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AERIAL SURVEYS OF WATERFOWL PRODUCTION IN NORTH AMERICA, 1955-71

by

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PREFACE

This report, as the title implies, summarizes July waterfowl production survey data collected by personnel of the Bureau of Sport Fisheries and Wildlife and other cooperating agencies during the 1955-71 period. In recent years the survey has been used to monitor waterfowl populations on approximately 855,700 square miles of the North American breeding range. To enable the report to be timely, analysis and discussion are kept to a minimum, although some obvious relationships are described. Summaries of basic information collected during the survey are presented in tabular form in the Appendices. Appendix A refers to the data obtained in the southern Prairie Provinces of Canada; Appendix B, northern Prairie Provinces and the Northwest Territories; Appendix C, North Dakota, South Dakota, and Montana; Appendix D, Minnesota; and Appendix E, northwestern Ontario.

This and a companion report (Pospahala et al., in prep.) on the May Breeding Ground Survey were prepared because information collected annually on the size, distribution and production of North American waterfowl populations had never been summarized in a comparable manner. Prior to this date, the information was published annually in the Bureau's "Waterfowl Status Reports" (Special Scientific Report–Wildlife). A close review of the published survey statistics indicated that no two sets of the same data were in agreement. The discrepancies were partially the result of annual updates and corrections. As a part of the comprehensive Mallard Study being conducted by the staff of the Migratory Bird Populations Station, all breeding ground survey data were reconstructed. Since these data are not available for machine processing, this report is to serve as a vehicle to make these data available as future reference material to research and management biologists throughout North America. Also, it is hoped that the data presented here will stimulate population ecologists and systems ecologists from other disciplines to become more interested in the dynamics of waterfowl populations.

Cover photo: Type V prairie pothole in late summer. (By Grady Mann, Bureau of Sport Fisheries and Wildlife)

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The annual sporting harvest of waterfowl in North America significantly affects the annual mortality rate of continental waterfowl populations (Hickey, 1952; Geis, 1963). This fact, operating in conjunction with unstable habitat conditions in the most important portions of the waterfowl breeding grounds, creates one of the most dynamic game animal management situations known. In order to ensure perpetuation and equitable use of the resource, desired harvest levels must be determined on an annual basis. Therefore, to monitor the status of the continental waterfowl population the Bureau of Sport Fisheries and Wildlife, in cooperation with the Canadian Wildlife Service and various Provincial wildlife management agencies, conducts two aerial surveys on the major waterfowl breeding grounds in North America each year (Crissey, 1957). The first, conducted during May and early June, is a census of waterfowl breeding populations; the second, conducted over the same transects in July, is a production survey. Historically, these surveys have been used to monitor the annual status of the continental waterfowl population, and the information collected has been of paramount importance in the setting of annual waterfowl regulations (see discussion by Geis et al., 1969). In addition to providing estimates of waterfowl numbers present on the breeding grounds each year, these surveys provide data on annual habitat conditions and indexes to expected production. Information collected also satisfies, in part, an ever-increasing demand for a historical data base from which to study waterfowl population ecology.

Recently, Pospahala et al. (in prep.) summarized the data obtained from the May Breeding Ground Survey for the 1955-71 period. Our report is a companion report presenting the results of the July Production Survey for the same time period. The purpose of this report is to provide basic information to individuals either directly or indirectly involved in waterfowl management and research, and to reconcile discrepancies in previously published material relating to this survey. The July Production Survey statistics presented in this report supersede all information previously published (primarily in Waterfowl Status Reports).

SURVEY DEVELOPMENT AND TECHNIQUES

Development

Aerial surveys in May were initiated on an experimental basis in 1947 when aircraft and pilots first became available for such work, and the July aerial surveys were begun in 1950. Williams (1948) first established that aerial waterfowl surveys were sufficient to

adequately determine the annual status of the waterfowl resource. The breeding range was divided into strata on the basis of habitat type, habitat stability, and waterfowl nesting density for sampling purposes. Stewart et al. (1958:364) discussed the allocation of sampling units.

Initially, waterfowl breeding ground surveys were concentrated in the southern portions of the Prairie Provinces of Canada. Waterfowl populations in three strata in southern Alberta (74,612 square miles), five strata in southern Saskatchewan (113,220 square miles), and two strata in southern Manitoba (38,728 square miles) have been sampled on a comparable basis annually since 1955 (fig. 1). Four additional strata including 222,030 square miles in the northern portions of the Prairie Provinces were added in 1959 and 1960, and in 1966, five strata in the Northwest Territories (195,513 square miles) were included. July Production Surveys were initiated in North Dakota in 1958, and in South Dakota in 1959; however, procedures employed in these first surveys were not consistent with those in other surveyed areas. Consequently, data collected for the Dakotas prior to 1966 are not presented. Beginning in 1966, the Dakotas and Montana are included, adding an additional 209,893 square miles of waterfowl habitat to the survey. Portions of Ontario which were

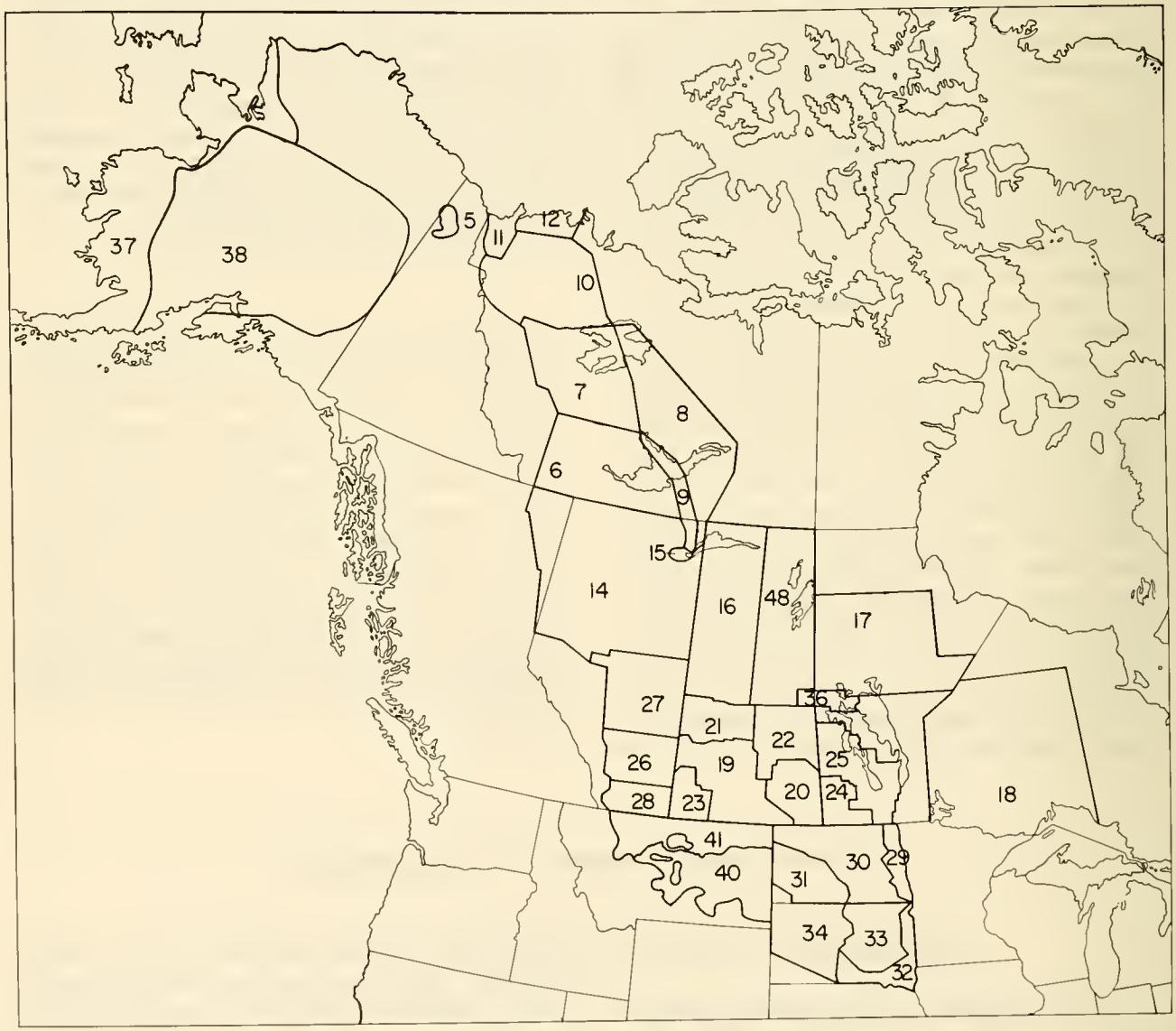

Figure 1.—Strata for aerial surveys of waterfowl breeding grounds.

surveyed on an experimental basis for 4 years in the early 1960's are also included.

