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MIGRATION AND NESTING OF FLORIDA BALD EAGLES

BY CHARLES L. BROLEY

PREVIOUS to January 1939 few Bald Eagles (*Haliaeetus l. leucocephalus*) had been banded in Florida. The Florida Bald Eagle was considered non-migratory and was regularly recorded as a permanent resident of the State. In 1938, Richard H. Pough, of the National Audubon Society, suggested that I band a few eagles as an experiment, and during the eight years, 1939 to April 1946, I banded 814 Bald Eagles along the Gulf Coast of Florida—practically all in January and February, a few in March. Meanwhile, I kept a year-by-year record of most of the nests in the banding area, which extended from Hernando County south to Lee County.

MIGRATION DATA

In 1939 I banded 44 eagles. To my surprise, one of the first recoveries (May 8, 1939) was made at Columbiaville, New York, more than 1,100 miles from the place of banding. During the following years (up to April 1946), reports of recoveries, numbering in all 48, came in rapidly from 17 States and Provinces (Map 1; Tables 1 and 2). Seven of these birds were recovered at the nest or within a mile of the place of banding; but more than a third were recovered at least a thousand miles away; and one, more than 1,600 miles away (Kings County, Prince Edward Island, June 1, 1941).

As can be seen in Table 2, there were no recoveries north of Florida in the months of January, February, or March, and none in Florida between June and October in any year—indicating that at least immature Florida Bald Eagles spend late summer and early fall in the north. It seems reasonable to assume that the Georgia recovery in November and the South Carolina recovery in December were birds taken while on their way back to the south.

A comparison of the dates of banding with dates of recovery in Table 1 shows that some young eagles reach Canada within a few weeks of learning to fly. For example, a bird from Nest 35 was banded at MacDill Field Army Air Base, Tampa, on February 25, 1942. Since it

WANDERING TATTLERS

Heteroscelus incanus

Two downy young females, collected at the edge of a small mountain pool at the headwaters of the Alsek River (altitude, about 4,000 feet), British Columbia, on July 11, 1944. The parent more closely attending the young was collected and proved to be the female; the male was more shy. The downies, when discovered at the edge of the pool, readily took to the water and swam out a short distance but soon returned to the shore.

From a painting by T. M. Shortt.

TABLE 1

RECOVERIES * OF FLORIDA BALD EAGLES, 1939–APRIL 1946

†	RECOVERED		PARTICULARS		BANDED (FLORIDA)	
26	FLORIDA	Bradenton	16 Feb 43	Fd. dead	Bradenton	8 Feb 43
46		Bradenton	17 Feb 45	Shot	Bradenton	23 Mch 44
1		near Largo	29 Mch 39	Fd. dead	Largo	28 Jan 39
14		Palma Sola	1 Apr 42	Fd. wounded	Bradenton	26 Jan 42
4		Newberry	8 May 39	Shot	Largo	4 Mch 39
3		Sumner	15 May 39	Fd. injured	Largo	27 Feb 39
34		Tampa	19 May 44	Fd. dead	Tampa	11 Feb 44
6		Tampa	20 May 39	Killed	Gibsonton	12 Feb 39
39		Lakeland	1 Nov 44	Fd. dying	Osprey	3 Feb 44
23		Sarasota	26 Dec 43	Shot	Sarasota	2 Feb 42
31	GEORGIA	Statesboro	20 Apr 44	Shot	Ruskin	29 Jan 44
40		Moniac	26 Apr 45	Shot	Aripeka	23 Feb 45
9		Swainsboro	22 May 40	Fd. dead	Crystal Beach	22 Feb 40
15		Hilltonia	7 May 41	Shot	Placida	18 Feb 41
41		Alma	1 Jne 44	Captured	Placida	15 Feb 44
20		Rentz	26 Nov 42	Shot	Gibsonton	6 Feb 42
44	MISSISSIPPI	Meridian	21 Jly 45	?	Fort Myers	13 Feb 45
38	S. CAROLINA	White Pond	23 May 44	Shot	Bradenton	23 Mch 44
24		Moncks Corner	29 Jly 43	Fd. dead	St. Petersburg	19 Jan 43
27		Whitehall	7 Dec 43	Fd. dead	Bradenton	10 Feb 43
17	N. CAROLINA	Roxboro	8 May 41	Captured	Placida	18 Feb 41
10		Fremont	11 May 43	Captured	Englewood	17 Feb 41
11		Catawba	27 May 40	Killed	New Port Richey	9 Mch 40
8		Creswell	29 Jly 40	Killed	Largo	3 Feb 40
48	VIRGINIA	Widewater	Apr 46	Band found	Placida	20 Jan 46
5		Walnut Point	30 May 39	Shot	Largo	4 Mch 39
33	PENNSYLVANIA	Ringtown	3 Jne 44	Fd. dead	Sarasota	2 Feb 44
35		N. Springfield	29 Jly 44	Fd. dead	Venice	18 Feb 44
30		Shawnee-on-Delaware	18 Aug 44	Fd. wounded	St. Petersburg	29 Jan 44
32	INDIANA	New Castle	27 Apr 44	Shot	Largo	1 Feb 44
45	ILLINOIS	Homer	16 May 45	Shot	Bocagrande	15 Feb 45
47		Mendota	30 Aug 43	Shot	Englewood	16 Feb 43
16	CONNECTICUT	Stonington	15 Apr 41	Shot	Placida	18 Feb 41
25	NEW YORK	Fort Terry	4 May 43	Fd. dead	Ruskin	27 Jan 43
2		Columbiaville	8 May 39	Shot	St. Petersburg	28 Jan 39
43		Pine City	21 May 45	Shot	Largo	2 Feb 45
42	MICHIGAN	Grass Lake	14 May 45	Shot	Crystal Beach	24 Feb 45
22	MAINE	Burnham	20 Aug 42	Fd. dead	St. Petersburg	21 Jan 42
7	QUEBEC	St. Germaine	6 May 40	Fd. wounded	Indian Rocks	6 Feb 40
12		Lac St. Jean Co.	11 May 42	Shot	Indian Rocks	22 Jan 42
18	N. BRUNSWICK	Leger Brook	23 May 42	Shot	Tampa	25 Feb 42
21		Millbank	15 Jly 42	Fd. dead	Bradenton	12 Jan 42
28		Chipman	20 Aug 44	Shot	St. Petersburg	23 Feb 43
37	NOVA SCOTIA	Halifax	10 Jne 44	Fd. dead	Ruskin	25 Feb 44
36		E. Jeddore	24 Jne 44	Shot	Tampa	21 Feb 44
19		Yarmouth Co.	19 Sep 42	Shot	Ruskin	7 Mch 42
29		Halifax Co.	18 Oct 43	Shot	St. Petersburg	5 Mch 43
13	PRINCE EDW. ID.	Kings Co.	1 Jne 41	Shot	Largo	8 Feb 41

