

Duck-nesting Studies

Lower Souris Refuge

1937

by

Merrill C. Hammond  
Biological Aide

## Table of Contents

	<u>page</u>
Introduction.....	1
Method of Field Study.....	2
Number of Nests Studied.....	2
Location of Nesting.....	3
Cover and Grazing.....	5
Fate of Nests.....	6
Tables I - IV.....	7
Nest Output of Young Birds.....	11
Relative Abundance of Nesting Species.....	12
Nesting Success of the Various Species.....	13
Average Clutch Size.....	14
Infertility and Addling.....	14
Effect of Weather on Nesting.....	15
Tables V - VIII.....	17
Maps of Nesting Concentration in 1936 and 1937.....	20
Summary.....	22

Introduction

In this report an attempt has been made to summarize some of the notes made during the nesting studies at the Lower Souris Refuge in 1937. While assisting Mr. Kalmbach in this work, a separate copy of field notes was kept by the writer.

The information given here will at least be partly duplicated when Mr. Kalmbach prepares his notes some time in the future. However, this report has been prepared principally for use on the refuge and as a Divisional Report, rather than for a more general application.

Comparisons have been made between this year's work and the results of Mr. Kalmbach's studies last year, as well as his Canadian Studies, some notes of which were given in the 1936 report left at the refuge.

Respectfully submitted August 23, 1937

*Merrill C. Hammond*

Merrill C. Hammond

Biological Aide, CCC Camp BF4,

Kramer, North Dakota

### Method of Field Study

The nesting studies of 1937 have been carried out in the same manner as Mr. Kalmbach's studies in 1936. The nests were located by the use of a crew of CCC men, five or six of whom would drag 100 foot strands of telephone wire between them. This first line was followed by two or three "Spotters" who located the nest as the duck was flushed and identified it, if possible. Mr. Kalmbach or the writer then came up and recorded the desired information about the nest.

The crew was used two or three days each week, the rest of the time being needed to revisit and check on previously located nests. The visits were spaced about 6 to 10 days apart.

All of the principal areas were worked twice with the crew, once early in the season and once later. This caught both early and late nesting ducks. However, denser nesting areas have, in actuality, received more disturbance than thinner nesting areas, since, in visiting nests, more walking around and searching will naturally be done where nests are located more thickly. This will result in a greater percentage of the total number of nests being discovered. In certain areas quite a number of the nests have been located while making visits. This is particularly true where ducks have apparently concentrated on a relatively small area, as they are apt to do occasionally.

### Number of Nests Studied

In 1936, 394 nests, of which 351 had completed histories, were located. This year, 572 duck nests have been located, 566 of which have completed histories. The last figure includes



some nests of questionable species, but not lost nests. The increase is partly accounted for by the fact that in 1936 the use of the crew was not started until later in the season, June 19th. In 1937 we began on May 18th. The last nest was found on July 16th, both years.

#### Location of Nesting

In 1936 the majority of the nests were located in the area flooded by dam #341. This year relatively few nests were found in this area, the greatest concentration being found near dam #326, on both sides of the dam (see maps appended). Difference in water levels for the two seasons is probably one of the principal reasons for the change, the #341 unit averaging about 18 inches higher last year than this, and #326 probably being nearer the optimum level for maximum production in 1937.

According to Mr. Kalmbach, the crew was not used in the areas between highway #14 and dam #326, or the area southeast of dam #326 during 1936. There was more water here and it was less accessible than in 1937. Consequently, there is the possibility that, had these areas been worked with a crew in 1936, they may have yielded a somewhat greater concentration than they did.

There were 40 nests located on the part of "Ison Island" in section 30 during 1936. This area is in the #341 unit and on the west side of the river. In 1937, only 12 nests were found here.

On the area from Newburgh bridge south two miles, called "Newburgh Island", 124 nests were found last year. Only 7 nests were located this year.