Since 1966, approximately 855,700 square miles of the North American waterfowl breeding range have been sampled annually on an operational basis by Bureau personnel and other cooperators during the July Production Survey. A description of the habitat in each stratum is discussed in the companion report by Pospahala et al. (in prep.). The present surveys do not sample all of the waterfowl breeding grounds in North America, but probably provide sufficient information for most management decisions. Several State conservation organizations provide additional insight into production in areas not surveyed by the standard July Production Survey. Similarly, several of the Provinces have surveys; however, this report is limited to the discussion of data obtained from the Bureau survey (see Waterfowl Status Reports for data collected by States and Provinces).

Techniques

GENERAL

During the July Production Survey, estimates are made of the following waterfowl and habitat conditions: (1) the number of Class I, Class II, and Class III broods (Gollop and Marshall, 1954), regardless of species; (2) the average number of ducklings in Class II and III broods; (3) the number of paired and single (male and female) ducks by species; and (4) the number of ponds. Information on the numbers of pairs and singles in breeding areas during July that have not moved to moulting areas is used as an indicator of the comparative amount of renesting underway. The timing of the July Production Survey is determined by the date on which information must be available for the U.S. regulations meetings, which occur in early August. Therefore, not all young have been hatched at the time field work is terminated on about July 25 each year. Consequently, an index to the number of young produced cannot be calculated directly. Rather, the approach taken is to obtain indexes relating to factors which either affect or reflect current production success when compared to similar data collected during prior years.

The July Production Survey, like the companion May Breeding Ground Survey, is conducted from aircraft flying 100 to 200 feet above the ground along linear routes or "transects." The transects are divided into segments 18 miles long for convenience in summarizing data. The survey crew consists of one person acting as a pilot-navigator-observer, and another as an observer. Each person records waterfowl data (broods and single and paired adults by species) from a strip one-sixteenth mile wide (110 yards) on his side of the aircraft. One member of the crew, usually the observer, counts ponds on one side of the aircraft for a distance of one-eighth mile (220 yards). Information collected during the survey is recorded and transcribed to data forms (flight sheets) at the end of the day. Unidentified pairs and singles are allocated among the identified in direct proportion to the species and categories of the observed birds. Sampling intensities vary greatly among the various strata that have been defined on the basis of habitat type, habitat stability, and waterfowl nesting density. Strata in the prime waterfowl habitat in the southern portions of the Prairie Provinces of Canada range in size from approximately 11,000 to 38,000 square miles. The median date for conducting the survey during the past 17 years has been July 12-15.

Forecasting production and the subsequent fall flights of waterfowl are difficult, but Geis et al. (1969) have reported on techniques combining data collected from the two breeding ground surveys in past years. A check is available on the fall flight prediction, although the information is not available until the following year. Age ratios in the harvest can be adjusted for differential vulnerability to hunting pressure to yield the age ratio in the preseason population (a measure of production) (Bellrose et al., 1961: 435; Kaczynski and Geis, 1961). In this procedure we utilize information collected during the Waterfowl Harvest Survey, Wing-Collection Survey, preseason banding program, and May Breeding Ground Survey. Presently, this analysis is performed annually for mallards (Anas

platyrhynchos) only. Revised annual production estimates for mallards, and estimates for other species, are not available at this time, because the data are being reconstructed for use in the Mallard Study (see Anderson and Henny, 1972). Rather than present recruitment rate estimates for each year that may be in error, no recruitment rate information obtained from age ratios in the kill adjusted for differential vulnerability will be presented.

SURVEY PROCEDURES

Procedures for conducting aerial waterfowl surveys have been discussed by Crissey (1957) and summarized by Stewart et al. (1958). Details of the current survey instructions are contained in the Bureau's "Standard procedures for waterfowl population and habitat surveys, Revised 1969." Diem and Lu (1960) and Martinson and Kaczynski (1967) discuss many of the problems associated with surveys of this type, although the latter study primarily concerns adjustments of aerial data available only for the May Breeding Ground Survey. Most of the associated problems relate to observation difficulties associated with habitat, water conditions, time of day, weather, and differences in observer capability. In general, adjustments to July Production Survey data for these nuances are not possible at this time. Since the appearance of early work on sampling error associated with aerial surveys (see Stewart et al., 1958), the approach has changed and more recent techniques are presented by Pospahala et al. (in prep.).

AIR-GROUND SURVEY

All ducks and broods on the transects cannot be seen from the air; thus, adjustment factors for visibility from the air are desirable. It is well known that variation in the proportion of birds seen is related to species characteristics, cover, density of birds, phenology, seasonal changes in water levels, and changes in crew members. Furthermore, brood data represent an aggregate estimate of all species present; species-specific differences are not measured. Average brood size information may vary tremendously from location to location, depending upon local conditions, but also depending upon the species composition of the breeding ducks present. Therefore, a summary of the species composition of the ducks nesting in the southern portions of the Prairie Provinces, the Dakotas, and Montana, as determined from the May Survey, is presented in table 1.

Table 1.--Average ranking of the 10 most common breeding species of ducks in the southern portions of Alberta, Saskatchewan, and Manitoba, and in Montana, and the Dakotas (from Pospahala et al., in prep.).

Rank	Location									
	Alberta (1955-71)		Saskatchewan (1955-71)		Manitoba (1955-71)		Montana (1965-71)		Dakotas (1960-71)	
1	Mallard	26.0	Mallard	30.8	Mallard	25.8	Mallard	26.7	Blue-winged Teal	27.3
2	Pintail	19.3	Pintail	19.2	Blue-winged Teal	25.1	Pintail	18.9	Pintail	18.0
3	Blue-winged Teal	11.3	Blue-winged Teal	15.9	Scaup	13.0	American Widgeon	13.9	Mallard	17.9
4	American Widgeon	10.8	American Widgeon	6.7	Pintail	8.2	Blue-winged Teal	12.7	Gadwall	13.5
5	Scaup	7.0	Scaup	6.3	Redhead	5.5	Gadwall	10.1	Shoveler	8.5
6	Shoveler	5.8	Shoveler	5.3	American Widgeon	4.7	Green-winged Teal	6.4	Redhead	5.0
7	Gadwall	5.5	Gadwall	4.5	Ruddy Duck	4.6	Shoveler	5.1	Ruddy Duck	3.4
8	Green-winged Teal	5.5	Green-winged Teal	4.2	Green-winged Teal	3.6	Scaup	3.1	American Widgeon	2.2
9	Redhead	2.9	Redhead	2.9	Shoveler	3.4	Ruddy Duck	1.4	Green-winged Teal	1.8
10	Ruddy Duck	2.5	Ruddy Duck	2.0	Canvasback	2.1	Redhead	1.1	Scaup	1.4
Percent of Total Breeding Ducks		96.6		97.8		96.0		99.4		99.0

An attempt was made during the period 1961-64 to determine by intensive ground beat-out methods the number of broods by species on a series of short transects scattered within the area surveyed by each aerial crew. The aerial crews covered each of the transects four times--twice in early morning and twice in late morning. The purpose was to determine the proportion of broods by size and age class, and the paired and single adults by species actually present, that the aerial crew was able to see and record. The method depended upon the ground crew's ability to find all broods and single and paired adults within the transect, but it soon became evident that this was not feasible. Even with intensive coverage, the ground crews obviously missed many broods, especially those species whose escape mechanism often caused them to leave the pond and hide in surrounding upland vegetation. Also, it became apparent that changes from year to year in the density of emergent vegetation in the ponds caused the ground crews to find varying proportions of the broods, which meant that their efforts did not result in a useful index to the number of broods present. For this reason, the July air-ground comparison survey was discontinued after the 1964 breeding season.

Nevertheless, an average of the data collected during the 4 years did provide a crude aerial visibility rate for broods that should be reasonably comparable among the three age classes. Since the ground crews did not find all of the broods, the aerial visibility rates are higher than they should be, and the adjusted brood index is, therefore, too low. The unadjusted brood index is presented first in the body of this report, and is followed by the adjusted figures. This will facilitate ease in readjusting the figures at a later date if more refined visibility rates become available. The adjusted figures are still crude, but we believe they are more meaningful than the unadjusted data. Only the unadjusted brood index counts are shown in the Appendix tables.

Air-ground comparisons in survey strata to the north of the Canadian prairies, and in the United States, have not been undertaken, and therefore no adjustments to the brood indexes could be made in these areas.

RECONSTRUCTION OF FILES

As a result of investigations into the condition of aerial survey files associated with the May Breeding Ground Survey (see Pospahala et al., in prep.), July Production Survey data were also examined. Discrepancies appeared when previously published reports were compared with available basic field data. Consequently, all July Production Survey data were carefully checked and resummarized. In addition, several survey boundaries were changed, and information collected from partial segments (those less than 18 miles long) was deleted.

The corrected and pooled southern Prairie Province data on July ponds were not too different from the "old" data except for 1955 through 1957 (fig. 2). Estimates pertaining to broods and waterfowl indexes were less seriously affected.

