

A STUDY OF THE INDIGO BUNTING
(Passerina cyanea)

by

Helen L. Ripley
2101 Ray Street
Lansing, Michigan

A Report of an Original Investigation at
the University of Michigan Biological Station

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INTRODUCTION

SCOPE AND PURPOSES OF STUDY

During the period of June 23rd to August 4th, 1947, Hazel L. Bradley and I made a study of the development of the young of the Indigo Bunting (Passerina cyanea), and of their parental care. This study was a special problem in ornithology for Hazel, and a part of the work in Advanced Ornithology (Zoology 119) for me, and was carried on in the area around the University of Michigan Biological Station at Douglas Lake, Cheboygan County, Michigan, under the direction of Dr. O. S. Pettingill, Jr.

METHODS OF STUDY

Since the Indigo Bunting is a bird that prefers high perches for singing, we traveled along the roads within a three mile distance from the station, listening for the song - a sweet, simple song with the notes usually paired. When we heard the song, or saw a male, we would search the area nearby for a nest. By using this method, we found six nests, which were designated by the letters A, B, C, D, E, and F, in the order in which they were discovered. One of the nests (Nest C) was chosen for observation and a tepee blind was erected about five feet from it. For the observation of another nest (Nest F) located late in July, a car was used for a blind.

NUMBER AND LOCATION OF MALES HEARD SINGING
AND OF NESTS LOCATED

Within the distance of three miles from the station, 14 males were heard singing and six nests were discovered (not including a last year's nest which was not reused this summer). Three nests were found within a half-mile along the Pellston road where four males were heard singing; and one just off the Pellston road on the Bryant's road where a male was seen. Between the station and Riggsville Corners on the Cheboygan road, we heard seven males, including two at the beginning of the Green Star Trail, but only one nest was located. Two males were heard on the Topinabee road where one nest was found, and this was the nest chosen for observation.

ENVIRONMENT

Of the six nests found, five were at the edge of the woods two to twenty feet from the road. The one closest was in a blackberry bush (Rubus allegheniensis Porter) about four feet high, near two aspens (Populus tremuloides Michx.) which added to the shelter. The sixth nest was in a maple clump (Acer rubrum L.) in a cut-over area, about forty feet from the Cheboygan road. This area was being taken over by the maple, bracken (Pteris acuilina L.), and sumac (Rhus glabra L. var. borealis). Two of the other nests were also in blackberry bushes, one in a

maple clump, and the other in a raspberry bush (Rubus idaeus L.). Bracken was used as shelter and support at two of the nests, one in a blackberry and one in a maple clump. All the nests, were well hidden by the plants in which they were placed, and in most cases by the surrounding plants. So none received direct sunlight. No nest was found in the woods proper but at the edge. Forbush (1929:119) says that the nest is to be found "in bush or brier-patch, sometimes in garden shrubbery, usually very low, but rarely in old orchard trees 10 to 12 feet from the ground, or in grape vine." He also says that the breeding preference is for "bushy lands, such as bushy pastures, scrub, briery hillsides or slash and sproutland where woods have been cut off."

CLIMATE

According to the Weather Bureau figures, the climate at Cheboygan, during the months of June, July, and August, shows maximum temperatures of 95°F., 101°F., and 95°F., respectively; minimum temperatures of 28°F., 33°F., and 35°F.; and mean temperatures of 61°F., 66°F., and 65°F.. The prevailing winds are from the northwest. The number of days with precipitation is 7, 8, and 9 with amounts of 1.85 inches, 3.10 inches, and 2.97 inches.

During the period of study, the weather was variable. There were several days of hot weather, several days of cool, even cold,

weather, several rain storms, and two or three days of rather high winds.

RELATIONSHIPS WITH MAMMALS AND OTHER BIRDS

We did not observe any mammals around the area. In the clearing below the hill where the nest we observed was located, was a sawmill with piles of lumber. Here I saw, on two occasions, a young woodchuck (Marmota monax). Snakes were also seen around the mill. This was outside the territory of the Indigo Bunting, however.

