102.13

CAPE BRETON ISLAND WATERFOWL STUDY

G.F. Boyer - 1955
A.J. Erskine - 1961
- 1962
- ~~1963~~ superseded by R
- 1964 - Completion Report
- ~~1955-60 Summary Rpt.~~ not included

CWS C 1166

Department
of Northern Affairs
and National Resources National Parks Branch
Canadian Wildlife Service

Ministère
du Nord canadien et
des Ressources nationales Direction des parcs nationaux
Service de la faune

Superintendent,
Eastern Region

Sackville, N. B., March 5, ~~1965~~.

our file / notre dossier WLU 60-Erskine
your file / votre dossier

Supplement to completion report on project O 2-1-11 Cape Breton Island Waterfowl Studies

There is no possibility of extrapolating the results of the surveys to the whole of Cape Breton Island. The survey areas were selected as the most productive waterfowl areas that were accessible by road. Probably the total area surveyed, a little under 5000 acres or about eight square miles, represented at least half of the more productive areas that were readily accessible. With unlimited access, with aerial surveys, it might be possible to find considerably more good habitat. Possibly the areas surveyed make up 20 per cent of the best waterfowl habitat in the general region covered (bounded by red line on map). That is, there might be about 40 square miles (8 mi.x2/0.20) of "optimum habitat" in the total area of perhaps 2000 square miles.

The surveys showed about 80 pairs of ducks on the 8 square miles of the survey areas. Extrapolation to the supposed 40 square miles of "optimum habitat" would give some 400 pairs. If the remainder of the region supported only one pair per square mile instead of the ten pairs per square mile on the survey areas, there might be 2000 pairs on the unsurveyed area as a while. The so-called "boreal forest" transects run in the Maritimes in 1949-55 gave indices of about 1.25 ducks per square mile. It seems rather unlikely that even half the ducks actually present can have been seen from the air (cf. page 9, table 4 of this report), so the figure of one pair per square mile (for similar habitat on Cape Breton Island) is probably a reasonable estimate. The survey areas, though comprising a substantial proportion of the best habitat, probably support only a small fraction of the total number of ducks breeding in the region. Until we have more precise figures for the total wetland acreage and the densities of ducks to be found in the various habitat types, we can hardly make any guess as to the importance of the survey areas in the overall picture.

It was my impression (Erskine, 1961, Cape Breton Waterfowl Studies, 1955-1960, conclusion 1, page 16, and Appendix 1) that the Cape Breton survey areas were the most important areas in Nova Scotia readily accessible by road. Possible exceptions are the Yarmouth County salt marshes, which I had not visited at that time, and the Amherst Point area. With those exceptions, I still think that a

..... 2

ground observer can see more ducks and more variety of duck species in breeding season on the Cape Breton study area than elsewhere in the province.

There are three main types among the survey areas, namely: fresh marshes around Lake Ainslie (McCormack, Loch Ban, and Scotsville), estuaries and bays around the brackish Bras D'Or Lakes (Baddeck River, Middle River, Whycocomagh, and River Denys), estuaries and coastal ponds around George Bay (Antigonish, Pomquet, Judique, and Mabou). There is fairly good separation between spring and summer duck population densities on the three types, fresh marshes having the highest population densities and areas abutting on George Bay the lowest. The indices used were total spring ducks divided by two to give (very roughly) the number of pairs present, and total broods seen in summer. Figures used were the averages for 1961-63. Margaree, River Inhabitants, and Shoal Lake were not included in the comparison, as coverage of these areas was incomplete in one or more years or seasons.

Area (acres)	Spring "pairs" per 100 acres	Summer broods per 100 acres
Fresh marshes		
Loch Ban (178)	5.6	3.9
McCormack (128)	10.2	7.0
Scotsville (38)	11.8	10.5
areas off Bras D'Or Lakes		
Baddeck River (380)	4.2	2.9
River Denys (282)	5.7	3.9
Middle River (213)	4.5	1.9
Whycocomagh (69)	8.0	10.1
Areas off George Bay		
Judique (424)	3.0	0.9
Mabou (266)	2.6	0.4
Antigonish (244)	3.7	1.6
Pomquet (62)	4.0	1.6

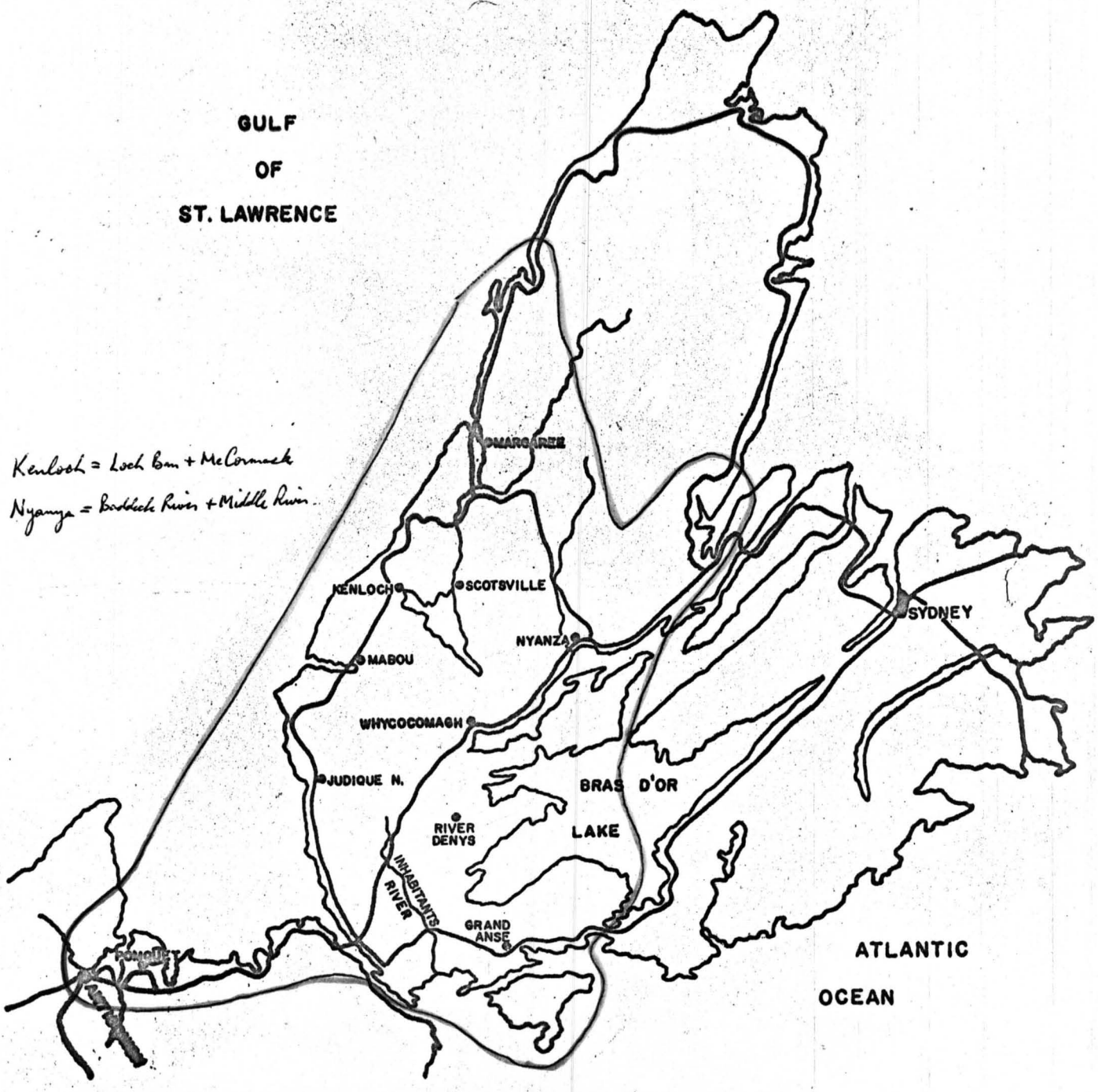
Much of Lake Ainslie and the northwestern part of the Bras D'Or Lakes is underlain by gypsum deposits, which may enhance the alkalinity and thereby the growth of plants favoured by waterfowl on these areas.

A. J. Erskine,
Wildlife Biologist.

/mt.

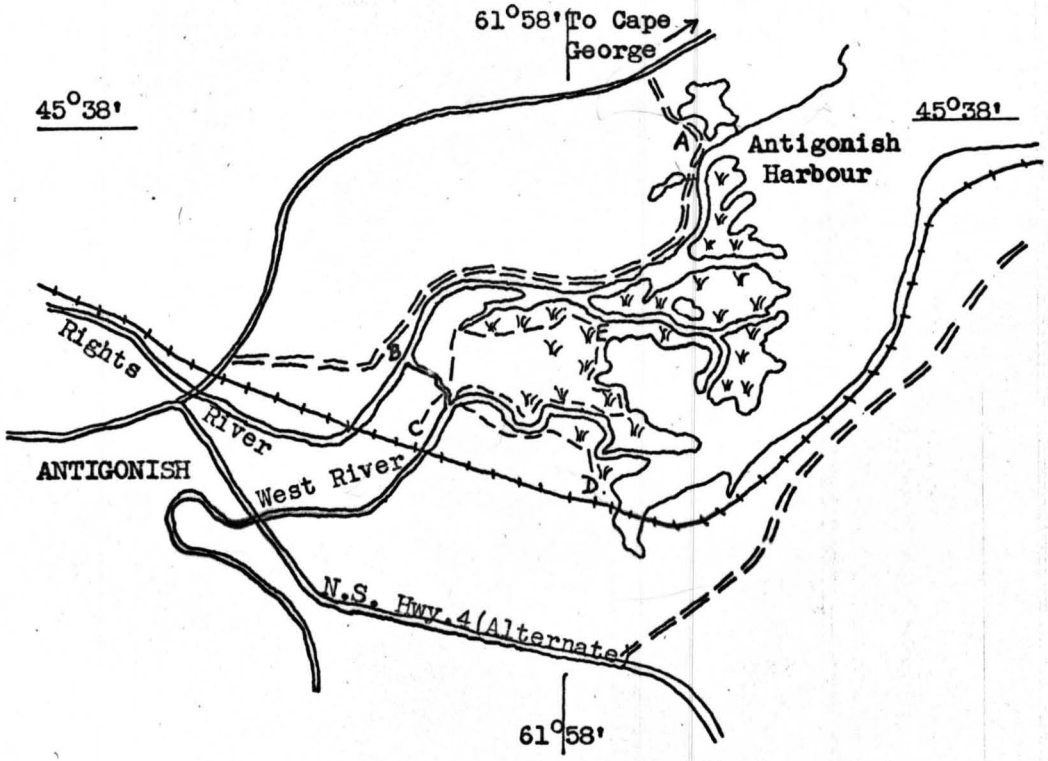
Supplement to → 02-1-11

FIGURE 1. LOCATION OF WATERFOWL SURVEYS, CAPE BRETON ISLAND 1961–63



Kenloch = Loch Ban + McCormack

Nyanza = Baddeck River + Middle River



ANTIGONISH

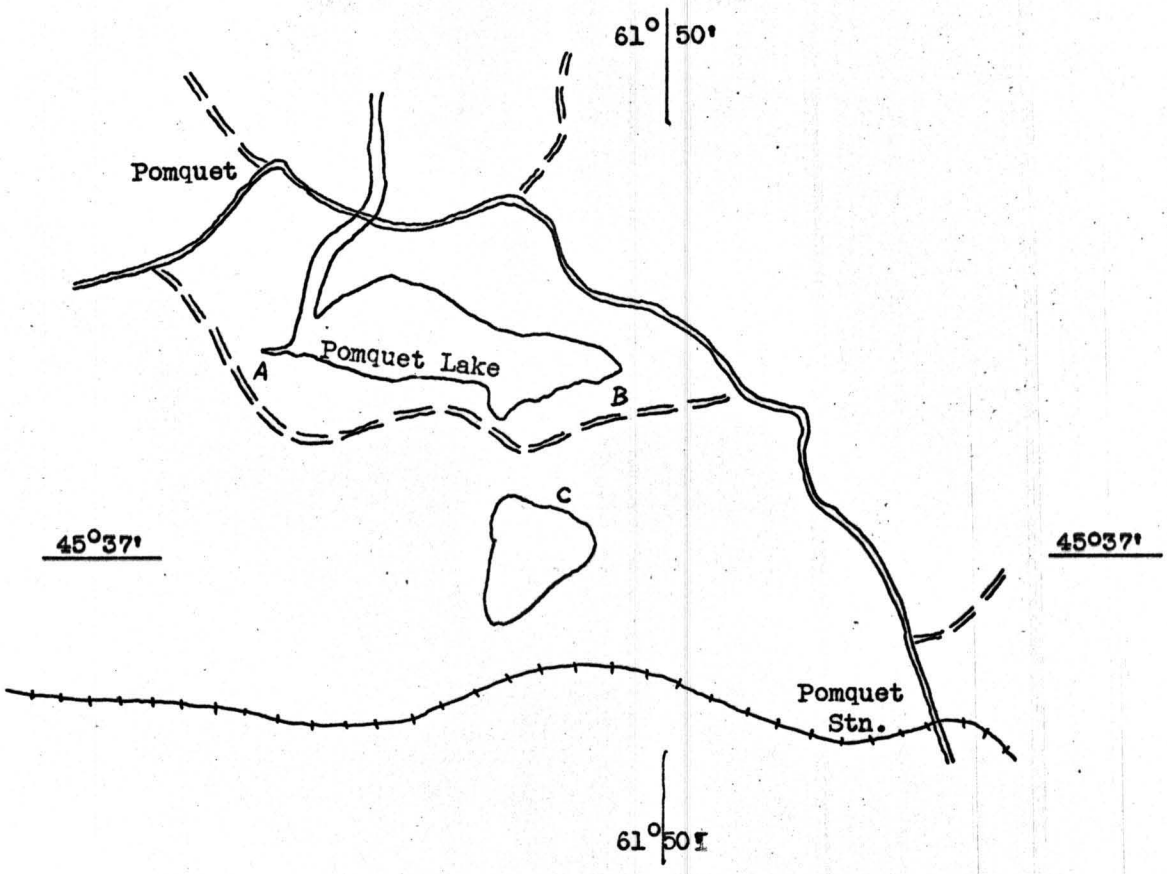
Scale: 1 inch = about 0.4 miles (1:25,000)

Approximate area: 244 acres

"Rapid" survey - spot counts from car along road between A and B, and on foot along railroad between C and D;

"Intensive" survey - as above, plus beat-out between C, D, and E, as shown by broken line.

Remarks: "Intensive" coverage requires hip boots. Creek connecting Rights River and West River may be crossed in hip boots except at high tide during spring freshet; other channels cannot be forded except West River just north of creek at summer low water. Ducks are much more easily seen from road at high than at low tide (tidal range about 6 feet). The William Point road on the east side of Antigonish Harbour does not give any view of the marsh area.



POMQUET

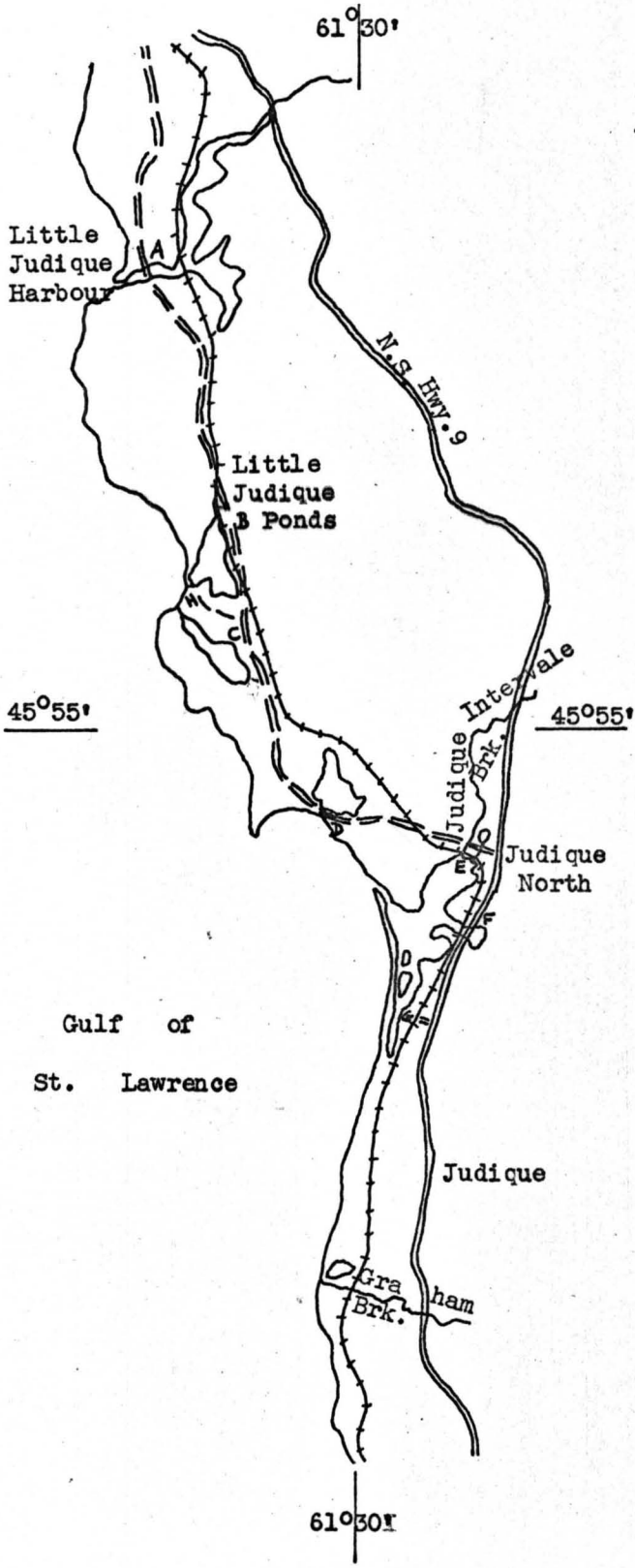
Scale: 1 inch = about 0.4 miles
(1:25,000)

Approximate area: 62 acres

"Rapid" survey - spot counts from car on road at A and B;

"Intensive" survey - count on foot along entire south side of lake, plus count on pond from C.

Remarks: The outlet of Pomquet Lake was dammed by beavers between the 1960 and 1961 breeding seasons. Since then tide has not influenced the level of the lake, but fluctuations were not over a foot even in 1960.



JUDIQUE

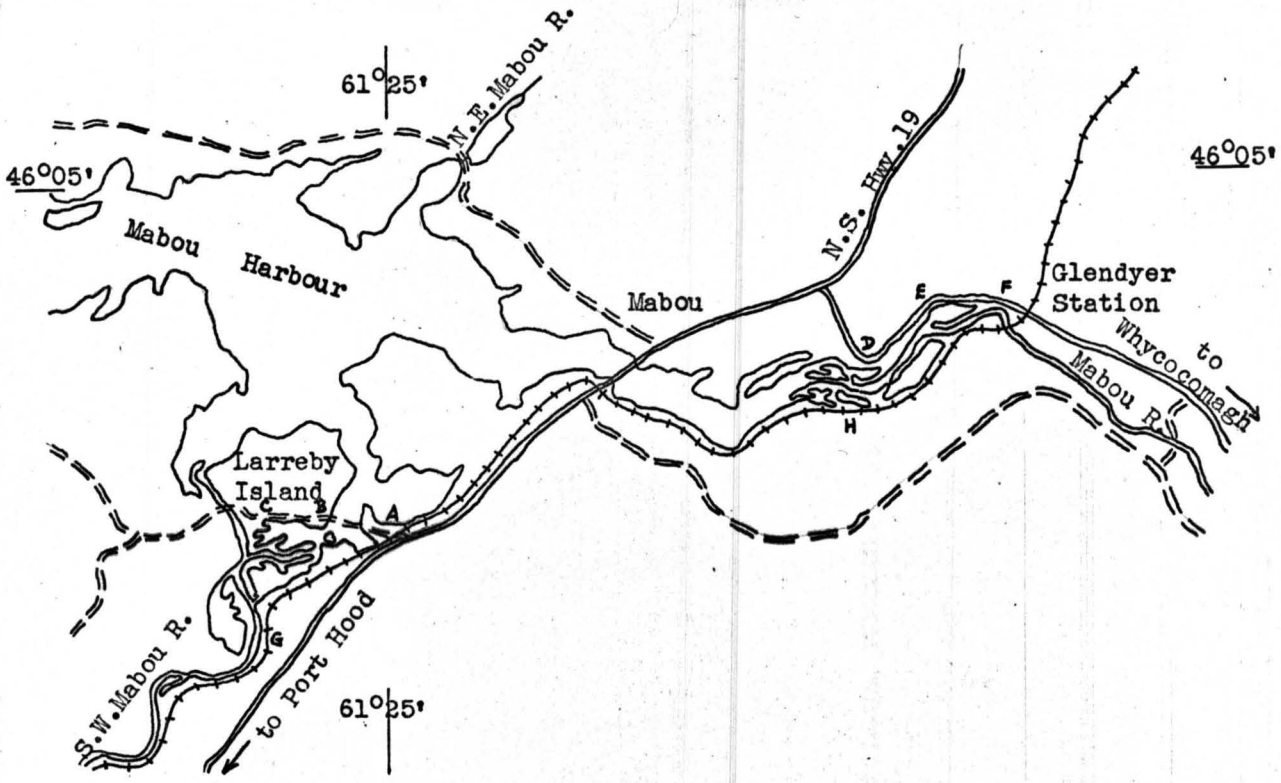
Scale: 1 inch = about 1.1 miles (1:71,000)

Approximate area: 424 acres

"Rapid" survey - spot counts from car on road at A, B, C, D, E, F, and G.

"Intensive" survey - as above, plus walking shores of Little Judique Ponds between C and H, and beat-out of marsh at E.

Remarks: The water level does not change with tide except at Little Judique Harbour, where the range is three to four feet.



MABOU

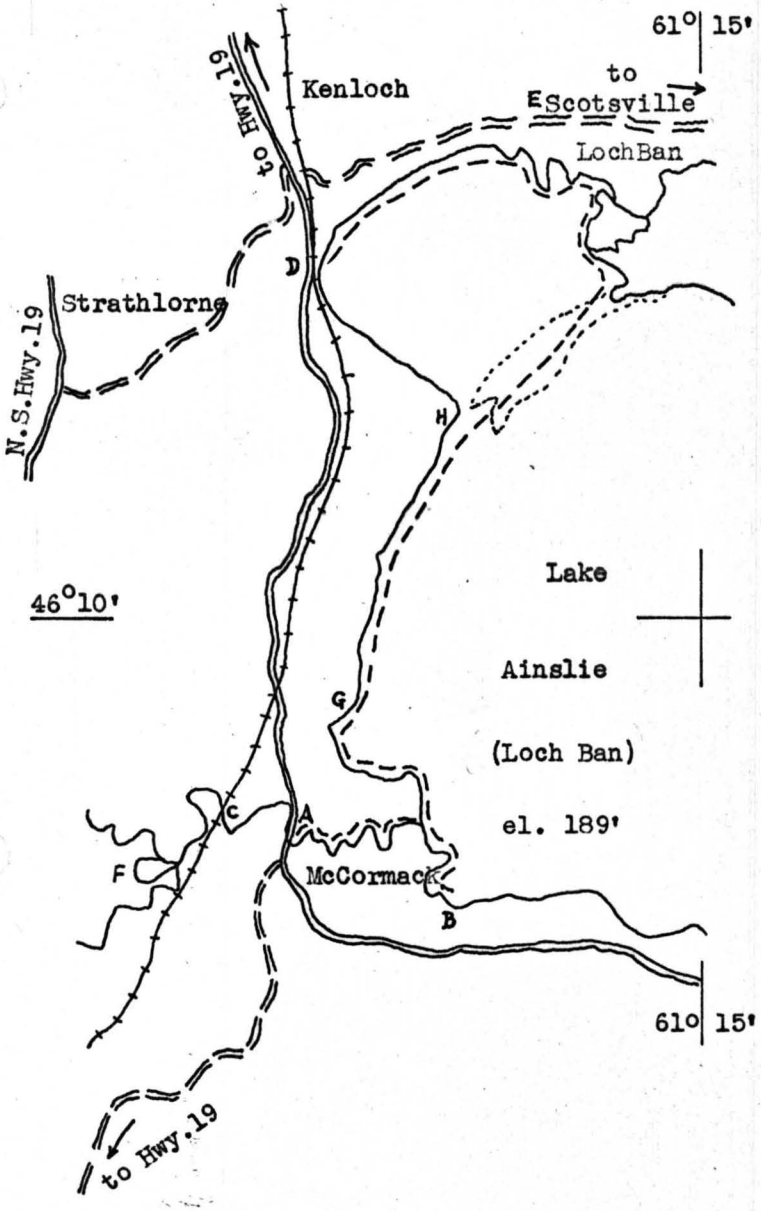
Scale: 1 inch = about 0.8 miles
(1:50,000)

Approximate area: 266 acres

"Rapid" survey - spot counts from car on road at A, B, and C, near Larreby Island, and at D, E, and F, near Glendyer.

"Intensive" survey - as above, plus count on foot along railroad between A and G, and between F and H.

Remarks: The direction of the wind influences the water level much more than does the stage of the tide; with an east wind water levels in Mabou Harbour are low, with a west wind high water prevails. Fluctuations have little if any effect on visibility of waterfowl. Broods of Black Ducks have been seen between Glendyer and Hillsboro, in the course of Mergnser surveys.



KENLOCH - (McCormack and Loch Ban)

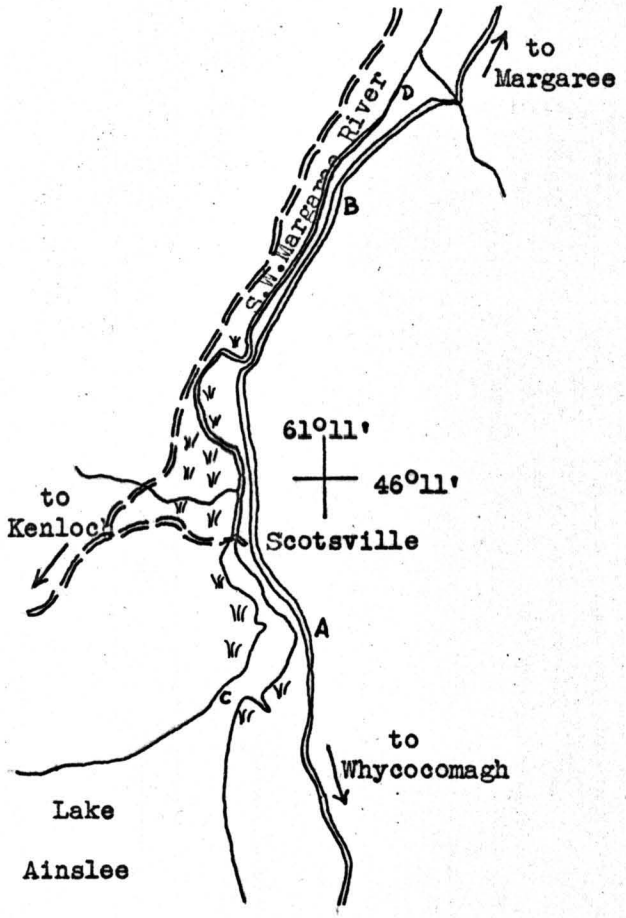
Scale: 1 inch = about 0.5 miles (1:32,700)

Approximate area: 306 acres
(McCormack - 128 acres)
(Loch Ban - 178 acres)

"Rapid" survey - spot counts from car at A, and on foot at B and C (latter reached by walking along railroad), near McCormack, and from car on road at D and E, near Loch Ban.

"Intensive" survey - except with strong winds between northeast and southeast, McCormack and Loch Ban were usually surveyed in a single canoe trip, as shown by the broken line; if the wind was northerly, launching was at D and landing at A; if southerly, launching at A and landing at D. The creek at McCormack was canoed or walked as far as the pond (F).

Remarks: Waterfowl were seldom seen along the exposed sandy shore between G and H. Large flocks of moulting Ring-necked Ducks were seen each year in July at either F, G, or B. The road to Highway 19 southwest from McCormack is poor except in dry weather; the easiest access is by the more northern of the two roads from Strathlorne.



SCOTSVILLE

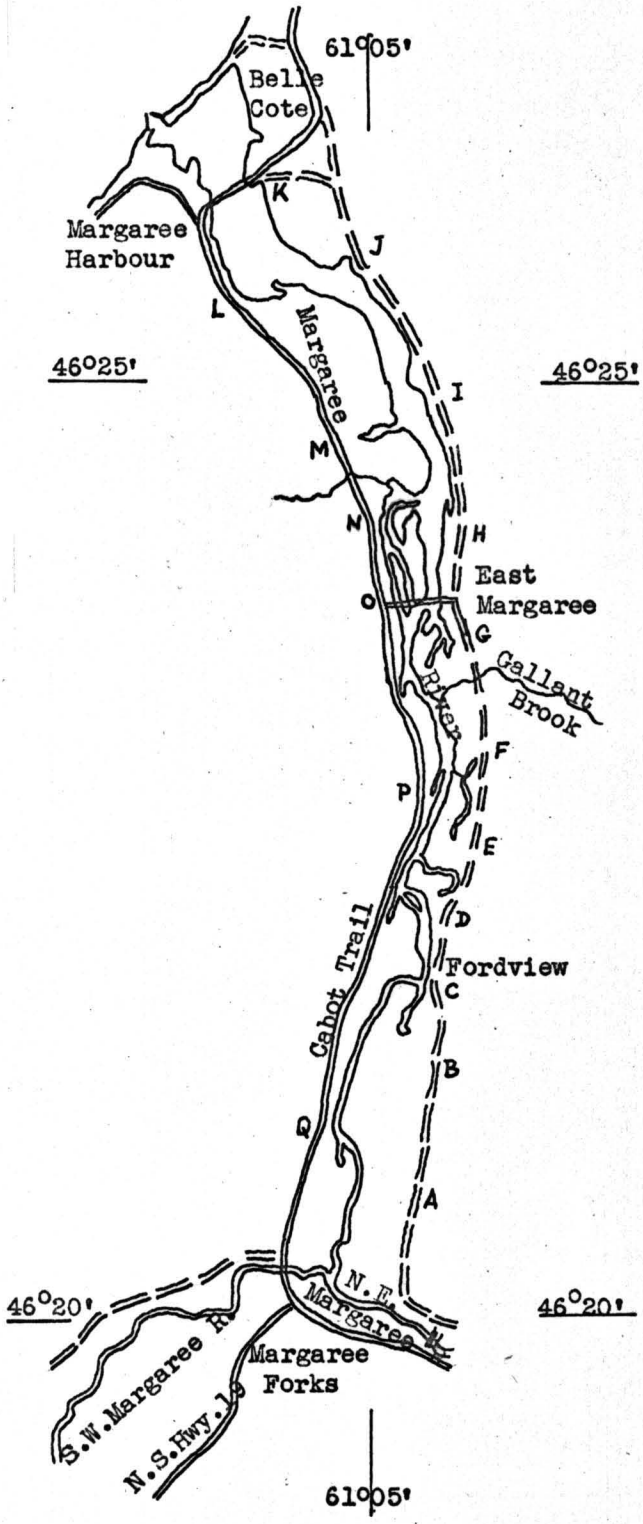
Scale: 1 inch = about 0.5 miles
(1:32,700)

Approximate area: 38 acres

"Rapid" survey - spot counts from car along road between A and B;

"Intensive" survey - as above, plus canoeing from A to C to B.

Remarks: The whole marsh below the bridge may be flooded at spring freshet. Broods have also been seen between the rapids at B and at D.