* Arranged from south to north by State and Province.
† Figures in column 1 represent band numbers.

was then four weeks old, it would first have been able to fly about April 15. Observers at the Base last saw it on April 21. It was found shot at Leger Brook, New Brunswick, nearly 1,600 miles away, 32 days later (May 23).

A study of Table 1 also shows that with only two exceptions the birds were recovered within a year of banding, one of the exceptions being a bird banded February 17, 1941 (at Englewood, Florida), and captured May 11, 1943 (at Fremont, North Carolina), when more than two years old. Table 3 shows the number banded each year and the number of these recovered up to April 1946.

Since I have been able to band but one adult eagle, and have not been in Florida between May and September, I can make no definite statement concerning the possible migration of adult birds. However, for five years I have had the assistance of 20 or more reliable observers who live near or even within sight of nests in my banding territory.

Raymond Conway, of Placida, who patrols a 28,000-acre tract twice a week, kept the following record of adult eagles seen during July and August between 1941 and 1945: 1941—0; 1942—2; 1943—1; 1944—0; 1945—0. Early on the morning of September 7, 1944, he saw 27 adult eagles sitting about in dead trees on an island not far from his house—the first eagles he had seen that year since June. Mrs. Reagle, at Nest 69, one mile south of Sarasota, reports that the birds, absent during late summer, returned on September 12 in 1942, September 5 in 1943, October 1 in 1944, September 3 in 1945. Mr. and Mrs. G. W. Marett, of Sarasota, live 400 feet from an eagle's nest. They report that

TABLE 2

RECOVERIES OF FLORIDA EAGLES BY LOCALITY AND MONTH, 1939 TO APRIL 1946

	Jan.	Feb.	Mch.	Apr.	May	Jne.	Jly.	Aug.	Sep.	Oct.	Nov.	Dec.	Totals
Florida	..	2	1	1	4	..	..	..	..	..	1	1	10
Georgia	..	..	..	2	2	1	..	..	..	..	1	..	6
Mississippi	..	..	..	..	..	..	1	..	..	..	..	..	1
South Carolina	..	..	..	..	1	..	1	..	..	..	..	1	3
North Carolina	..	..	..	..	3	..	1	..	..	..	..	..	4
Virginia	..	..	..	1	1	..	..	..	..	..	..	..	2
Pennsylvania	..	..	..	..	..	1	1	1	..	..	..	..	3
Indiana	..	..	..	1	..	..	..	..	..	..	..	..	1
Illinois	..	..	..	..	1	..	..	1	..	..	..	..	2
Connecticut	..	..	..	1	..	..	..	..	..	..	..	..	1
New York	..	..	..	..	3	..	..	..	..	..	..	..	3
Michigan	..	..	..	..	1	..	..	..	..	..	..	..	1
Maine	..	..	..	..	..	..	..	1	..	..	..	..	1
Quebec	..	..	..	..	2	..	..	..	..	..	..	..	2
New Brunswick	..	..	..	..	1	..	1	1	..	..	..	..	3
Nova Scotia	..	..	..	..	..	2	..	..	1	1	..	..	4
Prince Edw. Id.	..	..	..	..	..	1	..	..	..	..	..	..	1
Totals	..	2	1	6	19	5	5	4	1	1	2	2	48

on May 14, 1944, 45 or 50 eagles came soaring over their house and took "their" eagles away in a northerly direction; they did not see the eagles again until September 18. On August 1, 1945, Roger Tory Peterson and Frank McCamey visited Merritt Island on the east coast and were unable to find a single eagle in a whole day's search. Reports from others similarly indicate absence of eagles during July and August, with some time in September as the average date of return. Several concentrations of birds in September (presumably returning migrants) have been reported to me.

A study of the Hawk Mountain Sanctuary Association reports of Bald Eagles moving south shows that the great majority of the birds go over in September. The counts * for 1941, for example, were: September—41, October—6, November—3; for 1942: September—60, October—5, November—6. September is too early for northern Bald Eagles to migrate south. The eagles of Leeds County, Ontario (north of the St. Lawrence River, across from New York State), remain there through November and December until the freeze-up of the lakes. Three recoveries from the 29 eagles I banded in Leeds County indicate a late migration: Kent County, Maryland, December 22, 1941; Bridgeport, Tennessee, December 12, 1943; Mehoopany, Pennsylvania, October 17, 1946. It seems probable, then, that the eagles seen over Hawk Mountain in September are not northern birds but southern birds returning to the south.

Near Largo, Florida, I have noticed a definite concentration of eagles about the last week of March each year. Some 40 or 50 birds then frequent a large field, chasing each other around on the ground and among the trees. In 1943, I counted 29 immatures and 5 adults. Of the 29 young birds, only one wore a band. Since I had combed the area thoroughly for nests, 28 of these birds probably came from districts outside my banding territory, and this, taken in connection with the dates of the northern recoveries (Table 1) suggests that the regular movement north begins by April.

