

Breeding Bird Survey - Maritimes  
1968  
by  
A. J. Erskine

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PROJECT HISTORY SHEET

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title Breeding Bird Survey - Maritimes, 1968

Investigator A.J. Erskine and volunteer co-operators

Date of approval of project plan 16 March 1966 (memo from Ottawa)

Date of submission of progress report November 1968

THIS HISTORY SHEET ACCOMPANIES: (check one)

Project Plan \_\_\_\_\_ Progress report draft X

Completion report \_\_\_\_\_ Draft manuscript \_\_\_\_\_

Proposal for shift of emphasis \_\_\_\_\_

Other (describe) \_\_\_\_\_

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

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b) PAPERS DELIVERED: \_\_\_\_\_

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FINANCIAL STATUS (to be completed at Ottawa)

Year	Investigator	Estimate	Disbursement	Cost to date

## BREEDING BIRD SURVEY - MARITIMES

1968

### Objectives

1. To look for substantial changes in land bird populations in the Maritime Provinces by means of a statistically acceptable random sampling plan
2. To assemble data on distribution of land birds in the Maritimes for correlation with possible limiting factors in the physical and biotic environment.

### Justification

Man's activities are changing his environment in ways which may be expected to affect bird numbers. It is necessary to try to detect and measure such changes in bird populations in order to ensure their continued survival. Random sampling procedures are needed for the assessment of trends in bird populations over wide areas.

Factors limiting distribution and abundance of birds have not been previously assessed, except locally, on other than an empirical ("rule of thumb") basis. The random sampling plan used to assess changes in bird numbers will permit systematic collection of distributional data over wide areas. Data on possible limiting factors such as

bedrock, soils, forest cover, and human use are being collected through the Canada Land Inventory, and can be obtained from the data bank when necessary.

### Procedure

The technique used in the Maritime Provinces Breeding Bird Survey was devised and experimented with in Maryland and Delaware in 1965. Since then it has been extended across the settled parts of the United States and Canada (Robbins & Van Velzen 1967, 1968), reaching the Pacific coast in 1968. The procedure used in the Maritimes differs from that in general use (Appendix 1) only in minor details.

All routes surveyed in the Maritimes were laid out at the Canadian Wildlife Service office in Sackville, and co-operators were requested not to alter the route unless a section was considered to be impassable. In 1968, observers were requested to record details of weather, wind, and temperature at the end of every 10 stops as well as at the start and end of a survey (giving six determinations instead of two). This should permit more accurate assessment of the comparability of weather conditions. Observers were also asked to compare, in a brief statement, the weather and traffic conditions, and locations of stops, in 1968 with those of 1967. To further improve comparability,

observers were provided with details of the date and conditions prevailing on the 1967 survey, and the correct starting time and most comparable date (approximate) for the 1968 survey.

### Results

(a) Coverage. Coverage was virtually complete, as only one assigned route was not covered. At least one route was covered in each degree block in the Maritimes. Two routes each were covered in nine of ten blocks in Nova Scotia, in ten of eleven blocks in New Brunswick, and in each half of Prince Edward Island. Third routes were covered in blocks NS 1 and NB 8 as in 1967.

Approximate locations of routes are shown in Figure 1.

No attempt was made to carry out check coverage on a wide scale, experience in 1967 having shown that we do not have the personnel necessary for this task. One route, on which results had differed from expectations in 1966 and 1967, was checked by a different observer in 1968.

(b) Birds noted. A total of 146 species was listed on the 46 routes surveyed. The numbers of species and of individuals on each route are listed in Table 1, with those for 1966 and 1967 repeated for comparison. Four species, Tree Swallow, Robin, White-throated Sparrow, and Song Sparrow, were found on all routes, and three

others, Barn Swallow, Yellowthroat, and Junco, were noted on all routes except one. Average numbers per route of the 20 most numerous species and the percentage of stops at which each was recorded are listed in Table 2, in comparison with similar data for these species in the 1967 survey.

### Discussion

(a) Coverage in 1968 was essentially complete. The one route covered in 1966 but missed in 1967 (NB 10 2) was surveyed again in 1968, but one route covered in 1966 and 1967 (NS 6 1) was missed in 1968. Three routes not previously surveyed (NS 3 2; NB 2 2; NB 6 2) were covered in 1968, although coverage of the first two of these cannot be ensured in the future. We hope that the people who have assisted in providing such complete coverage will continue to help in 1969 and succeeding years.

