places in my catalogue. Only two species mentioned by him, ash, *Fraxinus* sp., and sassafras, *Sassafras vari-*

*folium*, are not listed in my total of 36 species for two areas in Oakland County in southeastern Michigan (Tables 2 and 3). It may be noted that Walkinshaw (1938: 7) does not list any of the hawthorns as nest sites, although he mentions materials of this genus used for nesting by the Goldfinch. My studies in the Cranbrook area show that 43 nests were found in hawthorns, second only to the number found in panicled dogwood, the most frequently chosen nest site. Todd (1940: 618) states that "red haws growing in abandoned pastures were frequently chosen." Allen (1930: 52 and 1934: 218) lists "thorn bushes," presumably hawthorns, on two occasions as nest sites for the Goldfinch. Stokes (1950: 117-118) in Wisconsin found 230 nests of the Goldfinch in 14 species of trees, shrubs, and forbs. Some pronounced differences are found in the relative abundance of several species of shrubs and in the relative number of nests found in both shrubs and forbs in his study area and mine. Sixty-eight per cent of his nests compared to 3.4 per cent of mine were in elderberry. Eight per cent of Stokes's nests were in "dogwood"; 38 per cent of mine were in three species of dogwood. Stokes lists "hawthorn" as sites for "small numbers" of nests outside his study area. Over 17 per cent of my nests were in hawthorns. In order of abundance in his swamp habitat, Stokes puts elderberry, red osier dogwood, buttonbush, and tartarian honeysuckle. My list for swamp habitats includes, in order of abundance, panicled dogwood, red-osier dogwood, silky dogwood, willows, elderberry, hardhack, and buttonbush. Tree birches, not included in my list, are reported as nest sites in Quebec by Mousley (1932: 200) and in Maine by Gross (1938: 253).

Herbaceous plants are apparently among the rarest nest sites used by the Goldfinch in many parts of its range. This is not surprising, as only a few species of plants are sufficiently strong or branching to furnish safe anchorage for nests. Exceptions are some of the thistles, corn, sunflowers, asters (*Eupatorium*), wild lettuce, and the goldenrods. My list includes three nests in two species, bedstraw and goldenrod. Two nests in Iowa have been reported in bull thistle by Pierce (1922: 186) and Lynds Jones (1922: 186). Ten nests were found in Canada thistle in Ohio by Nice (1939: 123). Roberts (1932: 369) lists a nest in "thistle," apparently swamp thistle, and shows a photograph of the nest from Minnesota. Dugmore (1904: 144) mentions large thistles and coarse ferns as occasional nest sites. Stokes (1950: 117) lists 11 nests or five per cent of his total in thistle and states (1950: 125) that Lewis (unpublished) found the remarkable number of 608 nests in thistle during a four-year period at St. Paul, Minnesota. Stokes also lists sunflower, *Helianthus giganteus*, joe-pye weed, *Eupatorium*



TABLE 2  
SITES OF 243 NESTS OF GOLDFINCHES IN THE CRANBROOK AREA, MICHIGAN, BY  
SPECIES OF TREES AND SHRUBS

<i>Plant species</i>	<i>Number nests</i>
Paniced dogwood, <i>Cornus racemosa</i> . . . . .	63
Hawthorns, <i>Crataegus</i> spp. . . . .	43
Red Osier dogwood, <i>Cornus stolonifera</i> . . . . .	25
American and slippery elms, <i>Ulmus americana</i> and <i>fulva</i> . . . . .	22
Silky cornel, <i>Cornus obliqua</i> . . . . .	12
Shrub willows, <i>Salix</i> spp. . . . .	12
Common elder, <i>Sambucus canadensis</i> . . . . .	9
Red maple, <i>Acer rubrum</i> . . . . .	6
Privet, <i>Ligustrum vulgare</i> . . . . .	6
American aspen, <i>Populus tremuloides</i> . . . . .	6
Osage orange, <i>Maclura pomifera</i> . . . . .	5
Apples, <i>Malus</i> spp. . . . .	3
Bur oak, <i>Quercus macrocarpa</i> . . . . .	3
Staghorn sumach, <i>Rhus typhina</i> . . . . .	2
Hardhack, <i>Spiraea tomentosa</i> . . . . .	2
Choke cherry, <i>Prunus virginiana</i> . . . . .	2
Common locust, <i>Robinia Pseudo-Acacia</i> . . . . .	2
Wild plum, <i>Prunus americana</i> . . . . .	2
Wild black cherry, <i>Prunus serotina</i> . . . . .	2
Prickly ash, <i>Zanthoxylum americanum</i> . . . . .	2
Shrubby bittersweet, <i>Celastrus scandens</i> . . . . .	2
Goldenrods, <i>Solidago</i> spp. . . . .	2
Swamp white oak, <i>Quercus bicolor</i> . . . . .	1
Ninebark, <i>Physocarpus opulifolius</i> . . . . .	1
Box elder, <i>Acer Negundo</i> . . . . .	1
Red mulberry, <i>Morus rubra</i> . . . . .	1
Common buttonbush, <i>Cephalanthus occidentalis</i> . . . . .	1
Nannyberry, <i>Viburnum Lentago</i> . . . . .	1
Lilac, <i>Syringa</i> sp. . . . .	1
Grapes, <i>Vitis</i> spp. . . . .	1
Silver poplar, <i>Populus alba</i> . . . . .	1
Bedstraw, <i>Galium</i> sp., on wire fence. . . . .	1
TOTAL SPECIES	
<i>Shrubs</i> . . . . .	16
<i>Trees</i> . . . . .	13
<i>Vines</i> . . . . .	2
<i>Herbaceous Plants</i> . . . . .	2

*maculatum*, asters spp., wild lettuce, *Lactuca* sp., and goldenrod as sites for 21 nests or nine per cent of his total. Barrows (1912: 477) mentions a nest found in a corn shock by Samuel Spicer of Genessee County, Michigan. Parks Allen of Ithaca, Gratiot County, Michigan, told me of a Goldfinch nest which he found on an ear of standing corn in his field about 1940.