MARGAREE

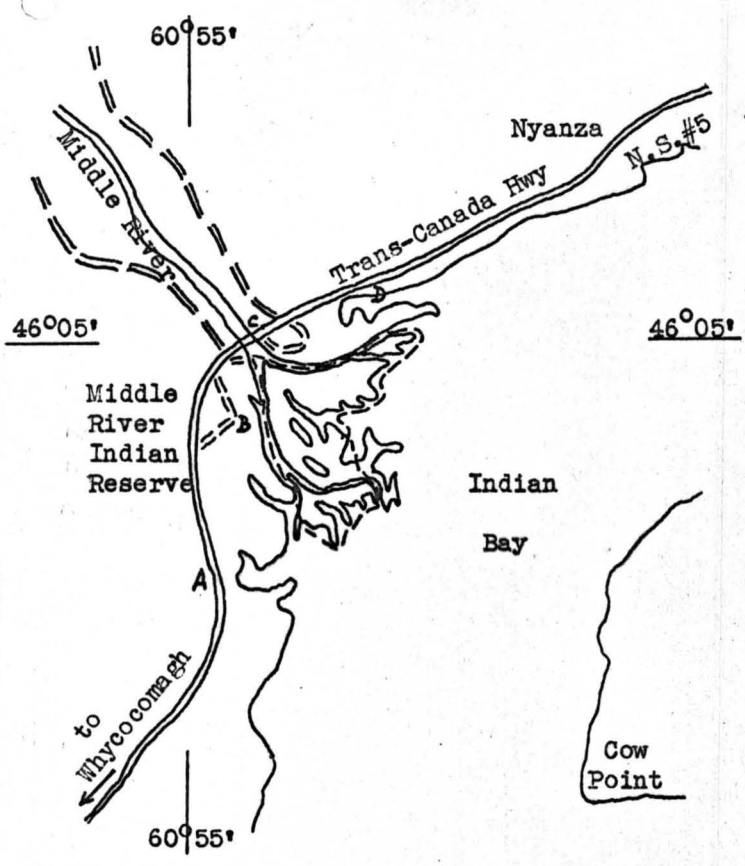
Scale: 1 inch = about 1.1 miles (1:71,000)

Approximate area: 1272 acres

"Rapid" survey - spot counts from car, usually at approximately A-Q inclusive, and intervening points if necessary (total time about one and one-quarter hours).

"Intensive" survey - as above, plus canoeing downstream from Doyle's Bridge east of Margaree Forks to East Margaree.

Remarks: During spring freshet, the entire valley bottom is flooded in some years. Ducks are much more easily seen in years when water is high, as they then frequent temporary pools and ox-bows in the flood-plain, rather than remaining in the alder-hung backwaters. Tidal influence is felt nearly up to Fordview. but only in the marshes immediately above (between G and O) and below (between H and N) East Margaree is visibility appreciably poorer at some particular stage of the tide (poorer at low water).



MIDDLE RIVER

Scale: 1 inch = about 0.5 miles
(1:32,700)

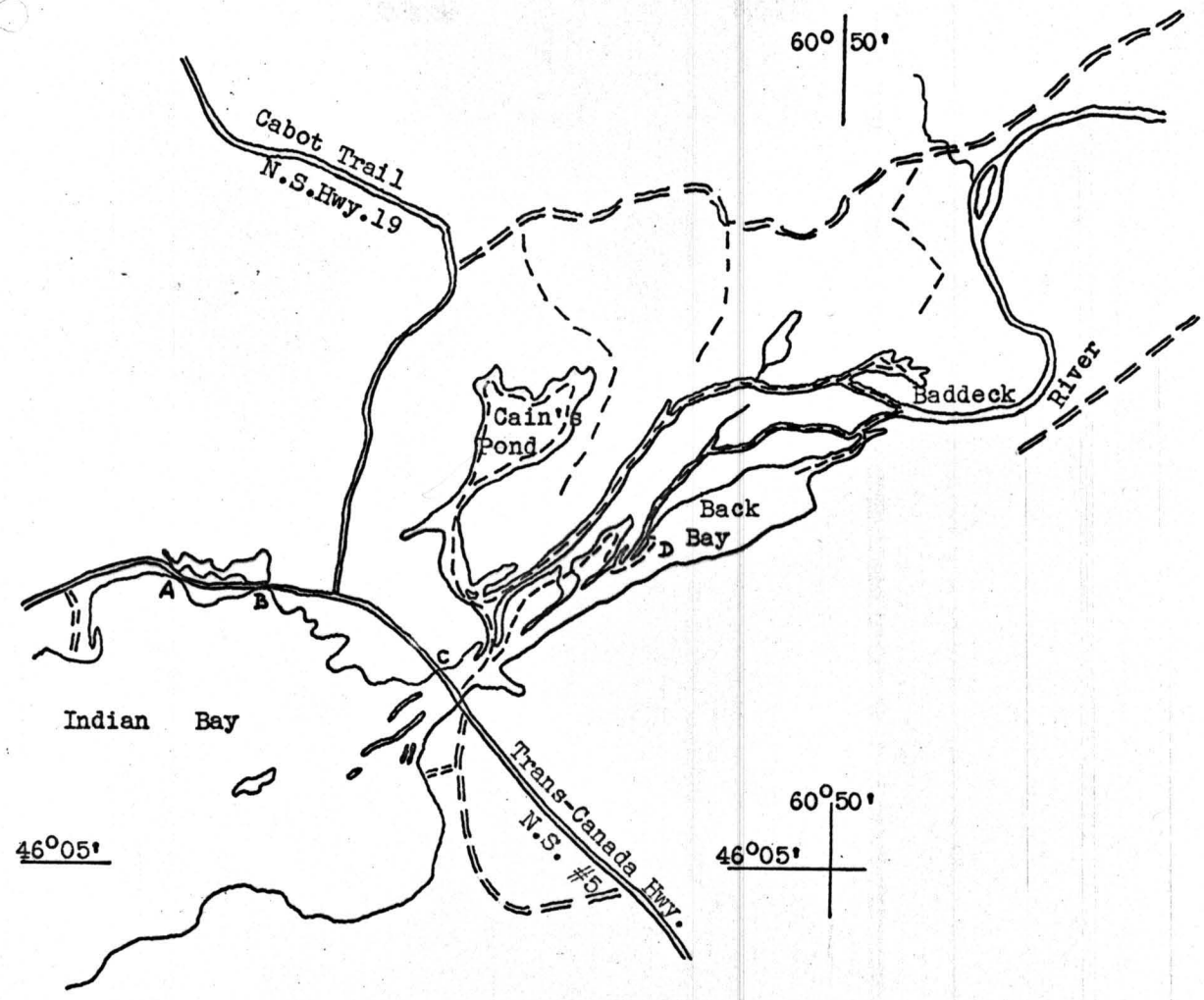
Approximate area: 213 acres

MIDDLE RIVER

"Rapid" survey - spot counts from car on road at A-D inclusive.

"Intensive" survey - as above, plus either canoeing as shown by broken line or walking shoreline of main island of delta.

Remarks: The southern branch of the river could be forded in hip boots except during spring freshet, just below the head of the delta.



BADDECK RIVER

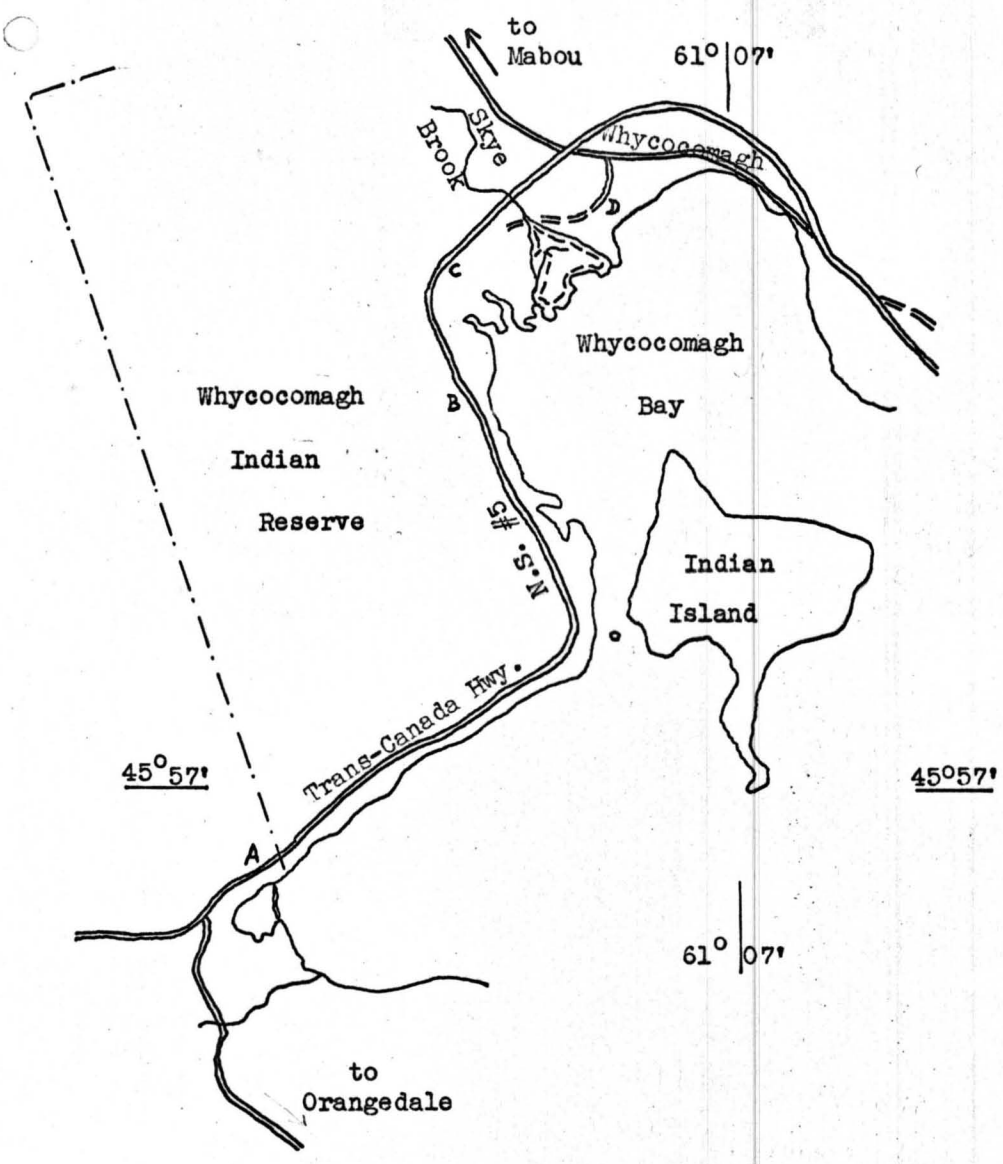
Scale: 1 inch = about 0.5 miles
(1:32,700)

Approximate area: 380 acres

"Rapid" survey - not representative.

"Intensive" survey - spot counts from car on road at A, B, and C, plus canoeing as shown by broken line. The marsh along the north side of "Back Bay" was surveyed on foot during the summer surveys.

Remarks: The direction of the canoe trip depended upon the direction and strength of the wind, to permit the stretch from C to D to be done with the wind if possible (the wind was usually either east or west). Strong west winds raised the water level in the marsh. There is no appreciable tidal change in the Bras D'Or Lakes.



WHYCOCOMAGH

Scale: 1 inch = about 0.5 miles
(1:32,700)

Approximate area: 69 acres

"Rapid" Survey - spot counts from car on road at A, B, C, and D;

"Intensive" survey - as above, plus walking around the delta of Skye Brook as shown by broken line. The area west of the brook was only covered during brood surveys, and only then if a second observer was present. Hip boots were not needed in summer except in case of heavy dew.

RIVER INHABITANTS

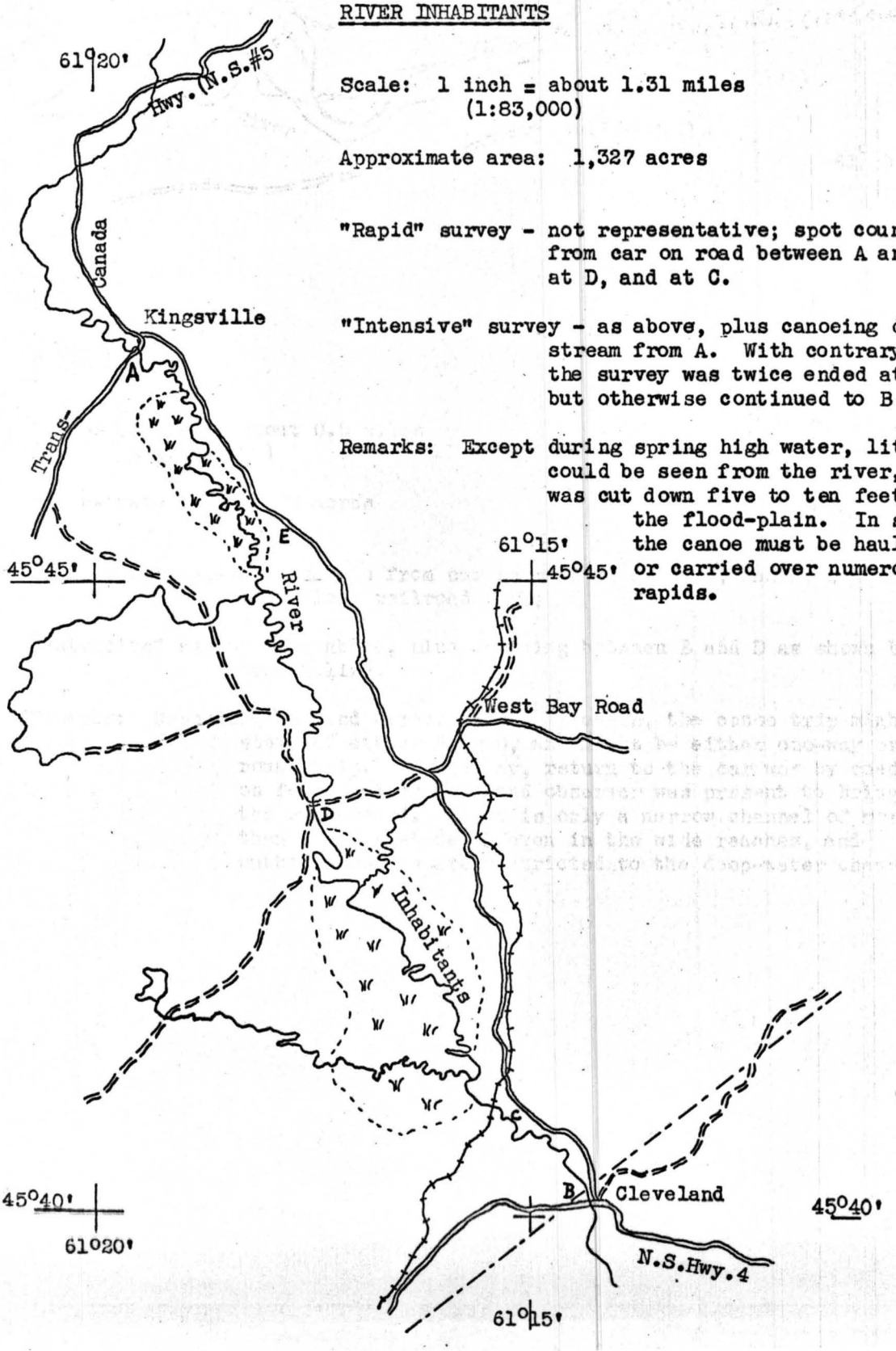
Scale: 1 inch = about 1.31 miles (1:83,000)

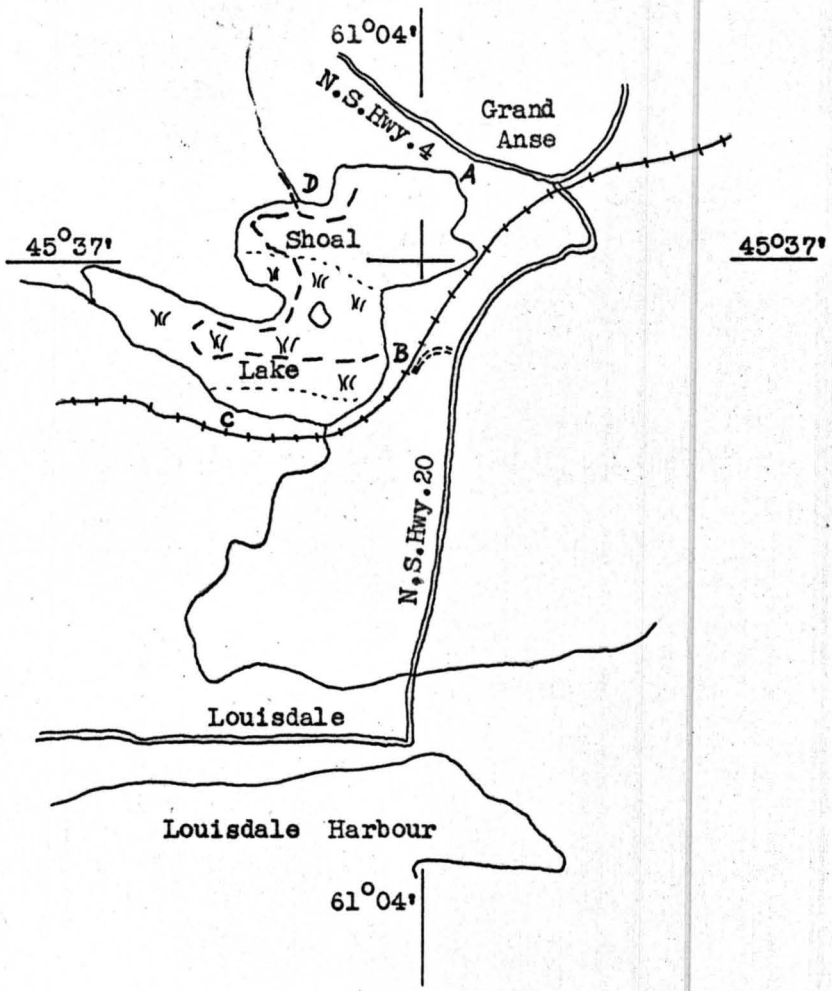
Approximate area: 1,327 acres

"Rapid" survey - not representative; spot counts from car on road between A and E, at D, and at C.

"Intensive" survey - as above, plus canoeing downstream from A. With contrary winds, the survey was twice ended at D, but otherwise continued to B or C.

Remarks: Except during spring high water, little could be seen from the river, which was cut down five to ten feet below the flood-plain. In summer, the canoe must be hauled or carried over numerous shallow rapids.





SHOAL LAKE

Scale: 1 inch = about 0.2 miles
(1:20,000)

Approximate area: 92 acres

"Rapid" survey - spot counts from car on road at A and B;

"Intensive" survey - as above, plus count on foot along railroad from B to C. In summer, the canoe was used, as shown by the broken line, between B and D.

Remarks: The lake was grown up with aquatic vegetation too dense in many areas to permit easy travel by canoe, but not solid enough to permit walking. B was the only place where one could conveniently get a canoe to the shore.

Project Control

PROJECT HISTORY SHEET

Project No. 02-1-11 Date 9/10/64

Title Cape Breton Island Waterfowl Studies

Investigator A. J. Erskine

Date of approval of project plan 1961

Date of submission of progress report November 30, 1963

THIS HISTORY SHEET ACCOMPANIES: (check one)

Project Plan _____ Progress report _____

Completion report X Draft manuscript _____

Proposal for shift of emphasis _____

Other (describe) _____

a) PUBLICATIONS AND REPORTS ARISING FROM THE PROJECT: (Bibliographic references; proposed titles)

See "References" at end of report ; also Erskine, A.J., 1962. "Cape Breton Waterfowl Studies". Unpub.report, C.W.S. pp. 21

b) PAPERS DELIVERED: "Cape Breton Island Waterfowl Studies", N.E.Wildlife Conference, Hartford, CONN., Jan. 21, 1964

c) PUBLICATIONS OR PAPERS PROPOSED: _____

FINANCIAL STATUS (to be completed at Ottawa)

Year	Investigator	Estimate	Disbursement	Cost to date
62-3	A.J.Erskine	$215.00	$209.00	$209.00
63-4	A. J. Erskine	$215.00	$97.37	$306.37
64-5	A. J. Erskine	-	-	$306.37

PROJECT COMPLETION REPORT

CAPE BRETON ISLAND WATERFOWL STUDIES

Designation: O 2-1-11,3,1963 (formerly O-1-30 or O 2-1-38)

Personnel: A. J. Erskine, assisted by R. S. Gibbon on summer surveys in 1961 and 1963. S. B. Macleod, of N. S. Department of Lands and Forests, made independent brood surveys on some areas in 1962.

Objectives: The purpose of this study was to establish procedures giving the greatest amount of useful data on spring and summer waterfowl populations in the least amount of time. At the same time, survey data were to be kept comparable to those from previous years, to permit detection of population trends.

Introduction: Waterfowl population studies are one of the duties of Canadian Wildlife Service biologists. Since waterfowl surveys are at present accorded relatively low priority, and since time spent on them might be used for other projects with higher priorities, it is essential that survey procedures be designed for maximum economy of time and effort.

Surveys to assess waterfowl population trends in the Maritimes were made each year since 1949. Coverage was extremely variable, for a number of reasons, and there was little continuity of comparable data. Although nearly all parts of the Maritimes were surveyed at some time between 1949 and 1960, no attempt was made to put the surveys on a statistical basis. By 1960, it was obvious that waterfowl surveys in the Maritimes did not provide,

and probably never had provided, adequate numerical data on the status of waterfowl there (A.J.Erskine,verbal report, meeting of C.W.S. ornithologists from eastern Canada, Ault Island, Ont., Oct. 18-20,1960).

At the 1960 meeting on Ault Island, it was suggested that Erskine make a study of procedures for spring and summer waterfowl surveys with the aims of ensuring economy of time and effort and, if possible, of improving their representativeness. No formal project plan was then required, nor was it suggested that the project should be based on a statistical sampling plan. Since Erskine was committed to work on another project in Cape Breton Island, economy of time dictated that the new project also be located in eastern Nova Scotia. Other time commitments determined that manipulation of survey procedures be restricted to the spring surveys, and that field-work on the project be completed in 1963. Funds in the general waterfowl survey project, now designated O 2-1-1, permitted work on the new project to start in 1961.

Materials and Methods: Waterfowl species which breed in Cape Breton Island include Black Duck, Green-winged Teal, Blue-winged Teal, Wood Duck, Ring-necked Duck, Common Goldeneye, Common Merganser, and Red-breasted Merganser (Godfrey, 1958; Erskine, 1964). Mergansers are the subject of a special study in Cape Breton (Project O 2-4-1), and are not discussed in this report.

Equipment used in this project included a car, a canoe, hip waders, binoculars, and a telescope. An electric outboard motor was used with the canoe during windy weather in May 1961

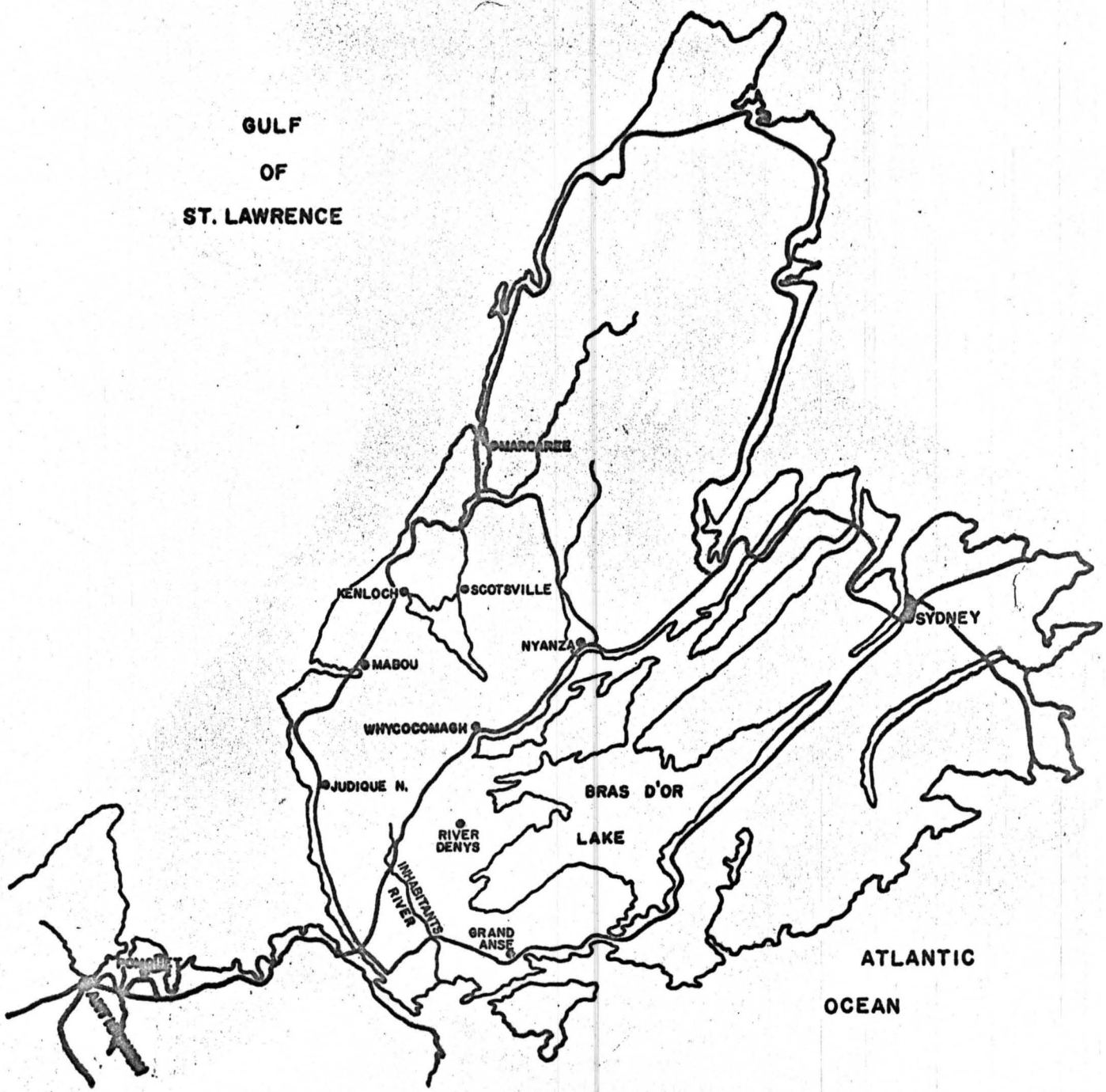
but not thereafter. An aeroplane (Piper Tri-Pacer) was provided by the Nova Scotia Department of Lands and Forests for an aerial survey in May, 1961.

Areas where waterfowl surveys were made in spring and summer in 1961-63 are shown in Figure I. Antigonish and Pomquet are on the Nova Scotia mainland, about 25 miles from the nearest part of Cape Breton Island. Data from those areas have been included throughout without further qualification. McCormack and Loch Ban are combined as Kenloch, and Baddeck and Middle Rivers as Nyanza, on the map and in some previous reports. Shoal Lake (at Grand Anse) and River Inhabitants were not surveyed for this study after 1961. Brief descriptions of the areas follow:

Antigonish	tidal estuary; brackish to fresh
Pomquet	pond at head of tide; brackish to fresh
Judique	barrier-beach ponds; brackish
Mabou	tidal estuary; salt
McCormack	lakeshore and marsh; fresh
Loch Ban	lakeshore and marsh; fresh
Scotsville	lake and river; fresh
Margaree	river and marsh; fresh to brackish
Baddeck River	river delta; brackish to fresh
Middle River	river delta; brackish
Whycocomagh	lakeshore and marsh; brackish
River Denys	river and marsh; brackish
Shoal Lake	bog and lake; fresh
River Inhabitants	river; fresh

To follow page 3

FIGURE 1. LOCATION OF WATERFOWL SURVEYS, CAPE BRETON ISLAND 1961–63



Results of ground surveys made on May 6-9, May 16-21, and May 29-June 2, 1961, were compared to determine the most suitable date for spring surveys.

Survey methods were compared on the two later surveys in the spring of 1961. The main comparison was between numbers of waterfowl seen from one or more vantage points adjacent to each study area, or "rapid" survey, and those counted while the observer walked or canoed along the shoreline of the study area, or "intensive" survey. The "intensive" survey immediately followed the "rapid" count, and included all birds seen on the latter.

The study areas were surveyed from the air on May 25-26, 1961. The results were compared with those from "intensive" counts on May 16-21 and May 29-June 2, to find out what proportion of the ducks known to be present were observed on the aerial survey.

In 1962, results of surveys made either before 0900 hours or after 1800 hours, "twilight" counts, were compared with those from surveys made between 0900 hours and 1800 hours, "daytime" counts. Each study area was surveyed by the "intensive" method once at "twilight" and once in the "daytime", between May 21 and May 29, the two surveys of any area being made on the same day or on consecutive days except when weather unsuitable for surveys intervened.

In 1963, each study area was covered three times by the "intensive" method, at the same time of day, on three consecutive days between May 21 and June 3. Comparison of results of those surveys permitted an assessment of replicability.

Brood surveys were carried out each year between late June and mid-August. The "intensive" survey was used throughout, and surveys were made at "twilight" when it was feasible to do so. Each area was surveyed twice, and most areas a third time, in each year. Dates of those surveys were June 22-July 11, July 19-24, and August 3-15, 1961; July 3-13, July 20-31, and August 13-18, 1962; and June 22-July 2, July 18-22, and August 4-6, 1963.

Weather and waterfowl breeding: Pertinent weather data for 1961-63, compared to long-term averages, are shown in Table I.

Table I. Weather data for 1961-63 compared with 10 year average, Baddeck, Nova Scotia

	Snowfall in preceding winter (inches)	Monthly mean temperatures (°F)					Total precipitation (inches)		
		March	April	May	June	July	May	June	July
1961	117.0	25	36	47	59	63	7.9	5.2	1.4
1962	90.9	31	38	45	55	58	1.7	1.8	7.5
1963	95.2	26	33	48	54	65	3.0	2.1	1.7
average 1951-60	98.2	30	39	49	58	66	4.0	3.3	3.0

No one weather station is properly representative of all the study areas. Snowfall accumulations are much greater on and around the Cape Breton plateau than at Baddeck, and run-off from the plateau is correspondingly greater. Average snowfall values at Cheticamp, Ingonish Beach, Margaree Forks, and North East Margaree

are 193, 139, 127, and 114 inches, based upon 2, 5, 3, and 6 years' data respectively. Temperature inversions, in narrow valleys cut into the plateau, tend to slow spring run-off and to delay development of vegetation.

In 1961, a late and cold spring following a heavy accumulation of snow led to a late and prolonged run-off, but the summer was warm and very dry. The early spring of 1962 was warm, but May was very cold. The summer was cool, and July was extremely wet. The spring of 1963 was similar to that of 1961, with heavy snows in April. The summer was generally dry, and cold except for a three-day heat wave in late July. Waterfowl breeding was late in the cold springs of 1961 and 1963, but summer conditions favoured brood survival in those years. Summer conditions in 1962 were considered to be unfavourable, particularly for late-nesting species.

Results: 1) Timing of the spring survey. Results of the spring surveys in 1961 are compared with the numbers of broods of each species found in summer in Table II. The number of broods, calculated by the method of Gollop and Marshall (1954, p.12), should approximate the number of successful pairs, and cannot be smaller than the actual number of pairs present on or near the study areas in spring.

Migrating ducks of most species were present on the study areas on May 6-9. Transient Green-winged Teal and Ring-necked Ducks were still present on May 16-21. The first Black Duck brood was seen on May 31, during the third survey.