Nearly two-thirds of the routes (29 out of 46) were surveyed in the first half of June, and all were completed before 25 June. Suggesting a suitable date for each survey seems to have ensured that most routes were completed in good time, although two were not done until 24 June and three others on 22 June. Even the latest arriving species were singing regularly at the time of the earliest surveys (two on 2 June, one on 5 June). The mean date for all routes surveyed was 13 June, three days earlier than in 1967 and five days earlier than in 1966.

(b) Comparability of coverage. In 1967, I proposed (Erskine, 1967) an outline for evaluating comparability of coverage; variables considered were (i) observer and assistant, (ii) date, (iii) weather and traffic conditions, and (iv) adherence to stated procedure. Each route was assigned scores ranging from 0 to 3 on each of these four factors, giving a maximum possible score of 12. Routes scoring 8 or more, with no zero scores, were considered likely to be comparable, and statistical comparisons were restricted to results from such routes. This procedure was used again in 1968, when 32 (76 per cent) of the 42 routes surveyed both in 1967 and 1968 attained comparability scores of 8 or more (Table 3).

Some features of the original scoring system should perhaps be modified. The presence of an assistant does not appreciably improve the performance of the observer unless the assistant lists the birds as well as keeping time and/or driving the car; an assistant who is slow in recording data (usually due to lack of familiarity with the species list) may actually prove more of a distraction than a help. A change from "observer with assistant" to "observer alone" (or vice versa) might sometimes rate a score of 2 or even 3, rather than 1 as originally suggested.



Under "adherence to stated procedures", it seemed proper to exclude (zero score) any routes which started over 30 minutes too early, since such coverages (two in 1966) listed no birds at all on the first 3 to 5 stops and gave proportionately lower totals as a result. It seems doubtful that even a very late start (one was 45 min. late in 1967) should be so severely penalized, provided that the route was then completed briskly. No scores lower than one were assigned to routes which started on time but took unduly long to complete (one took 6 hr. 20 min. in 1967, although the average was about  $4\frac{1}{4}$  hours), while the route which started 45 minutes late was completed within  $5\frac{1}{4}$  hours of the recommended starting time.

The problem of objectively assessing comparability of phenological dates, as distinguished from calendar dates, is still being studied. Phenology was estimated to have been about six days earlier in 1968 than in 1967; although different species certainly varied on either side of this figure, virtually all were believed to have reached a given stage of their breeding cycle on an earlier calendar date than in 1967. If this estimated phenological timing was used in assessing comparability of dates, rather than using calendar dates as in Table 3, three routes now rated as acceptable (scores of 8 or more)

would have to be rejected, while three other routes would become acceptable. We shall delay making any decisions as to possible changes in the system of comparability scoring until a third set of comparisons (1968 vs. 1969) are available.

(c) Comparisons of numbers. Methods for comparing numbers of birds reported in different years are being studied. In 1967, we treated the total number of birds of a species seen in each year as a sample of those actually present, and applied the chi-squared test to the hypothesis that the two samples were representative of the same population. On this basis three species showed significant changes from 1966 to 1967. Since the total number of birds seen on the 18 "comparable" routes was 10.9 per cent greater in 1967 than in 1966, the hypothesis that each species might have been expected to show an increase of this size was also tested; three species, including one showing a significant increase under the first hypothesis, showed significant changes under the second hypothesis. Since the aggregate change in numbers of birds seen on the 32 comparable routes in 1967 and 1968 was much less than one per cent, only the first hypothesis needed to be tested this year. Only one species, Blue Jay, showed a significant change from

1967 to 1968 (a highly significant increase), and no other species even approached this scale of change. Various alternative groupings of routes, obtained by varying the scoring system, were also tested, but the result was unchanged. One or more of three alternatives may be true: that only the Blue Jay experienced a significant (95 per cent probability) change in numbers in the Maritimes between 1967 and 1968; that other species experienced significant changes but that the method of gathering data is not sufficiently sensitive to detect such changes; or that the method of statistical analysis is not sufficiently sensitive to detect changes in the data collected.