The upland area south of the "Skaar place" yielded 23 nests last year as compared with 9 found in 1937. The crew was only used once in 1937, however.

Since the area near dam #326 was not worked with a crew in 1936, it is impossible to make a comparison of the above kind. There is no question that there has been a greater concentration this year, however. Mr. Kalmbach and an assistant were able to locate only 23 nests between highway #14 and a point approximately  $1\frac{1}{2}$  miles east of dam #326 during the nesting season of 1936, and considerable time was spent here. This year we found 232 nests in the same area. It was not uncommon to locate 6 or 8 nests while two men were checking for 3 or 4 hours. Probably not fewer than 70 or 80 nests were found while checking in this area.

Mr. Henry says that broods are more numerous this year than last in the #326 nesting unit.

In the area around #320 dam and the rubble masonry unit, only 5 nests were found in a day and a half of work with the crew. A brood census made on July 27 revealed a little better condition than the crew work indicated. 14 broods were counted along the east side of the area flooded by the rubble masonry dams.

Due to the fact that the area had grown up so profusely with grasses and Polygonum, only a few places were open enough to see broods. Consequently, the count was by no means the total number of broods present.

Using Mr. Kalmbach's assumption that approximately 50% of the nests present on areas worked with a crew were discovered, table I has been prepared. This gives an estimate of nest production on the nesting areas in several sections.

Table II covers several of the more important smaller areas, and shows up nesting concentration a little better, since cultivated and unfavorable land are not included.

In 1936 the concentration on 1490 acres of prime area ran 3 acres per nest. In 1937, using 1360 acres of prime area as a basis for figuring concentration, the result is 1.9 acres per nest. The areas used in figuring this in 1937 are given in Table III.

Due to the fact that it was impossible to work much of the #332 dam area, it is difficult to estimate duck output here. The marsh makes ideal diving duck nesting area, and broods were seen all through the nesting season.

Since there is reason to believe that a shift in nesting took place in 1937, from the #341 unit into the area about  $1\frac{1}{2}$  to 2 miles on both sides of dam #326, it will be interesting to note in future years whether or not the nesting will be concentrated in particular areas or will shift about, as the last two years would seem to indicate. Perhaps when water levels become more stable over a number of years, the nesting will be more evenly distributed.

A good general picture of the nesting for 1936 and 1937 can be had by comparing the two maps which are appended. Since so few nests were found further south, it was not thought advisable to include them.

#### Cover and Grazing

It is Mr. Kalmbach's opinion that last year's nesting cover was, in general, better than this, due principally to the fact that there was more water in 1936. However, later in the season, several heavy rains brought up a good stand of vegetation on the nesting

areas, although in most places it consisted largely of weeds.

The amount of grazing on potential nesting ground has been less this year than in 1936. Last year the ducks seemed to nest rather abundantly on the northern areas in spite of some grazing. Overgrazing excluded nesting from certain areas during both years, and there is no doubt that where stock had been pastured, nest destruction and desertion resulted during both seasons (see nesting maps for location of heavily grazed areas).

#### Fate of Nests

In table IV a summary of the fate of nests at various dates during the nesting season of 1937 may be found, also the final result in 1936.

It will be noted that in 1937, 68.9% of the nests hatched, as compared with 54.4% in 1936. Very likely the reason for this striking increase in the success of hatching is to be found in the fact that extensive skunk control work was done during the winter and spring of 1936-37. 423 skunks were trapped or killed from November 1, 1936 to July 1, 1937. It should be noted however, that trapping operations were much reduced after May 1, 1937. While 30.4% of the nests were destroyed in 1936 by these predators, only 6.7% were destroyed by them in 1937.

Although some crow control work was done in 1937, no considerable amount was attempted as in 1936, when 99 crows and potential crows were removed from the nesting area and 60 crows near the Sandhills and away from the refuge. Not more than one fifth this number were removed in 1937, which may account for the slight increase in nest destruction by crows.