Table II. Comparison of results of three spring surveys, with population estimate based on numbers of broods produced, Cape Breton Island, 1961

Species	Survey	No. of pairs	Total no. of adult ducks	Total no. of broods (estimated)
Black Duck	1st	8	88	
	2nd	18	61	13
	3rd	10	79	
Green-winged Teal	1st	7	114	
	2nd	13	29	3
	3rd	2	6	
Blue-winged Teal	1st	0	0	
	2nd	5	16	13
	3rd	4	16	
Ring-necked Duck	1st	15	83	
	2nd	54	139	29
	3rd	44	119	
Common Goldeneye	1st	4	14	
	2nd	1	9	11
	3rd	2	4	

2) Comparison of "rapid" and "intensive" surveys. Results of the "rapid" and "intensive" surveys in the spring of 1961 are compared in Table III. No "rapid" survey was feasible at Baddeck River, and "intensive" counts from that area were omitted from the comparison. Survey time totalled 5 hr. 39 min. for the "rapid" coverage and 18 hr. 33 min. for the "intensive" count on the same areas during the second survey, and 5 hr. 38 min. and 18 hr. 45 min. during the third survey.

Table III. Numbers of ducks seen on "rapid" and "intensive" surveys on Cape Breton Island, N.S., in spring of 1961

Species	Number of ducks seen			
	2nd survey		3rd survey	
	"Rapid"	"Intensive"	"Rapid"	"Intensive"
Black Duck	47	61	54	72
Pintail (migrants)	2	2	0	0
Green-winged Teal	11	29	1	5
Blue-winged Teal	5	16	4	11
Wood Duck	2	2	0	0
Ring-necked Duck	106	123	54	74
Common Goldeneye	9	9	5	6

About three-quarters of the Black Ducks, Ring-necked Ducks, and Common Goldeneyes seen on the "intensive" surveys were found by the "rapid" coverage. Less than half of the teal were found by the "rapid" coverage.

3) Comparison of aerial and ground surveys. Results of the aerial survey in 1961 are compared to those of ground surveys in the same spring in Table IV. Shoal Lake was not surveyed from the air, and was omitted from the comparison. Survey time on the aerial count totalled 0 hr., 55 min., compared to an average of 20 hr.,26 min.on the two ground counts. An aircraft was not available in Cape Breton Island that spring, and ferrying to

and from the study areas accounted for about 70 per cent of the total flying time.

Table IV. Numbers of ducks seen on aerial and ground surveys on Cape Breton Island, N.S., in spring of 1961

Species	Number of ducks seen	
	Aerial survey	Mean of "intensive" counts on 2nd and 3rd ground surveys
Black Ducks	22	65
Ring-necked Duck	23	86
Common Goldeneye	7	8
teal (both species)	0	26

About 25-35 per cent of Black Ducks and Ring-necked Ducks seen on the "intensive" ground counts were found by the aerial survey. Common Goldeneyes were readily seen from the air, but no teal of either species were identified on the aerial survey.

Data collected in Prince Edward Island in 1960 provide a similar comparison. C. O. Bartlett (unpubl.data) found that an aerial survey recorded 81 per cent of the Black Ducks detected on ground surveys, 25 per cent of the teal, 10 per cent of the Ring-necked Ducks, and about 41 per cent of the Mallards, Pintails, and American Widgeons.

4) Comparison of "daytime" and "twilight" counts. Results of the "daytime" and "twilight" surveys made in the spring of 1962 are shown in Tables V and VI.

Table V. Numbers of ducks of each species seen on "daytime" and "twilight" surveys on Cape Breton Island, in spring of 1962

Species	Number of ducks seen							
	"Daytime"				"Twilight"			
	Pairs	Singles	Flocked	Total	Pairs	Singles	Flocked	Total
Black Duck	11	11	15	48	17	12	27	73
Green-winged Teal	1	1	1	4	2	0	0	4
Blue-winged Teal	8	6	1	23	10	7	2	29
Ring-necked Duck	61	0	30	152	52	0	16	120
Common Golden-eye	2	0	10	14	2	0	7	11
other species	0	0	1	1	1	0	0	2

Table VI. Numbers of ducks seen on each study area on "daytime" and "twilight" surveys on Cape Breton Island, N.S., in spring 1962

	Number of ducks seen							
	"Daytime"				"Twilight"			
	Pairs	Singles	Flocked	Total	Pairs	Singles	Flocked	Total
Antigonish	4	2	0	10	7	3	6	23
Pomquet	2	0	0	4	2	1	1	6
Judique	7	5	0	19	11	4	0	26
Mabou	2	0	18	22	1	1	16	19
Margaree	4	6	1	15	7	2	1	17
Baddeck Rv.	13	0	8	34	11	1	2	25
Middle Rv.	4	2	1	11	8	2	5	23
Whycocomagh	4	2	0	10	4	4	0	12
River Denys	8	1	15	32	9	1	11	30
Scotsville	3	2	0	8	4	2	2	12
Loch Ban	12	2	5	31	11	1	2	25
McCormack	20	3	3	46	10	1	2	23

Most Ring-necked Ducks flushed at Loch Ban flew in the direction of McCormack, and vice versa. Duplication was suspected in "daytime" counts on those areas.

5) Replicability of spring survey results. Results of three comparative counts in 1963 are given in Tables VII and VIII.

Table VII. Numbers of ducks of each species seen on three spring surveys on Cape Breton Island, N.S., in 1963

Species	Number of ducks seen											
	1st survey				2nd survey				3rd survey			
	Pairs	Singles	Flocked	Total	Pairs	Singles	Flocked	Total	Pairs	Singles	Flocked	Total
Black Duck	7	7	9	30	7	6	12	32	9	8	18	44
Green-winged Teal	1	2	2	6	3	0	3	9	0	1	0	1
Blue-winged Teal	3	7	3	16	5	7	3	20	4	7	0	15
Ring-necked Duck	33	2	28	96	27	5	14	73	35	5	12	87
Common Golden-eye	1	1	0	3	1	3	0	5	1	2	0	4
other species	0	1	0	1	0	1	0	1	0	0	0	0

Table VIII. Numbers of ducks seen on each study area on three spring surveys on Cape Breton Island, N.S., in 1963

Area	Number of ducks seen											
	1st survey				2nd survey				3rd survey			
	Pairs	Singles	Flocked	Total	Pairs	Singles	Flocked	Total	Pairs	Singles	Flocked	Total
Antigonish	2	1	10	15	4	0	5	13	3	2	0	8
Pomquet	1	0	2	4	0	0	0	0	0	0	0	0
Judique	3	0	3	9	2	1	2	7	4	2	0	10
Mabou	0	0	0	0	0	1	0	1	1	0	0	2
Margaree	3	6	0	12	2	5	0	9	1	5	1	8
Baddeck R.	8	3	8	27	5	2	7	19	11	4	3	29
Middle R.	2	2	4	10	2	2	5	11	3	2	8	16
Whycocomagh	3	2	0	8	3	3	4	13	2	2	0	6
River Denys	10	1	11	32	13	2	7	35	11	0	16	38
Scotsville	3	1	0	7	3	2	0	8	3	4	0	10
Loch Ban	5	2	0	12	3	0	3	9	1	2	0	4
McCormack	6	1	8	21	6	3	0	15	9	0	2	20

Ducks flushed at Middle River were seen flying to Baddeck River, and vice versa. Movements between Loch Ban and McCormack were also seen.

6) Relative effectiveness of the summer surveys. The numbers of duck broods seen each year in 1961-63, with the total number of broods estimated to have been present each year, are shown in Table IX.

Table IX. Number of duck broods (all species combined) seen on each summer survey on Cape Breton Island in 1961-63. The 2nd survey in 1962 and the 3rd in 1963 were incomplete. The total number was estimated by the method of Gollop and Marshall (1954)

Year	Number of broods seen			
	1st survey	2nd survey	3rd survey	Total (est.)
1961	17	47	38	67
1962	26	15	27	58
1963	19	40	42	66

7) Comparison of species composition on spring and summer surveys. Results of spring and summer surveys in 1961-63 are compared in Tables X and XI. The number of ducks seen on the spring survey differs from those listed in Tables III, V, and VII, because comparative data for some areas were lacking. Only areas covered in both spring and summer in all three years are included in Table X.

Table X. Numbers of ducks seen on spring surveys and of duck broods seen on summer surveys, Cape Breton Island, N. S., 1961-63

Species	Number of ducks seen			Number of broods seen		
	1961	1962	1963	1961	1962	1963
Black Duck	49	54	41	13	15	12
Green-winged Teal	4	4	1	2	2	4
Blue-winged Teal	13	21	9	13	11	11
Ring-necked Duck	106	120	86	26	23	29
Common Goldeneye	6	7	4	9	2	6
Total	178	206	141	63	53	62

Table XI. Species composition of ducks seen on spring surveys and of duck broods seen on summer surveys, Cape Breton Island, N.S., 1961-63

Species	% of total ducks seen			% of total broods seen		
	1961	1962	1963	1961	1962	1963
Black Duck	27.6	26.2	29.1	20.6	28.3	19.4
Green-winged Teal	2.2	1.9	0.7	3.2	3.8	6.5
Blue-winged Teal	7.3	10.2	6.4	20.6	20.8	17.8
Ring-necked Duck	59.6	58.2	61.0	41.3	43.4	46.8
Common Goldeneye	3.4	3.4	2.8	14.3	3.8	9.7

Similar data on species composition were obtained in 1955, and 1960, (Erskine,1961, Table IV).

8) Breeding success. The ratio of broods seen in summer to pairs seen in spring on the same areas should give an indication of the success of nesting. The ratios for 1961-63 are shown in Figure II. Data on brood survival are inadequate for comparisons, since the samples are too small, and since combining of broods frequently lead to a larger average number of young in older broods than in younger broods.

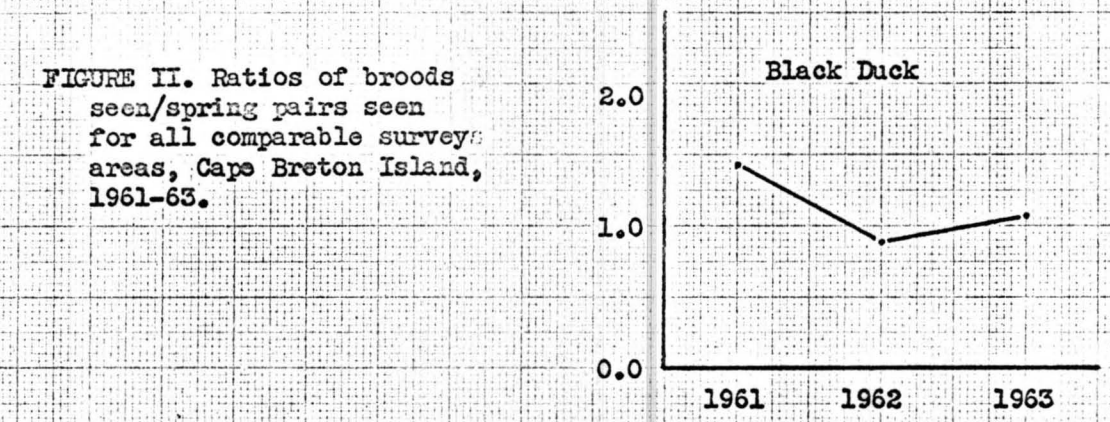
9) Detection of population trends. Some areas in Cape Breton Island have been surveyed each spring since 1955, and others in several of those years. Trends in the numbers of ducks seen in spring are shown in Figure III.

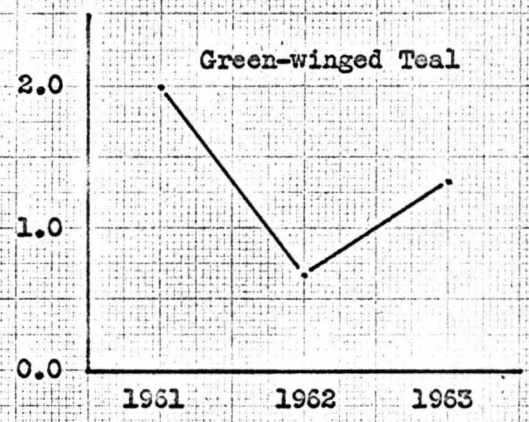
The 1956 and 1957 survey dates were probably not comparable phenologically to survey dates in other years.

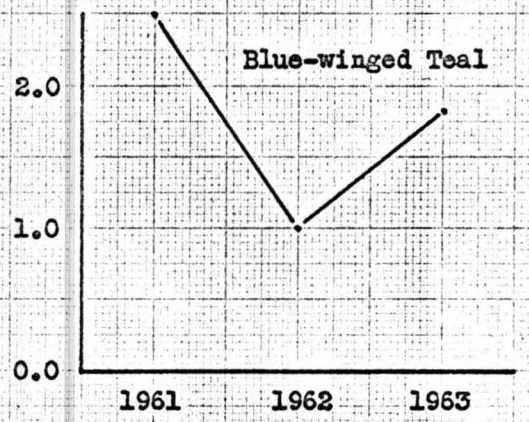
Numbers of broods reported on summer surveys also provide some information upon trends in waterfowl breeding populations. Some data are given in Table XII.

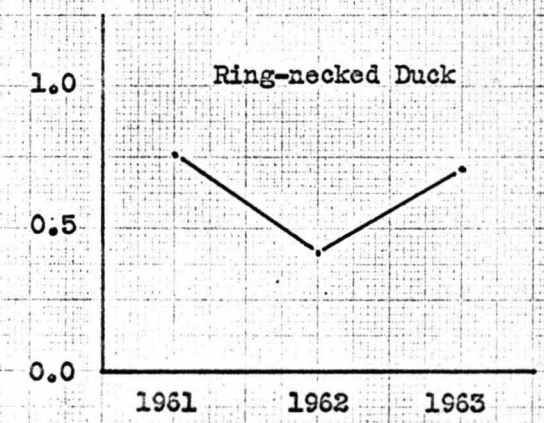
To follow page 16

FIGURE II. Ratios of broods seen/spring pairs seen for all comparable survey areas, Cape Breton Island, 1961-63.









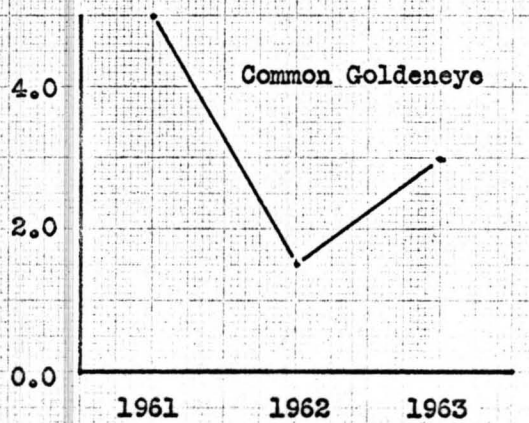


FIGURE III. Number of ducks (all species combined) seen on spring surveys, Cape Breton Island, 1955-63.

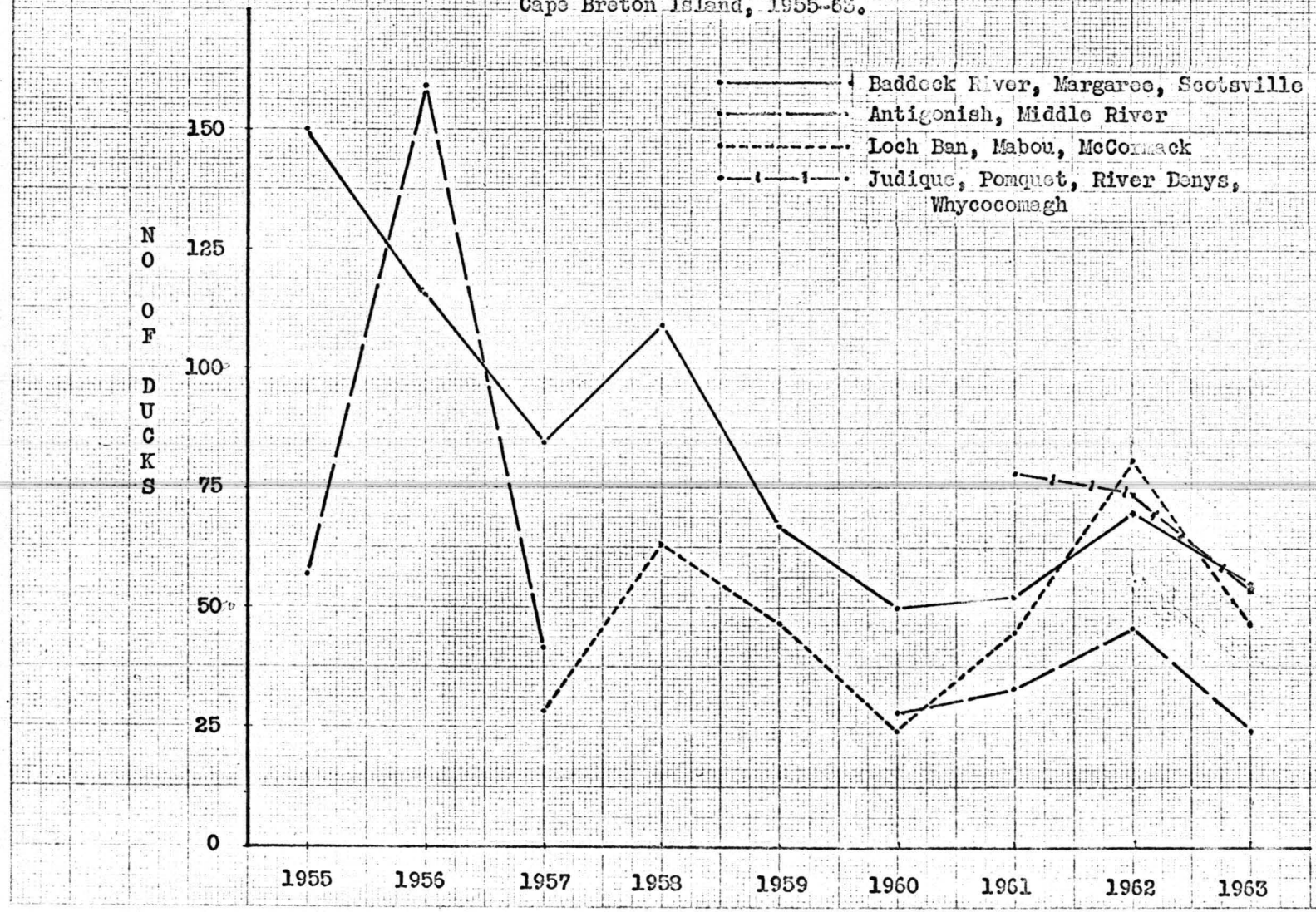


Table XII. Numbers of waterfowl broods seen at Nyanza and in other areas in eastern Nova Scotia, 1952-63

Year	Number of broods(all species)		
	at Nyanza		Mabou, Scotsville, Margaree, Whycocomagh, Antigonish
	Baddeck R.	Middle R.	
1952	22	No data	No data
1955	26	23	14
1956	8	11	5
1960	12	2	9
1961	12	3	14
1962	11	2	21
1963	11	6	19

The 1956 brood survey was made too early to detect broods of late-nesting species.

10) Comparison of waterfowl studies in Cape Breton with others in the Maritime Provinces. Data on species composition in Cape Breton Island were presented in Table XI. Similar data for Prince Edward Island, and for the St. John River marshes in New Brunswick, are presented in Tables XIII and XIV.

Table XIII. Waterfowl observed on spring surveys and broods seen in the summer, on Prince Edward Island, 1957-60, from Bartlett (1961) with merganser data omitted

Species	Adults seen in spring		Broods seen in summer	
	Number	Per cent composition	Number	Per cent composition
Black Duck	367	45.0	172	46.5
Pintail	51	6.2	28	7.6
Green-winged Teal	31	3.8	9	2.4
Blue-winged Teal	203	24.9	110	29.7
American Widgeon	80	9.8	24	6.5
Ring-necked Duck	72	8.8	25	6.8
Common Goldeneye	10	1.2	1	0.3
others (Mallard, Shoveler)	2	0.2	1	0.3

Table XIV. Waterfowl observed on spring surveys, and broods seen in summer, on St. John River marshes, N.B., 1957-59, from Canadian Wildlife Service surveys May 5-12 and July 3-15, and Northeastern Wildlife Station surveys July 16-August 17

Species	Adults in spring		Broods in summer			
	C.W.S.		C.W.S.		N.E.W.S.	
	Number	% composition	Number	% composition	Number	% composition
Black Duck	1450	54.2	38	31.9	40	28.7
Green-winged Teal	43	1.6	6	5.0	11	6.3
Blue-winged Teal	105	3.9	6	5.0	46	26.1
Wood Duck	60	2.2	18	15.1	18	10.2
Ring-necked Duck	343	12.8	3	2.5	31	17.6
Common Goldeneye	477	17.8	48	40.4	26	14.8
others(Mallard, Pintail, Widgeon)	193	7.2	0	0	4	2.3

DISCUSSION

1) Timing of the spring survey. Boyer (1955) recommended that the spring survey in Cape Breton Island be made about May 10-15, which, in an average year,would be phenologically equivalent to the time of the second survey in 1961. The results of the first and second surveys in 1961 were of little use as indices of local breeding populations because many migrant ducks were present them. Migrants were believed to have moved away before the third survey, which was

made about the time of appearance of the first Black Duck broods. Recent surveys in Prince Edward Island (C.O.Bartlett,pers.comm.) have also been made about the time that the first Black Duck broods were appearing. That timing seems to be optimum for spring surveys in Cape Breton Island.

2) Comparison of "rapid" and "intensive" surveys. If the survey results are to serve as indices to breeding populations, rather than as measures of total population on particular areas, the "rapid" survey is as useful as the more time-consuming "intensive" survey, for Black Ducks and Ring-necked Ducks. The "intensive" method may be necessary to provide indices for teal of either species, but even that method did not show more than a fraction of the total breeding population of Blue-winged Teal and Common Goldeneye.

3) Comparison of aerial and ground surveys. The same comment applies to aerial surveys as to the "rapid" ground survey. The aerial survey is perhpas as useful as a ground survey, if only a population index is desired, and if the teals are ignored. The lack of aircraft in Cape Breton Island made for an uneconomically large amount of ferrying time.

4) Comparison of "daytime" and "twilight" counts. There did not seem to be any important differences in the number of ducks seen in the middle of the day and in the early morning or evening, except perhaps for Black Ducks, which were seen more frequently on the "twilight" counts (see also next section).

5) Replicability of spring survey results. The results of the three surveys were surprisingly similar, considering the likelihood of movement between areas and consequent duplication of counts.

6) Relative effectiveness of the summer surveys. In summer, it is quite unusual to find on a single survey all of the broods produced on an area. That is partly a consequence of staggered breeding schedules, whereby early-hatched Black Ducks are flying before late nests of Ring-necked Ducks are hatched, and partly because plant growth hampers visibility in summer. Possibly one summer survey during July might provide a useful brood index, but replicability of summer surveys has not been tested.

7) Comparison of species composition on spring and summer surveys. As noted above (Section 2), the spring surveys consistently under-estimate the proportion of Blue-winged Teal and Common Goldeneye in the total breeding population. Goldeneyes were probably absent from the study areas at the time of the spring surveys. They usually nest along rivers, but they later bring their young to the estuaries, where most of the study areas were located. The spring Ring-necked Duck counts are much larger than the final number of broods produced. Large groups of Ring-necked Ducks, including females as well as drakes, have been noted in summer on some study areas in Cape Breton. Pro-

bably the spring counts of that species included birds which did not breed, or which did not attempt to re-nest after a first nesting attempt failed.

8) Breeding success. Data in Figure II suggest that nesting success was relatively poorer for all species in 1962 than in 1961 or 1963, and rather less good in 1963 than in 1961. Brood survival data are inconclusive, and Common Goldeneye was the only species which had markedly poor breeding success in 1962. The weather in July 1962 was both cold and wet, conditions likely to be unfavourable for both nesting and brood survival.

9) Detection of population trends. Figure III shows that trends on different areas were generally parallel. Total numbers of ducks seen on spring surveys decreased from 1955 to 1959, and have remained relatively constant since then.

Data in Table XII suggest that the decline was most conspicuous in, if not actually restricted to, the Nyanza area. Numbers of Black Duck and Green-winged Teal broods seen at Middle River, and of Ring-necked Duck broods and probably of Common Goldeneye broods at Baddeck River, were markedly lower in 1960-63 than in 1955. The 1956 surveys, which were made before the main hatch of Ring-necked Ducks, suggest that the decrease may not have begun until after that year.

The upward trends in spring counts in 1961 and 1962 would seem reasonable after favourable breeding conditions in 1960 and 1961, and the downward trend observed in the spring of 1963 is also well-correlated with the adverse conditions in the summer

of 1962. There are no useful data on fall migrations and hunting success in Nova Scotia to suggest whether or not local hunting pressure might influence the number of ducks returning to breed in the following spring.

10) Comparison of waterfowl studies in Cape Breton with others in the Maritimes. There was good agreement in species composition of broods and of spring adults in Prince Edward Island, but not in either Cape Breton Island nor in the St.John River marshes. The timing of the spring surveys on the St. John area did not correspond with the phenological dates used in the other areas, and neither brood survey there covered the entire brood season. Even with such unsatisfactory data, it seems certain that waterfowl species composition does differ markedly between study areas, probably at least partly in response to differences in habitat. Other areas in the Maritimes might show yet other species compositions. The Black Duck is everywhere one, if not the only, major species, and one or more of the other species may be lacking in areas with waterfowl breeding densities lower than those on the three areas discussed above.

SUMMARY AND CONCLUSIONS

Waterfowl breeding populations in Cape Breton Island, N.S., have been studied by the Canadian Wildlife Service since 1955. The object of intensive studies since 1960 has been to select survey techniques for obtaining the greatest possible amount of population data on breeding waterfowl in the least possible time.

It is hoped that some of the conclusions of this study will find application in other parts of eastern North America.

The spring pair survey is probably the most useful single survey. It requires less time per unit area than any useful brood survey, and may even be made from aircraft over areas otherwise inaccessible, once adequate air to ground comparisons have been made. Data from spring pair surveys have a fairly consistent relationship to summer data if allowance is made for the effects of weather on breeding success. The principal drawback is that certain species, particularly the teals, are not seen in proportion to their numbers even by intensive surveys in spring. That may be partially compensated for if adequate data on species composition are available for an area. Brood surveys give the most accurate data on species composition, and almost the only data on breeding success. However, they are exceedingly time-consuming, as each area must be covered carefully two or even three times each summer, and as a result brood surveys can hardly be made on an extensive basis. Complete brood survey data cannot be made available in time for administrative use in the setting of seasons and bag limits.

Spring pair surveys are best made about the time of appearance of the first Black Duck broods, in order to avoid confusion of migrants with the local breeding population. The phenological date of the spring survey must be held constant if the data obtained are to be comparable.

If adequate data are available for relating results of aerial surveys to the actual waterfowl population, the more rapid procedure is to be preferred for spring surveys, the more so since it is applicable on an extensive basis, and according to statistically designed sampling plans.

Intensive ground surveys have been shown to be replicable. The time of day of surveys seems to be relatively unimportant, in spring.

No one summer survey gives adequate data on brood production. No direct effects of weather or water conditions on breeding success were established. However, the ratio of broods to spring pairs was markedly poorer in 1962, when the weather in July was cold and wet, than in other years. Breeding schedules were apparently later in cold springs, but brood samples were too small to define hatching peaks precisely, and no clear correlation of breeding schedules with spring weather conditions has been established.

Brood surveys give the best available data on species composition in the breeding population, but species composition varies markedly between areas. The variation in species composition found in various parts of the Maritimes makes it difficult if not impossible to select a few representative survey areas. To adequately assess year-to-year fluctuations in waterfowl populations on an extensive basis, all major regions may have to be studied, including both high and low density areas, and both inland and coastal localities.

References cited

Bartlett, C.O. 1961. Some characteristics of black duck populations on Prince Edward Island. Paper presented at Northeast Wildlife Conference, Halifax, June 12-14,1961; 21 pp.

Boyer, G.F. 1955. Cape Breton waterfowl studies. Unpublished report, Can. Wildlife Service; 19 pp.

Erskine, A.J. 1961. Cape Breton waterfowl studies. Unpublished report, Can.Wildlife Service, 23 pp.

_____ 1964. New bird records from Cape Breton Island, Nova Scotia. Can.Field Nat.,78:89-92.

Godfrey, W.E. 1958. Birds of Cape Breton Island, Nova Scotia. Can.Field Nat.,72:7-27.

Gollop, J.B., and W.H.Marshall. 1954. A guide for aging duck broods in the field. Mimeographed bulletin, Mississippi Flyway Council Tech. Session; 14 pp.

Appendix I. Number of ducks of each species seen on surveys on Cape Breton Island, spring 1961. Abbreviations used: pairs (p), single birds (s), and birds in flocks (f)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Antigonish	"rapid" 2nd	1p					
	"intensive"	1p		1p			
	"rapid" 3rd	12f					
	"intensive"	1p,12f					
Pomquet	"rapid" 2nd				3p,8s		
	"intensive"				4p,7s		
	"rapid" 3rd				1p,2s		
	"intensive"				2p,1s		
Judique	"rapid" 2nd	3p					
	"intensive	3p					
	"rapid" 3rd	2p,2s,4f		1s	1p,1s		
	"intensive"	2p,2s,4f		1s	1p,1s (also 6p,8s,on area not previously covered)		

(cont.)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Mabou	"rapid" 2nd "intensive"	1p 1p,1s					
	"rapid" 3rd "intensive"	10f 17f					
Margaree	"rapid" 2nd "intensive"	2p,7f 4p,7f	3p 3p	1s 1p,1s			
	"rapid" 3rd "intensive"	1s,10f 1s,10f		 1s,1f			
Baddeck Rv.	"rapid" 2nd "intensive"	1s 1s			4p,4s 11p,6s		
	"rapid" 3rd "intensive"	 7f	 1s	 2p,1s	 8p,5s		

(cont.)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Middle Rv.	"rapid" 2nd	1p,1s,4f			4p,4s	7f	
	"intensive"	1p,1s,4f	3p,1s	2p	4p,4s	7f	
	"rapid" 3rd	1s		2f	2p,1s	1p,1f	
	"intensive"	1p	1p	1s,2f	3p,2s,1f	1p,1f	
Whycocomagh	"rapid" 2nd	1p,1s,4f	1p,1s				
	"intensive"	1p,1s,4f	3p				
	"rapid" 3rd	1p			1p		
	"intensive"	1p		2p	1p		
River Denys	"rapid" 2nd	1s			16p,4s		
	"intensive"	1p,1s			16p,4s		
	"rapid" 3rd				8p,4s		
	"intensive"	1p			9p,7s		

(cont.)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Scotsville	"rapid" 2nd	1p			2p	1p	
	"intensive"	1p,1s			3p	1p	
	"rapid" 3rd					1p	
	"intensive"	1p				1p,1f	
Loch Ban	"rapid" 2nd	1s	1p		6p,6s		Pintail 1p
	"intensive"	1p,1s	1p,1s		9p,7s		1p
	"rapid" 3rd	4f			1p,1s		
	"intensive"	1p,5f			4p,1s		
McCormack	"rapid" 2nd	1p			2p,1s		
	"intensive"	1p,1s			4p,2s		
	"rapid" 3rd	1p	1s		3p		
	"intensive"	1p,1s (/ brood of 10)	1s		4p		

(cont.)