Apparently, the Goldfinch in its chosen territory will use almost any species of tree, shrub, or herbaceous plant which provides the requirements of safe anchorage along the sides of the nest, proper support underneath, "normally" safe height above the ground, concealment, and either vertical or horizontal "edge." Nests found in sites which

do not meet most of these requirements are, in my experience, exceptions. Apparently, certain structural factors found in the trees, shrubs, or herbaceous plants are important in the determination of sites. The minimal number of points of attachment appear to be two, as I have never found a nest with less than this number. Table

TABLE 3  
SITES OF 16 GOLDFINCH NESTS AT CAMP OHIVESA, MICHIGAN

<i>Plant species</i>	<i>Number nests</i>
Tamarack, <i>Larix laricina</i> . . . . .	4
Red oak, <i>Quercus rubra</i> . . . . .	4
Hardhack . . . . .	2
Swamp birch, <i>Betula pumila</i> . . . . .	2
Red maple . . . . .	1
Elm . . . . .	1
Swamp white oak . . . . .	1
Common buttonbush . . . . .	1
TOTAL SPECIES	
<i>Shrubs</i> . . . . .	3
<i>Trees</i> . . . . .	5

1 shows the number of points of attachment counted for all types of sites. It will be noted that upright forks, with three or more forks (points of attachment), were used for 124 of the 147 nests (or 84.4 per cent) of those whose forks were counted. An analysis of Table 2 shows that the first eight species of trees and shrubs account for 186 nests (or 76.5 per cent) of the total. Apparently three factors largely account for this high percentage of nests found in a few species. The first is found in the relative abundance of these species present in the habitat. The second and third factors are revealed in the mechanical structure and growth habits of the species concerned—that is, a structure and distribution which furnishes the most satisfactory type of nest site for the Goldfinch. Panicked dogwood, in which nearly 26 per cent of all nests in the Cranbrook area were built, is the most abundant shrub listed for both swamps and the dry bordering territory. Its branching, upright growth furnishes a cup-like resting place for the nest, with a maximum number of branches for points of attachment. Moreover, its habit of growing in clumps provides nearly a maximum amount of "edge" which appears to be one of the primary nesting requirements of the Goldfinch. The hawthorn group, although almost entirely restricted to open dry slopes and fields and less widely distributed, meets all the other requirements. This genus furnished sites for 17.7 per cent of all nests tabulated for the Cranbrook area. Although the other six species were neither as abundant in the study area nor as suitable structurally as panicked dogwood and the hawthorn

group, their distribution in relation to "edge" was similar. Nearly 33 per cent of the nests for the area were located in these species. Of the 25 other species, 13, which included privet, osage orange, apple, black locust, wild plum, prickly ash, ninebark, box-elder, red mulberry, buttonbush, nannyberry, lilac, and silver poplar, were scarce or restricted in the study area and accounted for only 11.1 per cent of all nests. The remaining 12 species appeared to fall into various categories; red maple, bur oak, swamp white oak, and black cherry are

TABLE 4  
SITES OF FIVE GOLDFINCH NESTS AT WALLOON LAKE, MICHIGAN

<i>Species of trees</i>	<i>Number nests</i>
Red pine, <i>Pinus resinosa</i> . . . . .	1
Scotch pine, <i>Pinus sylvestris</i> . . . . .	1
Apple . . . . .	1
Sugar maple, <i>Acer saccharum</i> . . . . .	2
TOTAL SPECIES OF TREES . . . . .	4

mostly restricted to the margins of woods, where they appear to be used as nest sites largely because of the scarcity or absence of other suitable species. Choke cherry and staghorn sumac are neither abundant in the habitat nor ordinarily structurally suitable. Hardhack and quaking aspen are relatively plentiful in the nesting areas but are poor structurally. Bittersweet, grape, and bedstraw were used only when climbing upon more rigid species to which nests were partially attached. Goldenrods were abundant in many of the nesting areas, but only a few large plants growing in rich soil were strong enough to support a nest. One of the two nests found in this plant blew down during a strong wind and the young were destroyed. Stokes (1950: 124-125) reports that "nests built in elderberry heavy with fruit or in forbs were subject to destruction by high winds and were found tilted so far over that eggs or young had fallen out."

HEIGHTS OF NESTS FROM GROUND

The heights of nests above the ground vary greatly in different types of habitats and especially in situations where both shrubs and larger trees are found. The higher nests are in trees along fencerows and woods' edges. Four nests in red oak averaged 22.8 feet above the ground. The highest nest was 33 feet up in red oak, the lowest nest one foot above the ground in hawthorn. Two nests in sugar maple averaged 25 feet. Homer Roberts (MS) reports a nest at the University of Michigan Biological Station in Cheboygan County, Michigan, at a height of 45 feet in sugar maple. Three nests in tamarack

averaged 14.7 feet; five nests in red maple averaged 13.2 feet; 22 nests in high shrubs such as hawthorn, privet, and willow averaged 7.6 feet above the ground. The average height from the ground to the rims of 211 nests was 6.1 feet. Stokes (1950: 118) measured 278 nests which averaged about five feet above the ground. Walkinshaw (1938: 5) found 111 nests averaging about 4.3 feet from ground to rim.