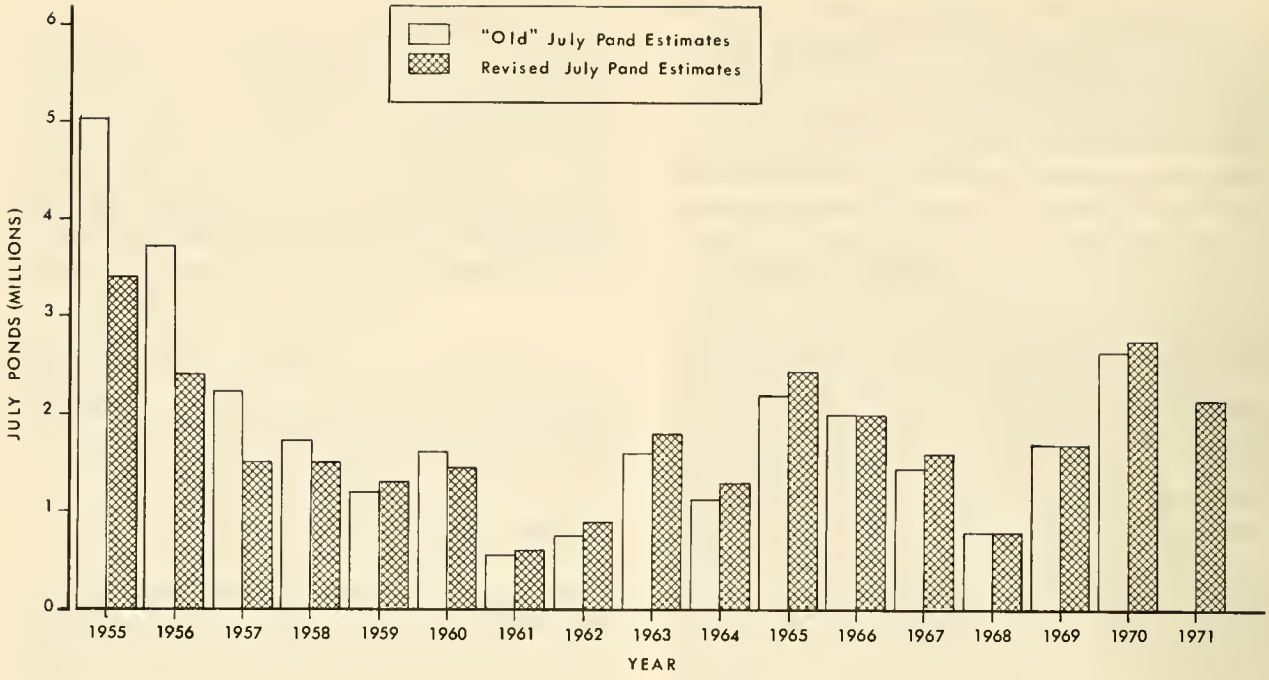

Figure 2.—A comparison of the estimated number of July ponds in the southern portions of Alberta, Saskatchewan, and Manitoba before and after file reconstruction.

RESULTS

The chronological sequence in developing the surveys throughout the breeding ground provides a logical outline for discussing the data collected. Seventeen years of information are now available from the southern Prairie Provinces of Canada which, because of their waterfowl densities, are the most important breeding grounds. Crissey (1969) estimated that annually an average of 57 percent of the mallards and 47 percent of the total game ducks in North America bred in this area during the 1955-64 period. The surveyed areas were gradually expanded northward and southward from the hub of breeding activity. The results of the surveys in each portion of the breeding range are discussed separately. Most management decisions are made on the basis of information collected in the southern Prairie Provinces of Canada; thus, this area will be discussed in more detail because, indeed, it is the most important. The basic information for the southern Prairie Provinces is presented in Appendix A; for northern Canada and the Northwest Territories, in Appendix B; and for North Dakota, South Dakota, and Montana, in Appendix C. A small amount of data from western Minnesota (1958-66) is presented in Appendix D, and a small amount of data from northwestern Ontario (1960-64) is presented in Appendix E.

Southern Prairie Provinces

JULY POND COUNTS

The southern Prairie Provinces of Canada (226,560 square miles) have a history of alternating periods of water abundance and drought (Lynch et al., 1963). The obvious importance of the instability of the ponds and the probable influence of water on waterfowl production rates in the southern Prairie Provinces led to the counting of ponds during the annual surveys in both May and July. Lynch et al. (1963: 107) wrote that "...the most durable of prairie

environments serve as an oasis of waterfowl survival during periods of water deficiency, and from which breeders can proliferate into the 'intermittent' and eventually into the 'temporary' environments at such times as the latter become available." Similarly, Dzubin and Gollop (1972) concluded that the center of mallard abundance occurs in a most unstable and climatically unpredictable environment. The center of the southern Prairie Provinces (Saskatchewan) has the least stable water levels, with its coefficient of variation of the July pond numbers being approximately twice that of either Alberta or Manitoba (table 2, fig. 3). It is the periodic drying that makes nutrients available and leads to high productivity of plant and animal biomass when water is available. The estimated number of July ponds in Saskatchewan ranged from a low of 193,000 in 1961 to a high of 2,039,000 in 1955. Crissey (1963, 1967) and Gollop (1965) documented a direct relationship between pond numbers and the number of mallards produced in southern Alberta, southern Saskatchewan, and southern Manitoba. Water, indeed, is the most crucial factor which influences waterfowl production.

Table 2.--Summary of July pond estimates for the southern portions of Alberta, Saskatchewan, and Manitoba, 1955-71.

Year	Alberta	Saskatchewan	Manitoba	Total
1955	770,656	2,039,359	636,363	3,446,378
1956	852,572	1,106,170	417,008	2,375,750
1957	574,220	665,747	250,582	1,490,549
1958	592,545	396,656	519,166	1,508,367
1959	378,266	510,232	413,086	1,301,584
1960	523,275	618,746	374,982	1,517,003
1961	302,000	193,113	128,234	623,347
1962	469,450	256,254	225,400	951,104
1963	945,628	718,469	326,871	1,990,968
1964	435,071	507,010	446,729	1,388,810
1965	1,095,337	915,765	390,189	2,401,291
1966	593,268	1,079,018	411,978	2,084,264
1967	725,641	620,558	276,963	1,623,162
1968	380,264	342,380	160,555	883,199
1969	420,564	960,087	353,679	1,734,330
1970	610,924	1,728,214	416,708	2,755,846
1971	649,544	1,094,162	405,681	2,149,387
1955-62 Mean	557,873	723,285	370,603	1,651,760
1963-71 Mean	650,693	885,074	354,373	1,890,140
1955-71 Mean	607,013	808,938	362,010	1,777,961
Coefficient of Variation (X 100)	35.5	61.7	34.9	40.3
July Ponds/Square Mile				
1955-62 Mean	7.48	6.39	9.57	7.29
1963-71 Mean	8.72	7.82	9.15	8.34
1955-71 Mean	8.14	7.14	9.35	7.85

SAMPLING ERRORS IN THE MEASUREMENT OF JULY PONDS

The estimate of the number of July ponds present in each survey stratum is subject to substantial sampling error. This is due to: (1) the small sampling intensity (from 0.3 to 1.6 percent in the various strata in the southern portions of Alberta, Saskatchewan, and Manitoba); (2) the large variability that seems to be associated with pond numbers; and (3) the small number of transects in each stratum. Estimates of the variability on the numbers of July ponds were obtained by considering the transects within a stratum as the basic sampling unit. Confidence intervals were calculated using a ratio method (Cochran, 1963: 163) where the transect length was used as the auxiliary variable. Estimates of average confidence intervals for the 1955-71 period for strata in the primary Canadian breeding areas are presented in table 3.

Ninety percent confidence intervals, as a percent of the estimate, ranged from as low as $\pm$ 7 percent to as high as $\pm$ 73 percent for an individual stratum in a particular year. Generally, the largest variances relate to the smaller or less important strata (e.g., stratum 28 in Alberta). Estimates of the total number of ponds in the southern portions of Alberta, Saskatchewan, and Manitoba have an average confidence interval of $\pm$ 37 percent (range 22-63 percent, during the 1955-71 period).

BROOD INDEX (ALL SPECIES)

An index to waterfowl production is obtained from the number of duck broods (Class I, Class II, and Class III [from Gollop and Marshall, 1954]) seen from the air. All previous uses of the brood index have involved the total brood count, irrespective of age classes or species. It is known that some species, particularly diving ducks, are more easily seen from the air due to their behavioral traits. Furthermore, annual variation in vegetative cover may

Figure 3.—Number of July ponds per square mile in the southern portions of Alberta, Saskatchewan, and Manitoba, and in the north-central United States, 1955-71.

also significantly affect the percentage of broods seen from the air. Since broods usually are not identifiable or designated by species, and the percent of vegetative cover on the ponds is not measured, adjustments for these factors cannot be made. However, air:ground comparisons made on a limited scale in the southern Prairie Provinces during the years 1961-64 suggested that for all species combined an average of approximately 10.7 percent of the Class I broods, 32.3 percent of the Class II broods, and 46.0 percent of the Class III broods were visible from the air. Accordingly, the brood counts were adjusted by these crude figures in an attempt to obtain a more precise estimate of brood indexes.