Area	Survey	Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Shoal Lake	"rapid" 2nd	1s		2s	6p,5s		Wood Duck 2s
	"intensive"	1p,1s	1p	1p,3s	7p,5s		2s
	"rapid" 3rd			1s	1p,2s		
	"intensive"		1s	1s	2p,2s		
River Inhabitants	"rapid" 2nd	2p,1s		2s			
	"intensive"	2p,1s	2p,1s	2s			Unknown 1s
	"rapid" 3rd						
	"intensive"	1p	1p				

Appendix II. Numbers of ducks of each species seen on surveys on Cape Breton Island, spring 1962. Abbreviations used: pairs (p), single birds (s), and birds in flocks (f)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Antigonish	mid-day	3p,2s (+ brood of 9)			1p		
	evening	3p,2s,4f		3p,1s,2f	1p		
Pomquet	mid-day				2p		
	morning	1f		1p,1s	1p		
Judique	mid-day	1p,4s (+ brood of 10)		2p	4p,1f		
	evening	3p,3s (+ brood of 10)			8p,1f		
Mabou	mid-day	1p,10f				1p,8f	
	morning	15f		1s		1p,1f	
Margaree	mid-day	1p,2s		3p,4s,1f			Canada Geese 2
	morning	2p	1p	3p,2s		1f	
Baddeck Rv.	mid-day		1p	1p,1s	11p,9f		
	evening	1p		1p	9p,3f		
Middle Rv.	mid-day	1p,1s	1f	1p	1p	1p	Oldsquaw 1s(migrant)
	evening	1p,1s	1p	1p	4p,1f	1p,5f	

(cont.)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Whycocomagh	mid-day	1s		1s	3p		Mallard 1s(with Black)
	morning	1p,2s		1p,2s	2p		
River Denys	mid-day	5f		1p	7p,10f	1f	
	evening	1p,1s,7f			8p,4f		
Scotsville	mid-day				3p,1f	1f	
	morning	1p,1s			3p,3f		
Loch Ban	mid-day	1p,1s			11p,6f		
	evening	1p,1s			10p,2f		
McCormack	mid-day	2p,1s	1s	1s	19p,3f		
	evening	3p,1s			6p,2f		

Appendix III. Number of ducks of each species seen on surveys on Cape Breton Island, spring 1963. Abbreviations used: pairs (p), single birds (s), and birds in flocks (f)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Antigonish	27 May	1p,1s,4f		1p,2f			
	28 May	2p,5f		2p(nest)			
	29 May	2p,1s		1p,1s			
Pomquet	27 May				1p,2f		
	28 May						
	29 May						
Judique	21 May	1p			2p,3f		
	22 May	2p			1s,2f		
	23 May	1p,1s			3p,1s		
Mabou	21 May						
	22 May	1s					
	23 May	1p					
McCormack	1 June	1s			6p,8f		
	2 June	1p,1s	1p		4p,2s		
	3 June				9p,2f		
Scotsville	1 June				2p	1p,1s	
	2 June				2p,1s	1p,1s	
	3 June	1s			3p,1s	2s	
Margaree	1 June	2s		2p,4s	1p		
	2 June	1p,1s		1p,4s			
	3 June	1s (/ brood)		1p,4s	1f		

(cont.)

Area	Survey	Ducks seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Baddeck Rv.	28 May	1s,5f		1s,1f	8p,1s,2f		
	29 May	3f		2s,1f	5p,1s,2f		
	30 May	2p,1s		2s	8p,1s,3f	1p	
Middle Rv.	28 May	1p	1s,2f	1s	1p,2f		
	29 May	1s	3f	1p,1s,2f	1p		
	30 May	1s,8f		1p	2p,1s		
Whycocomagh	21 May	1p,1s	1p,1s			1s	Mallard 1s with Blacks
	22 May	1p,1s,4f	2p				1s " "
	23 May	2p,1s	1s				
River Denys	21 May	1p		1s	9p,11f		
	22 May	1s		1p	12p,7f	1s	
	23 May	1p,10f		1p	9p,6f		
Loch Ban	1 June	2p,1s			3p,1s		
	2 June				3p,3f		
	3 June	1s			1p,1s		

Appendix IV. Numbers of ducks and broods of each species seen on surveys on Cape Breton Island, summer 1961. Abbreviation used: adults (a); broods classified according to Gollop and Marshall (1954)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Antigonish	29 June	48a,4♂II, 7Ia,3♂Ic	14a	4a			Wood Duck 1a
	19 July	18a,2IIb, 7IIb,4IIc	6a	2a,11Ib			
	14 Aug.	14a		4a,9III			
Pomquet	28 June				5a		
	19 July	2a		1a	4a		
	14 Aug.		1a	1a,6III			
Judique	28 June	3a			30a		
	16 July	6a,9Ib					
	20 July	1a,3IIa		1a	24a,9Ia, 3Ia		
	14 Aug.	30a	1a	7a,7III	5a,3Ic		
Mabou	28 June						
	20 July						

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	Other species
McCormack	10 July			1a,7Ia	76a,8Ia	2a,3Ia	Wood Duck 1a
	24 July	2a,5IIc, 6IIa	1a		103a,8Ic 7Ib,7Ic, 9Ib	3a,7Ib, 7IIb	
	14 Aug.	1a		2a,4IIb, 7III	96a,9IIa, 5IIb,3IIb, 1IIa,14II	2a,7III, 3Ic	
Loch Ban	10 July	2a,3IIc, 8IIa,2Ib	1a		22a,8Ia	1a,3Ic	
	22 July	4a			2a,8Ia, 18Ic		
	24 July	4a,3IIc, 11IIb	2a,4IIb		4a,18Ic	3a,3IIa	
	14 Aug.	6a			4a	1III,2III	

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Scotsville	23 June	1a			3a	4a,7Ib	Wood Duck 3a
	12 July	1a,5/II				1a,5IIa	
	22 July					1a,5IIb	
	9 Aug.	1a		1a,brood not ctd.or aged		1a,5III	
	14 Aug.				1a,6Ia		
Margaree	26 June	2a		5a	2a		
	2 July					1a,5IIa	
River Inhabitants	20 July		1a,1/III				
Shoal Lake	20 July	1a	1a	1a			

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Baddeck Rv.	22 June	1a		2a	18a,1 nest		Wood Duck 4a
	29 June		2a	4a		2Ib	
	11 July			2a	29a,1 nest 8Ia	1IIa	
	21 July			2a,7Ib, 7IIa	8a,9Ia, 8Ia,7Ic, 10Ic,7Ib (nest deserted)	2a,5IIa, 2Ib	
	15 Aug.		3a	13a,9III, 3III	6a,8IIc, 8Ic,7IIb, 8IIa,8IIa, 12IIc	2II	
Middle Rv.	29 June			3a			
	21 July	1a,5III		5a	1a		
	15 Aug.		3a	1a,10III	1a,6Ia		

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Whycocomagh	29 June	2a,9Ib	6a,10Ia	10a		3a	
	20 July		8IIa				
	21 July	1a,9IIb	3a	4a,6Ic, 4/Ia	19a,11Ia		
	15 Aug.	1a	ca.8 (flying young)	ca.10 flying young, 1a,4IIb	1a,5Ia/		
River Denys	29 June	5a		6a	19a		
	21 July	1a		9a,8Ib,	69a,2Ia, 7Ic,7Ia, 10IIa, 5Ia	2Ic-	Wood Duck 1a,9Ic
	15 Aug.		5a	1a,7III	5a,20IIa-b, 1Ia,7IIc, 6IIb,6IIb, 5IIb		

Appendix V. Number of ducks and broods of each species seen on surveys on Cape Breton Island, summer 1962. Abbreviation used: adults (a); broods classified according to Gollop and Marshall (1954)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Antigonish	4 July	6a,4IIb, 1IIa,8IIc		5a,6Ia			
	15 Aug.	56a		17a,5Ic			
Pomquet	5 July				5a		
	14 Aug.	1a			14a		
Judique	3 July	3a,1/Ia		4a	19a		
	14 Aug.	7a	18a	3a,4III	28a		
Mabou	3 July	8a					
	14 Aug.	18a,5III					

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
McCormack	9 July	5a			17a, 9Ia, 8Ia, 8Ia	6a	
	30 July	2a,3IIb 5III	2a		134a,5IIb, 4IIb,7IIa, 7IIb	1a,1IIa	Wood Duck 1a
	18 Aug.	3a			12a,1IIc, 4IIb,4IIc, 6IIb,2IIc		
Loch Ban	9 July	2a,6Ib, 10Ib,4IIb	1a		12a	2a	
	30 July	4a,4IIc	2a,2III		12a,1IIa, 4IIb	4a	
	18 Aug.						
Scotsville	13 July				3a,7Ia, 7Ia		
	20 July				3a,5Ib, 7Ib,8IIa		
	2 Aug.				2a, 8IIc, 3IIb		

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Margaree	9 July	2a		7a,2♂Ib			
	11 July	3a,5IIb		2a,11Ib♂			
	10 Aug.	27a					
	26 Aug.	10a					Mallard 1a
Baddeck Rv.	5 July			11a	10a	1a,3IIa	
	12 July	4a,4IIb, 10Ib,1IIa		10a,10Ic, 8Ia♂,5Ia♂	16a,3Ia, 10Ia		
	13 Aug.	43a,3IIb		3a	11a,2IIc, 4IIa,8IIc, 5IIa		Wood Duck 2a
Middle Rv.	7 July		10a	1a	6a	3a,1IIa	
	13 Aug.	1a		20a,6IIa		1a	

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Whycocomagh	5 July	7a	9a	2a,10Ia			
	15 Aug.	26a,6Ic	20a,6IIc	4a,2Ic, 9III			
River Denys	7 July				7a,11Ia		
	15 Aug.	41a	7a	6a	13a,4IIb 4IIb,2IIc, 5IIa,3IIa, 7Ia,2Ia, 6IIc,7III, 9III		

Appendix Va. Number of ducks and broods of each species seen on surveys by S.B.Macleod on Cape Breton Island, summer 1962. Abbreviation used: adults(a); broods classified according to Gollop and Marshall (1954)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Margaree	13 June	6a		3a			
	22 Aug.	5a,6III					Unident. 6a
Baddeck Rv. (not all of area surveyed)	13 June) 24 June) 25 June) 26 June)	3a,6/Ic 12Ia		7a,9Ia, 11Ia	27a	1a	Unident. 2a
	20 July) 23 July)	4a,12IIa, 4IIc,6Ib		6a,7IIb, 9IIb	5a,7Ia	1a	Unident. 5a
	21 Aug.) 22 Aug.)	1a,7III		20/a	4a,7IIc		

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Middle River	13 June	9a,10Ia	5a		5a		
	23 July	1a,9IIc		2a,7Ib	8a		Unident. 7a,5I
	23 Aug.	3a,5III		20a		11a	
Whycocomagh	23 June	3a	2a	2a	2a		
	21 July	3a,5IIa, 12Ic	1a	16a,6Ib, 9Ic(?)			Unident. 12a
	21 Aug.	7a,8III		24a,6IIc	1a		

Appendix VI. Number of ducks and broods of each species seen on surveys on Cape Breton Island, summer 1963. Abbreviation used: adults(a); broods classified according to Gollop and Marshall (1954)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Antigonish	27 June	11a,6Ib	21a	2a			
	18 July	1a,2/1c		1a,8IIb			
Pomquet	27 June				1a		
Judique	27 June	8a,8Ib, 5Ib		3a,12Ia	12a		
	19 July	1a		1a,7IIa	13a,7Ic		
	4 Aug.	9a	2a	1a,6IIb	25a,5IIb		
Mabou	2 July	1a,8Ib					
	23 July						

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
McCormack	2 July	3a,4IIb, 9IIa,1IIa, 1 brood heard	1a		56a,8Ia, 8Ia,5Ia	1a	
	20 July			1a,6Ib	96a,4Ib 7Ib,5Ib	1a	
	4 Aug.	3a,3III		1a,6IIb	18a,19IIa, 5IIa,1Ic, 1Ib,5IIb		Wood Duck 1a
Loch Ban	2 July	3a	1a		43a (flew to McCormack)	1a,4Ib	
	20 July	4a,1/IIa	1a,1IIb		9a,6Ic, 9Ib,4/Ib	1a,4IIa	
	4 Aug.	6a			2a,8IIb, 6Ic		

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Scotsville	30 June	1a,1 brood heard			3a		
	20 July	6a,6/IIc			8a,2I, 17Ib	4a,5Ic	
	4 Aug.	1a,7III		2a,8IIb	3a,5/Ic, 12IIb,3Ia	1a,4IIa	
Margaree	22 June			1a			
Baddeck Rv.	22 June	4a		1a	10a	4a,9Ic	
	22 July	5a		4a,8Ic, 11IIa	14a,6Ib, 6Ia,7Ic, 4Ib,8Ib, 8Ic		
	6 Aug.		5a	7a,1III, 9IIa,8III	33a,7IIa, 6Ic		
River Inhabitants	28 July	4a,2IIa, 8III	3a				

(cont.)

Area	Survey	Ducks and broods seen					
		Black Duck	Green-winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Middle Rv.	24 June	1a,6Ib/	7a,4Ia	1a	1a		
	22 July	1a,2/IIa-b	9a,4IIc		5a	4a,7IIa, 3IIa,1Ic, 6IIa	
	5 Aug.	2a	12a		1c,1Ib	2a,1♂IIb	
Whycocomagh	24 June	3a,2/Ia	5a,9Ia	2a		1a	
	19 July	1a	12a,1Ib	2a,10Ic, 5/Ic		1a	
	4 Aug.	2a,6Ic	15a,2/III, 2III	7a,10IIc, 6IIa,4IIa, 6IIa	1a		
River Denys	24 June	3a,21b		3a	20a	1a	Unident. 7IIb
	19 July	2a,2IIa		1a	38a,9Ib, 7Ic,7Ia/, 7Ia/		
	5 Aug.	4a	2a		17a,7IIb, 5IIb,9IIa, 6IIb,5Ic, 7Ib,9Ib, 7IIa,6IIa, 8Ib, 6Ic		

Appendix VII. Numbers of ducks of each species seen on aerial surveys on Cape Breton Island, 25-26 May, 1961. Abbreviations used: pairs (p), single birds (s), and birds in flocks (f)

Area	* Ducks seen					
	Black Duck	Green-win winged Teal	Blue-winged Teal	Ring-necked Duck	Common Golden-eye	other species
Antigonish	1p,3s					
Pomquet				2p,3f		
Judique	10f			1p,3f		
Loch Ban	1s,4f					
Scotsville					1s	
Margaree						Scoter 12f
Nyanza (Baddeck Rv.& Middle Rv.)				2p,1s,3f	6f	
River Denys	2p,4s			4p		
River Inhabitants	1p,2s					

* No ducks except mergansers were seen at Mabou, McCormack, and Whycocomagh.

Supervisor of Operations

WL.U.8-37

Jan. 9/64.

A. J. Erskine

Paper for Northeastern Wildlife Conference,
January 21, 1964.

Enclosed is a draft of "Cape Breton Waterfowl Studies", revised as requested. I trust that this will be satisfactory.

See you in Hartford.

A. J. Erskine,
Wildlife Biologist.

AJE/D.
Enc.

CAPE BRETON ISLAND WATERFOWL STUDIES

A. J. Erskine
Canadian Wildlife Service
Sackville, New Brunswick

INTRODUCTION

Studies of waterfowl populations in Cape Breton Island, Nova Scotia, have been made each year since 1955 by the Canadian Wildlife Service. Inventory of waterfowl in the Maritime Provinces is very time-consuming, because of low densities of breeding populations. A summary of results obtained through 1960 (A. J. Erskine, verbal report, C. W. S. Conference, Morrisburg, Ontario, October 18-20, 1960) showed little continuity of comparable data, and no serious efforts to outline the most satisfactory procedures for securing waterfowl population data in the Maritimes. Work on Cape Breton Island in 1961-63 included evaluation of spring and summer surveys of waterfowl populations. Surveys were planned to provide data comparable to those from previous years. Findings of that study may be of general application to waterfowl surveys in eastern North America.

The principal variables investigated were date of survey, methods, intensity of coverage, time of day, and reproducibility. One or more of the variables were studied each spring. Surveys were also made each summer to estimate total brood production on the study areas.

Waterfowl species which breed in Cape Breton Island include Black Duck, Green-winged and Blue-winged Teals,

Wood Duck, Ring-necked Duck, Common Goldeneye, and Common and Red-breasted Mergansers. Mergansers are the subject of a special study in Cape Breton, and are not discussed in the present report.

Areas where waterfowl surveys were made in 1961-63 are shown in Figure 1.

METHODS

Ground surveys to determine the most representative date for spring surveys were made on May 6-9, May 16-21, and May 29-June 2, 1961. The same areas were surveyed from the air May 25-26, 1961.

Comparisons were made between "rapid" and "intensive" ground coverage of study areas in spring of 1961. "Rapid" coverage consisted of a spot count or counts from adjacent vantage points. The "intensive" survey, carried out immediately following the "rapid" coverage, involved walking or canoeing around the entire study area. In 1962 and 1963, the "intensive" method of coverage was used exclusively. Brood surveys in all three years were made by "intensive" coverage.

The 1962 spring surveys were made on May 21-29. Each area was surveyed twice, once either before 0900 hours or after 1800 hours, the "twilight" coverage, and once between 0900 hours and 1800 hours, the "daytime" coverage.

Three surveys were made in the spring of 1963. Each area was covered at the same time of day on three consecutive days, between May 21 and June 3. Comparison of results of those

surveys permitted assessment of reproducibility of individual surveys.

Brood surveys were carried out each year between late June and mid-August. Three complete coverages were made in 1961, and two complete and one partial coverage in 1962 and 1963. Dates of those surveys were June 22-July 11, July 19-24, and August 14-15, 1961; July 3-13, July 20, 30, 31, and August 13-18, 1962; and June 22-July 2, July 18-22, and August 4-6, 1963.

PHENOLOGY

Weather data for the years 1961-63, compared to long-term averages, are shown in Table I.

TABLE I. Weather data for the years 1961-63 compared with 10 year average, Baddeck, Nova Scotia.

Year	Snowfall in preceding winter (inches)	Monthly mean temperatures (°F)					Total precipitation (inches)		
		March	April	May	June	July	May	June	July
1961	117.0	25	36	47	59	63	7.9	5.2	1.4
1962	90.9	31	38	45	55	58	1.7	1.8	7.5
1963	95.1	26	33	48	54	65	3.0	2.1	1.7
10 year average	98.2	30	39	48	58	65	4.2	3.4	3.5

The Baddeck weather station was considered most nearly representative of the study areas. Snowfall accumulations are

CAPE
BRETON
ISLAND
Cape St. Lawrence
St. Lawrence Bay
Cape North
Bay St. Lawrence
Meat Cove
Capstick
St. Margaret Village
Aspy Bay
Dingwall
Smelt Brook
White Point
Cape North
South Hbr.
Cape Egmont
Red River
Pleasant Bay
Neils Harbour
CAPE BRETON HIGHLANDS NATIONAL PARK
CABOT TRAIL
Warren L.
L. of Islands
Ingonish
Middle Head
Ingonish Beach
Cape Smoky
Ingonish Ferry
Petit-Étang
Chéticamp
Belle Marche
Point Cross
Grand-Étang
Wreck Cove
Gisborne L.
Wreck Cove Lakes
Skir Dhu
Briton Cove
North Shore
Forest Glen
Kingross
Belle-Côte
Margaree Harbour
Chimney Corner
Margaree
Fordview
Margaree Forks
Frizzleton
North East Margaree
Margaree I.
St. Rose
Dunvegan
Indian Brook
St. Ann's Bay
North River Bridge
Point Aconi
Alder Point
New Campbellton
Big Bras d'Or
Florence
Sydney Mines
New Victoria
New Waterford
Dominion
South West Margaree
Englishtown
Baddeck L.
St. Ann's
Gaelic Col. & MacAskill Mus.
South Haven
Inverness
Kenloch
Upper Margaree
Strathlorne
Sight Pt.
Scotsville
Middle River
Lake Ainslie
East Lake Ainslie
Trout River
Hunter's Mtn.
Bell Mus. Nat. Hist. Site
Big Hbr.
Boularderie
North Sydney
Leitches Creek
Reserve Mines
Sydney
More detail other side
Barachois Hbr.
Frenchvale
Birch Grove
Riverville
Glenora Falls
Hay's R.
Mabou
Hillsborough
Nyanza
Baddeck
Ross Ferry
Boisdale
Mira Gut
Horns Road
Cape Linzee
Port Hood
Port Hood Island
Henry I.
S. W. Mabou
Brook Village
L. Ainslie (S. Side)
Bucklaw
Washabuck Centre
St. Andrew's Channel
Beaver Cove
Skye Glen
Aberdeen
Hazeldale
Shunacadie
East Bay
Marion Bridge
Hillside
Albert Bridge
Dunakin
Glencoe
Whycocomagh
Little Narrows
Ottawa Brk.
Iona
Christmas Island
Ben Eoin
Trout Brook
Grand Narrows
Eskasoni
Maryville
Hillsdale
St. Patrick's Channel
Gillis Cove
West Alba
Castle Bay
Big Pond
Judique N.
Orangedale
Bras d'Or
Silver Mine
Glen Currie
Gabarus Bay
Cape George
Ballantynes Cove
Judique
Melford
Middle Cape
Terra Nova
Gabarus
Campbell
River Denys Sta.
Irish Cove
Victoria Bridge
Cape Gabarus
Long Pt.
Marble Mtn.
Lake
Johnstown
L. Uist
Enon
Gabarus Lake
Winging Pt.
Glendale
Kingsville
Lime Hill
St. George's Bay
Craigmore
Roberta
Hay Cove
Loch Lomond
Fourchu Bay
Lakevale
Morristown
West Bay Road
West Bay
Stirling
Big Marsh
Crystal Cliffs
Creignish
Queensville
Dundee
St. Georges Channel
Soldiers Cove
Framboise
Fourchu
CANSO CAUSEWAY (TOLL)
Troy
Havre Boucher
Port Hastings
Cleveland
Grand Anse
St. Peter's
Barra Head
Grand River
Frankville
McIntyre Lake
St. Esprit
Pomquet
Heatherton
Afton
Tracadie
Port Hawkesbury
Louisdale
Rockdale
L'Ardoise
Mulgrave
Pt. Tupper
Strait of Canso
Lennox Passage
Red Pt.
Michaud Pt.
Salt Sprs.
Lower South River
Bayfield Road
Mattie
D'Escousse
Monastery
Madame I.
St. Andrews
Black Avon
Goose Hbr. L.
Pondville
Glassburn
Lincolnville
Melford
Janvrin Hbr.
Petite de Grat Bridge
Shepherd L.
Clam Hbr. L.
Sand Pt.
West Arichat
Glen Alpine
Fraser
St. Francis Hbr.
Cape Argos
Arichat
Heath Head
East Point
See Ferry Service data below.
FERRY
SUMMER FERRY
FERRY TO PORT AUX BASQUES

much greater on and around the Cape Breton plateau than at Baddeck, and run-off from the plateau is correspondingly greater. Average snowfall values at Cheticamp, Ingonish Beach, Margaree Forks, and North East Margaree are 192.9, 138.8, 126.6, and 114.1 inches, based upon 2, 5, 3, and 6 years' data respectively. Temperature inversions, in narrow valleys cutting back into the plateau, tend to slow spring run-off and to delay development of vegetation.

In 1961, a late and cold spring following a heavy accumulation of snow led to a late and prolonged run-off, but the summer of 1961 was very dry. The early spring of 1962 was warm, but May was very cold. The summer of 1962 was cool, and July was also extremely wet. The spring of 1963 was very similar to that of 1961, with heavy snows in April. The summer of 1963 was generally dry, and cool except for a heat wave in late July. Breeding conditions were favourable in 1961, and 1963, but breeding schedules were retarded in those two years. In 1962, breeding conditions were poor, particularly for late-nesting species.

RESULTS

1) Timing of the spring survey. Results of the spring surveys in 1961, compared with the numbers of broods of each species found in summer on the same areas are shown in Table II.

TABLE II. Comparison of results of three spring surveys, Cape Breton, 1961.

Species	Survey	No. of pairs	Total no. of ducks	Total no. of broods
Black Duck	1st	8	88	
	2nd	18	61	13
	3rd	10	79(+ 1 brood)	
Green-winged Teal	1st	7	114	
	2nd	13	29	3
	3rd	2	6	
Blue-winged Teal	1st	0	0	
	2nd	5	16	13
	3rd	4	16	
Ring-necked Duck	1st	15	83	
	2nd	54	139	29
	3rd	44	119	
Common Goldeneye	1st	4	14	
	2nd	1	9	11
	3rd	2	4	

Transient ducks of most species were present on the study area May 6-9. Transient Green-winged Teal and Ring-necked Duck were still present May 16-21. Numbers of Blue-winged Teal and Common Goldeneye did not approach breeding populations on any of the surveys. Even the last survey did not accurately represent the final breeding population, but that date seemed more satisfactory than an earlier one. Phenologically, the third survey corresponded approximately to the date of appearance of the first Black Duck broods. Bartlett (pers. comm.) reached similar conclusions regarding the timing of spring waterfowl surveys in Prince Edward Island.

2) Relative efficiency of "rapid" and "intensive" surveys. "Rapid" coverage was 70-80% as effective as the "intensive" survey for locating Black Ducks and Ring-necked Ducks. For other species of ducks, the more intensive coverage was at least twice as effective. (Table III).

TABLE III. Comparison of numbers of ducks seen on different types of spring surveys in 1961, Cape Breton, N.S.

Method of Survey	Number of each species seen								
	Black Ducks			Ring-necked Ducks			Other Game Ducks		
	Survey			Survey			Survey		
	2nd	3rd	Air	2nd	3rd	Air	2nd	3rd	Air
"Rapid"	47	54	22	89	43	23	25	9	7
"Intensive"	58	71	65[a/]	104	61	82[a/]	49	22	36[a/]
Relative Efficiency[b/] (per cent)	81	76	34	86	70	28	51	41	18

a/ Average of numbers seen on the two intensive surveys.
b/ Rapid/Intensive, or Air/Intensive.

Black Ducks and Ring-necked Ducks make up about 80 per cent of all ducks seen on spring surveys, but only about 60 per cent of the total in summer. The "rapid" coverage did not accurately represent the total breeding population, since most ducks of the less common species were missed by those surveys.

3) Aerial vs. Ground surveys. The aerial survey was about 30 per cent effective for Black Ducks and Ring-necked Ducks, but much less effective for other species (Table III). No teal of either species were observed from the air.

Similar values were obtained by Smith (1953), in the first year of comparisons of air and ground surveys in parkland regions of Alberta. With practice, up to 55 per cent of the birds found by ground surveys were detected on spring aerial counts there (Smith, 1954, 1955). The only comparable data from the Maritimes were obtained in Prince Edward Island in 1960 (C.O.Bartlett,unpubl.data). Bartlett found relative efficiency ratios (air/ground) of 81% for Black Ducks, 25% for teal, 10% for Ring-necked Ducks, 41% for other species (Mallard, Pintail, American Widgeon) in that study. Differences in habitat, flying conditions, and experience of the observer, probably account for most of the discrepancy between the Cape Breton and Prince Edward Island data.

No systematic comparison of coverage by canoe and on foot was made. A subjective impression is that canoe surveys are less effective than ground coverage for locating broods of dabbling ducks, but that little difference is observed between the two methods on spring surveys. Canoe coverage is often the only feasible method of surveying extensive marsh areas.

4) "Daytime" vs. "Twilight" counts. Results of "daytime" and "twilight" counts on spring surveys are compared in Tables IV-VI.

TABLE IV. Total numbers of ducks seen on "daytime" and "twilight" surveys, Cape Breton, 1962

Survey	Groupings of ducks observed			Total ducks seen	chi-square
	No. of pairs	No. of singles	No. in flocks		
"Daytime"	73	18	57	221	0.56
"Twilight"	83	19	52	237	

TABLE V. Total numbers of each duck species seen on "daytime" and "twilight" surveys, Cape Breton, 1962

Species	Number of ducks seen		chi-square
	"Daytime"	"Twilight"	
Black Ducks	11/11,15[a/]	17/12,27	5.17[b/]
Green-winged Teal	1/1,1	2/0,0	0
Blue-winged Teal	8/6,1	10/7,2	0.69
Ring-necked Duck	51/0,30	52/0,16	0.57
Common Goldeneye	2/0,10	2/0,7	0.36
Other Species	0/0,1	1/0,0	0.33

a/ Number of pairs/number of singles,number in flocks.
b/ Statistically significant ($p < 0.05$).

TABLE VI. Total numbers of ducks seen on each sample area on "daytime" and "twilight" surveys, Cape Breton, 1962

Area	Number of ducks seen		chi-square
	"Daytime"	"Twilight"	
Antigonish	4/2,0[a/]	7/3,6	4.94[b/]
Pomquet	2/0,0	2/1,1	0.40
Judique	7/5,0	11/4,0	0.91
Mabou	2/0,18	1/1,16	0.25
Margaree	4/6,1	7/2,1	0.12
Baddeck River	13/10,0	11/3,0	2.03
Middle River	4/2,1	9/2,5	5.44[b/]
Whycocomagh	4/2,0	4/4,0	0.18
River Denys	8/10,6	9/5,7	0.06
Scotsville	3/1,1	4/4,0	0.80
Loch Ban	12/7,0	11/3,0	0.64
McCormack	21/5,0	9/3,0	9.9[b/]

[a/] Number of pairs/number of singles, number in flocks.
[b/] Statistically significant ($p < 0.05$).

Totals with all areas pooled, with all species pooled, and with both areas and species pooled, were compared by the chi-square test. Differences with statistical significance were, in nearly all cases, attributable to movements of

flocked birds. Whenever possible, brood surveys were made in early morning or evening. The impression that "twilight" counts were more effective for locating broods in summer was not confirmed experimentally, in this study.

5) Reproducibility of Spring Survey Results. Results of three comparative counts in 1963 are shown in Tables VII-IX.

TABLE VII. Total numbers of ducks seen on three spring surveys, Cape Breton, 1963

Survey	Groupings of ducks observed			Total ducks seen	chi-square[a/]
	No. of pairs	No. of singles	No. in flocks		
1st.	45	20	42	152	0.49
2nd.	43	22	32	140	
3rd.	49	23	30	151	

a/ Chi-square calculated on comparison between largest and smallest totals.

TABLE VIII. Total numbers of each duck species seen on three spring surveys, Cape Breton, 1963

Species	Number of ducks seen			chi-square[a/]
	1st survey	2nd survey	3rd survey	
Black Duck	7/7,9[b/]	7/6,12	9/8,18 (≠ 1 brood)	2.65
Green-winged Teal	1/2,2	3/0,3	0/1,0	6.40[c/]
Blue-winged Teal	3/7,3	5/7,3	4/7,0	0.71
Ring-necked Duck	33/2,28	27/5,14	35/5,12	3.29
Common Goldeneye	1/1,0	1/3,0	1/2,0	0.50
Other species	0/1,0	0/1,0	-	1.00

[a/] Chi-square calculated on comparison between largest and smallest totals.

[b/] Number of pairs/number of singles, number in flocks.

[c/] Statistically significant ($p < 0.05$).

TABLE IX. Total numbers of ducks seen on each sample area on three spring surveys, Cape Breton, 1963.

Area	Number of ducks seen			
	1st survey	2nd survey	3rd survey	chi-square[a/]
Antigonish	2/1,10[b/]	4/0,5	3/2,0	1.56
Pomquet	1/0,2	0/0,0	0/0,0	4.00[c/]
Judique	3/0,3	2/1,2	4/2,0	0.62
Mabou	0/0,0	0/1,0	1/0,0	2.00
Margaree	3/6,0	2/5,0	1/5,1	0.80
Baddeck River	8/3,8	5/2,7	11/4,3	2.08
Middle River	2/2,4	2/2,5	3/2,8	1.38
Whycocomagh	3/2,0	3/3,4	2/2,0	2.50
River Denys	10/1,11	13/2,7	11/0,16	0.51
Scotsville	3/1,0	3/2,0	3/4,0	0.62
Loch Ban	5/2,0	3/0,3	1/2,0	4.00[c/]
McCormack	6/1,8	6/3,0	9/0,2	1.00

a/ chi-square calculated on comparison between largest and smallest totals.

b/ Number of pairs/number of singles, number in flocks.

c/ Statistically significant ($p < 0.05$).

Significant differences between counts were attributable either to movements of flocked birds or to very small total counts. No comparison of reproducibility of summer brood surveys was made in 1961-63. Considerably greater variability

would probably be observed between individual summer surveys (see below, sections 6) and 7)).

6) Comparison of Spring and Summer Survey Results.