#### THE NEST

So durably built and strongly secured are most nests that they often remain in position for several years unless they are dismantled for nesting material by other birds or by small mammals. The lining is usually thick and so compact that an unoccupied nest will sometimes hold water for several hours after a heavy rain. Allen (1934: 218) states that nests are cushioned so tightly that they will hold water and even drown unprotected young. Forbush (1929: 28) and Walkinshaw (1938: 5) also mention that these nests hold water. Several times I have observed water standing in nests but have never found young birds drowned in them. At Cranbrook on July 9, 1944, I found a newly lined nest containing a half-inch of water several hours after a heavy rain. Usually the leaf canopy of the tree or shrub in which the nest is built gives adequate protection from all except severe cloudbursts. However, late nesting birds which use hawthorns or the dogwoods sometimes find themselves without cover when the leaves of these species drop in the early fall. Nests are easily found under these circumstances, as they may be seen at some distance. The leaves had dropped from many of these shrubs by September 10, 1949, in the Cranbrook area. Five active nests were found in leafless shrubs. One was in hawthorn, one in osier dogwood, and three in paniced dogwood. One nest held five young, three contained four young each, and the last held three young. The young flew from the first four nests in the following order: September 20, 20, 22, and 24. The young were abandoned in the last nest on September 25 and were dead the next day. When the three young flew from a site in common locust on September 22, the nest was still well-hidden by green leaves.

*Materials of the Nest.*—The plant materials used are many and varied despite the high percentage of nests in which thistle down is used as a lining material and the outer stem fibers of milkweeds for fastening and binding the outer basket. Many odds and ends of various kinds are used as fillers when the basketwork is being shaped, bound together, and fastened to the surrounding twigs and leaves. I have often seen the female pulling in all the loose and projecting

materials within reach and fastening them to the sides of the nest. Nesting materials are usually gathered in the vicinity of the nest site. Any apparent specificity in nesting materials, such as milkweed fibers and thistle down, is probably explained by their presence in adequate amounts in the habitat. Other materials which meet the basic requirements of flexibility and strength for bindings, and of softness and ease of compaction, are often used when they are as easily obtained.

*The Basket of the Nest.*—The initial steps in nest construction may vary somewhat, apparently in accordance with the limitations imposed by the structural features of the nest site itself and the “impulses” of the individual builder. One of two major procedures is usually followed. If the first two or three inches at the bottom of the fork is too narrow to permit a framework of normal diameter, the first step of the builder may be to fill this with bulky material. This may be thistle down, dry willow catkins, cattail down, or other material. Then, the normal-sized basketwork of fibrous materials is woven and fastened to the surrounding branches immediately above. Sometimes narrow forks are not filled at the bottom, and thus the nest is unsupported except at the sides. Again, a small cross twig may be the nest’s only support on the under side. The second procedure is followed when the bottom of the fork conforms to, or does not interfere with, the normal size limitations of the nest. In this case, the outer framework is constructed without the necessity of any adaptation of materials to site, other than those required in the usual process of nest construction. Not infrequently nests are found which show that no outer basket was constructed, the bulky materials being held together by the enclosing branches of the fork. Nests of this type are probably the result of an abundance of thistle down or cattail fluff near at hand and perhaps the “physiological urge” for speed in the preparation of the nest for the eggs. Of a total of 124 nests dissected, 80 (64.5 per cent) contained milkweed fibers in the basket and binding; 21 (nearly 17 per cent) contained the husks of dried willow catkins; seven contained cattail fluff; three had considerable amounts of fine grasses; one had milkweed down; one had down of thimble-weed, *Anemone virginiana*; and 11 nests had outer portions made of thistle down, largely unbound by fibrous materials. Other materials used less commonly or in smaller amounts are spider webs and cocoons and the dried froth of spittle-bugs, family *Cercopidae*, which is sticky and somewhat silklike. The webs of the tent caterpillar, *Malacosoma americana*, also were used. I have never found moss in nests, although a few authors list this material. Roberts (1932: 370), Headstrom (1949: 84), Dugmore (1904: 144), and Stoner (1932: 707) mention “moss” as a part of the basketwork of nests.

The nest is often rimmed with strips of the thin outer bark of grape, hawthorn, ninebark, and other shrubs, and the outer fibrous portions of some herbaceous plants. Some nests are rimmed with the down of thistles, thimbleweed, milkweed, cottonwood, willows, and the bright red-brown tomenta of ferns. These materials are held in place by fine fibers, spider silk, and caterpillar webs, apparently aided by some moistening secretion of the bird. The strength of the rim may be of some advantage in holding the young together for warmth and other protection from the elements. Most nests in upright forks go through the nesting season with only a slight flattening of the rim. Some indication of the degree of flattening is shown in the difference of 0.17 of an inch in average inside depths I measured in fresh and used nests. The flattening is considerably greater in horizontal sites because nests often lack support at the sides. The rims and sides of nests in which three or more young have been raised are almost invariably encrusted with dried excrement which often extends to the vegetation below. However, I have never found the inside of a nest fouled or any evidence that insects are attracted by the filth on the outside. I have one record of mite infestation in the nest of a Goldfinch. This was at Camp Sherwood, August 23, 1939. In contrast, my records of Eastern Kingbirds, *Tyrannus tyrannus*, Least Flycatchers, *Empidonax minimus*, Phoebes, *Sayornis phoebe*, Catbirds, *Dumetella carolinensis*, Robins, *Turdus migratorius*, Red-eyed Vireos, *Vireo olivaceus*, and Redstarts, *Setophaga ruticilla*, show many mite-infested nests.

*The Lining of the Nest.*—The usual lining of the nest is composed of both soft and warm materials compactly filling the outer basket and thinning upward to the rim. Within the cup of the lining is a thin supporting layer of hair-like fibers which tend to hold the linings in shape during the incubation period or longer. Much of the material of this layer is the finely shredded bark of grapes, hawthorn, and other shrubs. More rarely, rootlets and the coarser hair of horses and cattle are used. Three of 124 nests dissected contained horsehair and one contained rootlets. Soft materials composing the bulk of the linings in these nests were as follows: thistle down, 96 nests; thistle and cattail down, six; cattail down alone, 19; cottonwood fluff, one. Two nests were used without linings. It will be noted that 22 (17.7 per cent) of these nests contained no noticeable amounts of thistle down in the linings. Nearly all students of the Goldfinch list thistle down as the predominant lining material of the nest. A few writers list cottony material, and I have found two authors, Mousley (1930: 177) and Stokes (1950: 117), who specifically mention cattail down in a nest

lining. Nests studied by me show 15 per cent lined with this material and 4.8 per cent lined with mixtures of thistle and cattail down. Jones (1940: 92-93) gives an account of a nest in Virginia which was lined with the spines of the prickly pear cactus. Gross (1938: 253) describes a nest which was composed of vegetable fibers and catkins. Thistle down was not used. Most nests after being used by young show severe wear in the upper part of the lining.