With the exception of two recoveries made in Indiana and Illinois, the recoveries up to 1945 indicated a coastwise migration, through Georgia, the Carolinas, and Virginia. But in 1945 there were four inland recoveries (Mississippi, Illinois, Michigan, and Pine City, N. Y.). A possible explanation for this is a change that year in the prevailing winds. W. W. Talbot, of the Tampa Weather Bureau, was kind enough to provide me with a series of charts showing that from 1939 to 1944 the prevailing winds at Tampa during April and May were from the south, moving up the Atlantic coast, but that in April 1945 a decided change occurred, the surface winds coming across Florida from the Atlantic and then swinging north into the Mississippi valley.

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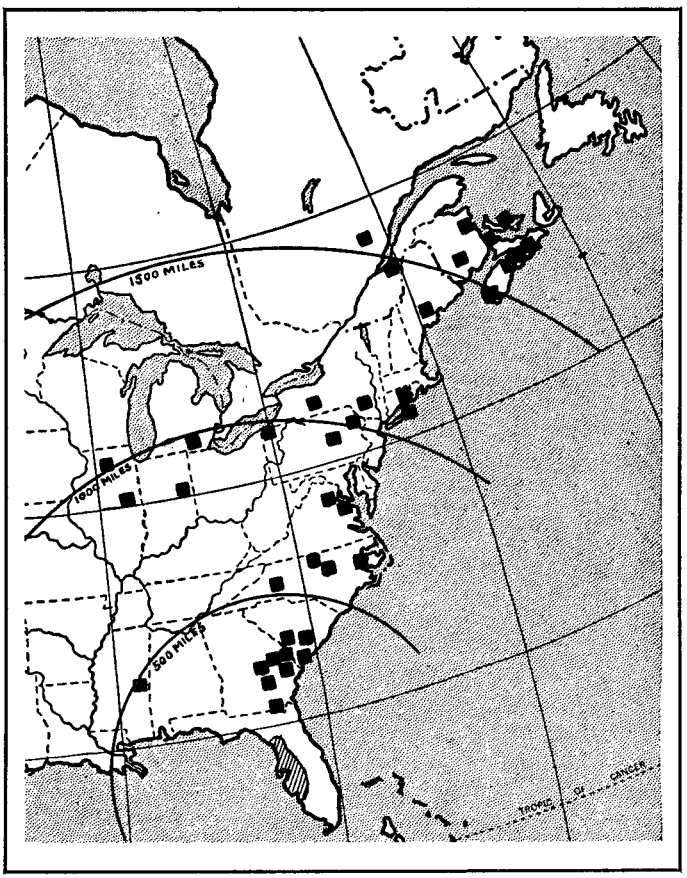
* "Hawk Mountain Sanctuary Association News Letter," 1942, 1943.

TABLE 3

RECOVERIES OF FLORIDA BALD EAGLES, 1939–APRIL 1946

	Number banded	Recovered by Apr.'46
1939	44	6 (13.6%)
1940	73	4 (5.4%)
1941	79	5 (6.3%)
1942	110	8 (7.2%)
1943	124	7 (5.6%)
1944	128	12 (9.3%)
1945	106	5 (4.7%)
Totals*	664	47 (7.0%)

* In 1946, 150 eagles were banded, one of which had been recovered by April 1946.



Map 1. Recoveries of Bald Eagles banded in Florida, 1939–April 1946.

Nesting

Distribution of nests. The Gulf coast area of Florida from Hernando County south 164 miles to Bocagrande, Lee County, is probably the most densely populated eagle nesting area in Florida; * it holds at least 140 active nests. The majority (about 80 per cent of the total) are in coastal areas, close to the Gulf or at least within two miles of the coast, and commonly within a mile or less of each other. The others are distributed through the interior; they are usually near small lakes and are 8 to 15 miles apart. Many old, unused nests are scattered through the State, but these disintegrate in 7 or 8 years, owing to high winds, or are torn apart for sticks to build new nests or to repair active ones.

I was able to follow in some detail the history of 101 nests, which were distributed by counties as follows: Hernando—2; Pasco—3; Pinellas—31; Hillsborough—21; Manatee—14; Sarasota—19; Charlotte—9; Lee—2. On 49 nests my data are fairly complete for the full eight-year period, and their history is summarized in Table 4.

Nest sites. Of the 140 nests under observation, 134 were in Florida long leaf pines, 4 in cypress, and 2 in black mangroves. However, during the past four years, Army demands for lumber have taken a tremendous toll of the pine all through the State, leaving many areas without any trees large enough for eagles' nests, and a number of eagles are moving inland into the dense cypress swamps, building their nests among the heavy masses of Spanish moss, where they are almost impossible to find.

Of the four nests known in the cypress, I have banded the young in only three. The fourth can be seen from a hill half a mile away, but once I enter the swamp, I have been unable to find the nest because of deep water, tangled undergrowth, and the abundance of cottonmouth snakes. Nest sites in these cypress trees are always very high—the three nests in which I banded the young are 90 to 125 feet from the ground.

The two nests in the black mangroves are situated on Bocagrande Island, which is five miles from the mainland. One nest is 15 feet from the ground, the other somewhat higher.

Three or four nests are built in trees within a town or city; one nest, in Sarasota, is no more than 100 feet from residences.

Nesting territory. A pair of nesting eagles appear to require, as a rule, a territory extending about half a mile on all sides of the nest, and they chase off all intruders (which, very frequently, are immature

* On March 1 and 2, 1946, I made a survey of a portion of the east coast, investigating Merritt Island and Brevard County with particular care, since reports from various sources had led me to believe that I would find a concentrated nesting area in this district. In "Florida Bird Life" (1932, p. 182), for example, Arthur H. Howell states that 37 occupied nests were found there in December 1930, "most of them being on Merritt Island." I could find only 6 nests on the island and none on the mainland of Brevard County. There is reason to think that heavy collecting of eagle eggs is the cause of this great decrease in the population.

PLATE 2

Photo by Roger T. Peterson, courtesy of *Life*

Adult Bald Eagle leaving the nest. Sarasota, Florida. February 9, 1946.