The evidence available suggests that the slight differences in weather and date of survey between 1967 and 1968 are unlikely to have disguised real changes in total numbers of birds present along the routes. Despite the miserably cold weather which so greatly retarded phenology in April and May 1967, the rest of that breeding season was neither particularly favourable nor unfavourable, so local conditions are unlikely to have caused great changes from 1967 to 1968. The unfavourable weather in the spring of 1967, on the other hand, could have reduced numbers of some bird species relative to 1966, but the greater familiarity with the survey

procedures in 1967 may have masked such effects. Actually, making allowance for improved technique by assuming a 10.9 per cent increase from 1966 to 1967, significant decreases were noted for Ravens and Song Sparrows, both early nesting species which would have been exposed to the cold, wet weather while nesting, prior to the 1967 surveys. Furthermore most warblers, small insectivorous birds whose food was probably scarce during the cold spell, also showed decreases from 1966 to 1967, although for these species the chi-squared test did not demonstrate significance.

Since the chi-squared test was applied only to the total numbers of a species seen on comparable routes in the two years, it was possible for (say) two or three routes with large increases to balance out a general but smaller decrease on the other routes. A test which gives less emphasis to such extreme values would be more satisfactory, although most other tests involve much more complicated calculations. We have worked out the 1966-1967 and 1967-1968 comparisons using a method described for "The Common Birds Survey" in Great Britain (Taylor, 1965). Details of the method are given in Appendix 2. We have arbitrarily calculated all percentage changes by dividing the smaller number by the larger; this ensures that no changes can be greater than 100 per cent. Results obtained by this procedure are compared with those from the

chi-squared test in Tables 4 and 5. Clearly this test recognized as "significant" many changes not so considered by the chi-squared test.

In most cases the results of the two tests were reasonably parallel, but the change in Blue Jay numbers from 1967 to 1968 was highly significant by the chi-squared test, and not significant by the other method. It seemed worth examining this case in detail. Twice as many Blue Jays were reported in 1968 as in 1967, and increases were noted on 22 routes compared to only six with decreases. Seven routes which lacked this species in 1967 reported from 1 to 9 individuals in 1968. Despite this general impression of increased numbers, three routes (with increases from 1 to 20, 7 to 21, and 10 to 44) accounted for over half of the total increase. Two of those three routes accounted for 7 of the 10 stops at which more than three Blue Jays were reported, including one flock of 16 birds, <sup>x</sup> one stop ~~each~~ with six <sup>by one with</sup> and five birds, <sup>x</sup> and four stops with four birds each. *meaning?* With these seven stops omitted, the proportion of stops with Blue Jays having over two individuals each was nearly the same in both years. Both of these routes were surveyed on 2 June, so these larger groups probably involved migrants. The "highly significant" change indicated by the chi-squared test was apparently spurious, which emphasizes the desirability

of using more than one test. We shall continue to look for more satisfactory (but not necessarily more sensitive) tests of the significance of year-to-year changes in numbers of birds observed on the Breeding Bird Surveys.

(d) Related work. In addition to the operational work on the Breeding Bird Survey, we are studying the relationships between birds reported during 3-minute count periods and the numbers actually holding territories within hearing distance of the same spot. This work is incomplete, but some of the preliminary results may help observers to understand the necessity of comparable coverage from year to year.

The distance at which a particular species may be heard varies with the habitat, being roughly twice as great across open areas (e.g. grassland, open marsh) as in dense forest. The clearing for the road right-of-way may permit hearing birds much farther along the road than at right angles to it. Accordingly, even a small change in position of a particular stop could make a big difference in the numbers of species which can be heard at great distances (e.g. Robins, White-throated Sparrows) if the stop had forest on both sides in one year and was just into the open beside a field in the other.

The distance at which an individual bird may be heard depends also on the number of other birds, both of

the same and of different species, which are singing near the observer. A decrease in the total density of birds may not be detected by the numbers listed during the 3-minute count period, since one may hear an equivalent number of more distant individuals which would have been "drowned out" by songs near at hand when more birds were present. There is little that one can do about this drawback within the framework of existing instructions for the Survey. A mapping procedure, or even crude estimates of the distances at which individual birds were heard, would help but is not likely to be feasible within the rather rigid time limits.