*Measurements of the Nest.*—Measurements of 46 completed but unused nests in upright forks averaged: 2.0 inches inside diameter; 2.9 inches outside diameter; 1.6 inches inside depth; and 2.8 inches total depth. Twelve (26 per cent) of these nests were deeper than wide, and four (8.3 per cent) were the same dimensions in diameter and depth. The least and greatest measurements ranged from: 1.5 inches to 2.5 inches inside diameter; 2.5 inches to 3.5 inches outside diameter; 1.3 inches to 2.3 inches inside depth; and 2.1 inches to 3.5 inches outside depth.

Three unused nests in horizontal sites averaged: 1.9 inches inside diameter; 3.0 inches outside diameter; 1.5 inches inside depth; and 2.2 inches total depth. All three nests were wider than deep.

Seventy-nine used nests in upright forks averaged: 2.3 inches inside diameter; 2.9 inches outside diameter; 1.5 inches inside depth; and 2.8 inches total depth. Thirty (38.0 per cent) were deeper than wide, and 14 (17.7 per cent) were of equal diameter and depth. The least and greatest measurements ranged from: 1.9 inches to 2.6 inches inside diameter; 2.3 inches to 3.3 inches outside diameter; 0.50 of an inch to 2.0 inches inside depth; and 1.8 inches to 7.0 inches outside depth.

Five used nests in horizontal positions averaged: 2.6 inches inside diameter; 3.0 inches outer diameter; 1.3 inches inside depth; and 2.4 inches outer depth. All nests were greater in width than in depth. My measurements of nests in vertical forks agree with Walkinshaw (1938: 8) that "some nests were much deeper than wide but the majority were wider than deep." My studies show that all nests, either fresh or used, in horizontal positions were wider than deep, but 33.6 per cent of all nests in vertical forks were deeper than wide. Also, 14.4 per cent were the same dimensions in width and depth. These findings do not agree with those of Allen (1930: 52) that nests of the Goldfinch are always wider than high. He makes essentially the same statement in two other publications (1928: 291 and 1934: 221). However, he indicates (1930: 52 and 1934: 218) that Goldfinches in his study area showed a preference for maples. This may indicate that most of the nests he measured were in horizontal sites in

larger trees. The majority of nests I have found in large trees were in horizontal sites near the ends of branches. All nests I found in horizontal sites were wider than high. I believe that the outer dimensions of the nest are often determined by the type of site and its dimensions, as well as by the abundance or scarcity of suitable materials in the nesting area. The female, when building in an upright fork, tends to adapt the nesting materials to the width of this site, as a result of securing the nest at the sides, and often to the degree of its spread from a narrow base. Considering the variation in fork widths, it is not surprising that nests which conform to the inner dimensions of these forks vary in a like manner. When building on horizontal sites, the builder has more freedom and is not usually confronted with the necessity of adapting to the limits of fork dimensions. Moreover, a great abundance of suitable building material near the site appears to

TABLE 5  
DRY WEIGHTS IN GRAMS OF 10 FRESH GOLDFINCH NESTS

<i>Basket</i>	<i>Lining</i>	<i>Total</i>
5.6	2.7	8.3
8.7	3.6	12.3
8.8	1.2	10.0
7.7	4.2	11.9
7.7	2.4	10.1
4.0	2.0	6.0
7.3	1.2	8.5
4.9	1.0	5.9
3.6	1.5	5.1
4.0	3.5	7.5
AVERAGE 6.2	2.3	8.6

stimulate in some birds the use of greater than normal amounts, resulting in nests of larger outside dimensions. The inner dimensions of the nest appear to be more definitely determined by the final molding actions of the builder. The average difference between the inner diameters of fresh nests in vertical and horizontal sites was only 0.05 of an inch in 49 nests measured. The average difference in inside depth was 0.14 of an inch, being greater for nests in vertical forks.

*Weights of Nests.*—Weights of nests show considerable variation due to size, kinds of materials, and degree of compaction. Thus, a smaller nest built more compactly of heavier materials may equal or exceed in weight a nest of larger dimensions. Nests containing catkins, leaves, grass, and larger amounts of bark fibers of trees are usually heavier in proportion to size. Also, nests lined with cattail down are heavier in proportion to the amount used than those lined with thistle down. Twenty dry nests were weighed after removal from their



forks. These were divided equally into fresh nests and those used by young birds. Linings were carefully removed and weighed separately. The used nests averaged heavier than those in a fresh condition owing to the accumulation of feather scales, feces, and other debris. The two heaviest nests weighed 13.6 grams each; one contained hawthorn leaves in the basket and had a lining of thistle down and the other had a thick lining of cattail down.