Photo by Roger T. Peterson, courtesy of *Life*

Young Bald Eagle at the time of leaving the nest (eleven weeks old). Placida, Charlotte County, Florida. February 8, 1946.

eagles—possibly offspring of former years attracted back to their birthplace). However, in a few congested nesting areas, the territories are smaller. There are two localities where three active nests are placed within a thousand feet of one another. A curious exception to territorial exclusiveness (recorded below under "Factors Affecting Survival") occurred in 1946 when a pair of eagles shared a nest with a pair of Great Horned Owls (*Bubo virginianus*).

Eagles show very strong attachment to a chosen territory. When a pair lose their nest or desert it after a disaster, they nearly always choose a tree close by for their new nest. Even if they move a mile or so away, they usually continue to feed on the old hunting grounds adjacent to their former nest site. Frequently I have seen eagles, rather than leave their territory, take a tree quite unsuited to their purpose, either a very weak tree or one with a very poor crotch; they sometimes build the nest right on top of a tree, on branches too weak to support it, but such nests seldom last more than a year—they go down in the first heavy wind. A pair may remain in their territory after loss of their nest tree even if it is impossible to nest. The tree holding Nest 41, at Gibsonton, was cut in 1943, and no other tree near by was at all suitable for an eagle's nest. The pair remained in the vicinity without nesting for two years. This also happened at Nest 52 (Ruskin).

It is remarkable how much disturbance may occur around a nest without causing the eagles to desert. Nest 35 is near Tampa on Gadsdens Point, which was taken over by the Army Air Forces in 1941. In 1942 a bombing target was located close to the nest, and planes cut in from all sides to drop their bombs, but the eagles remained. In 1944 all the trees around the nest tree were cut; bulldozers and tractors created a constant disturbance near by; and daily target practice continued. Still the eagles remained, although they did not nest after 1943. Nest 21A was five miles from St. Petersburg, overlooking the Gulf, in what is known as the "Jungle." Construction of a house within 120 feet of the nest tree was in progress in 1941 when the eagles reclaimed their nest for the season. They came to the nest every morning at dawn but left when the workmen arrived and did not lay that season. The following season, at my suggestion, the house owner suspended work during most of October, and the eagles became established again, nesting successfully every year through 1944; then their nest was destroyed by the hurricane, and they did not rebuild that season. In 1946 they nested a half mile away.

Eagles usually desert a nest after a disaster. For example, in 1941, the young in Nest 8 (near Clearwater) were killed by an owl, the young in Nest 40 (Gibsonton) were taken by men, and I found a dead young below Nest 81 (Englewood); in 1943, the eggs were taken from Nest 13A (Belleair); all of these nests were deserted. At Nest 22 (St. Petersburg), on the other hand, the eggs were taken by boys in 1944, and the eagles did not nest at all in 1945, but used the same nest again

in 1946. Occasionally a pair will move back to a nest they have deserted. The eagles at Nest 65A (Bradenton), disturbed by army activities in 1943, moved to Nest B in 1944. The tree in which Nest B had been built was cut after the one nesting season, and in 1945 the eagles moved back to Nest A.

Very rarely a nest is deserted without apparent reason. Nest 80A (Englewood) was deserted in 1944 after at least five years of successful nesting, and as far as I was aware the eagles had in no way been disturbed.

Sometimes a nest will not be used for a year, or even several years, the eagles remaining about the nest and using it as a feeding place, but apparently making no attempt to nest. Nest 1 (near Aripeka) was vacant from 1941 through 1944, Nest 2 (New Port Richey) in 1942, and Nest 5 (near Tarpon Springs) from 1942 through 1944. I was quite sure these eagles were not nesting elsewhere.

Nest building. When the birds return to their nesting trees, the last weeks of September or early in October, they immediately look over their eyrie and begin to repair it—or, frequently, to make substantial additions (one to two feet in a season). Nest 2, at New Port Richey, was in use from 1904 to 1943; then the tree was cut. Nest 23, at St. Petersburg, has been in use since 1910. Nest 13A (Belleair), 10 feet high in 1939, was 14 feet high by 1943 when it was deserted because the eggs were taken.

The nests of Florida eagles are in general much deeper than northern nests; the largest nest I know of in Ontario is 8 feet wide and 8 feet high; the largest nest in Florida (Nest 23, at St. Petersburg—perhaps the largest in America) is 20 feet deep and 9½ feet wide. The size and shape of a nest depends to a large extent on the kind of tree in which it rests. In many of the Florida pines, the crotches are very deep, giving good support to the nest, which can be built higher and higher each year. Most of the Ontario nests are in elms, which have outspreading crotches, and the nests tend to be wide rather than deep. This is also true of nests built in the outspreading crotches of Florida cypress trees. My widest Florida nest is in such a cypress, an immense tree with a girth of 22 feet. The nest, placed 115 feet from the ground, is 10 feet across, 5 feet deep. From the ground, it is very difficult to determine what a wide nest such as this contains. In most nests when the eagle is incubating, the white head can be seen over the top of the nest; when the eagle is brooding, its raised wings are visible; thus the nest's history can be followed even from the ground. But if the parent bird is in the middle of a very wide nest nothing at all can be seen.

In 1945, I found a very unusual nest, a new one built after the 1944 hurricane had destroyed the pair's regular nest. Halfway up a pine tree the branches spread out in all directions from the 14-inch trunk, and the nest was built around the trunk like the circular seats one sees

in hotels and railway stations. It was a large and well-secured nest, extending three or four feet out from the trunk on all sides.

The eggs are laid in a small well-formed cup, of Spanish moss or grasses, usually placed toward the center of the main nest-structure. This cup measures, on the average, 20 inches in diameter. In Florida, eagles sometimes cover the eggs with lining material in the period before they begin incubating or during absences from the nest after incubation begins. More lining is used in Florida nests than in those of the north, owing, perhaps, to the abundance of Spanish moss, which hangs everywhere in tremendous masses. During all stages of incubation and care of the young, the adults continue to bring in liberal quantities of this moss, which helps to keep the nest clean and sanitary, burying dead fish and other refuse. In 1944, at Nest 65 (Bradenton), 14 inches of moss was deposited in four weeks. In the nest was one young bird, four weeks old. Fourteen inches down in the moss was an addled egg. Since it was a new nest that season, the bad egg could not have been one left over from the previous year.