Several species of birds either nested near or were seen in the area. Among these were the Oven-bird (Seiurus aurocapillus); Black-throated Blue Warbler (Dendroica caerulescens); Hairy Woodpecker (Dryobates villosus); Catbird (Dumetella carolinensis); Red-eyed Vireo (Vireo olivaceus); Nighthawk (Chordeiles minor) and the Chipping Sparrow (Spizella passerina).

TERRITORY

The Indigo Bunting has a mating, nesting, and feeding territory. We observed that the nesting and feeding territories coincided, but began our study too late to see if the same territory was used for mating.

MATING

Inasmuch as our study did not start until after the nest

building activities were finished, we did not observe the courtship and mating.

NESTS AND NESTBUILDING

All the nests had been completed when we discovered them. Even the last nest, which was either a late or a second nest, was not found until completed and eggs laid.

The nest according to Forbush (1929:119) "is built of twigs, coarse grass, weeds, and a few leaves, lined with fine grass and sometimes with hair or feathers". And Chapman (1932:410) describes it as composed of "grasses, bits of dead leaves, and strips of bark, lined with fine grasses, rootlets, and long hairs". Table 1 indicates that we found the nests to be made of these materials. Some birch bark was used in one nest, and a piece of snake skin in another.

The dimensions of the nests, given in Table 2, were approximately the same, while the height from the ground varied from one foot to two-and-a-half feet.

EGGS AND EGG-LAYING

All of the nests had eggs in them when located, so egg-laying was not observed. One of the nest had been parasitized by the Cowbird (Molothrus ater), having two cowbird eggs and one bunting egg in it at the time of discovery. We found no evidence near

Table 1

Nest Location	A Pellston road 2.9 mi.	B Pellston road 2.6 mi.	C Topinabee road 1.3 mi.	D Cheboygan road 1.6 mi.	E Bryant's road	F Pellston road
Found in	Maple and Bracken	Black-berry	Black-berry	Maple	Rasp-berry	Black-berry and Bracken
Materials:						
plant fibers	X	X	X	X	X	X
leaves	X	X	X	X	X	X
grass-lined	X	X	X	X	X	X
other			birch bark	hair in lining		2 in. snake skin

Table 2

Nest Dimensions in inches	A	B	C	D	E	F
Outside diameter	3 3/4 x 4 1/4	4	3 1/2 x 4	3	2 3/4 x 3 1/4	4 x 3 1/2
Inside diameter	2 1/2 x 2 3/4	2 1/2	2 1/4 x 2 3/4	2	2 3/4	2 x 2 1/4
Outside depth	2	2 1/2	2 3/4	2 3/4	3	3
Inside depth	1 1/2	1 1/2	2 1/2	1 3/4	1 3/4	1 3/4
Height from ground in inches	18	22 3/8	13	15	29	27

the nest of other bunting eggs, the Cowbird probably having carried them into the woods.

Forbush (1929:119) describes the eggs as "3 - 4, rarely more; .70 to .81 by .50 to .60 inches, nearly oval; pale blue or bluish white, sometimes with a greenish tinge, rarely mottled with brown".

None of the eggs were mottled; all were pale blue. The measurements of one were .53 by .81 inches.

INCUBATION

Burns (1915:275) gives the incubation period of the Indigo Bunting as "12 days" and of the Cowbird, "10-- 11 days". In Nest B, where there were cowbird eggs with the bunting eggs, the cowbird eggs hatched on July 9th, and the bunting egg on July 11th. If they had been laid on the day discovered - June 29th, that would make a period of 11 days for the cowbird and 13 days for the bunting.

Nest A, discovered June 29th, had four eggs in it. One hatched on July 3rd, and the other three on July 4th. This nest was destroyed, probably by some rodent, on July 8th. Nests C and D, found on June 30th, each had three eggs. Nest C was observed on the morning of July 6th, when one young was found just hatched. That evening, when the nest was checked, the other two eggs had hatched. All three eggs in Nest D hatched on July 6th. Nest E had no eggs in it and was apparently deserted after

being built.