TABLE 6  
DRY WEIGHTS IN GRAMS OF 10 GOLDFINCH NESTS USED BY YOUNG

<i>Basket</i>	<i>Lining</i>	<i>Total</i>
5.6	3.5	9.1
10.8	2.8	13.6
6.4	2.4	8.8
7.4	2.7	10.1
9.5	4.1	13.6
7.1	3.3	10.4
6.9	2.1	9.0
8.1	2.7	10.8
6.6	3.2	9.8
6.8	3.3	10.1
AVERAGE 7.5	3.1	10.5

#### RECLAIMED NESTING MATERIALS

Drum (1939: 74) mentions the use of reclaimed nest materials by the Goldfinch. I mentioned this behavior (1943: 52-53) in citing two observations in 1933 during which I saw Goldfinches dismantling the nest of a Baltimore Oriole, *Icterus galbula*, and a Yellow Warbler, *Dendroica petechia*, and using the milkweed fibers in the basketwork of their own nests. Stokes (1950: 119) states that "following nest failure females commonly used material from the old nest or even material from a neighboring active nest." I have found indirect evidence of this type of behavior common in every study area. Two nests found September 1, 1943, in the Cranbrook area were three feet apart in the same elm. The first nest had been finished and partially dismantled. The second nest was under construction. Ten days later I found the first nest in the same condition as before and the second nest had been partially dismantled. Three nests found September 2, 1943, were 15 feet apart in a large clump of willows: one nest had been completed and partially dismantled; one was being lined; and one consisted of an unlined basketwork. Four nests were found in an area of less than an acre on August 19, 1949: two nests were finished and not used; the young had flown from one; and one had been partially dismantled. Five other nests of the Goldfinch showed

partial dismantling in the Cranbrook area in 1949. For a number of years I have observed that few nests of Yellow Warblers and Alder Flycatchers, *Empidonax traillii* (which I had marked with heavy tags), remained in place through the nesting season of the Goldfinch. I believe that the Goldfinch is largely responsible for their disappearance. Apparently in gathering nesting materials from the nests of other birds the Goldfinch seeks largely those which are suitable for use in the basket of its own nest. Of these, the flexible outer fibers of the milkweeds and other plants are in the majority. In dismantling its own nest, it may use both basket materials and lining. Vertical cross-sections of the older nests are often left behind. Occasionally only the basket materials are removed, leaving the lining unattached in the site. This type of behavior in the Ruby-throated Hummingbird, *Archilochus colubris*, has been reported by Todd (1940: 311), in the Blue-gray Gnatcatcher, *Poliophtila caerulea*, by Herrick (1935: 143), and in the Yellow Warbler by me (1943: 53).

#### UNFINISHED NESTS

The problem of nests which are left unfinished is one which will require much further study before an adequate explanation is reached. Most of these nests are found near one or more other nests which have been completed and used. Sometimes a third nest will have been finished and abandoned. Margaret Drum (1939: 74) describes two pairs which abandoned their original sites after carrying nesting material. My studies in 1943 showed six nests left in various stages from bare beginnings to the unlined basketwork. Ten examples of unfinished nests were recorded in 1949. Most nests left unfinished were found in the early part of the nesting season, remaining unfinished throughout. However, some new but unfinished nests were found near active ones well into September. On August 28, 1949, I watched a female Goldfinch as she wrapped fibers around the forks of a small nannyberry which was about 100 yards from an occupied nest. No further material had been added when I finally collected the nest on September 20. I believe that these incomplete nests are the work of the female, as I have never observed a male Goldfinch giving more than token assistance in nest-building. Herrick (1935: 133) mentions this type of behavior in the Red-wing and notes that Howard (1929: 48) in England found "Buntings" and "Warblers" building two or three nest frames but completing only one nest. Herrick suggests that it may be a "later manifestation of that phase of conduct in which a bird seems to be merely playing with her nesting materials before the normal rhythm of nest-building has become established."

Armstrong (1947: 37) says "when a bird is not physiologically mature for the activities of a particular phase in its cycle the execution of the reactions appropriate to that phase will be incomplete or abortive. It is often in such circumstances that birds fidget aimlessly with material or build imperfect nests." Walkinshaw (1938: 6) describes a nest of the Goldfinch which was started, apparently abandoned, and finally completed after 20 days, either by the original female or by another. All incomplete nests I have observed either have been finished within a week or have been abandoned.

While physiological considerations as outlined by Armstrong may be a partial explanation of incomplete nests of a species such as the Goldfinch, I believe that several external factors may operate to some extent. Adverse weather conditions may cause delay which results in abandonment. A sudden fright from enemies may cause nests to be abandoned. I have observed that frames are often found in forks which are narrower than the average in which the completed nests are built. I believe that some birds begin nests in such forks and at some stage in the construction of the basket find them too confining for "comfort" and abandon them. A frame of this type was found in the Cranbrook area on August 28, 1949. The inside measurement of this fork was a scant two inches at the level of the rim or more than three quarters of an inch narrower than the average for all nests measured in upright forks. An adaptation mentioned under "The Basket of the Nest" is the filling of the narrow portion with bulky material until adequate fork-width is attained. This adaptation is not always followed. Twigs, stubs, and thorns (hawthorns) sometimes penetrate the sides or bottoms of nest frames in such a fashion as to constitute possible obstacles to further building. Some so-called double nests of the Goldfinch appear to be the result of by-passing such obstacles and covering them with more materials instead of abandoning the site. The strength of the female's attachment to the site and the urge toward egg-laying may be determining factors in the reactions of individual birds.