Results of spring and summer waterfowl surveys in 1961-63 are compared in Tables X and XI.

TABLE X. Numbers of ducks seen on spring surveys and of duck broods seen on summer surveys, Cape Breton, 1961-63.

Species	Total no. of ducks seen			Total no. of broods seen		
	1961	1962	1963	1961	1962	1963
Black Duck	40	71	59	13	17	15
Green-winged Teal	6	7	9	3	2	5
Blue-winged Teal	14	40	22	13	13	11
Ring-necked Duck	101	140	96	29	23	29
Common Goldeneye	6	20	7	9	3	6
Total	167	278	193	67	58	66

TABLE XI. Species composition by per cent of ducks seen on spring surveys and of duck broods seen on summer surveys, Cape Breton, 1961-63

Species	% of total ducks seen			% of total broods seen		
	1961	1962	1963	1961	1962	1963
Black Duck	24.0	25.6	30.6	19.4	29.3	22.7
Green-winged Teal	3.6	2.5	4.7	4.5	3.4	7.6
Blue-winged Teal	8.4	14.4	11.4	19.4	22.4	16.7
Ring-necked Duck	60.4	50.3	49.7	43.3	39.7	43.9
Common Goldeneye	3.6	7.2	3.6	13.4	5.2	9.1

Similar data on species composition were obtained in 1955, 1956, and 1960.

In general, the number of Black Duck broods seen in summer was greater than the number of pairs seen in spring, often nearly equal to the number of pairs plus singles. The low representation of Black Ducks is perhaps a consequence of their wariness.

Numbers of Ring-necked Duck broods were consistently much smaller than numbers of spring pairs, even though more broods were seen of that species than of any other duck. Large numbers of apparently non-breeding Ring-necked Ducks were noted in Cape Breton Island each year.

In almost every year, more broods of both teal species and of Common Goldeneye were found in summer than pairs of those species in spring. No one factor explains the relative scarcity of those three species on spring surveys. The spring surveys may have been too early for Blue-winged Teal, which probably had not all arrived on the study area by the end of May in 1961 (See Table II). A probable explanation for the few Goldeneye seen on the spring surveys is that those birds nest along the rivers; a Goldeneye nest was found in a nest-box at North East Margaree, nearly 10 miles up-stream from the Margaree River study area, in 1962. Most of the survey areas are located on estuaries, to which Goldeneye broods are led after hatching; but no Goldeneye brood younger than class Ib has been observed on any of the study areas. The brood surveys seem to be essential to give a proportional representation of all species in the (successful) breeding population.

7) Relative effectiveness of the summer surveys. The fraction of total broods, from all surveys in a given year, found by each of the surveys in 1961-63, are shown in Tables XII and XIII.

TABLE XII. Numbers of broods (all species combined) observed on each summer survey, Cape Breton, 1961-63.

Survey	Number of broods observed		
	1961	1962	1963
1st	17	26	19
2nd	47	15[a]	40
3rd	38	27	42[a]
Total[b]	67	58	66

[a] Partial coverage only

[b] Each year some broods were observed on more than one survey.

TABLE XIII. Percentage of total broods (all species combined) on each summer survey, Cape Breton, 1961-63.

Survey	Percentage of total broods observed		
	1961	1962	1963
1st	25	45	29
2nd	70	26[a]	61
3rd	57	47	64[a]

[a] Partial coverage only.

Similar proportions of total broods were seen on single brood surveys in 1960. In a given year even the mid-July survey,

which is the best single brood survey, showed only about three-quarters of the total brood production indicated by repeated surveys. However, that fraction might be improved through use of a dog, as brood visibility is a major problem in summer.

8) Population trends. Detection of population trends requires comparable data. Although some areas in Cape Breton Island have been surveyed each year since 1955, the data are not fully comparable. A few gross changes in duck population are evident from the available data (Table XIV).

TABLE XIV. Waterfowl population data, Cape Breton, 1955-63.

		Year								
		1955	1956	1957	1958	1959	1960	1961	1962	1963
Spring pairs	(1)[a]	50	32	7	24	16	19	12	26	19
	(2)	-	-	9	12	9	11	10	25	14
	(3)	-	-	-	-	-	-	32	40	31
Total spring ducks	(1)	150	116	84	109	67	50	52	70	55
	(2)	-	-	28	63	47	24	45	81	37
	(3)	-	-	-	-	-	-	106	117	104
Total broods	(1)	31	12[b]	-	-	-	17	15	18	18
	(2)	-	-	-	-	-	5[c]	16	11	14
	(3)	32[c]	12[b/c]	-	-	-	11[c]	28	28	33

(1) Baddeck River, Margaree, Scotsville.
(2) Mabou, McCormack, Kenloch.
(3) Antigonish, Judique, Whycocomagh, River Denys, Middle River.

a/ Areas grouped according to duration of comparable surveys.
b/ Survey made too early for broods of late nesting species.
c/ Partial coverage only.

Examination of Table XIV shows that total numbers of ducks seen on spring surveys seem to have decreased markedly after 1956, with 1962 showing an isolated recent peak.

Data in Table XV suggest that the decline after 1956 was principally centered at Nyanza, where Black Ducks and Green-winged Teal decreased markedly at Middle River, and Ring-necked Ducks and perhaps Common Goldeneye at Baddeck River.

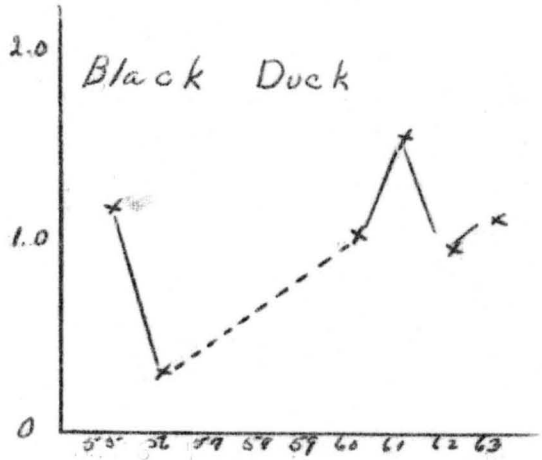
TABLE XV. Comparison of waterfowl brood production at Nyanza with other areas in Cape Breton, 1952-63.

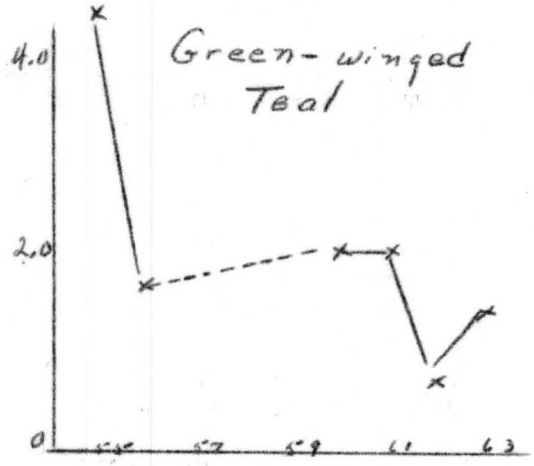
Area		Total broods (all species) Year						
		1952	1955	1956[a]	1960	1961	1962	1963
Nyanza	Baddeck River	22	26	8	12	12	11	11
	Middle River	-	23	11	2	3	2	6
Mabou, Scotsville, Margaree, Whycocomagh, Antigonish		-	14	5	9	14	21	19

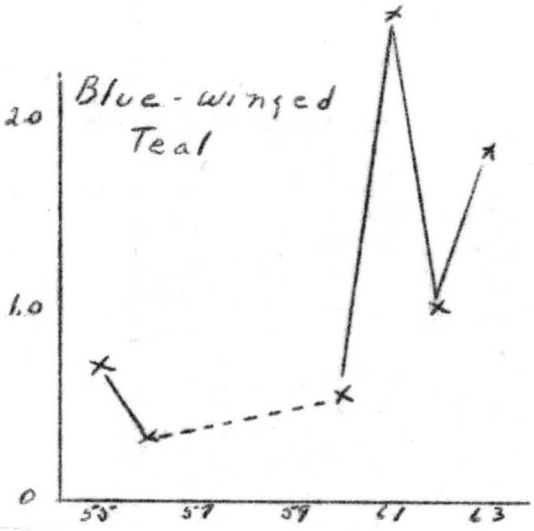
[a] Survey made too early for broods of late nesting species.

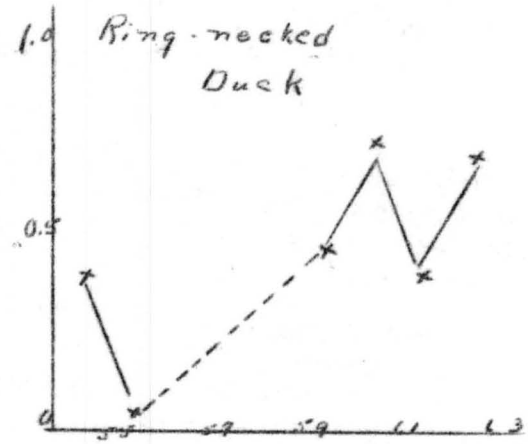
Numbers of Blue-winged Teal were generally lower in 1957-60 than at any time before or after that period. During the intensive studies of 1961-63, numbers of ducks probably varied little, but breeding success was much poorer for all species in 1962 than in 1961 or 1963. The ratio of broods to "spring pairs" was low for all species in 1962 (Figure 2). Ratios of

Original – not carbon
Names & numbers typed









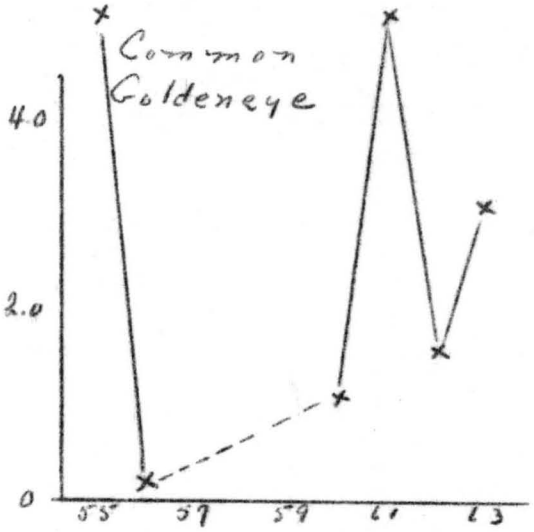


Figure II. Ratios of Broods seen/Spring Pairs seen for all comparable survey areas, Cape Breton, 1955-63.

broods to "pairs plus singles" or to "total ducks" seen in spring show similar trends.

9) Survey time. About 15 hours survey time were required for one "intensive" coverage in spring, and about 18 hours for a summer survey, of all areas. However, at least three days were required to complete a survey at either season, because of travel time between areas. Air coverage was even less economical of time. Of 8 hr. 30 min. flying time on May 25-26, 1961, only 2 hr. 33 min. was actual survey time; the balance was spent in travel to and from the airports.

10) Representativeness of the Cape Breton surveys. Comparison of species composition of broods with that of total adults observed on spring surveys is given in Table XVI.

TABLE XVI. Species composition of adult birds observed on spring surveys, and of broods observed subsequently on the same areas, in Cape Breton, 1961-63

Species	Adult birds		Broods	
	Number	Per cent composition	Number	Per cent composition
Black Duck	170	26.6	45	23.6
Green-winged Teal	22	3.4	10	5.2
Blue-winged Teal	76	11.9	37	19.4
Ring-necked Duck	337	52.8	81	42.4
Goldeneye	33	5.2	18	9.4
Totals	638		191	

Similar figures from Prince Edward Island (Bartlett,1961), and from the St. John estuary in New Brunswick (C.W.S. unpubl. data, and Northeastern Wildlife Station reports) are given in Tables XVII and XVIII.

TABLE XVII. Species composition of adult birds observed on spring surveys, and of broods observed subsequently on the same areas, in Prince Edward Island, 1957-60[a/]

Species	Adult birds		Broods	
	Number	Per cent composition	Number	Per cent composition
Black Duck	367	45.0	172	46.5
Pintail	51	6.2	28	7.6
Green-winged Teal	31	3.8	9	2.4
Blue-winged Teal	203	24.9	110	29.7
American Widgeon	80	9.8	24	6.5
Ring-necked Duck	72	8.8	25	6.8
Common Goldeneye	10	1.2	1	0.3
Others (Mallard, Shoveler)	2	0.2	1.	0.3
Totals	816		370	

a/ Modified from Bartlett, 1961, by elimination of Merganser data.

TABLE XVIII. Species composition of adult birds observed on spring surveys, and of broods observed subsequently on the same areas, in the St. John River estuary, 1957-59

Species	Adult birds[a]		Broods			
			C.W.S.[a]		N.E.W.S.[b]	
	No.	% composition	No.	% composition	No.	% composition
Black Duck	1450	54.2	38	31.9	40	22.7
Green-winged Teal	43	1.6	6	5.0	11	6.3
Blue-winged Teal	105	3.9	6	5.0	46	26.1
Wood Duck	60	2.2	18	15.1	18	10.2
Ring-necked Duck	343	12.8	3	2.5	31	17.6
Common Goldeneye	477	17.8	48	40.4	26	14.8
Others (Mallard, Pintail, Widgeon)	193	7.2	0	0	4	2.3
Totals	2671		119		176	

a/ Based upon C.W.S. surveys (May 5-12, July 3-15).
b/ Based upon N.E.W.S. surveys (July 16 - Aug. 17).

Good correlation between per cent composition of broods and of adult ducks was obtained in Prince Edward Island, but in other areas the relationships were not well defined. Differing

habitats in the various areas surveyed were probably reflected in the differences noted between species compositions. Other areas of the Maritimes would show yet other species compositions; the Annapolis Valley of Nova Scotia has chiefly Black Ducks and Blue-winged Teal, the salt marshes all around the Maritimes Black Ducks only, and lakes of the wooded interiors of Nova Scotia and New Brunswick Black Ducks and Ring-necked Ducks with a few Wood Ducks. The N.S.-N.B. border marshes probably have a species composition close to that found in Prince Edward Island, since Pintail and Widgeon are important in both of those areas.

The variation in species composition found in various parts of the Maritimes probably means that no single area is representative of the whole. To adequately assess year-to-year fluctuations in waterfowl populations, all major regions must be sampled. The samples discussed in this report are not of sufficient size to have any real significance in the continental waterfowl picture. However, locally raised ducks are the only ones available to waterfowl hunters in the Maritimes in the early part of the hunting season. It is thus desirable that some picture of annual variations in Maritime waterfowl populations be obtained. The data discussed in the present report are probably typical of what can be obtained with a reasonable expenditure of time and effort.

SUMMARY AND CONCLUSIONS

Studies of waterfowl breeding populations in Cape Breton Island, N.S., have been made since 1955 by the Canadian Wildlife Service. Intensive studies since 1960 have been directed at evolving procedures which would provide the greatest possible amount of waterfowl production data in the least possible time. It is hoped that conclusions of this study may be generally applicable in eastern North America.

The spring survey was the most useful single survey, since it gave a more representative picture of actual or potential production of both Black Duck and Ring-necked Duck than did any single brood survey. In any one year, no brood survey revealed more than about two-thirds of the total number of broods of all species found on the study areas by repeated brood surveys. If total production estimates are required, it is necessary to make a spring pair survey, and three brood surveys.

The phenological date of the survey must be held constant if comparable spring waterfowl data are to be obtained. The best time for the spring pair survey is around the time of appearance of first Black Duck broods, i.e. the last week of May in Cape Breton Island. Ground coverage was more satisfactory, as well as more economical, than aerial surveys. The results of ground surveys were reproducible, except in a few cases involving movements of flocked birds.

Correlation of breeding success with weather or water conditions was uncertain. However, the ratio of broods to spring pairs, and the survival of young ducks, were both poorer in 1962, when July was cold and wet, than in other, more favourable seasons. Although breeding schedules of early nesting species were apparently later in cold springs, it was not possible to establish a clear correlation of breeding schedules with spring weather conditions, because brood samples were too small to clearly define hatching peaks.

REFERENCES

Bartlett, C. O. 1961. Some characteristics of black duck populations on Prince Edward Island. Paper presented at the Northeast Wildlife Conference, Halifax, June 12-14, 1961.

Boyer, G. F. 1955. Cape Breton Waterfowl Studies. Unpublished report, C.W.S.; 19 p.

Erskine, A. J. 1961a. Cape Breton Waterfowl Studies 1955-1960. Unpublished report, C.W.S.; 23 p.

1961b. Cape Breton Waterfowl Studies, 1961. Unpublished report, C.W.S.; 23 p.

1963. Cape Breton Waterfowl Studies - 1962. Unpublished report, C.W.S.; 19 p.

1963. Cape Breton Waterfowl Studies - 1963. Unpublished report, C.W.S.; 21 p.

Smith, A. G. 1953. Waterfowl breeding ground surveys of special study areas in Alberta - 1953, U. S. Fish and Wildlife Service and Canadian Wildlife Service, Spec. Sci. Rep. - Wildlife No. 25:30-42.

Smith, A. G. and H. R. Webster. 1954. Waterfowl breeding ground surveys of special study areas in Alberta, 1954, U. S. Fish and Wildlife Service and Canadian Wildlife Service, Spec. Sci. Rep. - Wildlife No.27: 35-44.

Smith, A. G. 1955. Waterfowl breeding ground surveys of special study areas in Alberta - 1955, U. S. Fish and Wildlife Service and Canadian Wildlife Service, Spec. Sci. Rep. - Wildlife No. 30:33-44.

ANNUAL JOB PROGRESS REPORT

Title: Cape Breton Waterfowl Studies - 1962

Designation: 0-1-30, 2, 1962.

Prepared by: A. J. Erskine

Personnel: A. J. Erskine

S. B. MacLeod, Provincial Forest Ranger, Nova Scotia Department of Lands and Forests, carried out independent surveys on several of the same areas. Fred Payne, waterfowl biologist of that Department, has loaned Mr. MacLeod's data for comparison and to supplement my own. Mr. MacLeod accompanied me on three surveys in spring, and one in summer, in addition to his own work.

Objectives: The purpose of this study is to examine procedures used in collecting waterfowl population data in spring and summer, in order to establish the procedure giving the most usable data in the least time. The surveys should be maintained in a form giving data that are comparable from year to year, while effects of modifying the procedure are explored. The work is being done in Cape Breton Island and Antigonish County, N.S. The findings of this study may be of general application to waterfowl surveys in eastern Canada.

Introduction: A. J. Erskine (verbal report, C.W.S.Eastern Region meeting, Ault Island, Ont., Oct.18-20,1960) summarized the results of waterfowl production surveys in the Maritimes up to that time. He concluded that little continuity of comparable data existed, in spite of the large amount of time that had been spent on waterfowl production

surveys since 1949. The numbers of waterfowl observed on production surveys in the Maritimes are relatively small. Also, it is not possible to sample all important waterfowl production areas in the Maritimes each year without seriously curtailing or eliminating other work during May and July. Since other work is now given priority over the waterfowl production surveys, the latter should now be restricted to areas adjacent to those where other, specialized studies are in progress. The group suggested that a project be undertaken to examine procedures for collecting waterfowl production data, with the aim of improving efficiency and representativeness of those surveys. That suggestion led to the authorization of this project in 1961.

Erskine ("Cape Breton Waterfowl Studies, 1955-60" report submitted Feb. 1961) summarized work in Cape Breton Island, N.S., where his principal studies were located, through 1960. He suggested that area as a profitable locale for investigating waterfowl production surveys, but pointed out the need for further exploration of possible survey areas on the island. He also indicated that data on fall and winter distribution and numbers of waterfowl in Cape Breton were almost completely lacking, and that the fate of waterfowl produced there was unknown.

Work in Cape Breton in 1961 (Erskine, "Cape Breton Waterfowl Studies - 1961", Project 0-1-30, 1; report submitted Nov.1961) investigated the effects on spring waterfowl surveys of varying dates of survey and, independently, of varying the time and effort

expended on each survey. A comparison of air and ground surveys of the same areas was also made. Time did not permit experimentation with the summer brood surveys. Data were collected on distribution and numbers of waterfowl in Cape Breton in early October.

For best results, the spring waterfowl survey should be made in late May. Rapid spot-checks were found to be adequate for locating most (75% or more) of the Black Ducks and Ring-necked Ducks on most sample areas, but a more intensive coverage was needed to locate other duck species breeding in Cape Breton. The aerial coverage was not satisfactory. Only 20-35 percent of the ducks found on ground surveys were seen from the air, and the various species were not all visible from the air to the same extent.

The species composition of ducks breeding in various parts of the Maritimes was shown to vary widely. It seems unlikely that waterfowl surveys can adequately represent waterfowl production in the Maritimes, unless all the major production areas are sampled each year. Such an expenditure of time and effort would be quite out of proportion to the waterfowl production of the area.

No recommendations for changes in the project plan were made in 1961. Subsequent work was planned to study effects on spring waterfowl surveys of varying time of day of the survey, and to determine reproducibility of coverage of each sample area. The last-mentioned variable is scheduled for investigation in 1963, and the project will then be terminated. Other work would make it impossible to adequately study the effects of changes in summer brood survey procedures after that date.

Results of 1962 waterfowl production surveys in Cape Breton Island and Antigonish County, N.S., are presented in this report. All areas sampled have been discussed in earlier reports (Boyer,1955; Erskine,1961 a & B). Shoal Lake and River Inhabitats were found to be relatively unproductive and inconvenient to survey in 1961, and were omitted in 1962. All other waterfowl production areas visited in 1961 were covered again in 1962. No fall surveys were made in 1962, because of commitments to other work.

Coverage: The 1962 spring coverage included two surveys of each area in the manner described for "intensive coverage" in 1961. One survey, referred to as the "twilight coverage", was made either in early morning - i.e. completed before 0900 ADT, or in evening - i.e. started after 1800 ADT; the other coverage was made in the middle part of the day - i.e. 0900-1800 ADT. The surveys were to be made during May 21-26, a time phenologically equivalent to the late coverage in 1961. However, poor weather and the necessity for morning or evening coverages delayed completion of the survey until May 29.

All areas were visited twice in summer to search for broods. The first brood survey was made July 3-13, and the second was August 13-18, both dates being inclusive. The Scotsville and McCormack-Loch Ban areas were also surveyed on July 20 and July 30. Work on the merganser study prevented a complete coverage between July 13 and August 13, and some teal broods may have flown between the two coverages of some areas. Broods missed on both surveys

might have been found by a third coverage. The third survey of the McCormack-Loch Ban area, and MacLeod's surveys, did show some broods not seen at other times.

Phenology and Spring Migration: Weather data for 1961-62 are presented in Tables I and II.

TABLE I. Mean Monthly Temperatures in 1961-62 compared to 10-year Average Values, Baddeck, C.B., N.S.

Month / Year	Winter			Temperatures in degrees Fahrenheit)			Summer		
	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1961-62	32	22	18	31	38	45	55	58	63
Average	32	26	25	30	39	49	58	65	65

TABLE II. Total Monthly Precipitations in 1961-62 compared to 10-year Average Values, Baddeck, C.B., N.S.

Month / Year	Precipitation (in inches)								
	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1961-62	5.7	4.5	5.4	1.3	3.8	1.7	1.8	7.5	2.7
Average	4.8	4.6	4.2	3.6	3.4	4.4	3.5	2.8	4.1

Values for Cheticamp (3 years records), Ingonish Beach (11 years records), and North East Margaree (6 years records) are similar to those given for Baddeck, and the deviations from the average values are closely parallel at all four stations.

The winter of 1961-62 in Cape Breton was cold, but with normal precipitation. March was warm and dry, and spring migration began early. I was not in the Maritimes during the spring, but

Bagg (1962) reports a waterfowl migration through late March, particularly in connection with an influx of warm air from the south on March 29-31.

April weather produced temperature and precipitation values near normal, but the sustained cold weather in May apparently delayed breeding in many species. Some Black Ducks and Common Goldeneyes, which migrate early as a rule, were breeding at least a week ahead of the 1961 schedule. A flock of Canada Geese remained in the Margaree valley into May, and two were seen on a survey there May 23. None was seen after that date. June and August were cool and fairly dry, but July was colder and wetter than any other July in Cape Breton on record. However, the miserable weather of July did not seem to have adverse effects on waterfowl production, unless the low success of Goldeneyes was caused by unfavourable weather. Vegetation was retarded during May, and visibility was good during the spring surveys. Lush plant growth present during the summer reduced the visibility of ducks considerably.

I was not in the study area until May 16, and made no surveys before May 21 because of work on the merganser study. Transient or non-breeding Ring-necked Ducks and mergansers were present during the spring surveys, but other species had apparently completed their migration by May 21.

Results of the Surveys: (a) Relative efficiency of daytime vs. "twilight" counts. The results of the daytime and "twilight" counts are compared in Tables III-V. When all species and all areas were

pooled (Table III), the difference between the number of ducks seen on the daytime counts and on the "twilight" counts was not statistically significant by the chi-square test. The differences in numbers of each duck species seen on the daytime and "twilight" counts (Table IV) were statistically significant (chi-square test) only for Black Ducks and for mergansers. When the areas were considered separately (Table V), the differences in numbers of ducks seen on the daytime and "twilight" counts were statistically significant (chi-square test) only for Baddeck River, Middle River, and McCormack. It is believed that flocks of mergansers seen only on the daytime count at Baddeck River, and only on the evening count at Middle River, may have been partly responsible for the differences involving those areas and species. Baddeck River and Middle River are only two miles apart, and mergansers are known to travel between those areas. Flocks of Ring-necked Ducks were also seen flying between McCormack and Loch Ban. The differences between the total number of ducks seen on the two counts at McCormack may have also been caused by the movements of flocks of ducks.

TABLE III. Total Numbers of Ducks seen on Daytime and "Twilight" Surveys, Cape Breton, 1962

Survey	No.of pairs	/	No.of singles	No.in flocks	=	Total ducks seen	chi-squared
Daytime	83	/	19	116	=	301	1.42
"Twilight"	90	/	20	72	=	272	

TABLE IV. Total Numbers of each Duck Species seen on Daytime and "Twilight" Surveys, Cape Breton, 1962

	Daytime	"Twilight"	chi-squared
Black Ducks	11/11,15[x]	17/12,27	5.17#
Green-winged Teal	1/1,1	2/0,0	0
Blue-winged Teal	8/6,1	10/7,2	0.69
Ring-necked Duck	51/0,30	52/0,16	0.57
Common Goldeneye	2/0,10	2/0,7	0.36
Mergansers	10/1,59	7/1,20	17.7#
Other Species	0/0,1	1/0,0	0.33

[x] No. of pairs/no.of singles,no.in flocks

Statistically significant ($p < 0.05$)

TABLE V. Total Numbers of Ducks seen on each Sample Area on Daytime and "Twilight" Surveys, Cape Breton, 1962

	Daytime	"Twilight"	chi-squared
Antigonish	5/2,15[x]	8/3,9	0.02
Pomquet	3/0,0	2/1,1	0
Judique	7/5,0	11/4,0	0.91
Mabou	3/0,19	2/1,17	0.19
Margaree	9/6,14	11/3,5	0.94
Baddeck River	14/10,26	11/3,0	17.1[+]
Middle River	4/3,1	9/2,13	4.9[+]
Whycocomagh	5/2,3	4/4,1	0.14
River Denys	8/10,6	9/5,7	0.06
Scotsville	3/1,2	5/4,0	1.09
Loch Ban	12/7,0	11/3,1	0.44
McCormack	21/5,0	9/3,0	9.9[+]

[x] No.of pairs/no.of singles,no.in flocks

[+] Statistically significant (p. < 0.05)

(b) Comparison of spring and summer survey results.

A comparison of the numbers of ducks of each species seen in spring with the total brood production on those areas calculated from subsequent summer surveys shows results quite different from those reported in 1961. (Table VI). It was unusual to find more Black Duck pairs in spring than broods in summer, since numbers of broods were normal. Lowther noted the same situation in 1956. The number of Ring-necked Duck pairs, however, was as usual greatly in excess of subsequent production. Both teal and Goldeneye had about the same number of pairs and of broods, which might indicate more accurate timing of the spring surveys to census those species than before. Although the numbers of Goldeneye seen in spring were comparable to other years, production in that species was greatly reduced in 1962. The species composition of ducks seen on the 1962 spring and summer surveys was roughly comparable to those found in 1955, 1960, and 1961. (Table VII).

TABLE VI. Numbers and Groupings of Ducks and Duck Broods seen on Spring and Summer Surveys, Cape Breton, 1962

	Spring			Summer
	No.of pairs	No.of pairs and singles	Total ducks seen of each species	No.of broods[x]
Black Ducks	19	29	71	17
Green-winged Teal	3	4	7	2
Blue-winged Teal	14	23	56	13
Ring-necked Duck	56	66	140	23
Common Goldeneye	2	5[+]	20	3
	94	127	274	58

[x] including data collected independently by S.B.MacLeod.
[+] including lone adult females as well as drakes.

TABLE VII. Species composition of Ducks and Duck Broods seen on Spring and Summer Surveys, Cape Breton, 1962.

Species	Spring Species composition of ducks by percent	Summer Species composition of duck broods by percent[x]
Black Ducks	25.9	29.3
Green-winged Teal	2.6	3.4
Blue-winged Teal	13.1	22.4
Ring-necked Duck	51.1	39.7
Common Goldeneye	7.3	5.2
	100.0	100.0

[x] including data collected independently by S.B.MacLeod.

(c) The time-element. The actual survey time in the spring of 1962 was 15 hrs. 0 mins. for the daytime coverage, and 13 hrs. 55 mins. for the "twilight" surveys. The reduction from the figures quoted for the "intensive" coverage in 1961 was largely due to the elimination of River Inhabitants and Shoal Lake. Wherever possible, the daytime and "twilight" surveys of a given area were made on the same day, or on consecutive days, to keep travel time to a minimum. Even so, it was not possible to greatly reduce the total time spent on surveys. The surveys extended over nine days, of which about six and one-half days were spent on that work, the balance being lost to rain and a partial survey of River Inhabitants, or spent on other projects. Coverage of the same areas in search of broods occupied 18 hrs. 45 mins. in July and 19 hrs. 35 mins. in August, with those coverages occupying

six and one-half days and four days, respectively. It seems unlikely that the areas covered in 1962 can be surveyed adequately in less than four days, much of which, however, is travel time between the various areas.

(d) General remarks upon areas surveyed and survey techniques. Reproduction and populations of mergansers are discussed in a separate report. The numbers of duck broods of other species noted in the various areas confirmed the impressions of 1961. Baddeck River (including Nyanza Pond), River Denys, and the McCormack-Loch Ban area are the major brood-producing areas, accounting for 10 (11 with MacLeod's data included), 10, and 11 broods respectively, compared with 11, 10, and 19 in 1961. The decrease at Loch Ban was largely in Goldeneye (5 broods in 1961, 1 in 1962) and Blue-winged Teal (2 broods in 1961, 0 in 1962). Scotsville, Middle River, Whycocomagh, Judique, and Antigonish also produced broods, in lesser numbers. No broods were found at Pomquet Lake and Mabou Harbour, although ducks assembled at both places after breeding. The lower part of the Margaree River was moderately productive, but was difficult to survey adequately in summer.

MacLeod's brood surveys, which were all made on foot or from a car, were more effective than my own in locating Black Ducks. He located two broods at Whycocomagh, and one each at Middle River and Baddeck River, besides those which I found. I found only one Black Duck brood (at Whycocomagh) which was clearly distinct from his. He also noted two additional Blue-winged Teal

broods at Whycocomagh. Dabbling ducks, particularly Blacks, which tend to hide on shore, are less effectively surveyed from a canoe than are diving duck broods which take to open water. A canoe is the only means of covering the larger areas like Baddeck River, River Denys, McCormack-Loch Ban, and the Margaree, within a reasonable time, but in many cases a simultaneous survey by one man on shore and another in a canoe would provide a more complete coverage. Bartlett (pers.comm.) found that two-man parties were most effective for combined production surveys and banding with a dog, in Prince Edward Island.