Finally, for most species the proportion of birds actually present that are detected during a 3-minute count is depressingly low. For species detected by song, it rarely approaches one-half, and is more often one-quarter or even less. The proportion may be somewhat higher, with some observers, for species detected by sight in open habitats, but even there it is unlikely to consistently exceed one-half under the conditions of the Survey. If this fact is recognized, it will be seen that striving for an ever higher number of species or of individuals is not likely to be helpful for the purposes of the Survey. One should rather try to provide as nearly equal effort as possible in each year. I have been impressed at how little change from year to year was

detectable on those routes which I myself surveyed, other things (date, conditions) being equal, and I find the large changes in numbers reported by some observers extremely puzzling. The Survey procedure can only give us indices to population density, not absolute numbers, and the more comparable the coverage the more likely it is that real changes may be detectable.



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Sackville, N.B.  
6 November 1968.

A. J. Erskine

Table 1. Number of bird species and number of individual birds recorded per route

Route number	Number of Species			Number of Individuals		
	1966	1967	1968	1966	1967	1968
N B 1 1	42	46	43	425	566	460
2 1	43	49	46	522	968	657
2 2	-	-	46	-	-	444
3 1	55	58	66	735	777	839
3 2	-	67	69	-	1184	1169
4 1	64	64	69	723	929	1106
4 2*	56	56 43	46	604	686 691	753
5 1	54	52	59	602	870	954
5 2	-	64	65	-	936	1185
6 1*	54	63 73	66	616	674 1042	1006
6 2	-	-	54	-	-	818
7 1	-	56	69	-	673	884
7 2	-	71	76	-	1142	1205
8 1	61	71	67	852	947	1003
8 2	70	76	73	862	994	929
8 3	-	52	55	-	651	705
9 1	55	56	55	381	386	384
9 2	70	69	64	809	829	736
10 1	61	64	62	648	743	754
10 2	71	-	52	664	-	430
11 1	78	77	81	655	601	960
11 2	66	77	75	869	947	1020

\* Route was surveyed in 1967 by two observers, one of whom also did the 1966 survey and the other the 1968 survey.

Table 1. Number of bird species and number of individual birds recorded per route (concluded)

Route number	Number of Species			Number of Individuals		
	1966	1967	1968	1966	1967	1968
P.E.I. 1	37	49	48	1538	1355	1373
2	39	42	37	575	725	588
3	-	42	39	-	1141	957
4	-	47	42	-	783	640
N.S. 1 1	50	58	59	476	536	595
1 2	50	55	57	571	549	728
1 3	-	54	57	-	563	712
2 1	55	47	57	531	467	554
2 2	43	41	48	333	373	399
3 1	55	58	59	517	537	517
3 2	-	-	56	-	-	623
4 1	60	63	62	429	496	546
4 2	-	65	68	-	889	1029
5 1	55	57	51	500	444	492
5 2	54	61	66	542	570	871
6 1	40	46	-	683	854	-
6 2	51	59	55	466	549	540
7 1	52	53	52	784	772	713
7 2	-	59	59	-	624	622
8 1	53	50	52	475	524	571
8 2	55	52	48	514	364	347
9 1	50	42	58	793	727	1021
9 2	-	43	38	-	884	610
10 1	47	51	52	298	496	474
10 2	36	62	55	495	1030	640

Table 2. Mean number of birds per route and per cent of possible stops at which species were noted on Breeding Bird Survey, Maritimes, 1967-68\*

(\*) The 20 species recorded in greatest numbers in 1968, listed in order of abundance in that year

Species	Mean number birds per route		Per cent of possible stops	
	1967 43 routes	1968 46 routes	1967 2150 stops	1968 2300 stops
Robin	70.9	66.5	70.5	67.7
White-throated Sparrow	56.9	53.8	62.6	60.4
Starling	40.4	43.3	28.1	27.3
Common Grackle	40.7	38.8	25.2	27.9
Song Sparrow	32.6	33.3	42.4	43.5
Common Crow	32.3	32.4	35.2	35.9
Yellowthroat	20.0	21.8	32.1	33.3
Barn Swallow	20.8	19.6	17.3	19.3
Swainson's Thrush	16.0	17.8	23.4	25.0
American Goldfinch	19.6	16.9	19.0	19.7
Red-winged Blackbird	16.2	16.7	14.1	14.5
Herring Gull	19.3	15.2	7.8	7.7
House Sparrow	18.8	15.1	13.9	12.5
Slate-coloured Junco	16.2	14.2	23.9	21.8
Savannah Sparrow	14.5	14.2	18.8	18.0
Traill's Flycatcher	12.0	14.2	18.7	22.1
Tree Swallow	15.7	14.1	15.9	15.7
Evening Grosbeak	12.0	14.0	8.2	7.5
Magnolia Warbler	12.2	13.8	19.0	20.7
Ruby-crowned Kinglet	17.2	12.4	27.9	20.4

\*

Table 3. Comparability scores for various factors on Breeding Bird Survey routes covered in 1967 and 1968, Maritimes. Routes not covered in both years were omitted. Routes with total score in parentheses did not meet comparability requirements.