Table I  
Nesting Concentration

Township	Section	No. acres of nesting ground in section*	Total nests found	Acres per nest found	Computed acres per nest	Total acres in Refuge boundary	Computed acres per nest	Area
T161N R79W	13	320	7	50	25	420	30	#341 dam
T161N R79W	24	320	10	32	16	640	32	"
T161N R79W	19	320	3	107	54	320	54	"
T161N R79W	30	320	14	23	12	560	20	"
T161N R79W	31	320	6	53	27	640	53	"
T160N R79W	2	160	2	80	40	360	90	"
T160N R79W	1	200	4	50	25	240	30	"
T160N R79W	12	400	4	100	50	600	75	"
T160N R79W	13	80	2	40	20	240	60	"
T160N R78W	18	320	5	64	32	600	60	"
T159N R78W	3	480	167	2.8	1.4	640	1.9	#332 & #326 Dams
T159N R78W	2	320	51	6.2	3.1	640	6.2	#326 Dam

\* .... estimated

Table II

Nesting Concentration

Area	No. of Acres Nesting Land 1937	No. of Nests Found 1937	Acres per Nest Found 1937	Acres per Nest Computed 1937	1936
"Ison" Island	160	12	13.3	6.6	2
Newburgh Island	800	7	114	57	3.2
Brandt's Field	240	27	8.8	4.4	4
West of Patrol Road	230	78	3	1.5	-
Patrol Road Triangle	40	16	2.5	1.25	-
Dam #326 to Highway #14	180	70	2.6	1.3	-

Table III

Nesting Concentration

Area	No. Acres	No. Nests
West of Patrol Road	230	78
Section 3 (T159N R78W), eliminating $\frac{1}{4}$ as water and under cultivation	480	167
Brandt's Field	240	27
Section 2, $\frac{1}{2}$ (T159N R78W)	320	49
Area east of river and between dam #332 and highway (T161N R79W, sect. 19)	90	22
	<u>1360</u>	<u>343</u>

Table IV

Fate of Duck Nests in 1936 and in 1937

Fate	1936	1937					No. Nests
	(351 Nests)	July 1 (308 Nests)	July 8 (377 Nests)	July 19 (473 Nests)	July 23 (536 Nests)	Aug. 6* (566 Nests)	
Hatched	54.4%	58.1%	62.9%	66.6%	68.6%	69.9%	390
Crows	1.7	6.5	5.7	4.4	3.8	3.5	20
Skunks	30.4	8.8	7.9	7.4	6.9	6.7	38
Foxes		3.0	2.4	2.1	2.1	2.0	11
Unknown Cause	7.1	13.2	11.9	10.4	9.5	9.4	53
Deserted	3.4	8.8	7.4	7.4	7.5	8.0	45
Miscellaneous Causes	1.0	1.6	1.8	1.7	1.6	1.5	9
Unknown Fate	2.0						
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	566

\* .... final count

This table made up using Mr. E.R. Kalmbach's figures to July 23.



Foxes were a new predator to deal with in 1937. There has been a noticeable increase in their numbers here this year, and 2% of the nests were definitely destroyed by them. Due to their peculiar treatment, or lack of treatment, of the nest, it is difficult to determine when a fox has been the cause of destruction. In the case of nests definitely known to have been visited by a fox, there was no trace of eggs and the nest was not disrupted.

Observations made with a captive young female at the headquarters site indicate something of what may be characteristic of nest treatment. Eggs placed in the fox's pen were never eaten at the spot. The egg was picked up in the mouth and carried away to another part of the pen. It was then generally buried or placed in a hole and covered. Later she would go back, perhaps move the egg again and bite a small hole in it, then clean it out with her tongue. Afterward the egg shell was sometimes broken up.

Never has the fox been seen to eat the egg where it was found or given to her.

It is very probable that a large part of the 9.4% destruction charged against "Unknown Cause" has been really due to fox work. Also some nests deserted after the removal of one or more eggs should very likely be charged against the fox, it being responsible for the desertion.