Table 3.--Estimates of the average 90 percent confidence intervals for July pond counts in the southern portions of Alberta, Saskatchewan, and Manitoba, 1955-71

Province	Stratum	90% Confidence Interval (as a percent of the estimate)
Alberta	26	21
	27	22
	28	54
Saskatchewan	19	17
	20	24
	21	37
	22	49
	23	30
Manitoba	24	19
	25	24

These data remain indexes, and should not be misconstrued to mean anything else, particularly in view of the unmeasured behavioral and environmental factors. Unadjusted brood counts, together with the percentage of broods from each age class, are presented in table 4. If more realistic adjustment factors become available at a later date, these data may be used as the base for modification.

Adjusted brood indexes for the southern portions of Alberta, Saskatchewan, and Manitoba are presented in table 5. The 17-year pattern in brood indexes parallels that of the July pond estimates. The Saskatchewan brood index was the most variable, ranging from 143,000 to 2,161,000 (coefficient of variation 83.2 percent). Brood indexes for Alberta and Manitoba were less variable (coefficients of variation 31.9 and 47.1 percent, respectively). The 17-year adjusted brood indexes for the combined southern portions of all three Prairie Provinces suggest that the number of ducklings produced reached a peak in the mid-1950's, reached a low in the early 1960's, and returned to an intermediate level during the late 1960's and early 1970's (fig. 4). Crissey (1963, 1969) found a significant relationship between the number of ponds in July in the southern

Table 4.--Summary of unadjusted brood index information for the southern portions of Alberta, Saskatchewan, and Manitoba, 1955-71.

Year	Alberta				Saskatchewan				Manitoba			
	Unadjusted Brood Index	Percent in each age-class I	II	III	Unadjusted Brood Index	Percent in each age-class I	II	III	Unadjusted Brood Index	Percent in each age-class I	II	III
1955	358,431	7.8	45.0	47.2	244,111	24.5	48.8	26.7	24,318	29.7	37.1	33.2
1956	313,902	3.6	49.2	47.2	382,011	44.8	29.3	25.8	26,144	24.9	45.5	29.5
1957	430,378	5.5	47.7	46.8	414,454	23.7	31.7	44.6	62,441	29.0	47.8	23.1
1958	495,751	4.8	54.3	40.9	269,498	30.9	44.8	24.3	68,123	41.5	32.2	26.2
1959	288,973	11.1	58.6	30.3	104,549	27.6	39.9	32.6	33,215	61.5	34.1	4.5
1960	229,030	10.0	56.9	33.1	121,687	30.8	42.4	26.8	34,752	41.9	50.1	8.0
1961	279,972	8.2	44.4	47.4	71,774	22.7	33.1	44.3	32,581	30.3	58.8	10.9
1962	167,831	5.5	47.8	46.7	35,617	18.1	58.4	23.5	16,752	37.1	47.7	15.3
1963	258,943	4.7	49.0	46.3	46,102	20.4	41.1	38.4	33,502	14.4	43.8	41.8
1964	247,687	3.2	77.4	19.4	67,493	19.1	59.0	22.0	26,536	32.0	55.3	12.7
1965	132,024	21.2	51.2	27.6	47,342	24.9	51.2	23.8	23,032	39.1	60.6	0.3
1966	216,959	33.2	39.2	27.6	96,615	21.6	53.4	25.0	31,499	27.2	60.5	12.3
1967	201,737	40.7	39.7	19.6	95,443	35.1	41.6	23.4	31,073	62.8	33.8	3.4
1968	120,462	33.1	48.7	18.2	79,114	35.2	41.7	23.2	15,119	37.1	56.7	6.2
1969	207,377	34.1	42.6	23.3	177,945	14.8	52.9	32.3	25,306	36.3	51.3	12.4
1970	121,137	23.3	43.9	32.8	130,994	24.1	38.9	37.0	21,884	72.0	26.4	1.5
1971	124,631	39.6	36.4	24.0	180,832	15.1	41.3	43.6	16,213	47.2	46.2	6.6
1955-62 Mean	320,534	7.1	50.5	42.5	205,463	27.9	41.1	31.1	37,291	37.0	44.2	18.8
1963-71 Mean	181,217	25.9	47.6	26.5	102,431	23.4	46.8	29.9	24,907	40.9	48.3	10.8
1955-71 Mean	246,778	17.0	48.9	34.0	150,917	25.5	44.1	30.4	30,735	39.1	46.3	14.6
Coefficient of Variation (X 100)	43.8	--	--	--	75.9	--	--	--	47.0	--	--	--

Provinces and mallard production on a continent-wide basis.

Table 5.--Summary of adjusted brood index information for the southern portions of Alberta, Saskatchewan and Manitoba, 1955-71

Year	Adjusted Brood Index[1/] Alberta	Saskatchewan	Manitoba	Total
1955	1,128,536	1,069,922	113,015	2,311,473
1956	905,931	2,161,021	114,482	3,181,434
1957	1,294,798	1,726,813	293,136	3,314,747
1958	1,496,985	1,295,009	371,066	3,163,060
1959	1,014,862	473,081	229,347	1,717,290
1960	782,635	581,151	196,152	1,559,938
1961	887,986	294,984	159,399	1,342,369
1962	505,079	142,922	88,444	736,445
1963	767,287	185,092	120,982	1,073,361
1964	772,680	276,196	132,202	1,181,078
1965	550,318	209,808	127,623	887,749
1966	1,067,072	407,474	147,595	1,622,141
1967	1,101,781	484,772	217,307	1,803,860
1968	602,250	402,479	81,050	1,085,779
1969	1,039,910	662,777	132,942	1,835,629
1970	514,980	558,323	165,940	1,239,243
1971	667,002	657,920	97,097	1,422,019
1955-62 Mean	1,002,102	968,113	195,630	2,165,845
1963-71 Mean	787,031	427,205	135,860	1,350,095
1955-71 Mean	888,241	681,750	163,987	1,733,977
Coefficient of Variation (X 100)	31.9	83.2	47.1	46.5
Brood Index/Square Mile				
1955-62	13.43	8.55	5.05	9.56
1963-71	10.55	3.77	3.51	5.96
1955-71	11.90	6.02	4.23	7.65

1/ Asaumes 10.7 percent of Class I broods, 32.3 percent of Class II broods, and 46.0 percent of Class III broods are observed from the air.

The mean brood index per square mile for the 17-year period progressively declined from west to east in the southern portions of the Prairie Provinces (11.90 in Alberta, 6.02 in Saskatchewan, and 4.23 in Manitoba) (table 5). The difference appears to be independent of ponds per square mile, because the respective 17-year means are 8.14, 7.14, and 9.35 (table 2). The phenology of the season is earliest in Alberta, which may account for a higher percentage of the broods being observed (older age classes are easier to see from the air). Furthermore, a higher percentage of the broods may appear after the survey is completed in the east because the nesting season there is later. Brood visibility may also vary among Provinces, although the earlier season, combined with some other unknown factors, may lead to higher annual nesting success in Alberta. Hunters in the Pacific Flyway have enjoyed good populations of waterfowl and liberal regulations for years and a high percentage of the birds they harvest are produced in Alberta.

BROOD SIZE (ALL SPECIES)

The brood size of Class II and Class III ducklings is counted during the survey in July (table 6); however, it is not possible to segregate the brood-size data according to species. The mortality or brood-size decrease between Class II and III is usually less than 10 percent, and Stoudt (1971: 49-50) showed long-term averages for mallards, canvasbacks, and blue-winged teal of from 2 to 6 percent. Dzubin and Gollop (1972) show losses in mallards of from 3 to 10 percent between Class II and III. A brood-size decrease of from 2 to 10 percent is also shown in the Appendix tables. The small difference between the two age classes provides a strong case for pooling the data and using the two classes combined as an index

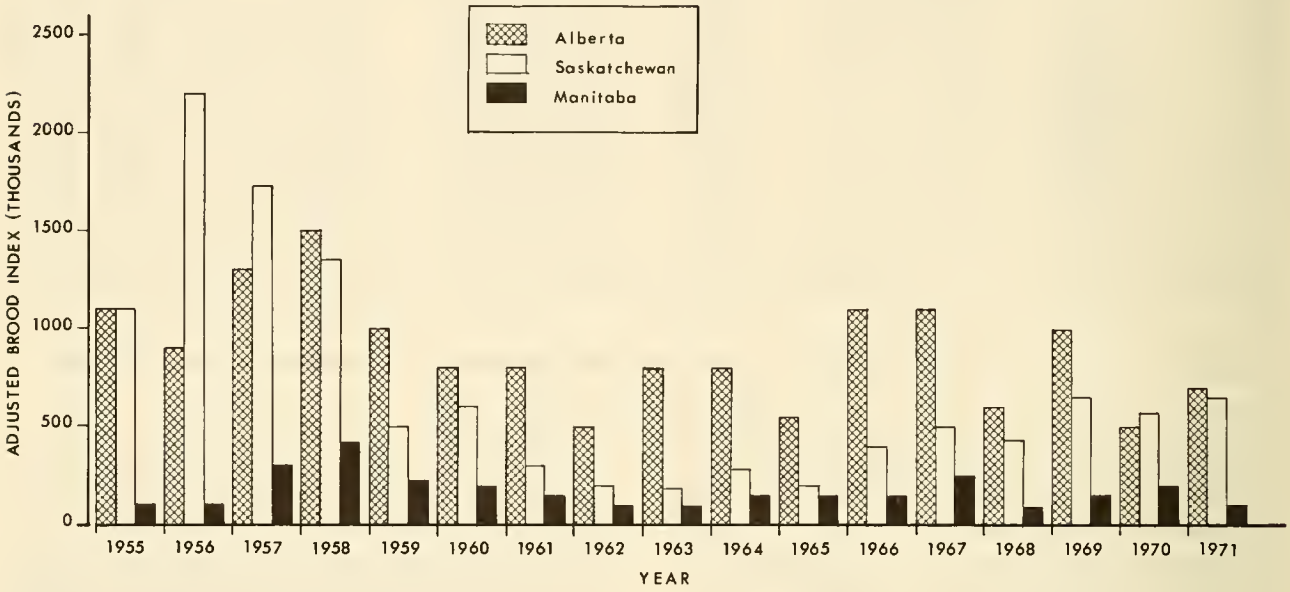

Figure 4.—Adjusted brood indexes in the southern portions of Alberta, Saskatchewan, and Manitoba, 1955-71.