Route	Observer	Date	Conditions	Rules	Total
N.B. 1 1	2	3	2	2	9
2 1	3	3	3	2	11
3 1	2	3	3	3	11
3 2	2	3	3	3	11
4 1	2	2	2	3	9
4 2	3	3	3	0 <sup>a</sup>	(9)
5 1	1	3	3	1	8
5 2	3	2	2	3	10
6 1	2	3	3	2	10
7 1	1	2	2	3	8
7 2	2	1	2	3	8
8 1	1	2	2	3	8
8 2	3	1	2	3	9
8 3	2	1	2	3	8
9 1	3	2	2	3	10
9 2	1	3	2	3	9
10 1	1	1	2	2	(6)
11 1	2	3	1	2	8
11 2	2	3	2	3	10
N.S. 1 1	3	3	2	2 <sup>b</sup>	10
1 2	3	1	2	0 <sup>b</sup>	(6)
1 3	1	2	3	1	(7)
2 1	1	3	1	2	(7)
2 2	3	3	2	2	10
3 1	3	3	2	2	10
4 1	1	3	2	1	(7)
4 2	3	2	1	1	(7)
5 1	3	3	2	2	10
5 2	1	3	3	2	9
6 2	1	3	2	0 <sup>b</sup>	(6)
7 1	2	3	2	2	9
7 2	3	3	3	3	12
8 1	3	3	2	2	10
8 2	3	3	3	2	11
9 1	1	0 <sup>c</sup>	2	2	(5)
9 2	3	3 <sup>c</sup>	2	2	10
10 1	3	0 <sup>c</sup>	2	3	(8)
10 2	1	3	2	3	9
P.E.I. 1	2	2	3	3	10
2	3	3	2	3	11
3	1	1	3	3	8
4	3	1	2	3	9

a. Too late start. b. Route changed. c. Date changed by over 20 days

Table 4. Comparisons of 1966 and 1967 results for selected species on 18 "comparable" Breeding Bird Survey routes, Maritimes, using chi-squared and ratio limits tests.

Species	Total no. seen		(assuming 10.9% increase 1966-1967)		
	1966	1967	Chi-squared	Per cent change	95% confidence interval of per cent change
Least Flycatcher	114	78	2.01	-32	-62 to -2**
Common Raven	177	112	4.94*	-42	-69 to -2*
Hermit Thrush	101	160	2.08	+37	-18 to +64
Yellow Warbler	90	54	3.30	-40	-68 to -11*
Magnolia Warbler	294	258	0.42	-12	-43 to +7
Chestnut-sided Warbler	109	84	0.53	-23	-62 to +18
Brown-headed Cowbird	156	231	1.78	+32	-20 to +58
Evening Grosbeak	61	103	2.05	+41	-23 to +63
Purple Finch	86	182	10.9**	+53	+25 to +67**
American Goldfinch	167	255	2.54	+34	+4 to +46*
Chipping Sparrow	118	169	0.95	+30	-24 to +55
White-throated Sparrow	882	1160	2.53	+24	+3 to +27*
Song Sparrow	589	447	4.58*	-24	-44 to -18*

\* Probability less than 5 per cent;  $\chi^2 > 3.841$ .

\*\* Probability less than 1 per cent;  $\chi^2 > 6.635$ .

Table 5. Comparisons of 1967 and 1968 results for selected species on 32 "comparable" Breeding Bird Survey routes, Maritimes, using chi-squared and ratio limits tests.