(e) Relative abundance of the various species. Goldeneye were much less numerous in the summer of 1962 than in 1960 or 1961, and Goldeneye reproduction in 1962 was almost a total loss. It is worth remarking that spring pair counts of Goldeneye should include lone adult females as equivalent to pairs, as well as lone drakes. Gibbs (1961) noted that most Goldeneye drakes in western Maine left the breeding area very soon after the hens commenced incubation, and were thus not available to initiate renesting for hens whose first nests had failed On several occasions, in both 1961 and 1962, I noted adult female Goldeneye alone in areas where broods subsequently appeared, but with no drake in evidence. It seems probable that the same situation prevails in Cape Breton as in Maine. Young Goldeneyes were only noted in company with adult females on two occasions in 1962, but young separated from the adult survived for long periods, possibly even to flying age. One

young bird was seen alone on Middle River, one mile up from the delta, on July 7 and 26, being class IIb by the latter date. Two young were seen on the Margaree River below Margaree Forks July 27. One class III young, possibly one of those seen earlier, was noted August 9 at Margaree Forks. If such survival of isolated Goldeneye young is of general occurrence, it may help to counter-balance the effects of pooling of broods, which Gibbs (1961) noted to make "brood size" meaningless as a measure of survival in that species.

(f) Brood survival. Brood survival was somewhat poorer than in 1961, adverse weather being a possible cause. Table VIII(a) is presented for comparison with other areas and other years. As remarked above for Goldeneye, one can have little confidence in such figures when they are based upon infrequent surveys and small samples. The surveys in 1962 were too widely spaced for the data on individual broods to be very satisfactory, but some data are presented in Table VIII(b)

TABLE VIII. Brood Survival Data, Cape Breton, 1962. (cf. Table VI in 1961 Report)

(a) Average Number Young per Brood[x]

Species	Number of Broods	Average size of Broods	Number of Broods	Average size of Broods	Number of Broods	Average size of Broods
Black Duck	7	7.9	8	4.4	2	5.0
Green-winged Teal	-	-	1	6.0	1	2.0
Blue-winged Teal	7	7.9	1	6.0	2	6.5
Ring-necked Duck	11	7.3	22	4.4	3	6.0
Common Goldeneye	-	-	3	2.0	-	-

[x] only complete broods included in Table.

(b) Broods seen more than once

Black Duck: Antigonish - May 23(9 Ia), July 4(8 IIc), lost 1 in 42 days
June 5(4 Ib), July 4(4 IIb), lost 0 in 29 days

Blue-winged Teal: Whycocomagh - July 5(10 Ia), Aug.13(9 III)
lost 1 in 39 days

Ring-necked Duck: McCormack - July 30(5 IIb, 4 IIb, 7 IIa, 7 IIb)
Aug. 18(3 IIc, 5 IIb, 4 IIc, 6 IIb)
lost 5 from 4 broods in 19 days

Scotsville- July 13(7 Ia), July 20(7 Ib), Aug.2(3 IIa)
lost 4 in 20 days
July 13(7 Ia), July 20(5 Ib)
lost 2 in 7 days
July 20(8 Ic), Aug.2(8 IIa)
lost 0 in 13 days.

Baddeck Rv.-July 12(3 Ia), Aug.13(2 IIc), Aug.18(2 III)
lost 1 in 37 days
July 31(8 Ib), Aug.13(5 IIa), Aug.18(4 IIb)
lost 4 in 19 days.
Aug.13(4 IIa), Aug.18(4 IIa)
lost 0 in 5 days.

When analysis of hatching dates was carried out, ages of broods of Ring-necked Ducks of the older plumage classes were found to be consistently underestimated. The same phenomenon was noted in 1961, so I was aware of that tendency and had tried unsuccessfully to correct for it in the field in 1962. By shifting the age of each brood above class Ib up one stage (i.e. Ic to IIa, IIc to III, etc.) during analysis of the data, consistent hatching dates were obtained for Ring-necked Duck broods which were observed more than once. Hatching schedules were computed as in past years (Table IX). The first Black Duck broods appeared earlier in 1962 than in 1961. Blue-winged Teal and Ring-necked Duck broods appeared on the same dates in both years. The samples of Green-winged Teal and Common Goldeneye were too small to be meaningful, but the latter species, in at least some cases, was nesting earlier in 1962. One Goldeneye hen was incubating a full clutch in a nest-box erected for mergansers near North East Margaree on May 6. However, the clutch disappeared between May 20 and 28, probably by human action, since no trace was left.

TABLE IX. Ranges in Hatching Dates of Waterfowl, Cape Breton, 1962. (cf. Table VII in 1961 Report)

Black Duck: May 20-June 1(4 broods); June 9-12 (5 broods); renests June 30-July 3(4 broods); July 14-31(2 broods). MacLeod's data add one brood June 9, and four broods June 30-July 8.

Green-winged Teal: June 21-July 12(2 broods).

Blue-winged Teal: June 30-July 7(8 broods); renests July 26-Aug.3 (3 broods). MacLeod's data add three broods June 24-July 13.

Ringnecked Duck:[x] July 2-25(21 broods); renests Aug.7(2 broods).

Common Goldeneye: June 13-July 1(4 broods)

[x] based on revised assignment of ages (see above).

Conclusions and Recommendations: 1) Waterfowl population data collected from spring and summer production surveys in Cape Breton Island, N.S., in 1962 are comparable to those collected in 1955, 1960, and 1961. The production of Common Goldeneye was much lower than in the other three years for which comparable data are available. The production of other ducks was about the same as in previous years, in spite of adverse weather during the brood season.

2) Varying the time of day of the spring waterfowl surveys in 1962 had only slight effects upon the total number of waterfowl seen. Movements of flocked ducks were considered to be the cause for most differences between counts made in the early morning or evening and counts made on the same areas in the middle of the day.

3) Omission of a third brood survey, because of other work in late July 1962, probably resulted in some broods being missed altogether. The latter part of July is probably the time of year when the greatest number of duck broods are flightless in Cape Breton. The first Black Duck broods are only just attaining flight, while the Ringnecked Ducks are almost all hatched by then. A brood survey should be made at that time each year, if possible.

4) In the 1961 report, it was shown that the numbers of broods of both teal species and of Common Goldeneyes were greater than the numbers of pairs or of pairs plus single birds seen on the same areas in spring. That was true in 1955 and 1960 as well as in 1961, but not in 1956 or in 1962. The failure of Goldeneye reproduction in 1962 was probably the cause for the numbers of pairs and broods of that species being equal in that year. Retarded growth of aquatic plants in the spring of 1962 may have provided better visibility and permitted more complete counts of teal then, but there are no numerical figures to support that impression.

5) The 1962 data indicate that the Common Goldeneye is not as stable in numbers as was indicated in 1961. The Blue-winged Teal is at present the third-ranking duck species in Cape Breton, after the Black Duck and Ring-necked Duck, and ahead of the Goldeneye.

The Program for 1963: The waterfowl production surveys will be continued in Cape Breton in the spring and summer of 1963, to provide data comparable to previous years. The reproducibility of the spring waterfowl surveys will be assessed, by covering each area at the same time of day on three consecutive days. That triple coverage will certainly take more time than the 1962 spring survey, and it will probably occupy most of the last two weeks of May.

I suggest that a bait-trapping station or stations be set up, on an exploratory basis, at the McCormack-Loch Ban area of Lake Ainslie, and/or at Mabou Harbour. Large flocks of moulting Ring-necked Ducks frequent the former area, and post-breeding groups of Black Ducks are regular at the latter, where migrants also assemble later in the year. I will be in that general area on the merganser study, during late July and early August, and will probably have time to do some bait-trapping on the side. There has been no bait-trapping done in Cape Breton, except for Lowther's work at Nyanza (47 ducks banded) in 1956, although concentration areas are now known. I consider that work, besides serving as exploration and perhaps providing useful data through band recoveries, as a useful experience for myself, since I have no previous experience with bait-trapping. Total expenditures would not exceed $50, unless trapping was unusually successful and was carried on for longer than originally planned.

It is unlikely that a visit to Cape Breton during the hunting season can be worked into my schedule for 1963-64. If time permits, visits will be made to explore the distribution and numbers of waterfowl there in winter.

References

Bagg, A.M. 1962. Spring migration, Northeastern Maritime Region. Aud.Field Notes, 16:387-391.

Boyer,G.F. 1955. Cape Breton Waterfowl Studies. Unpubl. mimeo. report, C.W.S.; 19 p.

Erskine, A.J. 1961a. Cape Breton Waterfowl Studies 1955-1960. Unpubl. mimeo. report, C.W.S.; 20 p.

_____ 1961b. Cape Breton Waterfowl Studies, 1961. Unpubl. mimeo. report, C.W.S.; 23 p.

Gibbs, R.M. 1961. Breeding ecology of the Common Goldeneye (Bucephala clangula) in Maine. M.S.thesis, Univ.Maine.

SUMMARY

Cape Breton Waterfowl Studies, 1962

Project 0-1-30

Studies of waterfowl in Cape Breton Island, Nova Scotia, were continued as in past years.

Spring waterfowl surveys were organized to compare the relative effectiveness of early morning or evening counts with those of counts taken during the middle part of the day. Summer waterfowl surveys were carried out to assess production on the areas surveyed in spring. General data on hatching dates, brood survival, and relative abundance of the various species, were collected concurrently with the production surveys.

It was concluded that the time of day made little difference to the results of spring pair surveys in Cape Breton. However, the dates of brood surveys were found to be most important; the omission of a late July survey because the time was required for other projects resulted in much less satisfactory brood data than in 1961.

Commitments to other projects precluded a fall survey in 1962.

A. J. Erskine

A. J. Erskine
Wildlife Biologist.

Sackville, N.B.
March 1963.

January 24, 1962.

Critique

Erskine, A.J. "Cape Breton Waterfowl Studies, 1961."
Progress Report, Project 0 - 1 - 30 02-1-11

by D.A. Benson

Introduction

"Critique" has been chosen as a general title for comments on progress reports. In the present instance it is not a particularly appropriate title, because I do not discuss the report itself; rather, a general discussion is offered, arising from item 5 of the "Conclusions and Recommendations" appearing on page 22 of the progress report:

"5) Species compositions of waterfowl breeding populations vary widely within the Maritime Provinces. It may be seriously doubted that samples from any one area represent trends prevailing in that region as a whole, and independent surveys in a single area may show glaring disagreement. Furthermore, the samples secured by most surveys to date are probably too small to have statistical significance; it might be desirable to have a statistician examine the reports from the Maritimes to confirm or refute that impression. It seems likely that adequate samples representing all major habitat types in the Maritimes would require an expenditure of time and effort quite out of proportion to the waterfowl production of the area."

Interpretation of the Report

The word "census" is used in this critique to mean a total count. A "survey" involves estimation of a population from sample tracts that have been censused. The following statements appear to be supported by the report:

1. A total count of all birds present is the objective of "intensive counts".

2. The method of "rapid coverage" is less efficient than "intensive counts", being "70-80 per cent as effective as the 'intensive' survey for locating black ducks and ring-necked ducks. For other species of ducks, the more intensive coverage was roughly twice as effective." (p. 5)

3. "Aerial coverage was not satisfactory." (Summary)

4. Waterfowl censuses in the Maritime Provinces have produced diverse results and in at least some cases have been most imprecise (i.e. repeated censuses do not produce results that conform closely).

5. Early season censuses have not proved to be particularly useful for the prediction of the number of broods to be found on the area censused at a later date.

Theoretical Considerations

There are two types of survey design commonly used for estimating waterfowl populations. They are the transect method used for aerial surveys in the western provinces, employing the transect technique, and ground counts of "representative" areas. If we exclude aerial surveys as unsatisfactory for the Maritimes due to the heterogeneity of the waterfowl habitat and geographical differences in species composition, then we are left with the use of representative areas.

What do "representative areas" really represent? The question cannot be answered with mathematical rigour unless a series of total counts of the whole geographical region being "represented" provides numerical conversion factors by which sample counts may be multiplied to estimate the total population, species by species, and the term "per cent sample" given a numerical meaning.

We must conclude that rigorous statistical procedures cannot be applied to waterfowl surveys in the Maritimes at the present time. The choice of "representative" areas must remain for the present more an art than a science.

That conclusion is in line with today's management procedures for many game species; many techniques are used, each imperfect in itself, but together presenting data on which to base a population estimate that is more or less adequate for management purposes.

It is unfortunate that the most used and best known procedures are not suitable for the Maritime Provinces, particularly Nova Scotia.

1. Mail questionnaire hunter kill survey. (No hunter universe in the form of licence stubs available in Nova Scotia.)

2. Aerial survey employing stratification by habitat and transect sampling applied to breeding grounds (not applicable due to heterogeneity of habitat and problems of visibility due to tree cover).

3. Wintering ground counts. (The shootable waterfowl of the Maritimes do not have discrete and recognized wintering grounds.)

4. Massive banding on the breeding grounds followed by analysis of first season recoveries. (The breeding grounds of birds harvestable in the Maritimes are too widely scattered, too inaccessible and too poorly known to make such banding a practical technique.)

It is interesting to note the techniques used on areas much smaller than the Maritimes. The study area of the Northeastern Wildlife Station is an appropriate example. Even there, statistical methods are largely inapplicable. Area counts are interpreted in the light of the phenological calendar, weather, water levels and other observable influences. The interpretation is of necessity subjective to a considerable degree.

Summary and Conclusions

A look at presently known waterfowl survey techniques adds nothing to the point previously made that, in the Maritimes, complete censuses of "representative" areas is the best available and applicable technique. The choice of areas, their size, number and the intensity and times of coverage must be determined by considerations that are logistic and subjective.

Perhaps the best that can be said for the method is that statistical error is not added to the other errors that are known or suspected to exist.

Evaluation and improvement of the method of representative areas, or the development of other techniques suited to local conditions may come about by experiment (e.g. Dr. Erskine's comparative studies). It is always wise to stress sound experimental design for any experimental surveys, because we are forced to conclude that there is at present no method of waterfowl survey, based on a sound statistical design, that is applicable to the Maritime region.

CAPE BRETON WATERFOWL STUDIES, 1961

A. J. Erskine

SUMMARY

Cape Breton Waterfowl Studies, 1961.

Studies of waterfowl in Cape Breton Island, Nova Scotia, were continued as in 1960.

Spring surveys were organized to determine the relative effectiveness of spot counts and intensive coverage in locating spring pairs, and aerial coverage of sample areas was also compared with ground surveys. Summer surveys were carried out to provide estimates of production on the areas sampled in spring surveys. General data on hatching dates, brood survival, and relative abundance of the various species, was collected concurrently with the production surveys.

It was condluded that the rapid coverage was adequate to sample Black Ducks and Ring-necked Ducks in spring, but that the brood surveys were essential to show numbers of Goldeneye and Teal breeding in the study areas. Aerial coverage was not satisfactory.

Variability of species composition between various parts of the Maritime Provinces casts doubt on the validity of sampling only a few districts within the area. Probably samples should be distributed throughout all major waterfowl areas in the Maritimes, but it is questionable whether samples of adequate size could be secured in the time available.

The lack of precise data on numbers of ducks present in Cape Breton during fall and winter gives us no adequate basis on which to recommend season changes there.

ANNUAL JOB PROGRESS REPORT

Title: Cape Breton Waterfowl Studies - 1961

Designation: 0-1-30, 1, 1961

Prepared by: A. J. Erskine

Personnel: A. J. Erskine, assisted on a voluntary basis during July and August by Robert S. Gibbon

Objectives: The purpose of this study is to evaluate the waterfowl surveys in the Maritime Provinces, and to make recommendations for their modification or discontinuance. I have also collected additional data on waterfowl production, migration, and concentrations, for the benefit of future research or management operations. The present report covers work on those two subjects in 1961.

Location of Study areas: The areas under investigation are located in Cape Breton Island and Antigonish County, Nova Scotia. The general term "Cape Breton" has been used in this report to cover the whole area, including the mainland portion. Most of the areas sampled have been discussed in earlier reports (Boyer, 1955; Erskine, 1961).

Coverage: In 1961, ground coverage in spring and summer was restricted to the area bounded by Antigonish, Grand Anse, Baddeck,

and Margaree Harbour. Aerial coverage also included the south-eastern part of Cape Breton. The fall ground survey covered the south shore of Cape Breton as well.

The spring ground surveys in 1961 included two visits, an early survey as advocated by Boyer (1955), and the later one which has been used in most years since then. Due to retarded phenology, the dates of both surveys were set back one week from those originally scheduled, and coverage occurred May 16-21 and May 29-June 2. The aerial coverage was made on May 25-26, using a Tri-Pacer aircraft provided by courtesy of the Nova Scotia Department of Lands and Forests.

Each ground survey consisted of one "rapid" count and one "intensive" count. The former usually involved spot checks from the road or from view-points close to the road, while the latter involved walking through or along the edge of a marsh, or use of the canoe. Binoculars and a telescope were used on all surveys.

Most areas were visited at least twice during the summer to search for broods. The first, incomplete survey was made between June 22 and July 11, when time could be spared from other studies. The second survey during the period July 19-24 covered all areas touched on the spring ground counts. The more productive areas were surveyed again August 14-15. The "beat-out" on foot was used wherever feasible; in other areas a canoe was used. The assistance of R. S. Gibbon during the July and August surveys is gratefully acknowledged.

The fall survey covered the period October 3-7. Low water levels prevented the use of the canoe in some areas where it had been used earlier; otherwise, methods were similar to those of the spring and summer surveys.

Phenology and Spring Migration: No appreciable thaw occured during the winter of 1960-61, and an unusually heavy snow cover was accumulated. March and April temperatures averaged well below normal, and the snow and ice melted very gradually, until early in May. Temperatures in May were generally near normal, except where the proximity of sea ice kept the air cool, and most run-off occurred in that month. The cold spring was probably the major cause both of a late migration and a retarded breeding season, but the late spring run-off did not affect waterfowl production in Cape Breton adversely.

My observations of waterfowl in Cape Breton from April 19 to June 5 give some picture of the spring migration in 1961.

Canada Goose: No large flocks were seen; 33 flew north over East Margaree April 20, and the last flock (7) was seen April 25. Pairs reported at Scotsville (seen April 29 and May 9) and near Margaree Valley (one seen May 14) aroused suspicions of intent to breed, but those birds disappeared after mid-May. One pair were seen on the sea off Donkin May 25.

Black Duck: Already numerous by April 19, and flocks were seen through May 7; on that date, 23 Black Ducks were seen to

leave a flock of 52 at Auld's Cove (Strait of Canso) and depart to the east overland, apparently migrating. Only 5 Blacks remained there ten days later.

Pintail: A lone drake accompanied the above-mentioned migrating flock of Black Ducks at Auld's Cove May 7; a pair of Pintail noted at Loch Ban May 21 were also presumably transients, as none are known to breed in Cape Breton.

Green-winged Teal: First noted April 25-26, when flocks of 27 and 26 birds, respectively, were seen on the south shore of Cape Breton. The first in the Margaree area were seen April 29 (7); in 1960, four were seen near East Margaree April 7. The spring survey data suggest that migrants of this species were still present May 16-21.

Blue-winged Teal: The first pair were seen near Margaree Forks May 3, but no more were seen until May 13. The spring survey data suggest that few locally-breeding birds had arrived even by May 21.

Wood Duck: A lone drake was seen at River Denys April 23, and the species was also noted at Antigonish and Shoal Lake during May.

Ring-necked Duck: First noted April 18 (1 M) in Pictou County; on April 26 12 drakes and one hen were seen in Cape Breton, while May 6-9 surveys listed 15 pairs, 35 males, 7 females, and 11 others. Many transients were apparently still present through May 21.

Common Goldeneye: Already present April 19, and counts in late April suggested continuing migration; numbers after May 1 were compatible with local breeding populations.

In summary, the migration of Black Ducks continued through May 7, while Pintail, Green-winged Teal, and Ring-necked Ducks were still migrating May 21. Blue-winged Teal did not reach full breeding numbers until the last week of May. Few Common Goldeneye were migrating much after May 1.

The Spring and Summer Surveys: (a) Relative Efficiency of "rapid" vs. "intensive" surveys. "Rapid" coverage was 70-80 percent as effective as the "intensive" survey for locating Black Ducks and Ring-necked Ducks. For other species of ducks, the more intensive coverage was roughly twice as effective (see Table I).

The "rapid" coverage was relatively less efficient for all species on the second survey than on the first (Table I). The ducks may have been in a more secretive stage of their breeding cycle during the later survey. Alternatively, water levels had receded somewhat between the two surveys, so visibility may have been less good on the second survey although neither aquatic vegetation nor water-side foliage had developed appreciably by June 1. The decline in efficiency of the "rapid" survey was fairly uniform for all species (5-16 percent), which suggests that the second alternative was more likely to be responsible.

In Cape Breton, Blacks and Ring-necks make up about 80 percent of all ducks seen on spring surveys; the "rapid" coverage would thus appear to provide data adequate to indicate population trends, but not for estimating total production.

(b) Aerial vs. Ground coverage. The degree of visibility undoubtedly is of major importance in aerial surveys. The effectiveness of the aerial survey was about 30 percent for Blacks and

Ring-necks, and less for other game ducks (Table I). Teal are notoriously difficult to observe from the air, and the only "other game ducks" observed in the 1961 aerial count were Goldeneyes.

TABLE I. Comparisons of numbers of ducks seen on different types of spring surveys in 1961, Cape Breton, N.S.

Species	Black Ducks			Ringnecked Ducks			Other Game Ducks			Mergansers
Coverage	1st	2nd	Air	1st	2nd	Air	1st	2nd	Air	Air
"Rapid"	47	54	22	89	43	23	25	9	7	81
"Intensive"	58	71	65[W]	104	61	82[W]	49	22	38[W]	136[W]
Relative Efficiency	.81	.76	.34	.86	.70	.28	.51	.41	.18	.60

[W] average of numbers seen on the two intensive surveys.

Those figures - 18-34 percent of birds found on ground surveys actually observed from the air - are similar to those obtained by Smith (1953), in his first year of comparisons between ground and air coverage of sample areas in the parkland regions of Alberta; with practice, Smith (1954,1955) found up to about 55 percent of birds on the spring aerial counts. The only comparable data for the Maritimes were obtained in Prince Edward Island in the spring of 1960 (C. O. Bartlett, unpub.data); his efficiency figures (air/ground) were Blacks .81, Teal .25, Ringnecks .10, others (Mallard, Pintail, Widgeon) .41. Differences in the habitat, flying conditions, and experience of the observer likely account for most of the discrepancy between the Prince Edward Island and Cape Breton figures.

Data on Mergansers were included in Table I for comparison, but those species are not discussed elsewhere in this report. As might be expected of ducks inhabiting water areas having little vegetative cover, Mergansers were more easily observed from the air than were other ducks.

(c) Relative visibility of the various species. An examination of Table II shows that the numbers of Teal and Goldeneye broods found in summer has been fairly consistently greater than the numbers of pairs of those species recorded on the spring surveys. The numbers of Ring-neck broods were much less than the numbers of pairs present in spring, while the pair counts and brood counts of Black Ducks were approximately equal. Due to variations in phenology and survey dates, the data from 1956 and the first survey in 1961 are not comparable to the others. It seems probable that most spring surveys earlier than May 20 would include too many transients to accurately represent the breeding population of most species, and in late springs even data from May 25 must be used with caution. Likewise summer surveys earlier than July 15 rarely give an adequate picture of reproduction by late-nesting species.

Even the "intensive" spring coverage appears to be quite ineffective in measuring the breeding populations of Teal and Goldeneyes. For proportionate representation of the (successful) breeding population, the summer brood surveys are indispensable in Cape Breton.

TABLE II. Numbers of ducks seen on spring surveys[≠] compared to numbers of broods seen subsequently in the same areas[m], Cape Breton

Species	Year	Spring Surveys Pairs	Spring Surveys Pairs & Singles[x]	Total individuals seen	Summer Surveys Broods seen
Black Duck	1955	12	22	96	15
	1956	31	31	123	11
	1960	8	13	21	9
	1961a	9	14	31	13
	b	8	11	40	13
Gr.-wing Teal	1955	2	5	7	9
	1956	3	3	8	6
	1960	0	0	0	3
	1961a	6	8	14	3
	b	1	1	2	3
Bl.-wing Teal	1955	2	2	7	5
	1956	6	6	27	2
	1960	2	2	4	1
	1961a	1	2	4	11
	b	6	8	14	13
Ringnecked Duck	1955	29	31	66	15
	1956	11	15	26	1
	1960	17	23	40	8
	1961a	47	70	117	27
	b	38	62	101	29
Common Golden-eye	1955	0	0	13	10
	1956	10	10	34	2
	1960	3	3	16	5
	1961a	1	1	9	9
	b	2	2	6	9

[m] Areas are not comparable from year to year; only areas for which both spring & summer data were available were used in each total, & coverages have varied from year to year.

[≠] 1961: intensive survey data used here a-1st coverage; b-2nd coverage.

[x] Lone ducks counted as pairs

(d) Representativeness of the Sample: In Prince Edward Island, Bartlett (1961) correlated percentage species composition of broods with total adults of a species observed on spring ground surveys (Table III). That correlation does not appear to hold in Cape Breton, although the order of abundance of the several species is the same in both spring and summer surveys there. Black Ducks and Ring-necked Ducks, the two most abundant species, occurred in the same proportions relative to each other in both spring and summer surveys (Table IV); however, those species accounted for only 58.6 percent of all game duck broods on the areas sampled, compared to 81.4 percent of adults on the spring surveys, whereas the two Teals and Goldeneyes rose from 18.6 percent in spring to 41.4 percent in summer. Species composition for spring and summer surveys on the Saint John River estuary in New Brunswick is shown in Table V. It was necessary to include data from both C.W.S. surveys and those of the Northeastern Wildlife Station in the summer brood figures, since neither alone gave a complete picture of production. The C.W.S. surveys were too early to adequately report on production of Blue-winged Teal and Ring-necked Ducks, the more so since spring floods on the Saint John River make those species even later nesting there than elsewhere; the Northeastern Wildlife Station data draw heavily on the later period, and the early-nesting Black Ducks and Goldeneyes are less well represented

in those figures. In the other areas discussed, surveys are believed to have sampled adequately the brood periods of all species occurring there.

TABLE III. Species composition (a) of adult birds observed on spring surveys, and (b) of broods observed subsequently on the same areas, in Prince Edward Island, 1957-60[W]

	(a)		(b)	
Species	No.adults	Percentage composition	No.broods	Percentage composition
Black Duck	367	45.0	172	46.5
Pintail	51	6.2	28	7.6
Green-wing Teal	31	3.8	9	2.4
Blue-wing Teal	203	24.9	110	29.7
American Widgeon	80	9.8	24	6.5
Ring-neck Duck	72	8.8	25	6.8
C. Goldeneye	10	1.2	1	0.3
Others(Mallard, Shoveler)	2	0.2	1	0.3
	816		370	

[W] Modified from Bartlett,1961, by elimination of Merganser data.

TABLE IV. Species composition of (a) adult birds observed on spring surveys, and (b) of broods observed subsequently on study areas[W] in Cape Breton in 1955, 1960, and 1961[/]

Species	(a) Number of adults 1955	1960	1961	Total	(b) Number of broods 1955	1960	1961	Total
Ringnecked Ducks	66	40	37	143	15	8	19	42
Black Duck	69	21	29	119	14	9	13	36
Common Goldeneye	13	16	5	34	10	5	8	23
Blue-winged Teal	7	4	8	19	5	1	11	17
Green-winged Teal	7	0	0	7	9	3	3	15
	162	81	79	322	53	26	54	133

	(a) Percentage composition				(b) Percentage composition			
Ringnecked Duck	40.7	49.4	46.9	44.4	28.3	30.8	35.2	31.6
Black Duck	42.6	25.9	36.7	37.0	26.4	34.6	24.1	27.0
Common Goldeneye	8.0	19.7	6.3	10.6	18.9	19.2	14.8	17.3
Bluewinged Teal	4.3	4.9	10.1	5.9	9.4	3.8	20.4	12.8
Green-winged Teal	4.3	0	0	2.2	17.0	11.5	5.6	11.3

[W] Areas covered are only roughly comparable from year to year, but major discrepancies in coverage have been eliminated to improve validity of comparison

[/] 2nd "rapid survey" data.

TABLE V. Species composition (a) of adult birds observed on spring surveys, and (b) of broods observed subsequently on the same areas, in the Saint John River estuary, 1957-59.

	(a)		(b)	
Species	No.adults	Percentage composition	No.broods	Percentage composition
Black Duck	1450[W]	54.2[W]	38[W] - 40[/]	31.9[W] - 22.7[/]
Green-wing Teal	43	1.6	6 - 11	5.0 - 6.3
Blue-wing Teal	105	3.9	6 - 46	5.0 - 26.1
Wood Duck	60	2.2	18 - 18	15.1 - 10.2
Ring-neck Duck	343	12.8	3 - 31	2.5 - 17.6
C.Goldeneye	477	17.8	48 - 26	40.4 - 14.8
Others (Mallard, Pintail,Widgeon)	193	7.2	0 - 4	0 - 2.3
	2671		119 -176	

[W] Based upon C.W.S. surveys (May 5-12, July 3-15)

[/] " " N.E.W.S. " (July 16 - Aug. 17).

It is probable that other areas of the Maritimes would show yet other variations in species composition from those given. For example, brood surveys in the Annapolis Valley in 1960-61 showed only Black Duck and Blue-winged Teal broods, although a few Green-winged Teal were seen, while the shoreline marshes of Nova Scotia apparently produce almost no game ducks except Blacks; the interior of mainland Nova Scotia would probably show mostly Blacks and Ring-

necks, with a few Wood Ducks. The species composition of the Nova Scotia-New Brunswick border area probably approximates more closely to that in Prince Edward Island than to most other areas, since Pintail and Widgeon are significant there also.

The great variation exhibited between the several parts of the Maritimes probably means that to adequately sample the year-to-year fluctuations in waterfowl populations all major regions must be sampled; no single area is representative of the whole, as might be the case in the Prairies. No claims can be made that the samples used in this or other reports on waterfowl numbers in the Maritimes are large enough to have statistical significance. To obtain such figures, from a representative sample of the various types of waterfowl habitat in the Maritimes, would probably require an expenditure of effort quite out of proportion to the total number of ducks produced in the region.

(e) The Time-Element. In 1961, the "intensive" coverage required roughly three times as much survey time ad did the "rapid" survey - 21h. 18m. vs. 5h. 39m. on the first coverage, and 21h. 35m. vs. 5h. 38m. on the second. Moreover, Baddeck River - one of the most productive areas, could not be covered at all by the "rapid" technique, due to a lack of roads near the shores. Travelling time between areas is necessarily the same for both "rapid" and "intensive" coverage, and in fact bulks large in the total time

involved in waterfowl surveys in Cape Breton. Minimum travelling time between the various areas was estimated at nine or ten hours, while a further two hours is needed for loading and unloading the canoe, quite apart from time for meals and rest. In 1961, it was found that about four and one-half days was needed to give all areas both a "rapid" and an "intensive" coverage. In future, reduction of "intensive" coverage, and elimination of less profitable areas might reduce that figure by one-third.

The time-element also renders aerial coverage uneconomical in Cape Breton, where Sydney is the only licenced airport. Of a total of 8h. 30 m. flying time, on May 25-26, 1961, only 2h. 33m. was used on surveys, the balance being travel to and from base. Fog and high winds admittedly hampered the effectiveness of aerial coverage in 1961, but it seems doubtful that aerial coverage is an economical use of time in a region with scattered breeding areas and widely-spaced airports.