Table 6.--Summary of Class II and Class III brood size data combined for the soutbern portions of Alberta, Saskatchewan, and Manitoba, 1955-71.

Year	Alberta	Saskatchewan	Manitoba	Weighted[1/] Total
1955	6.08	6.62	5.62	6.27
1956	6.08	6.00	5.08	6.00
1957	6.32	6.03	5.64	6.14
1958	6.35	4.40	6.87	5.76
1959	4.23	4.28	5.53	4.34
1960	6.12	4.79	5.65	5.66
1961	5.82	4.68	5.63	5.59
1962	5.59	5.45	5.09	5.53
1963	6.10	5.47	5.43	5.95
1964	5.94	5.77	5.04	5.83
1965	6.23	5.90	5.58	6.08
1966	6.61	5.83	5.32	6.28
1967	5.83	5.42	5.17	5.65
1968	5.33	4.90	4.79	5.13
1969	6.32	5.61	6.04	5.99
1970	5.48	5.37	5.64	5.44
1971	5.93	5.21	4.80	5.47
1955-62 Mean	5.82	5.28	5.64	5.66
1963-71 Mean	5.97	5.50	5.31	5.76
1955-71 Mean	5.90	5.40	5.47	5.71
Coefficient of Variation (X 100)	9.2	11.6	9.1	8.3

1/ Weighted according to the unadjusted brood index in each province.

to brood size at fledging time. The mean brood size (Class II and Class III combined) for the 17-year period shows that broods are larger in Alberta (5.90) and about the same size in Saskatchewan and Manitoba (5.40 and 5.47, respectively). It appears that, in addition to more broods being produced per square mile in Alberta (table 5), the average brood size is also larger (table 6). The species composition of the breeding ducks in Alberta and Saskatchewan is very similar (table 1).

Brood sizes in southern Saskatchewan had the highest annual variation and the lowest mean for the 17-year period. The annual brood size in southern Saskatchewan and the number of ponds in July per square mile were significantly correlated ($r = +0.62^{**}$, 15 d.f.). No significant correlations were detected from the data gathered in Alberta and Manitoba; however, the combined brood size in the southern portions of the three Prairie

Provinces also showed a significant correlation with the number of July ponds per square mile ($r = +0.44^{**}$, 49 d.f.). The average brood size increased as the average number of July ponds per square mile increased. Dzubin and Gollop (1972) report that mallard broods are highly mobile, and more ponds per square mile in July would generally shorten travel distance for broods in the event of a pond drying up. It appears that a closer proximity of ponds obviates the loss of a lower percentage of the ducklings during the prefledging period. Many other biological factors (e.g., breeding density, timing of production, etc.) and climatological factors may have an effect on brood size; therefore, an exceptionally high correlation coefficient between the two variables was not expected.

LATE NESTING INDEX (ALL SPECIES)

Pairs and single drakes without broods seen during the July survey are identified to species, if possible. Together they comprise the late nesting index, which is a measure of renesting effort and nesting season chronology. Flocked birds (three or more birds of different sexes) and groups consisting of two or more drakes are not counted.

To determine the importance and/or relative changes in the late nesting effort, the late nesting index must be evaluated in relation to the size of the breeding population. The late nesting indexes per 1,000 breeding mallards and per 1,000 breeding other ducks present during the May Survey are shown in table 7; in figure 5 and figure 6, they are compared with the quantity of July water in the southern Prairie Provinces of Canada. One would intuitively believe that a higher percentage of ducks would renest if more water is available in July. This appears to be the case, because a highly significant positive correlation was noted between the number of July ponds and the late nesting index for mallards ($r = +0.72^{**}$), and for all other species combined ($r = +0.67^{**}$). In addition to a higher correlation for mallards, the average late nesting index per 1,000 breeders was also higher (table 7). This is perhaps due to the mallards' steadfast persistence in trying to produce a brood. Hickey (1952) believed that considerable renesting occurred with mallards, and Coulter and Miller (1968) reported mallards being much more persistent renesters than black ducks (Anas rubripes) in the same habitats. During a 5-year period, Keith (1961) compared numbers of pairs and numbers of nests, and by knowing the percentage hatch on his areas in Alberta, estimated that 100 percent of the unsuccessful mallards on his study area renested; however, only 82 percent of the gadwall (Anas strepera), 75 percent of the shovelers (Spatula clypeata), 55 percent of the blue-winged teal (Anas discors), and 39 percent of the lesser scaup (Aythya affinis) renested.

Table 7.--Late nesting index per 1,000 breeding mallards and per 1,000 breeding other ducks recorded during the May Survey in the southern portions of Alberta, Saskatchewan, and Manitoba, 1955-71.

Years	Breeding Populations (Thousands)[1/]		Late Nesting Index (Thousands)		Late Nesting Index per 1000 Breeders	
	Mallards	Other Ducks	Mallards	Other Ducks	Mallards	Other Ducks
1955	9,728.9	24,064.1	219.2	352.1	22.5	14.6
1956	10,508.9	23,836.1	106.4	227.2	10.1	9.5
1957	9,473.2	19,271.0	63.7	97.6	6.7	5.1
1958	12,457.0	18,714.0	108.4	210.9	8.7	11.3
1959	6,873.7	17,473.1	72.6	144.9	10.6	8.3
1960	6,796.0	15,843.3	100.5	136.0	14.8	8.6
1961	3,343.7	11,986.7	30.6	41.2	9.2	3.4
1962	2,755.9	8,373.1	20.1	25.5	7.3	3.0
1963	3,214.4	7,866.4	36.2	80.2	11.3	10.2
1964	3,446.7	10,658.4	36.2	63.4	10.5	5.9
1965	2,596.7	8,517.0	73.7	166.8	28.4	19.6
1966	4,129.0	14,733.1	68.2	179.5	16.5	12.2
1967	3,957.8	14,939.0	49.0	160.0	12.4	10.7
1968	3,760.0	8,417.8	43.9	113.0	11.7	13.4
1969	3,800.0	13,711.9	70.3	222.4	18.5	16.2
1970	5,218.7	15,450.6	144.6	357.7	27.7	23.2
1971	6,481.7	14,367.5	101.5	272.6	15.7	19.0
17 year Mean	5,796.6	14,601.4	79.1	167.7	14.3	11.4

1/ Data from Pospahala et al. (in prep.).

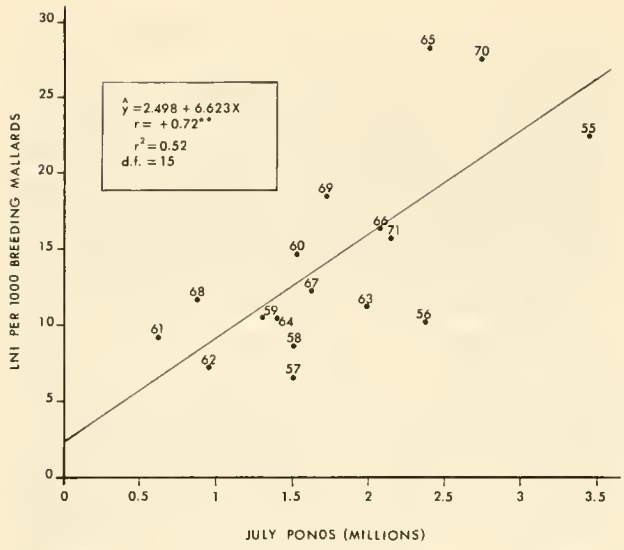

Figure 5.—Relationship between the late nesting index (mallards) and the number of July ponds in the southern portions of Alberta, Saskatchewan, and Manitoba, 1955-71.