Of the 566 nests with completed histories, 27 (4.8%) were found to have lost all the eggs, leaving no remains of shell or albumen. There were 15 cases (2.6%) of desertion following removal of part of the eggs. In each instance no trace of the missing eggs was found. Combining these two we have 7.4% destruction where no trace of missing eggs was found. Part of this, at least,



would appear to be due to fox work. There were also 14 cases where, although some eggs disappeared from the nest, a hatch of some sort resulted.

Contributing to "Unknown Cause" are instances where apparently a combination of factors had caused the destruction, and, many cases arise where the nest and egg remains are entirely lacking in appearance characteristic of any predator, at least as far as we can interpret the evidence.

Desertions are due to a number of causes. Disturbance by predators, humans, cattle, and storm being the most common. Some of the nests listed as desertions are in reality, destruction of eggs followed by desertion, it being difficult to draw a close line between the two some times. (See section of paper on weather for desertion caused by storm)

"Miscellaneous Causes" include, flooding of nests, destruction by cattle or humans, and killing of the female by predators.

"Unknown Fate" was not used in 1937, it being possible to place most nests in one of the other categories.

#### Nest Output of Young Birds

So far, in considering the fate of nests, no attention has been given to the actual number of young produced by the nests which have hatched. It will be valuable to know just how many young ducks are put out by nests of the various species, and what proportion of the eggs laid are hatching.

In preparing table V, 534 nests were used. These have all had the species positively identified. 38 of our nests were of questionable species or lost nests. Only "hatched" nests, i.e.,

nests in which at least one bird hatched, are considered in computing the duckling output per nest. In figuring clutch size, only nests were used of which two or more observations indicated that the clutch was complete.

Eggs were considered hatched if only one or two membranes were unaccounted for, and there was no evidence of destruction at or near the nest, it being believed that the female duck may remove a membrane occasionally. Also, eggs left in the nest after hatching and apparently destroyed, were included as infertile or addled, or with unhatched embryos, whichever the case might have been. In many instances it was difficult to determine whether predators came in before or after hatching, but in doubtful cases, the egg has been called "hatched".

From the above it will be noticed that any error in noting data will favor the number of eggs hatched, thus perhaps making this appear greater than it really is. However, it is believed that, due to the number of nests under record, and the relatively few questionable nests, any error arising will be extremely slight. For an analysis of hatching, see table V. The results are given for the total number of eggs and nests, and also by species.

#### Relative Abundance of Nesting Species

Table VI gives the number of nests found for each of the various species in 1936 and 1937. The fact that studies were started a month earlier in 1937 will probably account for the greater percentage of pintails. Less time was spent in search-

ing for the nests of diving ducks during 1937, and the number listed is not representative of the number of nests. In fact the refuge personnel report diving ducks and their broods to be more numerous this year than in 1936.

Unfortunately, no ruddy nests were located for observation in 1937, although several nests were found already hatched, and broods were rather numerous.

#### Nesting Success of the Various Species

Using only 534 nests with the species determined, it was found that 368 nests produced a hatch. These figures give the same per cent of hatch as is obtained by using 566 nests (which includes some of questionable ownership) with a hatch of 390, namely, 68.9%.

Table VII shows the nesting success by species, and is made up using only the 534 nests.

It will be noticed that, of the seven top species, the blue-wing teal was the most successful nester in 1937. Although having the best nest concealment of any of the species, it suffered greatest destruction in 1936. On checking Mr. Kalmbach's report for 1936 it was found that the skunk was responsible for nearly all cases of blue-wing teal nest destruction.

Since the blue-wing teal ordinarily nests in rather dense cover, her trail and nest are apt to be more conspicuous to a skunk than a nest built in a more open environment, where several different approaches to the nest may be made.

With the other species, there is little difference between the two years that cannot be accounted for by the laws of chance.

The one exception is the shoveller, which was second in 1936 and sixth in 1937.