The nesting season. In Florida, certain eagles, "early nesters," begin laying the first week in November; others, "late nesters," in mid-December. During my years of banding I have found that individual birds are usually consistent in nesting either early or late. Some nests I must visit early in January or the young will have left; others I do not visit until late in February because the young are never large enough to band before the end of that month. The eagles at Nest 91 (Myakka) are extremely late nesters, the young being still too small to band even in April.

Generally speaking, my banding period begins about January 5 and ends March 5. Defining birds with young large enough to band before February 10 as early nesters, and others as late nesters, I found that early nesters produced two young much more frequently than late nesters did. I have found many addled eggs in late nests, but my data are insufficient to determine whether late nesters lay fewer eggs or merely fewer eggs that are fertile—or whether other factors operate to reduce the number of young in late nests.

In 1945, in a tree near the sand flats south of Punta Gorda, I found a nest with an unusual lining. Quantities of shredded colored paper, of the type used in packing dishes, had drifted or blown ashore and lay in piles four to five feet deep. The eagles had used it liberally as lining material for the nest, which, with the long streamers of all colors hanging down from it, had a most bizarre appearance.*

* In Florida, eagles are in the habit of picking up odd articles and carrying them to their nests. Among the objects we have found in eagles' nests are the following: electric light bulb, Clorox bottle, snap clothes pin, rubber shoe, child's dress, gunny sack, sugar bag, ear of corn, many shells, white rubber ball (which an eag'e was "incubating" six weeks after its young had hatched), a fish plug, and a 70-foot fish line with hook attached (the last-named object perhaps brought to the nest with fish).

TABLE 4
NESTS OF FLORIDA BALD EAGLES, 1939–1946

	1939	1940	1941	1942	1943	1944	1945	1946	yg
HERNANDO CO.									
1, nr. Aripeka	2 yg	2 yg	—	—	—	—	2 yg	2 yg	8
PASCO CO.									
2, New Pt. Richey	A)2 yg	2 yg	2 yg	—	2 yg Tree cut	B)1 yg	2 yg Tree burned	C)1 yg	12
PINELLAS CO.									
4, Crystal Beach	—	2 yg	Owl	1 yg	2 yg	2 yg	2 yg	2 yg	11
5, nr. Tarpon Springs	1 yg	2 yg	1 yg	—	—	—	2 yg	1 yg	7
7, Dunedin	2 yg	2 yg	2 yg	1 yg 1[e]	[e]	1 yg	2 yg	Owl	10
9, Oldsmar	A)2 yg	2 yg	Owl	1 yg 1[e]	2 yg Tree cut	B)1 yg	1 yg	1 yg	10
13, Belleair	A)1 yg	2 yg	2 yg	2 yg	Eggs taken	B)2 yg	2 yg	2 yg	13
14, Largo	2 yg	1 yg	1 yg	—	1 yg	2 yg	1 yg 1[e]	1 yg 1[yg]	9
15, "	A)1 yg	2 yg	2 yg	2 yg	Tree cut	B)1 yg	—	2 yg	10
16, "	A)2 yg	Owl	B)2 yg	2 yg	1 yg 1[e]	1 yg Nest fell	C)—	Owl	8
101, "	A)2 yg	1 yg	2 yg Tree cut	B)2 yg	2 yg	2 yg Nest fell	C)Nest & eggs fell	No nest	11
21, St. Petersburg	A)2 yg	1 yg 1[yg]	—	2 yg	2 yg	2 yg	Nest fell	B)2 yg	11
22, "	1 yg	1 yg	1 yg	1 yg	1 yg	Eggs taken	—	[e]	5
23, "	2 yg	2 yg	2 yg	3 yg	2 yg	3 yg	3 yg	2 yg	19
26, "	A)2 yg	2 yg	2 yg	2 yg	2 yg	Owl	B)—	—	10
33, "	A)2 yg	Tree cut	B)—	2 yg	2 yg	1 yg	1 yg	1 yg	9
29, nr. Largo	1 yg	2 yg	1 yg	2 yg	1 yg 1[e]	2 yg	2 yg	1 yg	12
HILLSBOROUGH CO.									
34, Tampa	—	A)2 yg	2 yg	2 yg	2 yg	—	B)—	—	8
35, "	—	2 yg	2 yg	2 yg	2 yg	—	—	—	8
36, "	2 yg	2 yg	2 yg	2 yg	2 yg	2 yg	2 yg	Adult shot	14
37, "	[e]	[e]	[e]	[e]	[e]	—	—	—	0
40, Gibsonton	A)2 yg	2 yg	2 yg taken	B)2 yg	2 yg	2 yg	[e]	1 yg	13
46, Ruskin	A)—	—	—	1 yg	2 yg Tree cut	B)2 yg	3 yg	2 yg 1[e]	10
47, "	[e]	[e]	[e]	[e]	[e]	Tree cut			0
48, "	A)2 yg	1 yg	2 yg	1 yg	2 yg	Owl	B)1 yg	1[yg] fell	9
49, "	A)—	2 yg	Tree fell	B)— Nest fell	—	C)2 yg	[e]	1 yg	5
51, "	1 yg	1 yg	1 yg 1[yg]	2 yg	2 yg	—	—	1 yg	8