(f) General Remarks upon Areas Surveyed. Most areas visited in 1960 were revisited in 1961. As in 1960, River Denys and the Nyanza area were considered the most important waterfowl production areas, but improved coverage (by canoe) of the Loch Ban shoreline, from east of Kenloch to McCormack, has now shown that area to be of almost equal importance. The barachois ponds north of Judique

were also found to be worth regular investigation. Shoal Lake was found rather unsatisfactory as a survey area; the floating bog was judged unsafe for foot surveys, but canoe travel was impracticable except at times of high water. Few ducks can be seen from the shores. River Inhabitants was relatively unproductive, and the time involved in even a cursory survey of that area was considerable; it will probably be omitted in future. A few possible new areas were investigated; Malagawatch in Inverness County, the Washabuck peninsula in Victoria County, and Blue Lake in Richmond County, were all found to support negligible numbers of breeding ducks.

It seems probable that future studies in Cape Breton will secure more data in less time by concentrating upon the areas visited in 1961, with the above-mentioned exceptions, rather than by extending the range of the investigations.

(g) Relative Abundance of Waterfowl Species. In 1961, Blue-winged Teal were much more abundant than usual (cf.Table IV). Conversely, the Green-winged Teal was markedly less numerous in 1961 than in 1960. Workers in other areas (e.g.Munro,1945; Wright,1959) have also remarked upon large and irregular variations in abundance of the Teal species. The summary data in Table IV suggest that the Common Goldeneye should, on a long-term basis, be considered third in abundance after the Ring-necked Duck and Black Duck, although in any individual year either of the Teals might be more abundant. It is unlikely that the Ring-necked

Duck is actually much more abundant than the Black Duck; Black Duck broods are much less easily detected - except with a dog - than are those of Ring-necks, and ~~especially~~ most of the areas sampled are particularly good Ring-neck habitat. No Wood Ducks had been seen in 1960, but several were seen in the spring and summer of 1961, and one brood was seen at River Denys July 21. Godfrey (1958) did not list that species for Cape Breton Island, but we have one previous breeding record, a brood seen by Carter and Lowther at Nyanza July 24, 1956, and pairs were also seen in that area on the spring surveys in 1956 and 1959.

(h) Brood Survival. Brood survival was apparently good in all species in 1961. Adverse weather was almost wholly lacking during the brood period, and no rains of any consequence fell all summer. The high spring water levels resulting from the late freshet persisted well into the summer, and no problems of drought were found on waterfowl breeding areas in Cape Breton. However, many smaller streams went dry, and salmon rivers were so low that Merganser broods were forced to descend to the estuaries at a much earlier age than usual.

The numbers of broods seen was not sufficient to show consistent survival trends, and Table VI(a) is presented mainly for comparison with other similar data. The data on individual broods seen more than once are probably more representative of brood survival, although the evidence for identity of broods

TABLE VI. Brood Survival Data, Cape Breton, 1961

(a) Average Number Young per Brood[W]

Species	Class I Broods	Class I Average	Class II Broods	Class II Average	Class III Broods	Class III Average
Black Duck	4	8.8	9	5.7	2	6.0
Greenwinged Teal	1	10.0	2	6.0	-	-
Bluewinged Teal	6	7.2	4	5.5	7	7.9
Ringnecked Duck	33	7.5	12	7.0	-	-
Common Goldeneye	7	3.7	12	4.4	2	5.0

[W] only "complete" broods included in table.

(b) Broods seen more than once

Black Duck: Antigonish - June 29(7 Ia, 4 II), July 19(7 IIb, 4IIc), lost 0 in 20 days.
Loch Ban - July 10(3 IIc), July 24(3 III), lost 0 in 14 days.

Gr.-wing Teal: Whycocomagh - June 29(10 Ia), July 20(8 IIa), lost 2 in 21 days.

Bl.-wing Teal: McCormack - July 10(7 Ia), Aug.14(7 III), lost 0 in 35 days.
Antigonish - July 19(11 Ib), Aug.14(9 III), lost 2 in 26 days.
River Denys - July 21(8 Ib), Aug.15(7 III), lost 1 in 25 days.
Whycocomagh - July 21(4 Ia), Aug.15(4 IIb), lost 0 in 25 days.

Ringnecked Duck: Baddeck River - July 11(8 Ia), July 21(7 Ib), lost 1 in 10 days.
Judique Ponds - July 20(3 Ia), Aug.14(3 Ic), lost 0 in 25 days.

Common Goldeneye: Scotsville - June 23(7 Ib), July 5(6 IIa), July 12(5 IIb) July 22,28(5 IIc), Aug.9(5 III), lost 2 in 47 days.
Nyanza - June 29(2 Ib), July 11(1 IIa), lost 1 in 12 days.
Loch Ban - July 10(3 Ib), July 24(3 IIa), Aug.14(3 III) lost 0 in 35 days.
McCormack - July 24(7 IIb), Aug.14(7 III), lost 0 in 21 days.

seen on succeeding visits is only circumstantial, except in one case; a female Black Duck with yellow wing-linings - i.e. one which had wintered at Moore's Sanctuary in Prince Edward Island in 1960-61 - was seen twice with a brood at Loch Ban.

Wherever possible, broods were aged, using the method of Gallop and Marshall (1954), and hatching dates were computed. It was noted during analysis of the data that the calculated hatching dates for Ring-necked Ducks were not consistent, and it is evident that the ages of most broods of that species were under-estimated. However, it seems probable that all broods seen on the first and second summer surveys (i.e. through July 24) were actually Class I, while all, except those clearly specified as Class Ia, seen on the August survey were Class II. Hatching periods for the various species (Table VII) confirm that breeding schedules in 1961 were one to two weeks behind those of 1960.

TABLE VII. Ranges in Hatching Dates of Waterfowl in Cape Breton, 1961.

Black Duck: May 28-31(2 broods),June 9-23(11 broods);renests July 2-7 (2 broods)

Greenwinged Teal: June 11-29 (3 broods)

Bluewinged Teal: June 29-July 10(11 broods);renests,July 18-27(2 broods)

Ringnecked Duck: July 7 -about July 25[W](26 broods); renests Aug.8-12 (3 broods)

Common Goldeneye: June 10-28(7 broods);renests,July 6-15(4 broods).

[W] dates obtained by back-dating extended to Aug. 7, but it was clear during analysis that most broods above Class Ia were considerably older than estimated.

The Fall Survey. The data on fall waterfowl concentrations (Table VIII) were obtained October 3-7, 1961, compared to September 23-28, 1960. However, observations made elsewhere in the Maritimes suggest that the observed differences are not merely a consequence of the later survey date in 1961. Most Blue-winged Teal had moved out of Nova Scotia before the end of September, while large flocks of Green-winged Teal had already appeared by that time. Canada Geese too, appeared to be moving south in numbers rather earlier in 1961 than in 1960. Numbers of most other species were more or less comparable in the two years, although Pintail appeared to be more widespread in 1961. I have no data on sizeable flocks of Scaup in the Maritimes in fall from other years, but my impression would be that it was early to see the numbers observed October 3 and 6.

The duck concentrations observed ten days before the start of the hunting season in 1961 certainly indicate that the early season in Inverness and Victoria Counties is giving hunters their best opportunities there. No new data on wintering ducks in Cape Breton are available since my last report (Erskine,1961a), but the relatively few ducks seen along the south shore of the island October 4 and 6 (Grand River, Framboise, Mullcuish, and Belfry Lakes) suggest that the early season is of little benefit there. My own impressions are unchanged:- if there are to be early and late hunting zones on the mainland of Nova Scotia, the same should be true in Cape Breton, since the same ecological

division seems to hold there as well. The dates for opening the two zones will depend upon demand, but there seems no valid reason for more than two zones in Nova Scotia.

TABLE VIII. Early Fall Waterfowl Concentrations in Cape Breton, 1961

Area	Date	Black Duck	Pin-tail	Gr-w. Teal	Bl.-w. Teal	R-neck Duck	Gold-eye	Others
Antigonish-Pomquet area	3/10	25	-	35	7	-	-	C.Goose 45; Gr.Scaup 263 S.Scoter 7.
Judique area	7/10	96	1	4	-	9	1	Blue Goose 2; Ruddy Duck 1
Mabou Harbour	7/10	58	-	114	3	-	-	
Lake Ainslie	7/10	31	-	2	-	2	4	
Margaree Harbour	7/10	63	-	19	-	-	-	
Baddeck River	5/10	130	1	3	-	130	7	
Middle River	5/10	-	-	9	23	-	-	C.Goose 13
Whycocomagh area	5/10	8	-	105	-	-	-	Hooded Merg.4
River Denys	4/10	35	10	11	-	39	-	
Grand River	4/10	11	2	-	-	-	-	C.Eider 12
Framboise, Mullcuish, Belfry Lakes	6/10	41	-	25	-	-	-	Gtr.Scaup 210
Port Morien	6/10	-	-	-	-	-	-	C.Goose 117
Glace Bay Sanctuary	6/10	123	-	-	-	-	1	
Totals		621	14	327	33	180	13	C.Goose 175 B.Goose 2 Gr.Scaup 473 C.Eider 12 S.Scoter 7 Ruddy Duck 1 H.Merg. 4

Conclusions and Recommendations: 1) The 1961 data suggested that a late spring survey, probably about May 25, was more representative for most species than the early coverage advocated by Boyer (1955). Boyer's recommended dates for brood surveys were satisfactory.

2) Rapid spot checks were found to be nearly as effective as the intensive beat-out for detecting Black Ducks and Ringnecks in spring. Even the beat-out was inadequate to lacate Teal and Goldeneyes in numbers comparable to those evidenced by subsequent production; for those species, the summer brood survey is indispensable for estimating breeding populations, at least in Cape Breton.

3) Aerial coverage in 1961 was unsatisfactory. Adverse weather hampered the operation, and inexperience may have also contributed to the low count. It is probably desirable to provide aerial coverage again in the spring of 1962, in order to better compare the relative effectiveness of aerial and ground counts.

4) Surveys in 1961 failed to reveal any new important areas for waterfowl production. It is expected that directions can be provided so that a technical assistant could carry out the spring and summer surveys adequately, if and when this should prove desirable.

5) Species compositions of waterfowl breeding populations vary widely within the Maritime Provinces. It may be seriously doubted that samples from any one area represent trends prevailing in that region as a whole, and independent surveys in a single area may show glaring disagreement. Furthermore, the samples secured by most surveys to date are probably too small to have statistical significance; it might be desirable to have a statistician examine the reports from the Maritimes to confirm or refute that impression. It seems likely that adequate samples representing all major habitat types in the Maritimes would require an expenditure of time and effort quite out of proportion to the waterfowl production of the area.

6) Other commitments have prevented obtaining additional data on fall and winter waterfowl populations in Cape Breton. The 1961 fall survey confirmed the 1960 impression that early fall concentrations are largely concentrated on the breeding areas in central Cape Breton, with few birds in the wintering areas along the south shore. Until data for late fall and winter are available, we are on shaky grounds in making recommendations regarding hunting seasons in southern Cape Breton.

The Program for 1962. Variables to be investigated on future surveys include time of day of surveys, and reproducibility of results. It is unlikely that both those factors can be investigated in the time available during the spring of 1962, as each area will need to be covered at least twice and preferably three times, probably on separate days. Surveys in 1962 will include a spring coverage, probably May 20-25, and at least two summer surveys. A visit will be made to Cape Breton during the hunting season of 1962, if time permits.

A. J. Erskine

A. J. Erskine, Wildlife Biologist.

Sackville, N.B., November, 1961.

References Cited

Bartlett,C.O.(1961),"Some characteristics of Black Duck populations on Prince Edward Island",paper presented at Northeastern Wildlife Conference, Halifax,June 12-14,1961;mimeo,21 pp.

Boyer, G.F.(1955), "Cape Breton Waterfowl Studies",unpubl. mimeo. report, Canadian Wildlife Service; 19 pp.

Erskine,A.J.(1961),"Cape Breton Waterfowl Studies, 1955-1960", unpubl. mimeo. report, Canadian Wildlife Service; 20 pp.

Godfrey,W.E.(1958),"Birds of Cape Breton Island, Nova Scotia", Can. Field Nat.,72:7-27.

Gollop,J.B.,& W.H.Marshall(1954),"A guide for aging duck broods in the field"; mimeo.report, Mississippi Flyway Council, Technical Section; 14 pp.

Munro, J.A.(1945), "The birds of the Cariboo Parklands, British Columbia" Can.Jour.Research, 23D:17-103(N.B.pp. 40-41).

Smith,A.G.(1953),"Waterfowl breeding ground surveys of special study areas in Alberta - 1953", U.S.Fish & Wildlife Service and Canadian Wildlife Service,Spec.Sci.Rep.-Wildlife No.25: 30-42.

Smith,A.G.,& H.R.Webster(1954),"Waterfowl breeding ground surveys of special study areas in Alberta,1954", U.S.Fish & Wildlife Service and Canadian Wildlife Service, Spec.Sci.Rep.-Wildlife No.27:35-44.

Smith,A.G.(1955),"Waterfowl breeding ground surveys of special study areas in Alberta - 1955",U.S.Fish & Wildlife Service and Canadian Wildlife Service,Spec.Sci.Rep.-Wildlife No.30: 33-44.

Wright,B·S.(1959),"Waterfowl breeding ground survey of the Saint John estuary,N.B.,1959"; unpubl.mimeo.report, Northeastern Wildlife Station, Fredericton, N.B·

CAPE BRETON WATERFOWL STUDIES

1955-1960

A. J. Erskine

CAPE BRETON WATERFOWL STUDIES, 1955-60 (Project O-1-1).

Introduction: In 1955 the late G. F. Boyer, of the Canadian Wildlife Service, carried out a study of waterfowl in Cape Breton Island, Nova Scotia (Boyer, 1955), reconnaissance visits by H. R. Webster in 1952 and by Boyer in 1954 having suggested that the area might justify further study. In 1954 a party from the National Museum of Canada gathered considerable information on waterfowl distribution in Cape Breton (Godfrey, 1958). Since 1955, regular spring surveys have been made of the study areas established by Boyer, while a study of waterfowl in the Nyanza area was made by personnel in 1956 (Lowther, 1956). The present report includes data gathered in 1960 by the writer, and summarizes the information to date for the benefit of future research or management of waterfowl in the area. (Mergansers are the subject of a special study, and are not discussed herein).

The Study Areas: Areas surveyed by Boyer included salt marshes along the west coast of Cape Breton, freshwater marshes around Lake Ainslie, and brackish marshes, either at the head of

tidal influence or around the weakly saline waters of the Bras D'Or Lakes. (see Table I). In 1960, coverage was extended; summer surveys included barachois ponds along the east and south shores (Big Pond, Big Glace Bay Lake Sanctuary, Port Morien, Belfry Lake, Mullcuish Lake, Framboise Lake), and other ponds, rivers, and lakes in the same area (Gabarous Lake and nearby ponds, Ferguson Lake, Mira River and Lake, Grand River, Shoal Lake)(see Map). The most significant new area was the brackish estuary of River Denys, at the west end of Bras D'Or Lake. On the fall survey, estuaries and barachois ponds in northern Cape Breton were included (Petit Etang, Pleasant Bay, Aspy Bay, Ingonish River, Englishtown, St. Ann's), although the data gathered then may not be of great value for breeding localities.

Boyer's report (q.v.) included a section on "Physiography and Climate", which needs little amplification here. All but one (Shoal Lake) of the new areas are also underlain by Mississippian strata, as are most other areas in Nova Scotia which are productive of waterfowl.

Climatically, it may be significant that most of the favoured breeding areas for waterfowl in Cape Breton are shallow and sheltered waters, which freeze early; in 1960, the Margaree

marshes, the deltas of Baddeck River and Middle River, and much of Indian Bay, were frozen by December 11. On the other hand, the southern parts of the Bras D'Or Lakes usually remain open all winter, as do the ocean shores along the south of Cape Breton.

No detailed studies of habitat were made in 1960. However, it is worth remarking that Boyer found Potamogeton pectinatus common at Baddeck River and Middle River; in 1960 it was not noted at either place, although dense and extensive beds were found at River Denys. Whether or not an actual decline in that important waterfowl food plant has occurred in the Nyanza area, the waterfowl population there in 1960 was certainly less outstanding than in 1955 and 1956.

Methods: In 1955, a dog was used on all surveys, especially in summer when banding of local and flightless birds was carried out. Since then, surveys have depended on foot and canoe, with binoculars and telescope, for coverage of the study areas. Thus, results are not entirely comparable, quite apart from the changes in observers. No aerial surveys of Cape Breton in breeding season have been carried out; however, due to the large proportion of diving ducks (Ringnecks, Goldeneye, Mergansers) aerial surveys might be more effective there than in areas populated chiefly by dabbling ducks.

The 1960 Surveys: Boyer's "ground transect" was covered on May 22-27th. The data are given in Table I, with those of other years for comparison (not all areas were covered every year). Except in 1957, the survey dates are very similar to those of 1955. Boyer felt that his survey (May 25-27) was too late to give a good picture of Black Ducks and Goldeneye populations, but pressure of other work has since precluded the earlier (May 10-15) date he advocated.

In 1955, Boyer covered much the same areas on his July 14-18 visit as were surveyed in spring, while his August visit included the Nyanza area only. In 1960 most areas were surveyed twice, on June 22-30 and July 16-20. The assistance of G. F. vanTets in the July surveys is gratefully acknowledged. A few areas were also visited briefly August 3-5. Comparable data from the July surveys in 1955, 1956, and 1960, are given in Table II.

Boyer's second (August 17-21) visit gave some picture of post-breeding concentrations in the Nyanza area, and Lowther's work (q.v.) provided further details; no surveys of other areas are available for comparison with that of September 22-28, 1960. Not all areas covered in the spring and summer were again visited then, but some

areas not previously investigated were included (see p.1). Data on early fall concentrations in 1960 are given in Table III.

No previous winter surveys are available for comparison with that of December 9-13, 1960. Adverse weather and road conditions curtailed coverage on that trip. Waterfowl observations on the winter survey are compared with some figures for the same general areas, from Mid-Winter Waterfowl Inventories in 1958-61, in Table IV.

TABLE I. Results of Spring Pair Surveys in Cape Breton, 1955-60

	Date	Time (hr:min)	Black Duck	Gr-w Teal	Bl-w Teal	R-neck Duck	Gold-eye	Other Specie & Marsh Type
Judique	25/5/55	0:15	1/4 0					Barachois, Salt
	17/5/57	0:20	0/2 0					
	22/5/60	0:20	1/0 0					
Mabou Harbour	27/5/55	0:15	0/0 27					Estuary, Salt
	17/5/57	1:45	1/2 0			2/0 0		
	25/5/58	1:50	3/4 26		2/0 0	0/1 0		
	24/5/59	?	3/1 13		1/0 0		0/0 10	
	22/5/60	1:20	0/1 0	1/0 0				
McCormack	17/5/57	0/25	1/0 0					Lake, creek Fresh
	25/5/58	0:30	1/1 0	0/1 0	1/0 0			
	23/5/59	0:25	3/1 0					
	22/5/60	0:40	3/0 0			4/0 0	1/0 0	
Loch Ban	16/5/57	0:30	1/2 6	3/0 0		1/0 0		Lake, marsh Fresh
	25/5/58	0:30	2/2 3		2/0 0	1/1 0		
	23/5/59	0:30	1/2 0		0/2 0	1/0 0		
	22/5/60	0:25	1/1 0			1/0 0		

Table I continued

	Date	Time (hr:min)	Black Duck	Gr-w Teal	Bl-w Teal	R-neck Duck	Gold-eye	Other Species & Marsh type
Scotsville	27/5/55	1:40	2/2 0		2/0 0	6/2 0	1/0 2	(also M Mallar ♂ F Black)
	26/5/56	?	1/0 5				4/0 8	(also 2 pr. Gtr.Scaup)
	16/5/57	0:15	1/0 0					Lake,river
	25/5/58	0:15	2/0 0				1/0 0	Fresh
	23/5/59	0:15	1/0 0					
	22,27/5/60	0:50	1/0 0			4/1 3	1/0 0	
Margaree River	26/5/55	1:10	4/3 21		2/0 0	6/2 0	1/0 2	River,marsh Brackish
	26/5/56	?	8/0 3		1/1 0			
	16/5/57	2:15	2/2 26	2/0 5	0/0 12			(also 1 pr. Mallard)
	24/5/58	2:30	3/2 24		2/0 0	1/1 0		
	20/5/59	2:50	2/6 13		1/1 0	1/0 5		
	25/5/60	3:40	2/1 0		2/2 0	0/1 0		
Baddeck River	26/5/55	6:00	1/3 0	2/3 0	2/0 3	14/0 5	0/0 1	(also M Mall- ard ♂ F Blk)
	26/5/56	?	9/0 23	1/0 0	3/0 9	4/1 0	1/0 2	Delta, lake Brackish-fres
	16/5/57	2:25	1/1 0		1/0 0	0/0 16	0/1 0	(also 1 pr. Mallard)
	27/5/58	2:45	4/2 28		1/0 0	10/3 0	0/1 0	
	26/5/59	?	2/0 0			8/0 9	1/1 0	(also 1 pr. Wood Duck)
	23/5/60	3:00			0/1 0	8/2 0	1/0 0	(also 1 pr. Gtr.Scaup)

Table I concluded

Area	Date	Time (hr:min)	Black Duck	Gr-w Teal	Bl-w Teal	R-neck Duck	Gold-eye	Other Species & Marsh Type
Myanna Pond	26/5/55	0:15			2/1 0	5/0 0		Pond Fresh
	16/5/57	?	0/1 0			0/0 7		
	23/5/60	0:05	0/1 0			0/1 0		
Middle River	26/5/55	0:50	5/2 14			9/0 1	0/0 12	Delta, lake Brackish
	29/5/56	?	13/0 30	2/0 2	3/0 6	7/3 0	9/0 12	(also 1 pr.& 1 F Wood Duck
	16/5/57	1:00	1/1 0	1/0 0		0/0 18	0/1 0	
	23/5/60	1:00			0/1 0	1/0 0	1/0 10	

Key: abbreviations - Gr-w and Bl-w Teal = Greenwinged and Bluewinged Teal; R-neck Duck = Ringnecked Duck; Gold-eye = Common Goldeneye; numbers given thus: 4/3 means 4 pairs, 3 lone birds (usually 21 drakes), 21 in flocks.

Observers: 1955 - G. F. Boyer; 1956 - J. K. Lowther; 1957 - C. O. Bartlett; 1958 & 1959 - B. C. Carter; 1960 - A. J. Erskine.

TABLE II. Comparable July Brood Survey Results, 1955,1956, and 1960

Area	Year	Black Duck adults	Black Duck broods	Gr-w Teal Ad.	Gr-w Teal br.	Bl.-w Teal Ad.	Bl.-w Teal Br.	R-neck ad.	R-neck br.	G-eye ad.	G-eye br.
M A	1955	4	1								
	1960	1									
Scotsville	1955	4	1			1		1	1		
	1956	2	2								
	1960	3	1					1	1	1	1[X]
Margaree River	1955	4	2								
	1956	7	2			1					
	1960	3	2[+]								
Baddeck River & Nyanza pond	1955	9	2			7	4	52	12	9	8
	1956	1	3	2	1	16		2	1	2	2
			also	1 ad. 1 br. of Wood Duck							
	1960	3	3	1	1	3	1	7	5	1	2
Middle River	1955	17	9	9	9	5	1	2	2	20	2
	1956	10	4	4	5	10	2	2		4	
	1960			10	1	1		3			1[X]
Whycocomagh	1955	2	2								
	1956	2									
	1960	1	1					1	1		
ngedale	1955	1	1								
	1960	1	1								
Totals	1955	41	18	9	9	13	5	55	15	29	10
	1956	22	11	6	6	27	2	4	1	6	2
	1960	12	9	11	2	4	1	12	7	2	4

[X] June 29 & 30

[+] August 3.

Survey Dates: 1955 - July 14-18, G. F. Boyer
1956 - July 6-10,24 - J. K. Lowther
1960 - July 16-20, A. J. Erskine & G. F. vanTets

Abbreviations: Gr-w and Bl-w Teal = Greenwinged and Blue winged Teal; R-neck Duck = Ringnecked Duck; Gold-eye = Common Goldeneye;

TABLE III. Early Fall Waterfowl Concentrations in Cape Breton, 1960

Area	Date	Black Duck	Pintail	Gr-w Teal	Bl-w Teal	R-neck Duck	Gold-eye	Canada Goose
Mabou Harbour	25/9	115		13	1			
W.L.Ainslie	24/9					1	3	
Scotsville	24/9			2				
Margaree R.	23/9	42		9	8			
Baddeck R.	25/9	100		2		75	5	
Nyanza Pond	25/9				4	34		
Middle River	25/9	3		3	2			
Whycocomagh	24/9	19		16				
Orangedale	24/9				7	6		
River Denys	24/9	108	19	25	54	24		
Glace Bay Sanc.	26/9	125		11		5		2
South Gut St.Ann's	26/9	4						
Petit Etang	27/9						6	
North Aspy R.	27/9	20		11				
Ingonish R.	28/9			8	1			
Totals		536	19	100	77	145	14	2

Abbreviations: Gr-w and Bl-w Teal = Greenwinged and Bluewinged Teal; R-neck Duck = Ringnecked Duck; Gold-eye = Common Goldeneye.

TABLE IV. Winter Waterfowl Observations in Cape Breton, 1958-61

Winter	Source of Data	Black Duck	Scaup	Gold-eye	Buff-head	Old-squaw	Scoter	Others	Geese
Aree River									
1960-61	writer	12		2	3				
1958-59	W.W.I.	10							
Baddeck area									
1960-61	writer		- - - Nil - - -						
1957-58	W.W.I.	30		10			30	40	10
1958-59	W.W.I.	50		14	20		2	58	12
1959-60	W.W.I.	8		23		2	2	24	
1960-61	W.W.I.	6		14		4	2	27	
Great Bras D'Or - Leitches Creek									
1960-61	writer		- - - Nil - - -						
1957-58	W.W.I.	7						1	
1959-60	W.W.I.	14						2	
1960-61	W.W.I.		- --- Nil - - -						
Sydney River									
1960-61	writer	25							
1960061	W.W.I.	40							
Glace Bay Sanctuary, Lingan Bay, Port Morien									
1960-61	writer	250		1					700
1960-61	W.W.I.	230	60	30				4	650
Grand River area									
1960-61	writer			5		8		10	
1957-58	W.W.I.							323	
1959-60	W.W.I.	20					5	6	
1960-61	W.W.I.	275		35	15				
South shore Bras D'Or Lakes									
1960-61	writer		- - - Nil - - -						
1960-61	W.W.I.	6	600	100					
Totals (only greater figure used where two figures for same area in one ye									
1957-58		37		10			30	364	10
1958-59		60		14	20		2	58	12
1959-60		42		23		2	7	32	
1960-61		589	660	181	15	12	2	41	700

Abbreviations as in previous tables; Buff-head = Bufflehead;
W.W.I. = Mid-Winter Waterfowl Inventory data

Results: Comparison of spring and summer surveys indicates that certain areas in Cape Breton are particularly significant for breeding of waterfowl. Chief among those are the Nyanza area (deltas of Baddeck and Middle Rivers, and adjacent ponds) and River Denys, while the marshes around Lake Ainslie, Whycocomagh, Orangedale, and East Margaree, are also productive. Shoal Lake was the only productive area found in Richmond County, though reports suggested that River Inhabitants might bear further investigation.

As elsewhere in Nova Scotia (cf. Appendix I) the Black Duck and Ringnecked Duck are the most important breeding species in the areas surveyed. In Cape Breton the Greenwinged Teal is the third most important species, whereas elsewhere it is scarce; in contrast, the Bluewinged Teal is much more common on the Nova Scotia mainland than in Cape Breton, where only three broods were noted in 1960. The Common Goldeneye probably ranks between the two Teal in abundance. One other species warrants mention; two groups of Pintail, numbering 14 and 5, at River Denys on September 24, gave the impression of being family flocks. No breeding area for that species is known nearer than eastern Prince Edward Island, and no

previous records of the species in Cape Breton have been published (Godfrey, 1958).

Waterfowl populations in southwestern Cape Breton were apparently lower in 1960 than in 1955, although changes in observers and in methods may have been partly responsible for the differences. Breeding pairs in 1960 were lower than in any year from 1955 through 1959, while far fewer broods were found than in 1955, fewer even than in 1956 when much less time was spent on the survey. The decline was most apparent in the Middle River delta (see Tables I and II) though the Baddeck River delta was also affected; however, more broods were found at Margaree and Lake Ainslie in 1960 than in either 1955 or 1956. More attention to waterfowl food plants in the Nyanza area in subsequent years may throw light on the changes there.

Brood survival in 1960 was apparently quite good, as little adverse weather occurred during the brood season, with the exception of heavy rain and a thunderstorm June 25. The numbers of broods seen are too few to be really significant, but the data for survival are given in Table V, with notes on individual broods seen more than once (evidence for identity of individual broods is circumstantial only).

TABLE V. Brood Survival Data, Cape Breton Island, 1960.

(a) Average Number Young per Brood

Species	Class I Broods	Class I Average	Class II Broods	Class II Average	Class III Broods	Class III Average
Black Duck	2	7.5	7	6.4	3	8.0
Greenwinged Teal	3	9.0	4	9.8	2	7.0
Bluewinged Teal	-	-	1		-	-
Ringnecked Duck	14	8.3	3	5.0	-	-
Common Goldeneye	2	5.0	2	6.5	2	3.5

(b) Broods seen more than once

Black Duck: Orangedale - June 25 (8 IIa), July 16 (6 IIb), lost 2 in 21 days.

Whycocomagh - July 16 (9 IIc), August 4 (9 III), lost 0 in 19 days.

Gr-wing Teal: Nyanza - June 23 (11 Ic), 30 (11 IIa), July 17(11 III), lost 0 in 24 days.

" June 30 (12 Ib), July 17 (10, IIa), lost 2 in 17 days.

There appeared to be little or no difference in the timing of breeding in the southern and more northern parts of Cape Breton. Wherever possible broods were aged, using the method of Gollop and Marshall (1954), and hatching dates were

computed by back-dating. Where one or two broods were very much later than others of that species, they were considered to be the results of re-nesting. Ranges of hatching dates in Cape Breton in 1960 are given in Table VI.

TABLE VI. Ranges in Hatching Dates of Waterfowl in Cape Breton, 1960.

Black Duck:	May 26 - June 17 (11 broods), renests July 1-4 (2 broods).
Greenwinged Teal:	June 11-29 (6 broods), renests July 17 (1 brood).
Bluewinged Teal:	June 21 - July 4 (3 broods).
Ringnecked Duck:	June 18 - July 14 (16 broods).
Common Goldeneye:	May 26 - June 21 (5 broods).

The fall and winter surveys support Boyer's arguments for an early hunting season, in the main study areas. Heavy concentrations of waterfowl were noted in September (three weeks before the opening) at Mabou Harbour, at Baddeck River, at River Denys, and at the Big Glace Bay Lake Sanctuary. All except the last support considerable hunting pressure, at least during the early part of the season, but hunting ceases with the freeze-up in December. No benefit can there

be gained by a later season than that now prevailing (October 15-December 23). In Cape Breton and Richmond Counties, tidal salt waters remain open all winter, and conditions are more similar to those found upon the South Shore and Eastern Shore of Nova Scotia, which now have a late season (November 23-January 31). The south shore of Cape Breton, with the Bras D'Or Lakes, also supports a fairly significant population of wintering waterfowl (see Table IV), and it may be well in future to consider the possibility of a late season for some part of that area. Possibly the dividing line should follow the coast road from L'Ardoise through St. Esprit, Fourchu, and Louisbourg, to Sydney, rather than including the whole of Cape Breton and Richmond Counties, in the southern zone.

Conclusions and Recommendations: 1). Cape Breton at present appears to be the most profitable area in Nova Scotia for waterfowl studies. Other formerly important areas in Kings and Cumberland Counties have declined in the last decade due to increased drainage (cf. Appendix I).