#### Average Clutch Size

In figuring the average clutch size for each species (Table VIII), no sets of eggs have been included unless there was evidence that the maximum number of eggs had been reached, and was present. Only nests of species definitely determined were used. It is possible that, in the case of nests having particularly low numbers of eggs, some removal of eggs had taken place before observation began. With the number of nests considered, this is not apt to change the results particularly.

#### Infertility and Addling

Infertility and Addling are the greatest factors in reducing the number of hatches in nests which put out some young. 6.4% of the eggs in these nests being either infertile or addled. Some nests, included in "destroyed nests" had infertile sets. Mr. Kalmbach suggests that a small degree of lead poisoning, although insufficient to cause physical disability or death, may cause infertility. This has previously been demonstrated with other fowl.

There were 9 nests known to have sets of infertile or addled eggs, 4 of these nests were pintails, 3 shovellers, a mallard, and a widgeon, which hatched 1 egg out of 8, but continued with the nest. (There is a possibility that one or two of these nests had the eggs chilled during a heavy storm) Since some of the destroyed nests were, no doubt, with infertile sets, it is difficult to

judge the total percent of infertile or addled nests. It would very likely run between 2 and 3% however, using nearly 400 nests to judge from.

#### Effect of Weather on Nesting

During the nesting season of 1937, at least one storm had an important effect on nesting.

On June 3 a bad wind and rain storm began, continuing until June 6. During this period of over 2 days, any nest which was not covered by the female ran a good chance of being chilled or flooded. At least 4 or 5 inches of rain fell, along with a driving north wind, and the water level in the dam units was raised considerably. One redhead nest under observation was found to be partly inundated by the rising water. It is probable that many diving duck nests suffered similar fate.

Most of the nest desertions observed between June 7th and the 15th were very likely due to the effects of the storm. Also, cases found where the embryos were only partly developed may have been due to the chilling of the egg while the female was not on the nest.

On checking over our notes, it was found that 17 nests were definitely destroyed directly or indirectly by this one storm. The fates being desertion, flooding, or the killing of the young ducklings at the nest, in one instance. With 24 other nests there had been predator destruction of some sort by the time of our first visit after the storm. It is very possible that many of these nests were deserted during the storm and left exposed or partly exposed to predators. At least 3% and, at the most 7.2% of the

566 nests under observation, were destroyed by this one storm. (In working out the fate of nests, the 24 nests mentioned above have been charged against the particular predator causing the destruction, since it is impossible to tell just how many had been deserted previously.)

The effect of the storm on ducklings that had just hatched, and were not yet supplied with sufficient oil on their down to prevent wetting, must have been disastrous. Several dead ducklings were picked up that had evidently been killed by the rain. These were not near a nest.

There were several other storms of less intensity and duration through the nesting season, some of which may have, and probably did, cause some small destruction to nests and young.



Table V  
Hatching Data

	Pintail	B.W. Teal	Gadwall	Mallard	Shoveler	Widgeon	G.W. Teal	Red-head	Canvas-back	Lesser Scaup	Greater Scaup	Total
No. of Nests	149	97	91	86	54	40	7	4	3	2	1	534
No. of Nests Hatched	99	76	68	52	34	28	5	2	1	2	1	368
% of Nests Hatched	66.4	78.3	74.7	60.4	62.9	70.0	71.4	50.0	33.3	100.0	100.0	68.9
Total Eggs in Hatched Nests	710	712	575	413	325	209	46	14	10	16	10	3040
Total Eggs Hatched	623	649	530	359	290	189	30	10	5	16	10	2711
% of Eggs Hatched	87.7	91.2	92.2	86.9	89.2	90.4	65.2	71.5	50.0	100.0	100.0	89.1
No. of Eggs Destroyed	15	22	12	17	12	2	1	-	3	-	-	84
% of Eggs Destroyed	2.1	3.0	2.1	4.1	3.7	1	2.2	-	30	-	-	2.7
No. of Eggs Infertile or add.	60	35	23	31	20	17	7	1	2	-	-	196
% of Eggs Infertile or addled	8.5	4.9	4.0	7.5	6.2	8.1	15.2	7.1	20	-	-	6.4
No. of Eggs with dead Embryos	8	5	10	6	2	1	8	3	-	-	-	43
% of Eggs with dead Embryos	1.1	.7	1.7	1.5	.6	.5	17.4	21.4	-	-	-	1.4
No. of Dead Ducklings at Nest	4	1	-	-	1	-	-	-	-	-	-	6
% of Dead Ducklings	.6	.2	-	-	.3	-	-	-	-	-	-	.2
Average Clutch	7.18	9.37	8.38	8.09	9.30	7.55	9.20	9.00	9.00	8	10	
Ave. Hatch per Hatched Nest	6.29	8.54	7.79	6.90	8.52	6.75	6.00	5	5	8	10	