TABLE 4—Continued

NESTS OF FLORIDA BALD EAGLES, 1939–1946

	1939	1940	1941	1942	1943	1944	1945	1946	yg
MANATEE CO.									
54, nr. Ruskin	A)1 yg Tree cut	—	—	B)2 yg	[e]	2 yg	—	2 yg	7
55, Bradenton	A)2 yg	1 yg	1 yg	Tree fell	B)2 yg	2 yg	—	2 yg	10
60, "	1 yg	2 yg	—	2 yg	2 yg	1 yg	1 yg	2 yg	11
62, "	1 yg	2 yg	2 yg	2 yg	—	1 yg	[e]	—	8
63, "	A)2 yg	1 yg	1 yg	A) Owl B)2 yg	2 yg	2 yg	—	2 yg	12
64, "	1 yg	2 yg	2 yg	2 yg	—	2 yg	1 yg	2 yg	12
SARASOTA CO.									
66, Sarasota	A)2 yg	1 yg	Nest fell	B)2 yg	[e]	2 yg Tree cut	C)2 yg	1 yg	10
67, "	2 yg	2 yg	Adult killed	1 yg	1 yg	2 yg	—	1 yg	9
68, "	2 yg	1 yg	2 yg	2 yg	Adult killed	2 yg	2 yg	2 yg	13
69, "	2 yg	2 yg	1 yg	2 yg	2 yg	1 yg	1 yg	—	11
70, "	A)2 yg	Nest fell	B)2 yg	1 yg 1[yg]	1 yg 1[e]	2 yg	2 yg	2 yg	12
72, Osprey	A)1 yg	2 yg	A) Owl B)1 yg	2 yg	2 yg	2 yg	[e]	2 yg	12
75, "	1 yg	2 yg	1 yg	2 yg Tree cut	B)1 yg	2 yg	2 yg	1 yg	12
76, Englewood	—	2 yg	—	2 yg	1 yg	2 yg	[e]	[e]	7
77, "	1 yg	1 yg	2 yg	2 yg (weak)	1 yg	2 yg	1 yg	2 yg	12
78, "	A)2 yg	Owl	Owl	Owl	Owl	2 yg Tree fell	B)2 yg	Tree cut	6
79, "	1 yg	2 yg	2 yg	2 yg	2 yg	2 yg	2 yg	[e] (?Adult shot)	13
80, "	A)2 yg	2 yg	2 yg	1 yg	2 yg	B)2 yg	[e]	—	11
CHARLOTTE CO.									
82, Placida	A)1 yg	2 yg	2 yg	1 yg	B)2 yg	2 yg Tree fell	C)1 yg 1[e]	1 yg 1[yg]	12
83, "	—	A)1 yg	Owl	B)1 yg	2 yg	[e]	1 yg 1[e]	1 yg	6
86, "	—	1 yg	1 yg	1 yg	1 yg	1 yg	2 yg	1 yg 1[e]	8
97, "	—	2 yg	1 yg	2 yg	1 yg 1[e]	—	[e]	1 yg	7
TOTAL YOUNG	61 yg	69 yg	54 yg	69 yg	59 yg	65 yg	46 yg	48 yg	471

A dash indicates that the owners did not use the nest that year; "Owl," that the nest was taken over by Great Horned Owls.

An *e* in brackets indicates eggs that failed to hatch; *yg* in brackets, young found dead in nest.

A), B), and C) indicate successive nests of the same pair; a dash after such letter indicates that the nest was built but not used that year.

TABLE 5

NUMBER OF YOUNG PRODUCED PER NEST IN FLORIDA, 1939–1946

												Totals
Number of young per nest	19	14	13	12	11	10	9	8	7	6	5	0	471
Number of instances	1	1	4	9	6	7	4	7	4	2	2	2	49

Apparently it sometimes occurs that one egg is laid some weeks before the other. At Nest 34 (Tampa) there seems to be each year two or three weeks' difference between the ages of the two young. Also, at Nest 78 (Englewood), one young was much larger than the other, both in 1944 and 1945.

Table 4 shows the number of young produced by each of 49 nests in the 8-year period; Table 5 shows the productivity distribution. Nest 23, near St. Petersburg, produced three young in 1942, 1944, and 1945; Nest 46, at Ruskin, produced three young in 1945, two young and one bad egg in 1946; these are the only nests in which I have found three young. The 49 nests produced an average of 1.2 young per nest per year. Nest 23 produced 19 young in the eight years, and there were no returns. By contrast, at Nests 37 (Tampa) and 47 (Ruskin), eggs were laid yearly from 1939 through 1943, but none hatched, and the history of Nest 14 shows an extremely low survival for the young. This nest is in a high pine overlooking an orange grove near Largo in Pinellas County. It is a mile away from any water. In 1939, two young were raised. They were banded on March 4 and both shot the following May (one, May 8, in Florida; the other, May 30, in Virginia). In 1940, one young was raised, banded February 3, and killed July 29 (in North Carolina). In 1942, the pair did not nest (reason unknown). One young was raised in 1943, two in 1944. In 1945, one young and one addled egg were in the nest on February 2, the young only four days old. When I returned to band the bird on March 2, the nest was empty. In 1946, the nest contained one living, and one dead, young.

Table 6 lists the number of nests observed in detail each year with the number of nesting failures and their causes.

FACTORS AFFECTING SURVIVAL

Availability of suitable nest sites. In my eight-year survey of the area, active nests have shown little change in numbers except where timber has been cut, forcing the birds to move elsewhere. When these birds remain in the pine woods area, the new nests can be found without much trouble, but sometimes the eagles move 5 to 20 miles inland to the cypress swamps where it is almost impossible to find them, and thus the population may show a decrease in one area without showing a corresponding increase in another where a nest census is more difficult. If lumbering activities should continue in the same volume as from 1941 to 1945, large areas of many thousands of acres will be stripped

TABLE 6

EAGLE NEST FAILURES IN FLORIDA, 1941–1946

Cause of failure	*Number of nest failures*						
	1941 (83 nests)	1942 (84 nests)	1943 (107 nests)	1944 (106 nests)	1945 (115 nests)	1946 (124 nests)	Totals (619 nests)
Nests taken by owls	11	4	6	5	0	5	31
Eggs taken	0	0	1	1	0	0	2
Yg taken by men	3	0	0	0	0	0	3
Yg killed by wildcats	0	0	1	0	0	0	1
Yg shot	0	1	0	0	0	2	3
Yg died (late nests)	0	0	0	0	0	3	3
Adult shot	0	1	2	0	0	6	9
Adult killed by lightning	1	0	0	0	0	0	1
Eggs failed to hatch	5	5	7	2	0	6	25
Disturbance during incubation	0	0	3	5	0	0	8
Nest blown down	1	3	1	3	0	0	8
Nest trees cut	0	0	7	4	0	0	11
Hurricane (in the fall of 1944)	0	0	0	0	45	0	45
Lumbering	0	0	0	0	2	0	2
Undetermined	4	4	5	6	0	0	19
Totals	25 (30.1%)	18 (21.4%)	33 (30.8%)	26 (24.5%)	47 (40.8%)	22 (17.6%)	171 (27.6%)

of all trees suitable for eagles' nests, which require a strong crotch to hold them. Further details on this problem are given above in the section, "Nesting Territory."