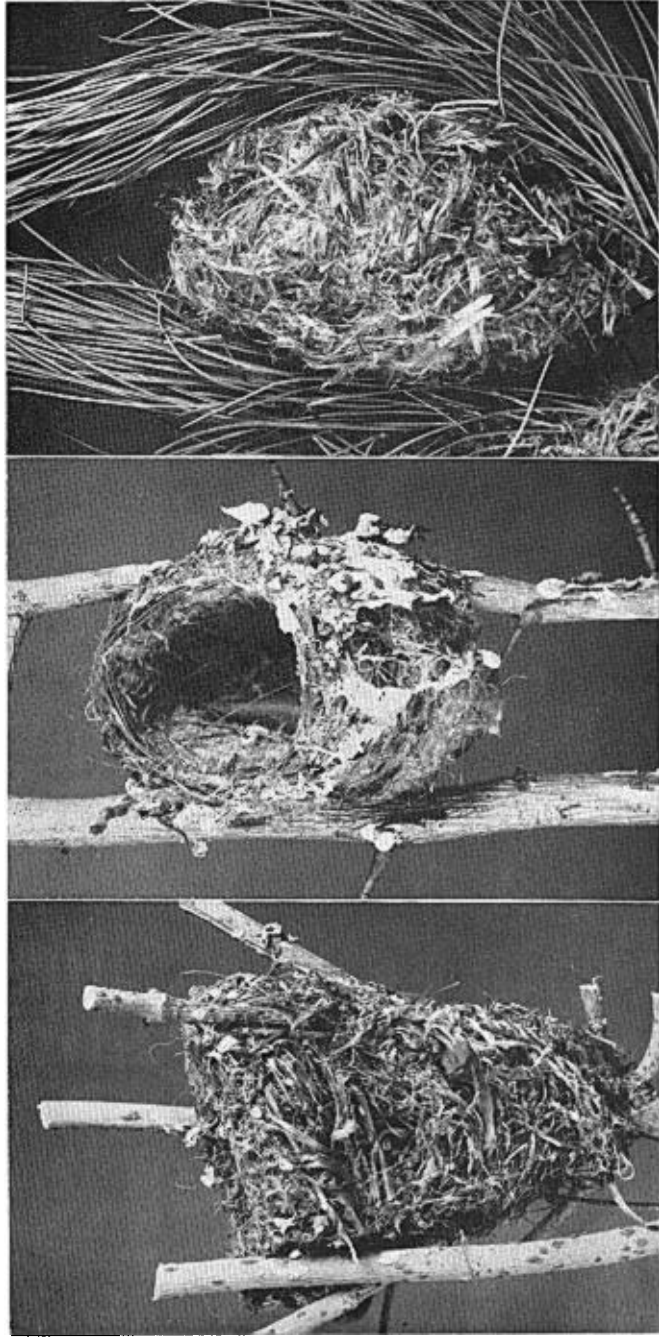
#### ABANDONMENT OF COMPLETED NESTS

I have recorded several completed nests which have been abandoned before an egg was laid. During August, 1943, a survey of about ten acres in the Cranbrook area revealed 17 nests of the Goldfinch. Four nests had held young, one contained young about a week old, and one contained two fresh eggs. Eleven nests were complete but showed no evidence of having contained eggs. Four other completed nests were abandoned in a territory near by. In 1949, 20 nests at Cranbrook

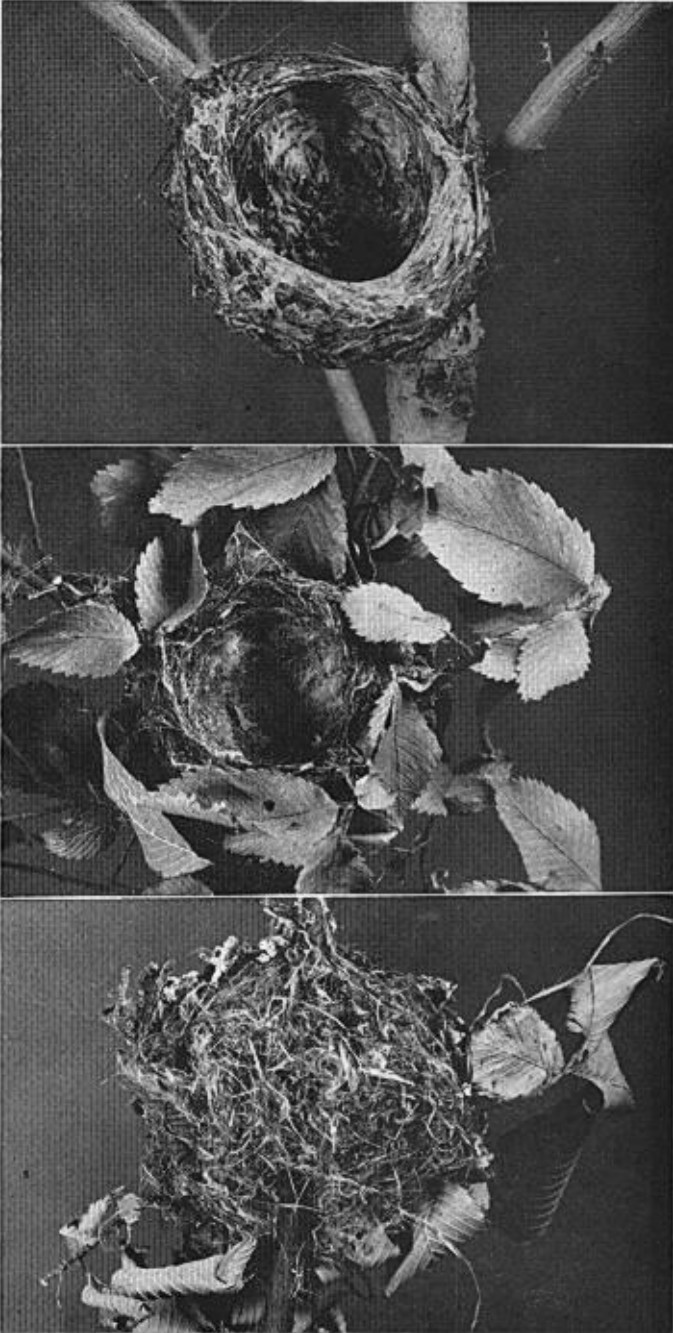
were completed and abandoned without being used. All such nests of both 1943 and 1949 were reasonably close to occupied nests. Three nests of the 1949 season will illustrate some possible causes for abandonment. The first nest was built in a small elm at a point where two separate uprights crossed. Apparently a strong wind had exerted sufficient pressure against the foliage to cause both sides of the nest to collapse, making it no longer habitable. Another nest in a hawthorn was attached to two separate uprights so that wind movement in the foliage above caused it to break loose from its anchorage. The third nest, built in the upper part of an osier dogwood without support at the bottom of the fork, was composed almost entirely of thistle down unbound by fibrous material. The weight of the young apparently caused the lining to drop through the flimsy outer part to the ground. I believe that it can be said that poor choice of site and the failure to adapt materials to site account for part of the nesting delays and casualties found in the Goldfinch.