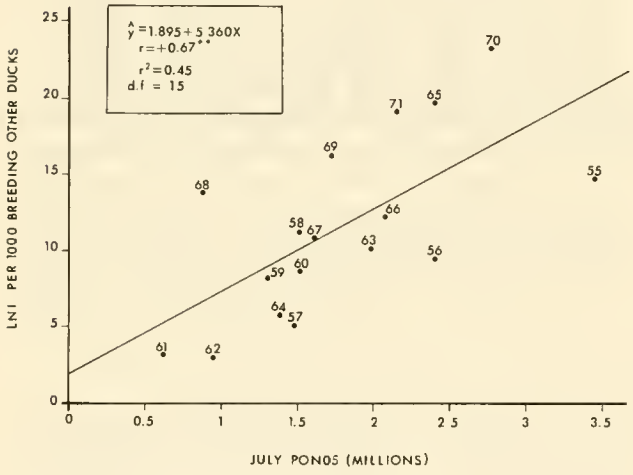

Figure 6.—Relationship between the late nesting index (all other species) and the number of July ponds in the southern portions of Alberta, Saskatchewan, and Manitoba, 1955-71.

RECRUITMENT RATE (ALL SPECIES)

The decisions pertaining to the annual waterfowl regulations for the United States are made in early August; therefore, fall flight forecasts must be made and appropriate regulations set at that time. All information from the May and July Breeding Ground Surveys is available by late July and can be used to predict the fall flight. Given the breeding population size (from May Breeding Ground Survey), the fall flight may be estimated if the annual recruitment rate of the population is known. Several procedures for estimating the annual recruitment rate have been used previously. During the 1950's and early 1960's, estimating annual production was a partially subjective procedure which weighed the results of the July Survey against the average of past years (Crissey, 1957).

During the last 10 years, the Waterfowl Harvest Survey, the Wing-Collection Survey, the preseason banding program, and the May Breeding Ground Survey have made possible an estimate of the number of young produced annually; however, the information is not available prior to the hunting season (Kaczynski and Geis, 1961). It is significant, however, that the procedure provides a basis for judging the accuracy of predictions made the previous July. In 1968, mallard production rates presented at the regulations meetings were estimated by a stepwise multiple linear regression analysis (Geis et al., 1969). The recruitment rates obtained a year in arrears for the period 1955-to-date were used, together with a constant and four independent variables (the number of July ponds, the continental mallard breeding population, the percent of ponds existing from the May Survey to the July Survey, and the index to the number of unadjusted broods of all species), to predict the recruitment rate for the current year. All data bases used in this approach are currently being reconstructed and corrected as part of the mallard study. The information presented in this report has resulted from the reconstruction effort. These corrections should improve our ability to estimate the numbers of birds in the fall flight; however, all of the necessary sets of data are not presently available. The results of the data reanalysis will be incorporated into the mallard study.

Dzubin (1969) cautioned that any comparisons between pond numbers and breeding pairs should be tempered with data on pond size, quality, and density; and that individual species and not ducks as a whole should be compared. We concur; however, the data available from the aerial surveys cannot be subjected to such an analysis. The broods seen from the air cannot be identified to species, and time is not

available to record additional information regarding characteristics of the ponds. Relationships between ducks per July pond and the recruitment rate index, together with many other correlations, would probably be more significant if we could follow the approach outlined by Dzubin.

Recruitment rates obtained from selected long-term ground studies are presented below. Intensive ground studies between 1952 and 1965 at Redvers, Saskatchewan--apparently, one of the better waterfowl breeding environments in Canada--provided the following average production rate estimates per adult: mallards, 1.4 young; pintails (Anas acuta), 1.0 young; blue-winged teal, 1.6 young; and canvasback (Aythya valisineria), 1.7 young (Stoudt, 1971). Average production estimates in the Alberta parklands (near Lousana) for approximately the same time period (1953-65) were somewhat lower per adult (assuming an equal sex ratio of birds on breeding grounds): mallards, 0.8 young; American widgeon (Mareca americana), 1.4 young; blue-winged teal, 1.6 young; and canvasbacks, 1.4 young (Smith, 1971). Dzubin (1969) noted recruitment rates for mallards in his Roseneath Study Area (Manitoba) of 1.3, 1.5, and 1.1 immatures per adult for 1952, 1953, and 1954, respectively; however, in the grasslands (Kindersley, Saskatchewan), the recruitment rate was much lower (0.3 to 0.7 immatures per adult). These data show that recruitment rates are quite variable between species and between locations and years. Therefore, any set of statistics which shows average recruitment rates for a large area (i.e., southern Prairie Provinces of Canada) and all species combined would be expected to show only general patterns, at best. Our recruitment rate estimates will primarily (if not solely) be based on information collected in the southern Prairie Provinces of Canada, although the percentage of game ducks nesting in the southern prairies may be an important statistic.

Northern Canada and Northwest Territories

Ponds are not counted during the survey in the northern portion of the breeding range because water is much more stable. Although the survey in northern Saskatchewan and northern Manitoba was initiated in 1959, a portion of this area was not surveyed the first year. Therefore, comparable data are available only for 1960-71. Production surveys in the Northwest Territories began in 1966, with 6 years of data now available, while surveys in northern Alberta began in 1969. See Appendix B for strata summaries.

BROOD INDEX (ALL SPECIES)

All brood index figures are unadjusted because no air:ground comparisons have been conducted to determine visibility rates. This is partially due to the low density of breeding waterfowl, the inaccessibility of the area, and the great difficulty in making representative ground censuses.

Brood indexes in northern Saskatchewan and northern Manitoba increased after 1965, with a peak reached in 1969; this was followed by a marked decline in 1970 and 1971 (fig. 7). The 3 years of information from northern Alberta show a similar decline in 1970 and 1971. Brood indexes for the Northwest Territories appear to fluctuate randomly, with no apparent trends. Climatic factors in the north are more rigorous, and weather may play an important role there.

The breeding population of dabbling ducks (from the May Survey) in northern Canada and the Northwest Territories remained relatively

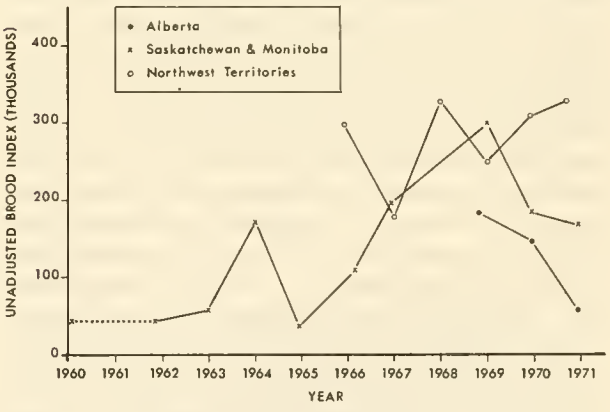

Figure 7.—Unadjusted brood indexes in the northern portions of Alberta, Saskatchewan, and Manitoba, and in the Northwest Territories. The dotted line indicates that no survey was conducted in 1961.

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unchanged during the last 10 years (Pospahala et al., in prep.); however, there was a large emigration of drought-displaced ducks to the Arctic in the late 1950's and early 1960's, particularly in 1959 (Hansen, 1960; Crissey, 1963; Hansen and McKnight, 1964). A large waterfowl breeding population (in excess of 30 million) on the prairies combined with a rapid reduction of suitable breeding territories on the prairies during the drought, was undoubtedly responsible for emigration. It is interesting that, during the drought years in the prairies, blue-winged teal, redheads (Aythya americana), ruddy ducks (Oxyura jamaicensis), canvasbacks, and shovelers were recorded in Alaska either for the first time or in much greater abundance than formerly (Hansen, 1960; Hansen and McKnight, 1964). Hansen and McKnight concluded that, although some individuals can and will nest successfully under displaced circumstances, not enough of them do in order to maintain an abundance commensurate with that attained in their normal environment. Recently, Smith (1970) reported a significant inverse relationship between number of water areas on the prairies of Alberta and Saskatchewan for the years 1959-68 and the portion of the pintail population moving north of the prairies and parklands. Furthermore, as the portion of the pintail population moving into the northern areas increased, an index of annual production declined significantly.

In addition to the major movement north in 1959, some evidence for northward movement in 1964 is also available (Pospahala et al., in prep.). A corresponding increase in the brood index in the north was reported in 1964 (fig. 7). Reasons for the continual increase in the brood index in northern Canada between 1965 and 1969 are unclear, because the breeding numbers observed during the May Survey remained relatively unchanged. The 6 years of combined information on brood indexes from northern Saskatchewan, northern Manitoba, and the Northwest Territories suggest an abrupt increase in broods in 1968 (fig. 7), the year when water levels in the southern Prairie Provinces of Canada were exceptionally low (less than 1 million ponds in July). Could a portion of the southern prairie birds have moved north after the May Survey was completed in the north? Smith and Hawkins (1948) also discussed the possibility of late nesting pairs moving into an area and not being enumerated by a census conducted at one interval. If this is the case, the decreased water levels in the southern prairies between 1965 and 1968 may have been responsible for the gradually increasing number of broods in the north; likewise, the improvement of water levels in the southern prairies in 1969-71 may be responsible for the downward trend in brood indexes in the north in recent years.

BROOD SIZE (ALL SPECIES)

Class II and Class III broods were combined and the average brood size presented in figure 8 for northern Saskatchewan and northern Manitoba, and the Northwest Territories. The average brood size appears to have increased in recent years. A mean brood size of 5.38 was reported from northern Saskatchewan and northern Manitoba during the years 1960-71--considererably lower than the 5.90 reported from southern Alberta (table 6); however, it is very similar to the average reported from southern Saskatchewan and southern Manitoba (5.40 and 5.47, respectively).