Species	Total no. seen		Chi-squared	Per cent change	95% confidence interval of per cent change
	1967	1968			
Traill's Flycatcher	378	433	0.25	+13	-18 to +38
Least Flycatcher	146	127	0.09	-13	-37 to +13
Common Raven	272	315	0.23	+14	-23 to +43
Common Crow	1045	1116	0.12	+6	-15 to +26
Blue Jay	128	256	16.0**	+50	-44 to +98
Red-breasted Nuthatch	32	53	1.36	+40	-78 to +inf.
Robin	2384	2229	0.39	-7	-15 to +2
Ruby-crowned Kinglet	440	336	1.91	-24	-40 to -3*
Starling	1386	1597	1.06	+13	-8 to +31
Red-eyed Vireo	262	307	0.48	+15	-8 to +34
Black-throated green Warbler	109	126	0.09	+14	-28 to +48
American Redstart	320	362	0.37	+12	-11 to +30
Bobolink	312	376	0.56	+17	-12 to +42
American Goldfinch	670	540	1.51	-19	-40 to +8
Slate-coloured Junco	504	415	0.84	-18	-40 to +11
White-throated Sparrow	2002	1851	0.23	-8	-15 to 0*

\*Probability less than 5 per cent;  $\chi^2 > 3.841$ .

\*\*Probability less than 1 per cent;  $\chi^2 > 6.635$ .



Appendix 2. Procedure for statistical analysis of bird population changes between years (after Taylor, 1965)

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In statistical terms, the procedure may be stated thus:

Using the individual bird as element and the number reported on one route as cluster, the ratio estimate on all routes reporting the species in either year of the proportion of the 1967 count to the sum of the 1967 and 1968 counts was calculated with its standard error. Plus and minus two-standard-error limits were then converted to the corresponding percentage changes from 1967 to 1968. (The distribution of the proportion is likely to be much less skew than that of the percentage increase.)

In detail, the following steps were carried out (example is Blue Jay):

- 1) Total 1967/Total 1967 and Total 1968 gives ratio  
 $128 / 128 \text{ \& } 256$  gives 0.333
  - 2) Ratios for each route were calculated  
 $0 / 0 \text{ \& } 5 = 0.000$ ;  $9 / 9 \text{ \& } 13 = 0.409$ ;  $5 / 5 \text{ \& } 6 = 0.455$ ; etc.
  - 3) Standard deviation and standard error of route ratios were calculated by "machine calculation method"  $\leq x^2 = \sum X^2 - (\sum X)^2/N$ ,  
giving St. devn. = 0.878; St. error = 0.155
  - 4) Twice the standard error limits were applied to the overall ratio, thus:  
 $2 \times 0.155 = 0.310$ ; ratio limits are  $0.333 \pm 0.310$ ,  
or 0.023 to 0.643.
  - 5) Ratio limits were converted to percentage change, thus:  
 $0.333 = 128/384$ , so 1968 total was  $384 - 128 = 256$ ;  
 $128/256 \times 100 = 50$ ;  $100 - 50 = +50\%$   
 $0.023 = 128/5570$ , so 1968 upper limit was  $5570 - 128 = 5542$ ;  
 $128/5542 \times 100 = 2.3$ ;  $100 - 2.3 = +97.7\%$   
 $0.643 = 128/199$ , so 1968 lower limit was  $199 - 128 = 71$ ;  
 $71/128 \times 100 = 55.5$ ;  $100 - 55.5 = -44.5\%$
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Section of Migratory Non-Game Bird Studies  
Bureau of Sport Fisheries and Wildlife  
Migratory Bird Populations Station, Laurel, Maryland 20810

COOPERATIVE BREEDING BIRD SURVEY OF NORTH AMERICA, 1968

Purpose: To obtain, by random sampling, an index of abundance of breeding birds. Such a technique is needed in order to provide information on distribution and relative abundance of North American birds, and specifically to measure changes in abundance that result from such factors as changes in land use and widespread applications of pesticides.

Sampling Technique: Each one-degree block of latitude and longitude (about 55 miles wide, east to west, by 70 miles long) will be sampled by one or more random transects or "routes." In most states west of the 100th meridian the sample size has been reduced to one route for each two-degree block. The number of routes per degree block will vary according to the number of qualified observers available, but preferably will remain uniform with a given State. Starting points and compass directions have been determined at random. Each route is covered once each summer by the following standardized procedure: Begin exactly one-half hour before sunrise; make 50 stops one-half mile apart and count all birds heard at each stop or seen within one-fourth mile during a 3-minute watching and listening period. One observer should do all the observing on a given route, but he may have an assistant to help with recording or driving. Unless driving conditions are very poor, most routes can be completed in 4 to 4 1/2 hours.