2). Spring and summer surveys from past years, including 1960, have been largely exploratory in nature, and consequently not strictly com-

parable from year to year. In future, both spring and summer surveys should be standardized in form, area, and timing, to permit direct comparisons between years. The unattainable objective - of the maximum of accuracy in the minimum of time - should always be striven for. That objective is the basis for a new sub-project under Project 0-1-1 discussed at the Canadian Wildlife Service conference in October, 1960. If it seems desirable, that project may receive a separate Project number for 1962-63 estimates.

3). More data are needed on waterfowl distribution and concentrations in Cape Breton in fall and winter. If such confirm present observations, a later hunting season for all or parts of Cape Breton and Richmond Counties should be instituted when seasons in Nova Scotia are next revised.

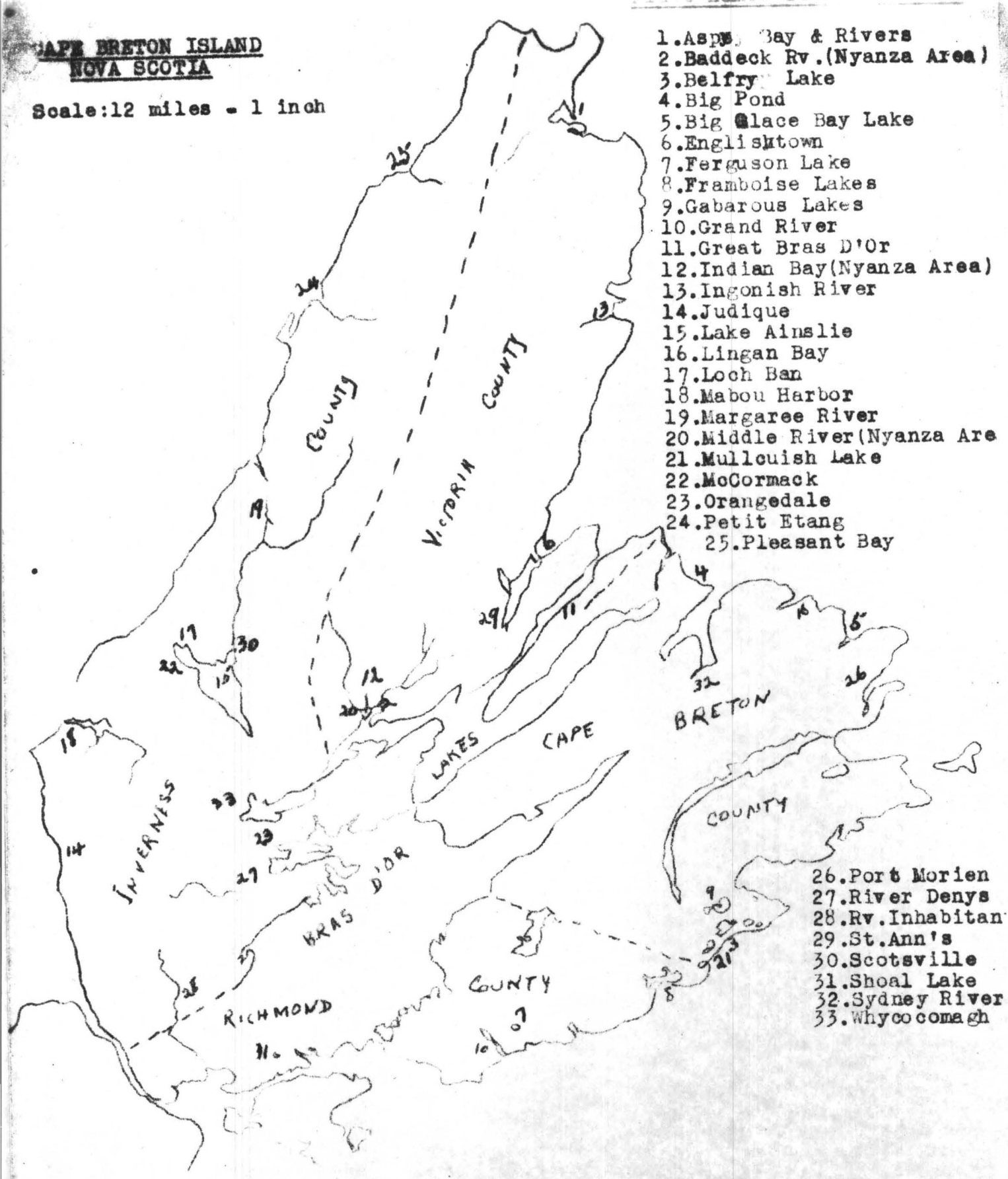
References Cited

Boyer, G.F. (1955), "Cape Breton Waterfowl Studies", 19 pp., 1 map, unpubl. mimeo. report, Canadian Wildlife Service.

Godfrey, W.E.(1958),"Birds of Cape Breton Island, Nova Scotia", Can. Field Nat., 72:7-27.

Gollop, J.B., & W.H.Marshall (1954), "A Guide for Aging Duck Broods in the Field", 14 pp. mimeo. report, Mississippi Flyway Council, Technical Section.

Lowther, J.K.(1956), "Nyanza, Cape Breton, Nova Scotia, as an Area for Waterfowl Banding", 24 pp. unpubl.mimeo.report, Canadian Wildlife Service.


CAPE BRETON ISLAND
NOVA SCOTIA
Scale:12 miles - 1 inch
1.Aspy Bay & Rivers
2.Baddeck Rv.(Nyanza Area)
3.Belfry Lake
4.Big Pond
5.Big Glace Bay Lake
6.Englishtown
7.Ferguson Lake
8.Framboise Lakes
9.Gabarous Lakes
10.Grand River
11.Great Bras D'Or
12.Indian Bay(Nyanza Area)
13.Ingonish River
14.Judique
15.Lake Ainslie
16.Lingan Bay
17.Loch Ban
18.Mabou Harbor
19.Margaree River
20.Middle River(Nyanza Are
21.Mullcuish Lake
22.McCormack
23.Orangedale
24.Petit Etang
25.Pleasant Bay
26.Port Morien
27.River Denys
28.Rv.Inhabitan
29.St.Ann's
30.Scotsville
31.Shoal Lake
32.Sydney River
33.Whycocomagh
VICTORIA COUNTY
INVERNESS COUNTY
CAPE BRETON
LAKES
BRAS D'OR
RICHMOND COUNTY

Appendix I

Comparison of Cape Breton with other areas in Nova Scotia for waterfowl BREEDING

Spring Survey 1960

Area	Dates	Time hr:min.	Black Duck	Gr-w Teal	Bl-w Teal	R-neck Duck	Gold-eye	Others
Cape Breton	May 22-27	11:20	8/4,0	1/0,0	2/4,0	18/5,3	4/0,10	1 pr.Gtr. Scaup
North Shore	May 12-13	5:10	9/7,42	1/1,0	4/2,0	-	-	-

Summer Surveys 1960

1st Coverage Cape Breton	June 23-July 1	13:15	51& 3br.	10&4br.	13&1br.	105&3br.	4&3br	1 Mallard
North Shore	June 16,22-23, July 1	5:15	17&9br.	-	2	1	-	-
Kings Co.-Musquodoboit	June 8-12	12:40	6&3br.	2	13	-	-	-
	July 2-3	4:10	5&4br.	2	9&3br.	8&1 nest	-	1 wood Du
NS-NB border	June 14-20	13:35	37&1br.	8&1br.	21	12	-	6 Widgeon 5 Wood Du
2nd Coverage Cape Breton	July 16/20	10:15	17&9br.	11&2br.	4&2br.	44&18br.	2&3br.	-
North Shore	July 15-16	5:05	5&3br	-	1	4	-	1 unident.
	Aug. 5	5:15	154&2br.	16	4	-	-	-
Kings Co.-Musquodoboit	Aug.9,13	4:15	21&2br.	18	7&5br.	-	-	1 Wood Du
NS-NB border	July 6-8	5:00	5	6&1br.	20&3br.	2&2br.	-	2&1br.Pi 6 Widgeo 4 Wood D

CAPE BRETON WATERFOWL STUDIES

INTRODUCTION:

It was not until the late summer of 1954 that a decision was made to include Cape Breton Island in the annual waterfowl survey. Previous investigations of the region had been made by various officers of this Service, a notable example of which ~~were~~ was the investigations carried out by Mr. Harry Webster in 1952. These preliminary checks indicated that the Island was one of the important duck producing areas of the Maritimes.

The reconnaissance of 1954 resulted in the detailed spring and summer surveys conducted this year over the south-western portion of Cape Breton bounded on the north and east by the National Park and the Bras d'Or chain of lakes.

It is hoped that this report will be of benefit to future waterfowl investigators and that work will continue in the major study areas discussed herein. This information is also intended to benefit the sportsmen of Cape Breton in utilizing their waterfowl resources.

AREAS WHERE STUDIES WERE CARRIED OUT:

In general the reconnaissance surveys included the coast road from Port Hastings to Margaree Forks, down Route 19 to Baddeck and thence down Route 5 to Whycocomagh. Marshes in the vicinity of Orangedale and the perimeter of Lake Ainslie were also studied.

As a result of this reconnaissance the following offer possibilities as major study areas:-

1. The Baddeck and Middle River estuaries including the marshes and ponds lying inbetween.

2. The lower part of the Margaree River between the bridge at Margaree Forks and the bridge at Margaree Harbour.

3. The head of the Southwest Margaree River and adjacent marshes at Lake Ainslie.

4. The marshes around Whycocomagh.

In addition small areas like Orangedale and the lower part of the Mabou River are worthy of attention.

The most detailed studies were carried out in Area 1. It is felt that all areas mentioned have possibilities for the banding of flightless birds by means

of a dog.

PHYSIOGRAPHY AND CLIMATE:

This region has been placed in the Cape Breton Plains region of the Acadian Forest by Halliday (1937). The terrain consists of rolling hills and wide valleys of intervale land. The prevailing forest association is mixed balsam fir, red spruce, white and yellow birch, beech and sugar maple. There is a scattered growth of white spruce on the intervales.

All the important waterfowl producing areas can be traced to the Mississippian Period, in geological formation, containing limestone and gypsum formations giving most of the fresh water areas a basic reaction (pH 7.5 - 8.5) and therefore favourable to the growth of many important waterfowl food plants.

The climate may be regarded as temperate and there is heavy precipitation at all seasons. The climate of Cape Breton is, in general, more like that of New Brunswick than the Nova Scotia mainland. The average annual snowfall at Sydney is 97.9 inches (69 year period) as compared with 95.5 inches at Fredericton, N.B. (67 year period). The highest annual measurement of snowfall on the Nova Scotia mainland, at Wolfville, is recorded as 86.7 inches (39 year period). The freeze up is early as compared with a large part of Nova Scotia and the spring is rather late.

HABITAT CONDITIONS:

During the course of the surveys an attempt was made to roughly evaluate habitat conditions, especially in the Baddeck and Middle River estuaries. The Bras d'Or Lakes are saline and the bays and marshes, particularly at the river estuaries, are very shallow and contain an abundance of aquatic vegetation. Many of these plants are not only valuable food sources in themselves, but harbour various small aquatic invertebrates especially important as a source of proteins for the young birds.

Above the bridge at the Baddeck estuary there are numerous lakes, ponds and small bays connected by narrow channels. Here are found many fresh water plants important as food and cover. pH readings in this area, taken on May 26th, 1955 ranged in value from 7.5 in the Upper end to between 8 - 8.5 about ½ mile above the bridge.

Some of the more important plant species found during the mid-August survey in this region are discussed in the following summary:

(1) Fresh Marsh and Lake (Baddeck River estuary above bridge)

Species	Abundance	Food value to Waterfowl
Clasping leaf pond weed (Potamogeton bupleuroides?)	Abundant	Excellent
Pondweed → (Potamogeton vaginatus)	Scattered	Good
Soft stem bullrush (Scirpus validus)	Scattered	Slight to fair
Cattail (Typha lalifolia)	Scattered	Shelter only
Bladderwort (Utricularia Sp)	Common	Doubtful
Burreed (Sparganium Sp)	Scattered	Fair
Arrowhead (Sagittaria Sp)	Scattered	Fair to Excellent
Horned Pondweed (Zannichellia palustres)	Common	Fair to good

---

(2) Saline Conditions (Baddeck & Middle River estuaries)

Species	Abundance	Food Value
Eel grass (Zostera marina)	Abundant	Excellent
Wigeongrass (Ruppia maritima)	Common	Excellent
Sago pondweed (Potamogeton pectinatus)	Common	Excellent
Alkali bullrush (Scirpus paludosus?)	Abundant	Good to Excellent
Arrowgrass (Triglochin maritima)	Common	Fair to Good
Three Square (Scirpus americanus)	Common	Excellent

(3) Brackish to Fresh Conditions (upper ends of saline influence)

Species	Abundance	Value
Clasping leaf pondweed	Abundant	Excellent
Soft-stemmed bullrush	Scattered	Slight to Fair
Cord grass (Spartina pectinata)	Common	Doubtful

Soft-stemmed bullrush, Equisetum Sp and Clasping leaf pondweed were noted as the most abundant plants from casual inspection in the marsh area at the head of the Southwest Margaree River.

METHODS:

The surveys were carried out by canoe and outboard, on foot with a Labrador retriever and by inspection from the road with telescope and binoculars. Usually the "beat-out" of the marshes with the dog is an essential adjunct to the canoe method. This method is essential in obtaining accuracy when dealing with black ducks and green-winged teal as these species tend to keep under cover more during the middle hours of the day. Ringnecks and goldeneyes can be successfully counted from the canoe even when the outboard is used.

The banding of flightless birds by means of the dog was carried out in conjunction with the "beat outs" and canoe surveys.

TABLE I

SPRING BREEDING PAIR SURVEY, 1955, Cape Breton Island, N.S.

Area No.	Location	Date	Habitat	SPECIES						TOTAL DUCKS	TOTAL GAME
				Black	Mallard	B.W. Teal	Ring. Nelka	Golden eyes	Merg-ansers		
1.	Judique	25/5/55	Salt marsh river	1/4 0	-	-	-	-	-	10	10
2.	Mabou Larreby Is.	27/5/55	"	0/0 27	-	-	-	-	-	27	27
3.	Lake Ainslie Chapel Lake	27/5/55	Lake & fr. marsh	-	-	-	2/0 0	-	-	4	4
4.	Loch Ban	-	marsh	not	Done	-	-	-	-	-	-
5.	S.W.Margaree R. Mouth	27/5/55	River & fr. marsh	2/2 0	1/0 0	2/0 0	6/2 0	1/0 2	0/0 5	39	34
6.	Margaree R. M.Forks Br. H.Harbour Br.	26/5/55	River, intervale & salt marsh.	2/1 21	-	-	-	-	2/0 5	36	27
7.	Mouth Baddeck River	26/5/55	River, lake & marsh.	1/3 0	1/0 0	2/3 0	14/0 5	0/0 1	3/0 36	96	54
8.	Sm.Lake near Mouth Baddeck	26/5/55	Lake & marsh	-	-	2/1 0	5/0 0	-	-	16	16
9.	Mouth Middle River	26/5/55	River Mouth & Marsh	5/2 14	-	-	9/0 1	0/0 12	3/0 3	68	59
10.	Whycocomagh			not	Done	-	-	-	-	-	-
TOTAL:				11/12 62	*2/0 0	6/4 0	36/2 6	1/0 15	8/0 49	296	231

* Both cases 0 → mallard paired with ♀ black.

TABLE II

SUMMER BROOD SURVEY, July 14-18, 1955.

	SPECIES															
	Black		G.W.Teal		B.W.Teal		Ring-neck		Golden-eye		Unident.		Merg-anser		TOTAL	
LOCALITY	Ad	Br	Ad	Br	Ad	Br	Ad	Br	Ad	Br	Ad	Br	Ad	Br	Ad	Br
ead S.W. argaree R.	4	1	-	-	1	-	1	1	-	-	-	-	-	-	6	2
argaree R. rom Marg.Fks. Marg.Harbour	4	2	-	-	-	-	-	-	-	-	2	-	1	1	7	3
ddeck Est. Adj.Marshes	9	2	-	-	7	4	52	12	9	8	1	1	-	-	78	27
ddle R. stuary	17	9	9	9	5	1	2	2	20	2	-	-	1	1	54	24
rangedale	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1
hycocomagh	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	2
abou	4	1	-	-	-	-	-	-	-	-	-	-	2	2	6	3
T O T A L	41	18	9	9	13	5	55	15	29	10	3	1	4	4	154	62

Adults - All adults including females with broods.

TABLE III

July 14 - 18, 1955

BROODS BY AGE CLASSES

Species	Not Determined	Age Class $ I	II	III	TOTAL
Black	3	2	12	1	18
G.W.Teal	5	2	2	-	9
B.W.Teal	1	2	2	-	5
Ringneck	-	15	-	-	15
Goldeneye	-	-	9	1	10
Unident.	-	-	1	-	1
Merganser	-	1	3	-	4
T O T A L:	9	22	29	2	62

Age Class $ I - Downy Young.

II - Between I and III.

III - Almost ready to fly.

TABLE IV

SUMMER BROOD SURVEY - Aug. 17 - 21, 1955

(Baddeck and Middle River Estuaries only)

Species	All Adults	Broods Age Class				
		Not Determined	I	II	III	Brood Total
Black Duck	117$	-	-	†	1 †	1 † $$$
G.W. Teal	35 $ $	-	-	-	1	1
B.W. Teal	7	-	-	1	2	3
Ringneck	7	1	-	13	6	20
Goldeneye	17	-	-	-	-	-
Unident.	-	-	-	1	-	1
Merganser	7	1	-	2	-	3
T O T A L:	190	2	-	17 †	10 †	29 †

$ - including 6 moulting females.

$$ - including 6 moulting females.

$$$ - several Class II & III blacks were examined but could not be classified as belonging to broods.

TABLE V

BROOD SURVIVAL DATA

SPECIES	Average Number per Brood								
	Class I			Class II			Class III		
	No.	Total	Ave.	No.	Total	Ave.	No.	Total	Ave.
Black Duck	-	-	-	7	49	7.0	1	7	7.0
G.W.Teal	-	-	-	1	7	7.0	1	6	6.0
B.W.Teal	2	17	8.5	3	25	8.3	2	12	6.0
Ringneck	13	100	7.7	12	69	5.8	5	29	5.8
Goldeneye	-	-	-	9	47	5.2	1	5	5.0
Merganser $	1	5	5.0	3	34	11.3	-	-	-

$ The possible season for this discrepancy between numbers of ducklings between Class I (5.0) and Class II (11.3) broods is probably due to the tendency of mergansers to "borrow young", sometimes complete broods, from another female. This tendency has been witnessed many times in the Miramichi area of New Brunswick when as many as 40 young accompanied by one female were caught by means of drive trapping. A small number of these birds had already been banded as a complete brood sometime before.

RESULTS:

The results of the 1955 surveys are shown in Tables I to V. Although the spring survey was very useful from the point of view of reconnaissance, it was carried out too late (May 25 - 27) to obtain an accurate pair count of early nesters such as the black duck and goldeneye. By this time the nesting season was well under way and in most cases the pair bond no longer existed. The number of "other adults" seen, no doubt indicated the formation of groups of post breeding males.

Since blue-winged teal and ringnecks are late nesters, the pair counts of these species can be considered to be more accurate.

A repetition of the spring coverage was carried out during the first brood survey (July 14 - 18). This survey probably gave the most accurate count of the three as the majority of black duck and goldeneye broods were over half grown and most of the blue-winged teal and ringnecks, although still in the downy state had appeared. Young green-winged teal seemed to be in about the same stage of development as the black ducks.

Post breeding flocks of male ringnecks (a flock of 34) and small groups of male blue-winged teal were noted in the Baddeck estuary.

The August survey was carried out too late to obtain much information on broods of early nesters although concentrations of flying "adults" probably indicated the success of the season. Some of the young blue-winged teal had by this time reached flying age. Out of 20 broods of ringnecks 13 were still in the Class II age class and six were in Class III. The age class of one brood was not determined.

It is interesting to note that although only one brood of black ducks was observed during the August survey several blacks were banded of late Class II and Class III on the salt marshes at the mouth of the Middle River. There was no evidence of any maternal behaviour among the "adult" birds on this same marsh. This might indicate that the maternal behaviour of female black ducks might be on the wane at this time of year. Similar instances have been observed while banding in other areas in August. Six adult female blacks and the same number of adult female green-winged teal in a flightless condition due to moult were also tallied on the Middle River salt marshes. The adult male ringnecks

previously noted (July) were not in evidence and had presumably ~~separated~~ departed.

The salt marshes at the mouth of the Middle River offer ideal conditions for banding with a dog. Not only are there concentrations of blacks and green-winged teal, but also a small number of ringneck broods use this area. It is the only place in the Maritimes where I have been able to band young ringnecks with the dog. Admittedly the number (two) was not significant, but given more time and better weather conditions, no doubt a reasonable number of these birds could be banded.

Banding was carried out successfully in the Middle River salt marshes during both brood survey trips. A few ducks were banded in other areas during July (Baddeck River - 1 ringneck; Whycocomagh - 3 blacks; Orangedale - 3 blacks).

In July ~~considerable~~ success was greatly curtailed by heavy rains during the Middle River and Whycocomagh attempts. This type of weather naturally lowers efficiency and hampers note keeping. It is felt that many more young ducks could have been banded in these two areas under better conditions. They are doubtlessly the best

two areas for this purpose in the region. Although it was not tried, banding could also probably be carried out successfully on the lower Margaree River. The South-west Margaree is not recommended.

The results of the summer bandings are shown in TABLE VI.

Table VI

Waterfowl Banded in Cape Breton During Summer Brood Studies, 1955.

SPECIES	ADULT $		Immature $$		TOTAL
	Male	Female	Male	Female	
Black Duck	-	3	21	16	40
G.W. Teal	-	2	3	2	7
Ringneck	-	-	2	1	3
T O T A L:	-	5	26	19	50

$ - Flightless moulters - banded Middle River, August 20th.

$$ - Locally raised young.

SUMMARY:

1. Detailed waterfowl studies were carried out over a large portion of Cape Breton Island in the Spring and Summer of 1955.

2. The principal species of breeding ducks were, in numerical order - black duck, ringneck, American goldeneye, green-winged teal and blue-winged teal.

3. The spring survey was carried out too late for an accurate estimation of breeding pairs of black ducks and goldeneyes. Blue-winged teal and ringnecks were still paired. Green-winged teal, concentrated in the Middle River estuary were overlooked on this survey.

4. The majority of broods of early nesting species were over half grown by mid-July. Concentrations of post-breeding males; blue-winged teal and ringnecks, were noted at this time.

5. The August survey was too late to obtain information on black duck and goldeneye broods. Large concentrations of flying birds of the former species were seen in many areas. Broods of blue-winged teal and ringnecks were successfully counted at this time.

6. Most female black ducks no longer exhibited brood behaviour although a number of well grown young birds was examined.

7. Small groups of moulting female blacks and green winged teal were recorded.

8. Banding by means of the dog was successfully carried out in July and August.

RECOMMENDATIONS:

1. Cape Breton Island is an important waterfowl producing area in the Maritime Provinces. Reconnaissance in the region South-west of the Bras d'Or Lakes might add to the existing study areas.

2. The spring survey should be carried out during the period May 10 - 15 for best results.

3. The best time for brood survey work is approximately mid-July. If two brood surveys are carried out, one should be done during the first week of July and the other during the first week of August.

4. Best survey results can be accomplished by a combination of canoe, foot and dog, and visual inspection by telescope and binoculars in all major study areas.

5. Banding with the dog can successfully be accomplished during brood survey work with little extra effort in the Middle River Estuary and the marshes around Whycocomagh. The possibilities of dog banding in the lower Margaree areas should be investigated.

6. Cape Breton closely resembles the ~~maintenance~~ mainland of New Brunswick and Prince Edward Island in climatic conditions. The local hatch of game ducks is high and there is a good percentage of early migrants. A considerable number of blacks raised in Labrador and Newfoundland migrate through Cape Breton as evidenced by banding recoveries (Addy). Mid-winter Inventory results (early January) do not indicate a high proportion of wintering ducks. Therefore, it is suggested that an opening day between October 1 and 15 would best suit the Cape Breton waterfowl hunter.

7. Biologically there appears to be nothing wrong with either October 1 or 15. The latter date would ease the shooting pressure on blue-winged teal and possibly ringnecks should this be necessary.

8. In the past I have objected to an October 1st opening date on Cape Breton because I felt that such a step would cause complications from an administrative point of view. I am not now entirely convinced that my objections are valid.

December 6, 1955. G.F. Boyer, W.W.O.

Literature Cited

Addy, C.E.

1953. Fall Migration of the Black Duck. Special Scientific Report: Wildlife No. 19. United States Department of the Interior, Fish & Wildlife Service 63 pp. Maps and graphs.

Halliday, W.E.D.

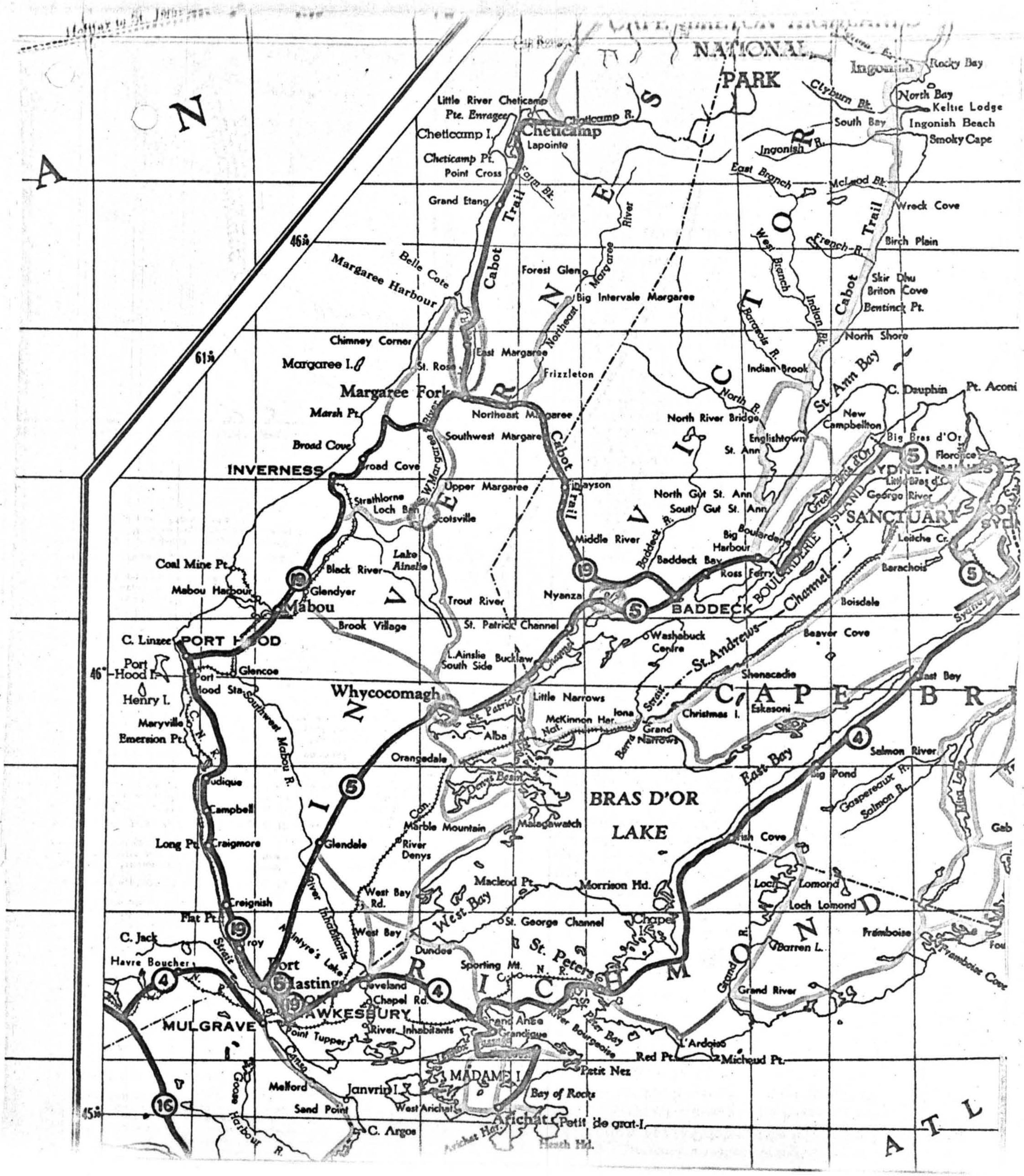
1937. A Forest Classification for Canada, Forest Service - Bulletin 89. Canada, Department of Mines and Resources; Parks Lands and Forests Branch. The King's Printer, Ottawa: 50 pp and folding map.

Martin, A.C. and F.M. Uhler.

1939. Food of Game Ducks in the United States and Canada. Technical Bulletin No. 634, United States Department of Agriculture, Washington, D.C. 157 pp.

Roland, A.E.

1945. The Flora of Nova Scotia. Truro Printing & Publishing Co. Ltd., Truro, N.S. 552 pp.


NATIONAL
PARK
Ingonish
Rocky Bay
North Bay
Keltic Lodge
Ingonish Beach
Smoky Cape
South Bay
Little River Cheticamp
Pte. Enragee
Cheticamp R.
Cheticamp I.
Cheticamp
Lapointe
Cheticamp Pt.
Point Cross
Grand Etang
Cabot Trail
Ingonish R.
East Branch
McLeod Bk.
Wreck Cove
Birch Plain
French R.
Belle Cote
Margaree Harbour
Forest Glen
Big Intervale Margaree
Skir Dhu
Briton Cove
Bentinck Pt.
North Shore
Chimney Corner
Margaree I.
St. Rose
East Margaree
Frizzleton
Indian Brook
St. Ann Bay
C. Dauphin
Pt. Aconi
Margaree Fork
Marsh Pt.
Northeast Margaree
North River Bridge
New Campbellton
Broad Cove
Southwest Margaree
Englishtown
St. Ann
Big Bras d'Or
Florence
INVERNESS
Broad Cove
Upper Margaree
Finlayson
North Gut St. Ann
South Gut St. Ann
George River
SANCTUARY
Strathlorne
Loch Ban
Scotsville
Middle River
Big Harbour
Boularderie
Leitche Cr.
Coal Mine Pt.
Lake Ainslie
Black River
Baddeck Bay
Ross Ferry
Barachois
Mabou Harbour
Glendyer
Mabou
Trout River
Nyanza
BADDECK
Boisdale
Brook Village
St. Patrick Channel
Washabuck Centre
Beaver Cove
C. Linzee
PORT HOOD
Port Hood I.
Glencoe
L. Ainslie South Side
Bucklaw
St. Andrews Channel
Shenacadie
East Bay
46°
Henry I.
Port Hood Sta.
Whycocomagh
Little Narrows
Iona
CAPE BRETON
Christmas I.
Eskasoni
Maryville
Emerson Pt.
Southwest Mabou R.
Alba
McKinnon Har.
Grand Narrows
Salmon River
Orangedale
Denys Basin
East Bay
Big Pond
Judique
Campbell
BRAS D'OR
LAKE
Gaspereaux R.
Salmon R.
Marble Mountain
Malagawatch
Long Pt.
Craigmore
Glendale
River Denys
Irish Cove
Macleod Pt.
Morrison Hd.
Loch Lomond
Creignish
West Bay Rd.
West Bay
Loch Lomond
Flat Pt.
C. Jack
Troy
West Bay
St. George Channel
Chapel I.
Framboise
Havre Boucher
Dundee
Sporting Mt.
St. Peters
Barren L.
Port Hastings
Cleveland
Chapel Rd.
Grand River
MULGRAVE
HAWKESBURY
Grand Anse
Point Tupper
River Inhabitants
Grandique
River Bourgeoise
L'Ardoise
Red Pt.
Micheud Pt.
Melford
Janvrin I.
MADAME I.
Petit Nez
Sand Point
West Arichat
Bay of Rocks
Goose Harbour R.
C. Argos
Arichat
Petit de grat I.
Arichat Har.
Heath Hd.
46½
61½
45½