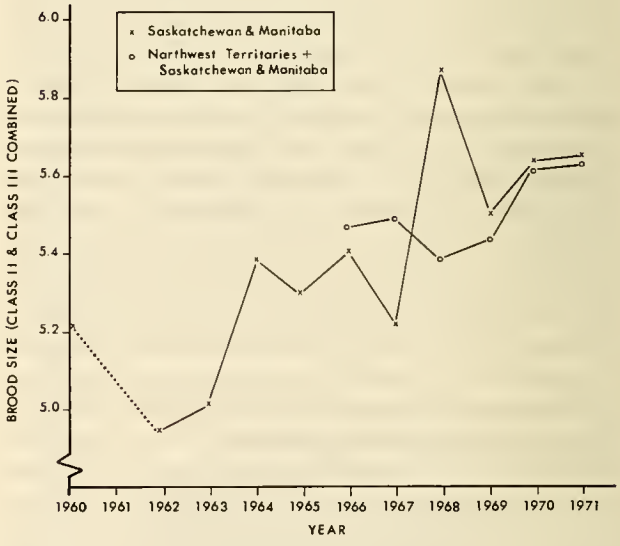

Figure 8.—Annual brood size (Class II and Class III combined) in northern Canada and the Northwest Territories. The dotted line indicates that no survey was conducted in 1961.

LATE NESTING INDEX (ALL SPECIES)

Information concerning the late nesting index in northern Saskatchewan and northern Manitoba is available for 11 years (since 1960). Systematic data collection during the July production survey began in the Northwest Territories in 1966, and in northern Alberta in 1969 (fig. 9). The square miles surveyed in northern Saskatchewan and northern Manitoba roughly equal the area surveyed in the Northwest Territories (222,114 square miles vs. 195,513 square miles). Collectively, the late nesting index in 1968 and 1969 nearly doubled the levels of 1966 and 1967, but dropped dramatically in 1970 and 1971. There was virtually no late nesting index in the Northwest Territories in 1971.

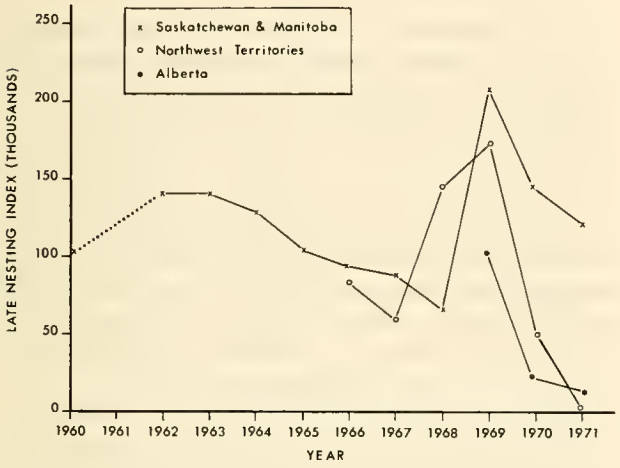

Figure 9.—Late nesting index in northern Canada and the Northwest Territories. The dotted line indicates that no survey was conducted in 1961.

North Dakota, South Dakota, and Montana

JULY POND COUNTS

Pond numbers in Montana have remained relatively stable (fig. 3), which is probably because a high percentage are man-made stock ponds. Pond counts in the Dakotas are more variable, and have shown an upward trend since 1968 which is similar to the trend observed in the southern Prairie Provinces of Canada. Only one to two water areas per square mile are reported from Montana, while approximately three to six per square mile are reported from the Dakotas (see Appendix C for additional details).

BROOD INDEX (ALL SPECIES)

It is of interest that the unadjusted brood index per square mile in Montana is consistently higher than the index in the Dakotas, even though more than twice as many water areas per square mile are found in the Dakotas. The brood index in the Dakotas ranged from approximately 50,000 to 90,000 during the last 6 years, while indexes from Montana ranged from 43,000 to 68,000. The surveyed area in the Dakotas is nearly twice the size of the surveyed area in Montana and has approximately four times the number of July water areas. Ponds in Montana are mostly open stock dams with little shoreline vegetation; however, the Dakotas have a portion of the potholes completely covered with emergent vegetation. Differing visibility rates are probably responsible for at least part of the observed differences.

BROOD SIZE (ALL SPECIES)

The 6-year average size for Class II and Class III broods from the Dakotas was 5.82, while the 5-year average from Montana was considerably lower--5.02 young. Most of the duck broods in the Dakotas are blue-winged teal, while the broods in Montana are primarily mallards (table 1). Smith (1971: 39) and Stoudt (1971: 47) have shown that blue-winged teal broods are consistently larger than mallard broods, which probably accounts for the differences in average brood sizes between the two locations. There is an indication that the average brood size in both Montana and the Dakotas improved in 1969 and 1970 when the density of water areas per square mile increased.

LATE NESTING INDEX (ALL SPECIES)

Only limited information is available regarding this parameter in Montana and the Dakotas. The late nesting effort in Montana appears to be much lower than the effort reported from the Dakotas.

SUMMARY

Basic information obtained from the July Waterfowl Production Survey is presented in 32 Appendix tables for the period 1955-71. The discussion of the data is minimized because the report is designed primarily to make the data available to waterfowl biologists and other interested individuals. Data presented include: (1) the number of July ponds, (2) the brood index, (3) the average size for Class II and Class III broods, and (4) the late nesting index. These statistics are presented for each stratum surveyed. A few of the obvious correlations are discussed, although more refined analyses of the data will be presented in the Mallard Study reports. Furthermore, additional supporting information will be available for the mallard reports.

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Numerous individuals have taken part in the annual July Production Survey during the last 17 years as either pilots or observers, and their work is gratefully acknowledged. G. Hortin Jensen has participated in the survey each year since 1955, while Rossalius G. Hanson has been a survey pilot for 16 of these 17 years. Two other Flyway Biologists, Morton M. Smith and Arthur R. Brazda, have piloted survey planes for 10 years. Pilots and observers who have worked with the survey for 5 years or more include: K. Duane Norman, Gerald Pospichal, Alva E. Weinrich, Richard C. Droll, R. David Purinton, Glen V. Orton, David W. Fisher, Joseph W. Perroux, Jr., and Charles D. Evans. Other participants include: James F. Voelzer, Edward G. Wellein, Everett B. Chamberlain, Gust J. Nun, J. Donald Smith, Robert H. Smith, Allen G. Smith, Donald Combs, Floyd A. Thompson, Donald N. Frickie, Joseph A. Serafin, Bonar D. Law, James L. Nelson, William Hyshka, Joe M. Matlock, Robert W. Slattery, Richard A. Gimby, Ralph Hancox, Maurice Lundy, Thomas J. Harper, Edgar L. Ferguson, Eugene V. Cofer, D. R. Halladay, N. G. Perret, Walter S. Okamoto, Donald E. Wieland, Hugh V. Hines, Ridley D. Duncan, Fred A. Glover, D. J. McIntosh, Marshall L. Stinnett, and Ralph Von Dane.

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Clerical work in resummarizing 17 years of the July Survey was a major task, and the following individuals are very much responsible for the rapid completion of the project: Judith P. Bladen, Colleen E. Bystrak, Marcella M. Edwards, Samuel E. Fowler, Marcia E. Henson, S. Kathleen Judy, Mary T. LePore, and Deanna L. Light.

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Appendix Table A1. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1955.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	238,519	9.690	149,600	6.033(181)	5.657(213)	5.832(394)	3,273	12,623	6,919	20,383
Stratum 27	36,763	478,114	13.005	201,710	6.755(94)	5.978(137)	6.294(231)	4,474	8,170	3,501	13,227
Stratum 28	13,235	54,023	4.081	7,121	5.222(9)	5.125(16)	5.160(25)	2,322	7,740	3,405	11,300
Subtotal[1/]	74,612	770,656	10.329	358,431	6.424	5.828	6.079	10,069	28,533	13,825	44,910
Southern Saskatchewan											
Stratum 19	37,911	374,451	9.877	27,158	6.633(98)	5.528(72)	6.165(170)	81,807	159,846	26,493	191,216
Stratum 20	20,151	1,020,262	50.631	35,968	6.270(37)	5.579(19)	6.036(56)	45,213	81,037	9,389	98,083
Stratum 21	18,570	138,607	7.464	35,684	6.772(57)	6.467(30)	6.667(87)	6,069	21,604	8,982	36,412
Stratum 22	25,243	385,530	15.273	127,150	7.121(140)	6.600(55)	6.974(195)	27,198	77,174	11,219	95,192
Stratum 23	11,345	120,509	10.622	18,151	6.400(20)	5.000(10)	5.933(30)	24,706	44,875	5,798	51,682
Subtotal[1/]	113,220	2,039,359	18.012	244,111	6.838	6.193	6.624	184,993	384,536	61,881	472,585
Southern Manitoba											
Stratum 24	11,088	360,348	32.499	12,801	6.357(14)	4.933(15)	5.621(29)	11,899	21,094	5,289	32,273
Stratum 25	27,640	276,015	9.986	11,517	12.000(1)	6.000(2)	8.000(3)	12,284	16,123	3,455	21,498
Subtotal[1/]	38,728	636,363	16.432	24,318	6.357[2/]	4.933[2/]	5.621[2/]	24,183	37,217	8,744	53,771
Southern Prairie Provinces											
Total[1/]	226,560	3,446,378	15.212	626,860	6.583	5.936	6.274	219,245	450,286	84,450	571,266