Time Period: In most States, routes should be run in June. In Canada and bordering States the first week of July is acceptable (except in Ohio, Pa., and southern N. Y.). In California, Arizona, N. Mexico, Texas, and Florida routes may be run as early as the last week in May, at the discretion of the State Coordinator(s). In general, select a date as near as possible to last year's.

Scouting of Routes is strongly recommended. More leisurely trial runs may be made in advance to become familiar with songs and calls and with roads and stopping locations. A single route may be run more than once if the observer wishes to have the practice, but only one coverage of a route should be reported; this must not be the best of several coverages, but the first one made under satisfactory conditions of weather and familiarity with birds along the route.

STRICT ADHERENCE TO RULES IS ESSENTIAL FOR STATISTICAL ANALYSIS OF RESULTS!

DIRECTIONS FOR RUNNING ROUTES

Equipment: Clip board, pencils, forms supplied by the Migratory Bird Populations Station, map, binoculars, watch with second hand (or automatic 3-minute timer), gasoline, thermometer.

Weather: To be comparable, routes must be run under satisfactory weather conditions: good visibility, little or no precipitation, light winds. Occasional light drizzle or a very brief shower may not affect bird activity, but fog, steady drizzle, or prolonged rain should be avoided. Counts preferably should be made on mornings when the wind is less than 8 m.p.h., except in

those prairie States and Provinces where winds normally exceed Beaufort 3.  
(If you can walk faster than the wind is blowing, winds are very satisfactory.)  
Counts should not be taken if the wind exceeds 12 m.p.h.

Weather codes (enter Beaufort Numbers on Summary Sheet)

<u>Beaufort Number</u>	<u>Wind Speed miles per hr.</u>	<u>Indicators of Wind Speed</u>
0	Less than 1	Smoke rises vertically.
1	1 to 3	Wind direction shown by smoke drift.
2	4 to 7	Wind felt on face; leaves rustle.
3	8 to 12	Leaves and small twigs in constant motion; wind extends light flag.
4	13 to 18	Raises dust and loose paper; small branches are moved.
5	19 to 24	Small trees in leaf begin to sway; crested wavelets form on inland waters.

Sky condition (enter these Weather Bureau code numbers on Summary Sheet)

0	Clear or a few clouds.	4	Fog or smoke.
1	Partly cloudy (scattered) or variable sky.	5	Drizzle.
2	Cloudy (broken) or overcast.	8	Shower(s).

Start 30 minutes before official sunrise. Consult newspaper or Weather Bureau for sunrise time. If starting point is more than 25 miles from the city of reference, start 4 minutes earlier for each degree block (55 mi.) east of the city or 4 minutes later for each degree block to the west. Be at the starting position at least 2 minutes before official start, to record weather and speedometer reading.

Look and listen for exactly 3 minutes and record the number of birds of each species seen within 1/4 mile in all directions and all birds of each species heard regardless of distance; limiting distance for birds seen may be judged as half the distance to the next stop.

Drive 0.5 mile to the next stop. If this stop falls in a place where it is dangerous to stop or where local noise is excessive, the stop may be moved as much as 0.1 mile (forward or back). Do not record any bird seen or heard while driving between stops unless it is subsequently heard at the next stop during the prescribed 3-minute period. In case of excessive traffic noise, up to one additional minute (but no more) may be added to a few stops--but not routinely to all stops. It is important to complete the 50 stops on schedule because singing decreases appreciably soon after 9 a.m.

Speedometers vary slightly, so please mark on your map the number and exact position of one or more stops every few miles--whenever there is a convenient landmark. This will enable you or another observer to stop at the same spots in a subsequent year and to make any necessary adjustments in speedometer readings.

Make 50 stops. Each route consists of exactly 50 stops. Allowing 3 minutes for each stop and 2 minutes driving time between stops, approximately 12 stops will be covered per hour and the entire route will take a little over 4 hours.

What Birds to Count: Count all wild birds (including Rock Doves) seen or heard that can be identified to species. Species recorded which are not found on the form should be added at the bottom. Estimates are permissible only in those cases where a flock is too large to count, bird by bird, in the brief time it is seen. Do not use check marks even for abundant species. No one will detect all birds within hearing or seeing distance of his stops. Hundreds of birds will be missed. Observers should not try to estimate birds that are missed or include them on their report forms even if they are known to be present. We wish to have reported only those birds actually seen or heard during the prescribed 3-minute stops.