Nest F was discovered on July 23rd and contained four eggs, three of which hatched on July 26th and the other on July 27th. This nest was not far from Nest A which was destroyed. It is quite possible that the same female built both nests. The nest was destroyed on July 8th, and with an incubation period of 12 days, the eggs could have been laid on July 14th and 15th, thus leaving a period of a week for nest building. We did not, while checking Nest C, observe any signs of nest building activities in the locality where Nest F was later found.

DEVELOPMENT OF THE YOUNG

The female removed the egg shell from the nest after the young had hatched, dropping it on the ground under the nest. The orangish-pink nestling, when newly hatched, has very little down on it. The nestling seemed to be all mouth. It would respond to vibrations caused by the female alighting on the nest, opening the mouth for food. There was a noticeable difference in size and amount of down in the bird hatched in the morning and the two hatched in the late afternoon. This difference was also noted in the last nest (F) where three young hatched a day ahead of the fourth.

On the third day after hatching, the young showed blue-gray down along the feather tracts. Their eyes, which were, when hatched, large membranous bulges on the sides of the very small head, were still closed. The next day, the wings showed the

beginnings of the flight feathers. Two days later, the feathers were breaking the sheaths; the eyes were open; and the birds were in the second phase of development. The eighth day after hatching, the young moved in the nest, stretching and preening themselves. They uttered a chattering food call. Inasmuch as the nest was not observed between the fourth and eighth days, only checked, the movements of the nestlings, which probably occurred earlier, cannot be stated with certainty as to when they first began. On the ninth day, the young left the nest as I approached the blind. They were fairly well feathered and were able to fly short distances of perhaps four or five feet. Hazel saw two of them the next day as she took down the blind. They were able to fly across the road. Their tails were still short.

The young did not return to the nest after leaving it but remained in the brush and bracken about 50 yards from it. Both days, the male joined the female in scolding us while we remained in the area.

The nest containing the cowbird eggs was not disturbed and the eggs hatched on July 9th. The female bunting fed the young and on July 19th, they left the nest. They were well feathered. The female continued feeding the young cowbirds after they had left the nest. The young bunting, which hatched on July 11th - two days after the cowbirds, disappeared on July 13th.

Burns (1921:179) gives the period of nestling life of the Indigo Bunting as nine days. For Nests C and D, the period was nine days, but for Nest F, it was only eight days. We believe that something happened to frighten the young so that they left the nest a day early. One of the young was seen the following day. It could not fly for the flight feathers had not developed sufficiently. It was probably the one which hatched last and was but seven days old.

PARENTAL CARE

The female was the only bird to incubate, brood, and feed. The male, at no time, was observed closer to the nest than 15 feet, and usually remained farther away. He could be heard singing nearby for most of the day. Several times he would chip furiously as at a disturber. One morning when I was in the blind, he chipped for over half an hour. The female joined him in chipping for part of the time, then returned to the nest to feed the young. The note of the male could be distinguished from that of the female as it was heavier.

Since the eggs in Nest C hatched on the seventh day after the nest was discovered, and the blind was not erected until the third day, we did not spend much time observing the incubation period. On July 3rd and 4th, a total of 842 minutes were spent in the blind. During that time the female spent 123 minutes on

the nest and 114 off. The period on July 3rd was of 102 minutes duration, 53 of which were spent by the female on the nest and 49 minutes off. The following day she was off for periods of 19, 20, and 21 minutes, and on for 15, 27, and 33 minutes. This would indicate an incubation rhythm of approximately 25 minutes of attentiveness and 20 minutes of inattentiveness. Whether this rhythm changed on the next day is unknown for neither of us was able to observe the nest. Both of these days were sunny and hot. The maximum temperature on July 3rd was 79° and on July 4th, 81°. The female would stand up in the nest, spread her wings, and pant.

On July 6th, only 57 minutes were spent in the blind, during which the female was on the nest three times for a total of 32 minutes, and was off for 19 minutes. The day was rainy and cloudy. There was one young in the nest, which was fed three times during the period spent in the blind. For that time, the average was 10.67 minutes and 6.33 minutes off.