Average number of ducklings per nest (534 nests) .....5.07

Average number of ducklings per hatched nest (368 nests)..7.36

Table VI

Order of Abundance and Number of Nests Found of Each  
of the Various Species in 1936 and 1937

<u>1936</u>	<u>1937</u>
Blue-wing Teal .. 84	Pintail ..... 149
Shoveller ..... 78	Blue-wing teal ..... 97
Gadwall ..... 72	Gadwall ..... 91
Pintail ..... 69	Mallard ..... 86
Mallard ..... 35	Shoveller ..... 54
Widgeon ..... 23	Widgeon ..... 40
Redhead ..... 13	Green-wing teal .... 7
Green-wing teal . 9	Redhead ..... 4
Canvasback ..... 8	Canvasback ..... 3
Lesser Scaup .... 2	Lesser Scaup ..... 2
	Greater Scaup ..... 1
<b>393</b>	Species questioned <b>534</b>
	and lost nests ..... <b>38</b>
	<b>572</b>

Table VII

Nesting Success by Species

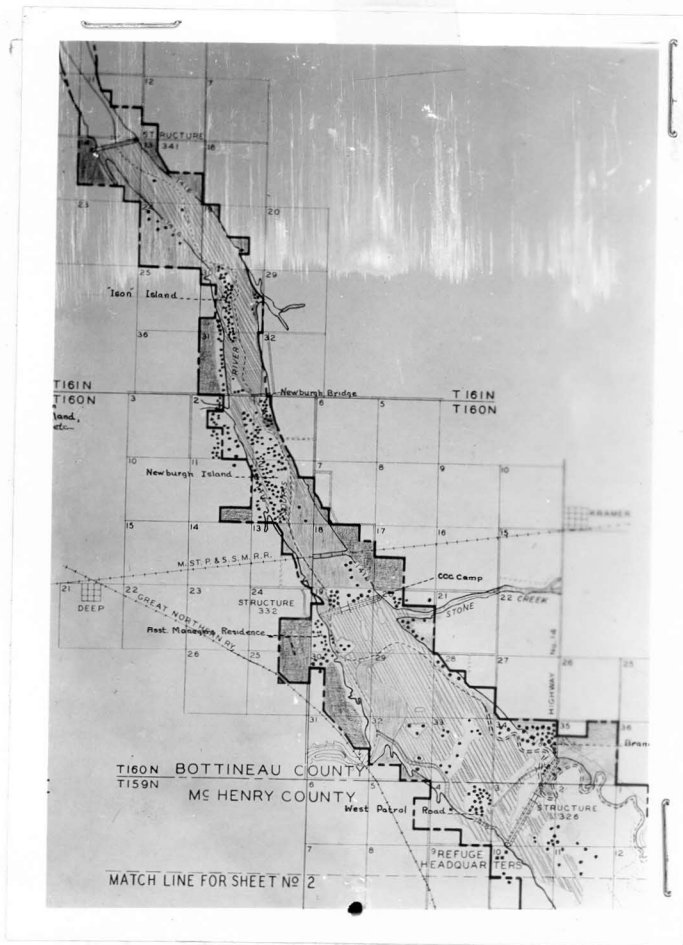
Species	No. Nests	No. Hatched	1937 % Hatched	1936 % Hatched
Blue-wing teal	97	76	78.3	35.1
Gadwall	91	68	74.7	64.0
Green-wing teal	7	5	71.4	44.5
Widgeon	40	28	70.0	58.-
Pintail	149	99	66.4	52.7
Shoveller	54	34	62.9	58.9
Mallard	86	52	60.4	46.9
Redhead	4	2	50.0	55.6
Canvasback	3	1	33.3	85.7
Scaup	3	3	100.0	100.0
Total	534	368	68.9	54.4