Record Keeping: Two types of report forms are enclosed. Take both in the field with you. The summary form is for recording weather conditions at the beginning and end of the count and for reporting a summary of observations that should be compiled after the count has been completed. The form with the ten columns after each species is to be used for recording birds in the field. Get familiar with this form so you can locate the species rapidly. Use one sheet for each ten consecutive stops. Number the first and last stop at the top of the columns, and enter the starting and ending time for each page. The additional spaces for time and speedometer reading for intermediate stops on each page of the Field Sheet are provided for the convenience of the observer (and such data may prove to be valuable).

Processing of Results: The five field sheets, one summary sheet, and the route map should be sent to Willet T. Van Velzen, Migratory Bird Populations Station, Laurel, Maryland 20810. The map will be returned the following year with new forms. This office will enter a State code and Route No. (if a new route), will abbreviate the locality and observer's name if they exceed 12 digits each, and will spot-check the lists. Data from the summary sheet will then be punched onto 80-column data cards, one for each species. A machine listing will be mailed to each observer and a State tabulation will be mailed to each coordinator. A summary of all lists will later be sent to each participant. A comparison of 1967 and 1968 counts will be prepared and an analysis of population changes for the entire area covered will be made available. Data on distribution and comparative abundance of individual species will be available to research workers on request.

ALL FORMS MUST BE COMPLETED AND RETURNED BY JULY 31, 1968.

Reporting Results: Immediately after coverage of your route has been successfully completed, please complete and mail the enclosed post card.

If for any reason it should be impossible for you to cover your route during the prescribed period, please contact your Coordinator to see whether arrangements might be made for another observer to run the route, or for you to cover it on a slightly later date.

One set of 5 tally sheets, representing 50 stops, plus one copy of the summary sheet, should be returned as soon as possible after completion of the count. (An extra set of forms is provided for your records.)

Upon completion of the route coverage data should be transferred from the Field Sheet to the Summary Sheet. The species totals for each of the 5 field sheets should be entered under the appropriate page totals column on the Summary Sheet. The sum of these 5 columns is entered in the Total Indiv. column and the number of stops, out of the total of 50, upon which each species was seen is entered in the Stops per Spec. column.

Special attention should be given to double checking the number of species recorded and all species totals listed on the Summary Sheets.

Details of Picking Starting Locations: Starting points of all routes were taken at random (generally from a table of random numbers corresponding to minutes of latitude and longitude). The intersection of latitude and longitude was found on a map and the first stop of the Route is on the road closest to the latitude-longitude intersection--preferably at some easily recognized landmark. The starting direction was determined from the minutes of latitude and longitude as follows: if the latitude and longitude both end in odd numbers, the route proceeds to the north; if latitude is odd and longitude is even the route goes to the east; if latitude is even and longitude odd the route goes south; and if latitude and longitude are both even (that is, both divisible by 2), the route goes west.

Details of Laying Out Routes: Route maps will be provided for each co-operator. Last-minute adjustments will have to be made in some routes because of impassable roads or heavy traffic, so the procedure for laying out routes is given here in detail. It is important that routes sample urban and suburban areas as well as rural and wilderness areas, so routes should not be changed to avoid populated areas or to include favorite birding localities.

Routes will proceed in the specified direction, as closely as possible, unless or until reaching (1) the edge of the one-degree block; (2) a State or Provincial line; or (3) a body of water that cannot be crossed by bridge. Upon (or at the last chance before) reaching such a barrier, turn clockwise and continue. If the route will reach a dead end before the 50th stop, change any or all of it (except the starting point) as necessary to make a continuous route that does not duplicate itself or another route. Maintain the direction as closely as possible to the original direction, or the next direction clockwise, returning to the original direction at the first opportunity. If routes must cross, omit from the second route any stop that falls within one-half mile of any stop on the first route; add the extra stop at the end. If one route must run along a short portion of another route, the first route has priority and the second route should skip the duplicate stops and add them at the end. If possible, avoid Federal numbered highways, Interstate highways, and State numbered highways as well as other roads that are apt to have heavy traffic at the time of day you will be there. If it is necessary to traverse a well-traveled highway for a short distance, and if traffic interferes seriously with observations, make counts at the first two stops on this highway, then proceed without stopping until you can leave the highway (then stop about 1/4 mile after leaving it). Add the extra stops at the end of the route.