On July 7th, Hazel observed for 176 minutes in the morning and I observed for 87 minutes in the afternoon. For the morning period, the average time spent on the nest was 15.43 minutes and the time off 9.71 minutes. The afternoon period showed an average of 3.71 minutes on and 8.71 minutes off. The total average time off during the day was 9.5 minutes and on, 9.9 minutes. The difference from the preceding day was due to the fact that there were three young, instead of one, in the nest, and the feedings and the feeding time was increased. The young were fed six times

in the morning, averaging one feeding every 29.3 minutes; and five times in the afternoon, averaging one feeding every 17.4 minutes. For the day, there were 11 feedings, or one every 23.9 minutes. The next day the time spent on the nest averaged 1.5 minutes; off, 10.8 minutes. There were six feedings in 90 minutes or one every 15 minutes.

One July 9th, the average time spent off the nest was 9.2 minutes, and on 2.1 minutes. There were 13 feedings in 141 minutes, or one every 10.8 minutes.

The nest was checked on July 10th, 11th, 12th, and 13th, but we were unable to spend any time in observation. On July 14th, however, the entire day from 4:35 in the morning until 8:30 in the evening was spent in observation, Hazel observing from 4:35 A. M. until 9:00 A. M. and from 1:00 P. M. until 5:00 P. M. and I taking the periods from 9:00 A. M. until 1:00 P. M. and from 5:00 P. M. until 8:30 P. M. During this period of 955 minutes, the female brought food to the young birds 119 times, or a feeding every 8.03 minutes. She also brooded seven times, the longest period being 19 minutes in late afternoon.

On July 3rd, the female was off the nest 48% of the time observed, and on the nest 52%. The following day the time off was 46% and on 54%. No observation was made July 5th, but the next day with one young and two eggs, she was on the nest 63% and off 37%. This would indicate that she spent more time on the nest with one young than with all eggs in the nest. However, the interval of observation was half that of the first day, so

the percentages are not accurate determinations of actual time spent on and off the nest. Longer observations would give better figures. On July 11th, 176 minutes were spent in observation, and this longer time shows 61% of the time was spent on the nest and 39% off. And on July 8th, she was off 92% and on 8%. She would spend from one to three minutes at the nest when she brought food to the young but did not brood. And the next day, the percentages were 80% off and 20% on. She spent more time at the nest as she brought food. July 14th, the day before the young left the nest, she was on the nest 17% and off 83%. Actual brooding was even less, or about 12%. Table 3 gives these percentages in tabular form.

FEEDING

Since the Indigo Bunting, like the other passerine birds, is a nidicolous species, the young are fed directly. The food is brought to the nest in the bill of the female (in this species), and put into the mouths of the young birds. She would put the food into the mouth of the nestling whose head was the highest. If he did not swallow it, she would remove it and try another mouth. All birds seemed to receive their share of the food.

Forbush (1929:121) informs us that "the food of the Indigo Bunting in New England consists largely of insects. Caterpillars, including canker-worms, and brown-tail caterpillars, many small beetles, among them click beetles (the parents of wire-worms)

Table 3

Date	Day before or after hatching	Weather Data Temp. Prec.	Time spent in obs. nest found	Average time on nest	Average time off nest	Longest time on nest	Longest time off nest	% On	% Off
June 30	6	80-59							
July 1	5	70-56	.03 checked						
2	4	74-54	blind						
3	3	79-58	102 min,	53	37	53	37	52	48
4	2	81-61	140 "	25	20	33	20	54	46
5	1	73-63	.28 none						
6	0	74-63	.07 .57 "	6	11	32	29	63	37
7	1	78-59	263 "	10	9	29	16	53	47
8	2	83-60	90 "	8.7	3.7	2	33	61	39
9	3	85-61	141 "	9.2	2.1	7	29	20	80
10	4	81-61	.03 checked						
11	5	82-61	"						
12	6	85-59	"						
13	7	90-59	.11 #						
14	8	80-65	.10 955 min.	10	19				
15	9	80-61	young left nest						

and curculios are eaten and very many grasshoppers. The greater part of the vegetal food consists of seeds of grasses and weeds, most of which they consume in the South in winter, and there they occasionally pick up some grain". Quoting again from Forbush (1907:298), "It feeds more on the caterpillars that infest trees and bushes than do most Sparrows, and takes many such larvae to its young. It is fond of grasshoppers, and takes some insects from the garden. It eats the birch plant louse with avidity. A few flies, mosquitoes, or gnats are taken; cankerworms and other measuring worms, the larvae of several species of butterflies, and the imagoes of nocturnal and Tineid moths, with small beetles of different species, constitute a portion of its insect food. The larger part of its food consists of seeds, many of which are those of weeds. During its short stay with us it is one of the few useful species seen much about the garden, and is of some service in the orchard".