Food. There is an abundance of many kinds of food for eagles in Florida the year round. The Gulf waters teem with fish, and I have at times found the nests full of fish, most of them of coarse varieties. One day I counted 19 fresh fish in one nest, 20 in another. When the tide goes out quickly ahead of a strong wind, it frequently leaves thousands of fish of all sizes trapped in shallow water-holes scattered over the sand flats, and then there is practically no limit to the number of fish an eagle may carry to its nest. Nest 2 (near New Port Richey) is in timber owned by Mr. Odell Osteen, a commercial fisherman. The eagles frequently await his arrival from the Gulf and swoop in at close range to retrieve the fish he throws them.

Mullets and catfish are the kinds most frequently found in nests, though trout, jackfish, needlefish, eels, and other species are also found. Catfish furnish most of the food, and since they are not a table fish, the economic loss is negligible. Turtles are also a common food.

Only twice, in banding 814 young, have I found remains of hens or other poultry. On one occasion I tethered a half-grown chicken at the foot of one nest tree and, after an interval, at the foot of another. I hid in blinds previously constructed, hoping to get a photo of the adult birds taking the chicken. I could distinctly see the eagles watching the fowl, but they made no effort to take it. However, certain eagles are apparently partial to wild ducks and other birds. I found a notable amount of bird remains at Nests 35 and 86 though not at other nests, and I list the following, not as typical, but as very exceptional, examples of nest contents:

Nest 17 (Largo), 1945—1 Brown Pelican (*Pelecanus occidentalis*), 1 Cormorant (*Phalacrocorax auritus*).

Nest 35 (Tampa), 1940—42 wings of Scaup Duck (*Aythya* sp.); remains of Scaups every year.

Nest 86 (Placida), 1940—3 Scaups
1941—1 Scaup, 1 Great Blue Heron (*Ardea herodias*)
1942—2 Great Blue Herons, 2 Brown Pelicans
1943—2 Great Blue Herons
1944—2 Great Blue Herons
1945—1 Great Blue Heron, 1 Cormorant

Nest 93 (Lutz), 1945—1 small pig, 1 soft-shelled turtle, 1 domestic fowl, 1 catfish.

It has been generally thought that eagles take young pigs, but Nest 19 (Largo) was close to a large piggery, and the owner never lost any pigs to the eagles. It is near this piggery, too, that early in April, 30 or 40 eagles, mostly immatures, gather before the northward movement

Bald Eagle bringing food to the nest. Gibsonton, Florida. February 7, 1946.

Photos by Roger T. Peterson, courtesy of *Life*

Bald Eagle four and a half weeks old. Ruskin, Florida. February 12, 1946.

The only pig I have ever found in a nest was the one in Nest 93, which is close to a highway. The pig may have been killed by a car and retrieved by the eagles.

Each year several raccoons are found in the nests. In 1945, four out of the first seven nests examined contained the remains of half-grown raccoons, which apparently had been taken alive by the eagles. (Since the hides were there, the animals had not been killed by trappers.)

I made no attempt to keep a complete record of all the remains of mammals and birds found in the nests, but the following were noted: raccoon, opossum, skunk (one only), shoat (one only), rat, rabbit, Pied-billed Grebe (*Podilymbus podiceps*), Brown Pelican, Cormorant, Anhinga (*Anhinga anhinga*), Great Blue Heron, Snowy Egret (*Leucophoyx thula*), Louisiana Heron (*Hydranassa tricolor*), Little Blue Heron (*Florida caerulea*), Scaup Duck, Red-breasted Merganser (*Mergus serrator*), Florida Gallinule (*Gallinula chloropus*), American Coot (*Fulica americana*), gulls (spp.), Flicker (*Colaptes auratus*), domestic fowl (2 only).

In nearly every nest there are epiphytes, about the size of an average pineapple. Often they look as if the birds had been eating them—the long leaves, especially at the base where they are tender, being ragged and torn.

The abundance of food found in Florida nests is in marked contrast with my findings in Ontario nests, limited to one large calico bass.

Great Horned Owls. Great Horned Owls are very plentiful in Florida and cause considerable disturbance among nesting eagles. They are very aggressive and take over many eagle nests about the time the eagles are ready to lay. The owls sometimes become established in the nests during the eagles' absence in late summer, and they may even have eggs by the time the eagles return. Once the owls are established it is difficult for the eagles to reclaim their nests, and I doubt if many eagles make a really serious effort to do so. In 1946, Great Horned Owls took Nest 7 (Dunedin) and raised young. The eagles frequently visited the nest and inspected the young owls, but they made no attempt to regain possession. If they built a new nest I failed to find it. Usually when displaced by owls, eagles do build another nest, but they seldom lay the same season. By the time they "decide" to build, find a suitable tree, and finish the nest, it is past their regular nesting time, and they do not lay. In one instance (Nest 16C in 1946), Great Horned Owls took over the nest after the eagles had been incubating 10 days. It is interesting that owls had taken over Nest A of this same pair in 1940 and Nest B in 1944 (although Nest B had been partly blown down).

In 1939, near Tampa, I found a Great Horned Owl incubating one of its own eggs and one of a Bald Eagle. The eagle egg was in good condition, but unfortunately the tree was cut before the eggs hatched.