Table VIII  
Average Clutch Size of the  
Nesting Ducks

Species	1937		1936*		Canada*	
	sets	ave.	sets	ave.	sets	ave.
Greater Scaup	1	10.00				
B.W. teal	83	9.37	45	9.44	41	10.75
Shoveller	42	9.30	47	9.35	22	7.85
G.W. teal	5	9.20	4	9.00		
Canvasback	2	9.00	5	11.8	21	9.16
Redhead	4	9.00	7	10.3	7	10.13
Gadwall	77	8.38	52	9.15	19	10.06
Mallard	66	8.09	23	7.74	141	8.05
Lesser Scaup	2	8.00	2	10.0	59	8.46
Widgeon	29	7.55	16	9.06	3	6.99
Pintail	118	7.18	36	6.77	39	6.99

\* ... E.R. Kalmbach's nesting report for 1936



Map of Nesting in 1936  
(382 Nests)

Location of nests shown by dots. Cross-hatching represents water or marsh area. Lightly shaded portion is land heavily grazed. Darkly shaded portion is highland and land under cultivation.

Location of nests shown by dots. Cross-hatching represents water or marsh area. Lightly shaded portion is land heavily grazed. Darkly shaded portion is highland and land under cultivation.

### Summary

The most outstanding fact brought out by the study of 572 duck nests in 1937 is that there was a remarkable increase in the percentage of nests producing a hatch. In 1936, 54.4% of the 394 nests under observation produced a hatch. In 1937, 390 nests, or 68.9% produced a hatch, an increase of 14.5%.

This increase has been attributed principally to the removal of 423 skunks from the refuge between the two nesting seasons. In 1936, skunks took 30.4% of the nests, and in 1937, only 6.7%.

There was a slight increase in the per cent of nests destroyed by crows in 1937, 3.5% as compared with 1.7% in 1936. This may be due to the fact that no extensive crow control work was attempted in 1937, as was done in 1936.

Foxes are becoming an important predator to deal with. At least 2%, and probably more, of the nests under observation were destroyed by them in 1937.

There was a shift in nesting, from the #341 unit in 1936, to the area around the #326 dam in 1937.

The pintail was the most abundant nesting species in 1937, 149 of it's nests being found. The blue-wing teal (97 nests), gadwall (91 nests), mallard (86 nests), shoveller (54 nests), and widgeon (40 nests) follow in the order named. The number of diving duck nests found is not indicative of their abundance, due to the fact that a representative sample of their nests was not taken.

The blue-wing teal was the most successful nester in 1937, hatching 78.3% of it's nests. The gadwall (74.7%), widgeon (70.0%),

pintail (66.4%), shoveller (62.9%), and mallard (60.4%) follow.

The average number of ducklings leaving the nest is 5.07.

This is figured by including all nests, whether hatched or not.

The average number using only nests producing a hatch is 7.36.

The gadwall hatched 92.2% of the eggs layed in nests which produced a hatch.

Infertility, and addling by other causes, are the greatest factors in reducing the number of hatches in nests which put out some young.

One severe storm during the nesting season of 1937 did serious damage to the nests, destroying at least 3% of the nests under observation.