As far as we could tell, only insect food was brought by the female to the young. We recognized little green grasshoppers, white grubs, worms (or larvae), egg cases - probably of spiders, big green locusts, and other winged insects.

The female almost invariably approached the nest through the bracken, and often left the same way. She would leave the nest by flying across the road, at which times she was in the open. Occasionally she would approach the blind from the north,

the nest being on the south side of the blind, flying past in a whirl of wings.

The rate of feeding has already been given. The interval between feedings increased from one every 17.4 minutes on July 7th to one every 8.03 minutes on July 14th, or twice as often.

NEST SANITATION

For the first day or two, the female ate the fecal sacs. On July 7th, I noticed the female carried the fecal sacs across the road when I observed in the afternoon, while Hazel, in the morning, found she was eating them. Again on July 9th, Hazel observed her eating them occasionally and carrying them away at other times. The nest was cleaned almost every time she brought food.

Several times the female was seen picking at the nest (or the young birds). Whether this was because of bird lice, we cannot say.

DEFENSE OF THE NEST

We did not observe any physical defense of the nest on the part of either the male or female. Both would utter their alarm note when we neared the nest or when they saw us in the blind. I have related how the male chipped for so long a time. Whether I was being scolded, although they could not see me in the blind,

or whether some intruder in the area was receiving their resentment, is a matter of conjecture. At another time, when the male was scolding, a Scarlet Tanager (Piranga erythomelas) joined him but Hazel did not observe the cause. At Nest F, she did observe a display of injury-feigning by the female when she attempted to watch the nest from under the bracken.

NESTING SUCCESS

A total of six nests were found and watched. Of these one had no eggs in it, two had three, and two had four. The sixth one had two cowbird eggs and one bunting egg. 17 of the total of 17 eggs hatched, or 100%. Twelve of these young left the nest, or 70.59%. Tables 4 and 4a give the results.

One thing that was noted was that the female would chip several times before returning to the nest. Often she would chip from some distance and repeat as she neared the blackberry bush in which she had built her nest. Until the last day the young were in the nest, she would call, but that day she returned in silence. While incubating, the call may have been a location call, a notice to the male that she was going to the nest, and while feeding the young, more of a food call. I did not hear her call while at the nest but she did utter very low sounds.

Table 4

Nest	No. of Eggs	No. Hatched	Total Success	% Success
A	4	4	0*	0
B	1 bunting 2 cowbirds	1 2	0 [#] 2	0 100
C	3	3	3	100
D	3	3	3	100
E	0	0	0	0
F	4	4	4	100
Totals	15 buntings 2 cowbirds 17	15 2 17	10 2 12	66.67 100 70.59

* Nest destroyed

Bunting disappeared on 2nd day after hatching

Table 4a

	No.	%
Nests parasitized by Cowbirds	1	16.67
Nests destroyed	1	16.67
Nests deserted	1	16.67
Nests successful *	3	50.00
Totals	6	100.00

*Successful in having buntings leave nest

SUMMARY

We found the Indigo Bunting to be a rather common bird in the area around the Biological Station.

The female is the only one who participates in the incubation, brooding, and feeding of the young. This is generally the case when the male is the brilliant colored one.

The male stays near the nest, that is, within his territory. He sings rather continuously during the day.

The Indigo Bunting is a species that is parasitized by the Cowbird.

There were several details which were not observed that should be included in a life history, some of which required more time than we could spend, both of us having other classes, and also some should have been begun earlier.