On January 21, 1946, as I approached a nest, I saw the eagle leave the eggs and fly away. I climbed the tree, and as my head came level

with the top of the nest, a Great Horned Owl whisked off close to my face. It had been sitting on its one egg not more than three feet from where the eagle had been incubating. The nest was on a slight slant, and the owl occupied the lower side of it. Developments might have been interesting, but heavy rains made the trails impassable, and I did not see the nest again that season. J. Warren Jacobs (1908, *Wils. Bull.*, 20: 103–104) recorded a Great Horned Owl nesting in a cavity in the side of an occupied Bald Eagle nest. However, since the nest was 15 feet high and the cavity 4 feet from the bottom, this seems a case of sharing a nesting tree rather than of sharing a nest.

Man. Egg collectors were gathering eagle eggs in Florida up to 1939, but since that date no permits have been granted by the State. To my knowledge, boys have robbed the nests of eggs only twice in the eight years of my study, and men have taken young from the nest twice. My returns from banded birds show only 10 eagles killed in Florida in the eight-year period. In the belief that eagles took young pigs for food, hog-raisers formerly rode the country, shooting all the young eagles they found, but I have not heard of this being done since 1939. On the whole, man seriously endangers the eagle population only through extensive lumbering and casual shooting.

The Florida Hurricane of 1944

The hurricane of October 17 to 18, 1944, caused considerable havoc among the eagle nests and was disastrous to nesting although it occurred four to six weeks before the usual laying period.

I made my first survey of nests in 1944 about the end of November and found that all the nests had been more or less damaged; 18 nest trees had been blown down, and many nests had been blown out of trees. However, with one exception, every nest was rebuilt. (In most cases, the birds used the sticks from the nest that had been blown down.) The new nests were built in plenty of time for normal nesting, and I thought that nesting would be normal, but this was not the case.

In 24 of the rebuilt nests no eggs were laid.

In 21 nests where eggs *were* laid, they did not hatch although the birds incubated for two months. It was interesting to watch the birds toward the end of this 60 days of incubation. One bird would go to the nest, adjust itself carefully on the eggs, incubate about 15 minutes, then leave the nest. The other bird would then spend 10 or 15 minutes on the eggs and join its mate on an adjacent limb. They would remain perched there for half an hour before resuming sporadic sessions on the nest.

These 45 nests under normal conditions would have produced about 54 young birds. Thus, one hurricane caused more loss through non-production than the mortality caused by man in six years (cf. the table of nest failures).

Poultry men in the district reported to me that their hens did not lay for three weeks after the hurricane, and that the hens appeared to

have lost their desire to incubate. It was noted that no owls took over eagle nests that season; apparently the hurricane upset their schedule also.

I am indebted to F. B. Hutt, Professor of Animal Genetics at Cornell University, for the following comments:

"I know of no data on the effects of hurricane upon egg production, or upon fertility of eggs in domestic fowl. However, it is common knowledge among poultry men that some disturbances, particularly the transfer of birds to new quarters, may cause a noticeable drop in egg production over a period of two or three weeks after the disturbance. . . . It is known that in hens which have ceased laying under the influence of unfavorable changes in the environment, the larger ova still attached to the ovary degenerate and are eventually resorbed. Is it possible that at the time of the hurricane, Oct. 17-18, 1944, the eagles might have had ova well advanced toward maturity? If so, their resorption and the development of new ova might have upset the normal reproductive cycle.

"While such a disturbance of the normal physiological processes usually does not affect the egg laying in fowl for more than a couple of weeks, it might very well do so in a species like the eagle that normally lays only two eggs in a clutch. An egg a day is nothing much in the life of a good domestic fowl, *but egg laying is a real event in the life of an eagle,* and the chain of physiological processes leading up to it *may be a long one.*

"The role of bird psychology in these processes must not be underestimated. It has been clearly proven by Benoit and others that reproductive activity of the avian ovary and testis results from stimulation by a gonadotropic hormone produced by the pituitary gland. While the pituitary may be activated by light, it is not improbable that other factors, such as courtship and nest-building, may play a part. One might venture to suggest that the rebuilding of the nests, particularly of such large nests as the eagle's, took so much time that the usual sequence of psychological states, and associated sequence of activation of endocrine glands were retarded. This could lower both the number of eggs produced and their fertility. The problem undoubtedly needs considerable study."

Reactions of Eagles to Banding Operations

The proper time to band the young is when they are between three and six weeks of age. If they are banded before the age of three weeks, the bands slip off. Up to 7 or 8 weeks of age the young do not offer strenuous resistance to being handled, but from 9 to 11 weeks, it requires careful and experienced handling to avoid injuring the bird or being injured oneself by its talons. The young eagle seldom uses its beak when fighting, but will make use of it when both feet are held. The average Florida bird is much more aggressive and difficult to band than individuals of the northern subspecies.

The most troublesome birds are those almost large enough to fly, which, on my approach, jump out of the nest and fly or glide to the ground. Since they cannot take off from the ground, they must be returned to the nest to save them from predators and from starvation, for the parents may not feed them on the ground. I have been obliged to replace more than 30 of these large birds. I once found an 8-week-old bird at the foot of a nest tree. It appeared weak and underweight. I returned it to the nest, and it immediately began to devour a fresh fish that was there, paying no attention whatever to me. But as I reached the nest with this bird, its nest fellow jumped out and flew a considerable distance. I had some difficulty finding it and restoring it to the nest. On another occasion a young bird jumped from the nest and became entangled in a grapevine on a near-by tree. It required an hour to release it and return it to the nest. It immediately hopped out on a dead stub where its nest mate was perched, knocking its nest mate off the stub and losing its own balance, so that they both fell into the lake below. They quickly flapped ashore and were well hidden in the underbrush by the time I had descended the tree. When they were finally restored to the nest I had spent a total of seven hours there.

The reactions of the parents while I am banding the young are varied. Certain individuals keep about 200 feet away, flying around and uttering disturbed cries. Others dive to within 10 feet of me. Still others sit on a high stub some distance away, watching proceedings, but apparently little disturbed. (These are often birds whose young I have banded for six or seven years.) Sometimes the adult pair have flown away as I approached the nest and not reappeared during my banding. Sometimes I band the young in a nest without seeing the adults at all. The eagles scream very rarely; I have never heard them scream while I was climbing the tree or banding the young.

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