#### ABANDONMENT OF YOUNG IN THE NEST

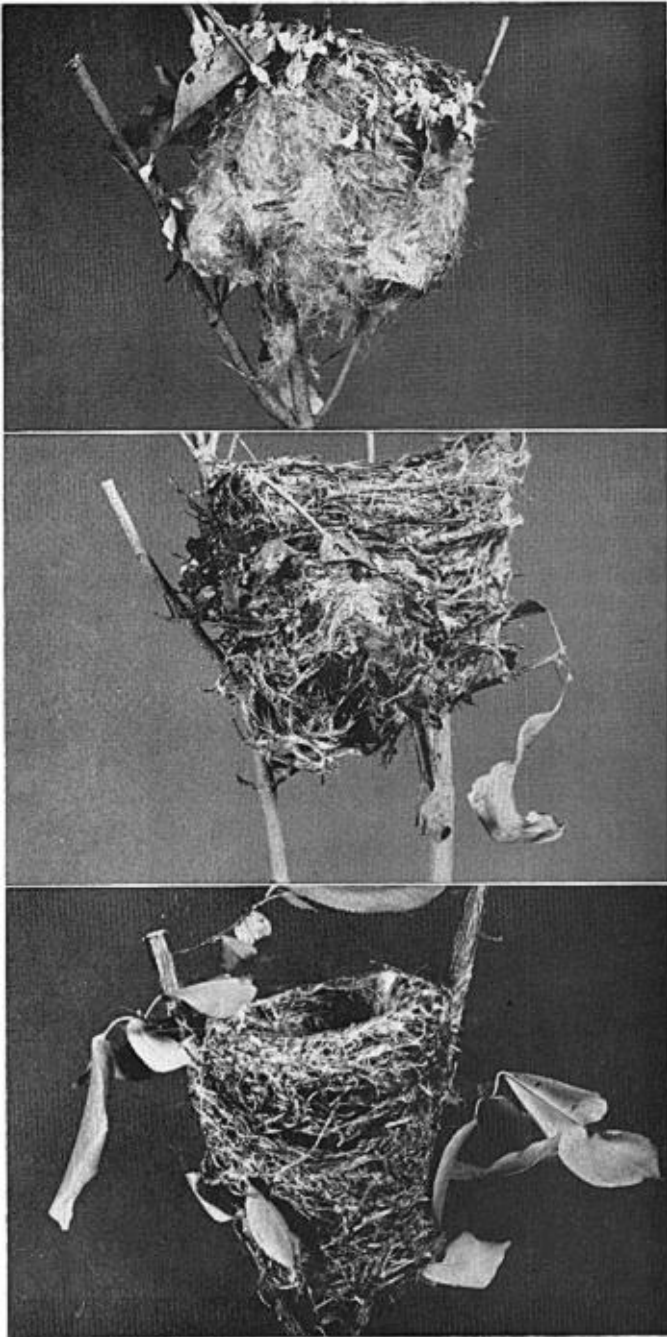
Apparently, Goldfinches rarely abandon young in the nest. As has been shown in this paper, nests are abandoned in all stages from mere beginnings to those with eggs under incubation. In the course of the breeding cycle the attachment of the adults normally becomes stronger as hatching time approaches, reaches its climax at the hatching of the young, and diminishes in intensity as the young approach independence. I have recorded six broods which were found dead in the nest. At Camp Sherwood, July 19, 1942, three Cowbirds, *Molothrus ater*, hatched in a Goldfinch nest. At the next observation on July 24, all young were dead. One was in the nest; the others were on the ground underneath. A female Goldfinch was seen in the vicinity but she did not go near the nest. A nest in the Cranbrook area held four 7-day Goldfinches and one infertile egg on August 8, 1943. Three days later, three of the young were dead, the fourth was dying. Neither of the adults was seen in the vicinity. Another nest at Cranbrook, September 15, 1949, contained one young about five days old and one infertile egg. The young appeared to have died two or three days before. No adults were seen. In the same area, another nest on September 21, 1949, held three 8- or 9-day young and one which had been dead three or four days. On September 23 and 25 the three young appeared about ready to fly, but on September 26 all were dead. Examination showed the crops empty. On October 23 and November 20, 1949, Harold Mahan of Ferndale, Michigan, found and brought to me two nests of the Goldfinch which held dead young.



TYPES OF NESTS OF THE EASTERN GOLDFINCH. (*Left*) TYPE 1. A DEEP NEST WITH FIVE POINTS OF ATTACHMENT OR SUPPORT. (*Middle*) TYPE 3. NEST HELD BETWEEN TWO VERTICAL SUPPORTS. (*Right*) TYPE 6. NEST SUPPORTED BETWEEN TWO HORIZONTAL BRANCHES WITH NO SUPPORT BENEATH.



TYPES OF NESTS OF THE EASTERN GOLDFINCH. (Top) TYPE 2. THREE POINTS OF ATTACHMENT ARRANGED ON ONE SIDE.  
(Middle) TYPE 4. NEST IN TUFT ON HORIZONTAL BRANCH.  
(Bottom) TYPE 5. UNDERSIDE OF NEST IN TUFT AND SADDLED OVER A BRANCH.



NESTS OF THE EASTERN GOLDFINCH. (*Top*) SHOWING NEST LACKING THE NORMAL BASKET OR OUTER BINDING.

(*Middle*) SHOWING LACK OF FORK-FILLING UNDER THE NEST.

(*Bottom*) FORK-FILLING UNDER THE NEST.