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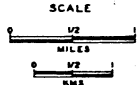
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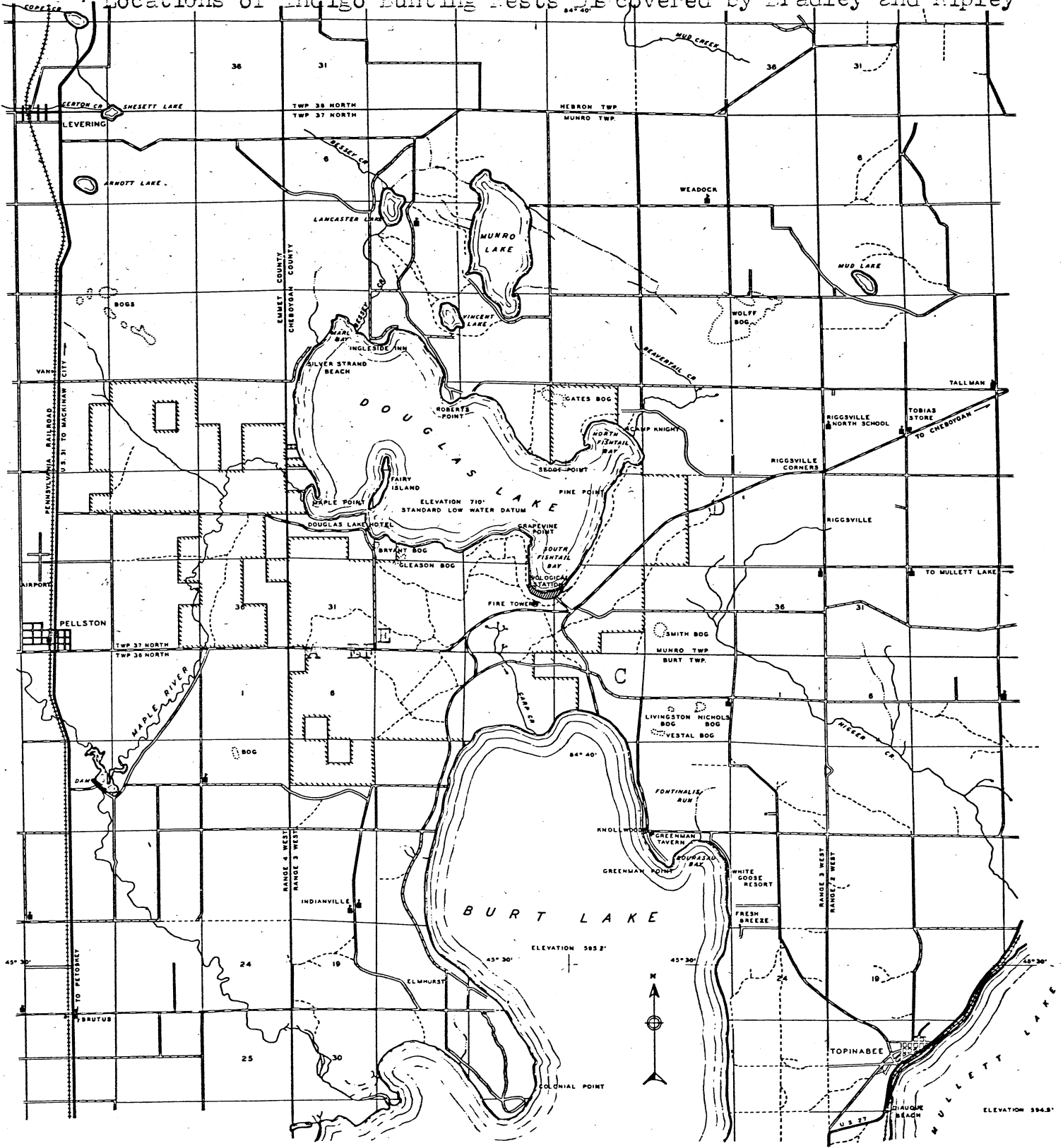
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LEGEND
 CHURCH
 SCHOOLHOUSE
 BOUNDARY OF UNIV. LANDS
 RAILROAD



LEGEND
 PAVED HIGHWAY
 GRAVELLED ROAD
 GRADED ROAD
 UNIMPROVED ROAD
 TRUCK TRAIL

Locations of Indigo Bunting Nests Discovered by Bradley and Ripley





Nest A which was
destroyed