In the first nest were four birds which had been about seven to nine days old at death, judging by the plumage growth. The young in the other nest appeared to have been four or five days old at death. All nests were examined for mite infestation which, if sufficiently heavy, apparently may cause abandonment of young in other species, but there were no signs of this. No definite cause of death in any of the young could be determined.

#### SECONDARY USES OF NESTS

Little mention has been made in the literature of secondary uses of birds' nests. I listed (1943: 51) three secondary uses of Goldfinch nests: (1) as remodeled winter nests of white-footed deer mice, *Peromyscus leucopus*; (2) as storage places for food by red squirrels, *Tamiasciurus hudsonicus*; and (3) as "dinner tables" or feeding platforms for red squirrels, deermice, and chipmunks, *Tamias striatus*. Stokes (1950: 125) mentions abandoned Goldfinch nests which he found occupied by white-footed mice. In 1949 in the Cranbrook area I witnessed the use of two different Goldfinch nests as roosting shelters for House Wrens, *Troglodytes aëdon*. On August 30 at nightfall I found a complete but unused nest saddled on a diagonal branch of an apple tree, 7.8 feet above the ground. When I cautiously lowered the branch the wren flew out of the nest and sat near by scolding for several minutes. Two evenings later at a place about two miles away, two wrens repeated this performance at an unused nest which was four feet up in an elm.

#### SUMMARY

A study was made of 264 nests of the Eastern Goldfinch in three areas in Michigan during 11 seasons between 1933 and 1949. The objective was to determine the changes which have occurred in Goldfinch habitats since the settlement of the country and the relationship between individuals and their environment.

A mass of evidence indicates that the Goldfinch has extended its habitat into areas not available in primitive times. Three major types of habitats were found in the areas studied. Two types existed in precolonial times and one has developed since the forests were cleared. These habitats are forest fringes, swamps, and open uplands. The greatest concentration of nests was found in swamp habitats. Two species of herbaceous plants naturalized from Europe (the Canada thistle and common dandelion) have become important as food and nesting materials for the Goldfinch.



Goldfinch populations were found to be smaller in the Walloon Lake and Camp Ohiyesa areas than in the Cranbrook region. Also, nests were here built at much greater heights above the ground.

All major types of habitat are represented in the Cranbrook area. Hawthorns, paniced dogwood, and American and slippery elms have spread into abandoned upland areas and are illustrative of the type of habitat which has appeared in about the last 100 years.

Suitable nesting sites and proximity of food and nesting materials are believed to be important in the selection of territory. The Goldfinch does not appear to exhibit strong territorial behavior. This agrees with the studies of Walkinshaw and Nice, but does not agree with the findings of Drum and Stokes. Nests were found in greater densities in swamp areas than they were in drier habitats where shrubs were more thinly distributed.

The nesting season of the Goldfinch begins later than that of any other species of bird in Michigan. Frequently, however, the Cardinal, Cedar Waxwing, and Mourning Dove finish the nesting season later.

Nest sites in this study have been divided into six main types; three types of site are vertical and three are horizontal. Two nests were in horizontal forks resembling the nest sites of Vireos. I have never found a nest of the Goldfinch on the ground.

While a great variety of trees and shrubs and a few herbaceous plants are used as nesting sites, paniced dogwood and hawthorns were used for more than 43 per cent of all nests recorded. Two nests were found in goldenrod. Structural features consisting of three or more points of attachment were found in a large majority of nest sites. Nests were found in 17 species of shrubs, 18 species of trees, two species of vines, and two species of herbaceous plants.

The materials used in nest construction are many and varied. Any apparent specificity appears to be the result of the presence of adequate materials which meet the requirements of flexibility, strength, and softness. Outer stalk fibers of milkweeds and thistle down are used in a majority of nests. The initial steps in nest construction are thought to be partially controlled by the structural features of the site, the abundance of building materials, or the physiological urge of the female.

Nests used by young are almost invariably incrustated with droppings. A small amount of flattening of the nest rim results from the weight of the young. The flattening is greater in nests in horizontal positions, due to weakness of support at the sides. One nest was infested with mites. More than a third (38 per cent) of used nests in upright forks were deeper than wide. All nests in horizontal sites were wider than

deep. Outer dimensions of nests in upright forks appear to be partly determined by fork dimensions and an abundance of materials near by. The inner dimensions appear to be more definitely determined by the molding action of the female. An average difference of only 0.05 of an inch was found in inner diameter of fresh nests in horizontal and vertical sites.

Weights of nests showed variations because of differences in size, materials, degree of compaction, and accumulation of feather scales, excreta and other debris. Weights of nests containing heavier materials were greater in proportion to size.

Heights of nests above the ground varied with different habitats and trees and shrubs. The lowest nest was one foot and the highest 33 feet above the earth. The average height of 211 nests in all sites was 6.1 feet above the ground.

It is believed that reclaimed nesting materials are often used in nests of the Goldfinch. Four records of this behavior have been found in the literature. I reported two in 1943, Drum one in 1939, and Stokes one in 1950. Reclaimed materials used by the Goldfinch are torn from their own as well as the nests of other species.

A number of unfinished nests were abandoned. Physiological immaturity was given as a possible cause by Armstrong. Some evidence exists of other factors involved. Adverse weather, fright, too narrow sites, and other obstacles are believed to be external factors causing abandonment. Completed nests were abandoned frequently. Some apparent causes of abandonment were found in a nest which had collapsed, one which had broken loose from the anchorage, and one from which the lining had fallen. Six nests containing young were abandoned. No definite causes of death of these young could be determined.

Some nests of the Goldfinch are used secondarily as winter nests, food storage, and feeding platforms for small mammals and as nesting material for the Yellow Warbler. Two observations of use as roosting shelters by House Wrens were recorded.

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*Cranbrook Institute of Science, Bloomfield Hills, Michigan, January 30, 1951.*