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A2. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1956.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	208,038	8.452	112,761	6.333(216)	5.747(158)	6.086(374)	1,590	5,049	7,574	13,932
Stratum 27	36,763	591,904	16.100	189,067	6.436(133)	5.938(180)	6.150(313)	5,446	7,781	5,446	21,396
Stratum 28	13,235	52,630	3.976	12,074	4.714(14)	5.050(20)	4.911(34)	310	1,703	1,548	3,251
Subtotal[1/]	74,612	852,572	11.427	313,902	6.332	5.834	6.079	7,346	14,533	14,568	38,579
Southern Saskatchewan											
Stratum 19	37,911	210,120	5.542	94,818	5.941(203)	5.721(226)	5.825(429)	24,668	73,894	10,902	87,990
Stratum 20	20,151	512,371	25.427	68,181	5.850(120)	4.529(87)	5.295(207)	29,324	56,047	5,778	65,870
Stratum 21	18,570	120,887	6.510	52,918	6.800(55)	6.213(61)	6.491(116)	6,069	9,953	6,554	18,449
Stratum 22	25,243	228,001	9.032	146,934	6.434(99)	6.023(86)	6.243(185)	14,838	35,829	12,667	58,991
Stratum 23	11,345	34,791	3.066	19,160	6.000(17)	6.178(28)	6.111(45)	4,286	11,597	2,269	13,866
Subtotal[1/]	113,220	1,106,170	9.770	382,011	6.237	5.715	5.998	79,185	187,320	38,170	245,166
Southern Manitoba											
Stratum 24	11,088	223,709	20.176	12,776	5.367(60)	4.429(42)	4.980(102)	14,480	28,412	5,719	39,424
Stratum 25	27,640	193,299	6.993	13,368	6.000(5)	4.500(6)	5.181(11)	5,420	7,949	1,084	10,478
Subtotal[1/]	38,728	417,008	10.768	26,144	5.691	4.465	5.083	19,900	36,361	6,803	49,902
Southern Prairie Provinces											
Total[1/]	226,560	2,375,750	10.486	722,057	6.259	5.722	6.001	106,431	238,214	59,541	333,647

1/ Brood size weighted according to brood index for each stratum.

Appendix Table A3. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1957.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	133,986	5.443	127,067	6.270(148)	6.170(165)	6.217(313)	1,590	4,675	6,639	12,155
Stratum 27	36,763	405,560	11.031	286,129	6.526(152)	6.283(173)	6.396(325)	2,723	5,641	5,835	13,227
Stratum 28	13,235	34,674	2.619	17,182	6.176(17)	5.347(23)	5.700(40)	774	2,786	929	3,715
Subtotal 1/	74,612	574,220	7.696	430,378	6.436	6.212	6.315	5,087	13,102	13,403	29,097
Southern Saskatchewan											
Stratum 19	37,911	127,629	3.367	168,359	6.569(269)	6.339(392)	6.433(661)	11,410	24,544	7,960	33,566
Stratum 20	20,151	297,716	14.774	128,129	6.171(140)	4.463(123)	5.372(263)	28,746	38,858	1,445	41,602
Stratum 21	18,570	58,987	3.176	71,610	6.474(57)	6.000(118)	6.154(175)	2,427	4,855	2,913	8,739
Stratum 22	25,243	162,507	6.438	19,884	6.804(112)	6.012(173)	6.323(285)	3,060	3,740	15,299	22,098
Stratum 23	11,345	18,908	1.666	26,472	6.733(15)	5.764(34)	6.061(49)	252	1,008	756	1,765
Subtotal 1/	113,220	665,747	5.880	414,454	6.452	5.649	6.028	45,895	73,005	28,373	107,770
Southern Manitoba											
Stratum 24	11,088	130,989	11.813	40,763	6.361(147)	4.782(119)	5.654(266)	9,430	14,115	1,156	16,853
Stratum 25	27,640	119,593	4.326	21,678	5.842(19)	4.833(6)	5.600(25)	3,252	5,781	0	7,587
Subtotal 1/	38,728	250,582	6.470	62,441	6.181	4.800	5.635	12,682	19,896	1,156	24,440
Southern Prairie Provinces											
Total 1/	226,560	1,490,549	6.579	907,273	6.426	5.858	6.137	63,664	106,003	42,932	161,307

1/ Brood size weighted according to brood index for each stratum.

Appendix Table A4. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1958.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	151,657	6.161	113,883	5.943(159)	5.862(138)	5.906(297)	2,525	7,667	5,610	14,399
Stratum 27	36,763	397,391	10.809	374,438	6.853(225)	6.155(218)	6.510(443)	973	1,362	4,668	8,948
Stratum 28	13,235	43,497	3.286	7,430	5.000(10)	4.600(5)	4.866(15)	1,703	4,179	2,632	7,275
Subtotal[1/]	74,612	592,545	7.942	495,751	6.616	6.064	6.347	5,201	13,208	12,910	30,622
Southern Saskatchewan											
Stratum 19	37,911	69,122	1.823	40,067	4.074(94)	4.070(71)	4.073(165)	20,299	32,239	7,429	40,199
Stratum 20	20,151	154,853	7.684	103,139	4.676(71)	5.433(60)	5.022(131)	29,324	71,937	11,123	85,516
Stratum 21	18,570	57,045	3.072	47,335	4.250(48)	3.941(34)	4.122(82)	16,021	24,760	2,670	31,800
Stratum 22	25,243	97,232	3.852	71,394	4.208(53)	3.583(36)	3.955(89)	21,418	31,617	3,740	39,097
Stratum 23	11,345	18,404	1.622	7,563	3.000(9)	4.400(5)	3.500(14)	6,051	8,572	2,017	10,589
Subtotal[1/]	113,220	396,656	3.503	269,498	4.341	4.449	4.398	93,113	169,125	26,979	207,201
Southern Manitoba											
Stratum 24	11,088	188,604	17.010	43,926	6.514(37)	6.638(47)	6.583(84)	1,521	38,390	15,575	56,581
Stratum 25	27,640	330,562	11.959	24,197	8.500(2)	6.667(3)	7.400(5)	8,562	16,379	5,584	24,941
Subtotal[1/]	38,728	519,166	13.405	68,123	6.514[2/]	6.638[2/]	6.873	10,083	54,769	21,159	81,522
Southern Prairie Provinces											
Total[1/]	226,560	1,508,367	6.658	833,372	5.872	5.589	5.760	108,397	237,102	61,048	319,345

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

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Appendix Table A5. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1959.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	104,627	4.251	53,015	4.873(165)	5.779(104)	5.223(269)	3,086	10,753	5,517	17,578
Stratum 27	36,763	206,768	5.624	216,299	3.306(528)	5.607(191)	3.917(719)	4,279	7,781	6,030	15,367
Stratum 28	13,235	66,871	5.052	19,659	4.656(32)	5.300(30)	4.967(62)	2,012	6,037	4,334	10,836
Subtotal[1/]	74,612	378,266	5.070	288,973	3.685	5.618	4.228	9,377	24,571	15,881	43,781
Southern Saskatchewan											
Stratum 19	37,911	122,986	3.244	13,002	3.971(34)	3.067(30)	3.547(64)	11,410	23,085	4,643	28,259
Stratum 20	20,151	208,588	10.350	21,957	5.625(24)	6.750(4)	5.785(28)	15,167	38,858	4,767	43,625
Stratum 21	18,570	40,053	2.157	30,100	4.313(16)	3.154(26)	3.595(42)	6,069	9,467	2,670	16,021
Stratum 22	25,243	107,091	4.242	36,717	4.308(26)	4.211(19)	4.267(45)	6,800	8,839	0	14,279
Stratum 23	11,345	31,514	2.777	2,773	2.400(5)	4.400(5)	3.400(10)	5,546	8,320	0	8,824
Subtotal[1/]	113,220	510,232	4.507	104,549	4.494	3.652[2/]	4.280	44,992	88,569	12,080	111,008
Southern Manitoba											
Stratum 24	11,088	103,672	9.350	15,940	5.350(40)	5.308(13)	5.340(53)	10,890	27,256	5,962	33,949
Stratum 25	27,640	309,414	11.194	17,275	5.444(9)	8.000(1)	5.700(10)	7,294	18,043	6,142	28,792
Subtotal[1/]	38,728	413,086	10.666	33,215	5.399	5.308[2/]	5.527	18,184	45,299	12,104	62,741
Southern Prairie Provinces											
Total[1/]	226,560	1,301,584	5.745	426,737	4.016	5.112	4.342	72,553	158,439	40,065	217,530

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A6. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1960.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size II	Brood Size III	Brood Size Total	Late Nesting Index Mallards	Late Nesting Index Dabblers	Late Nesting Index Divers	Late Nesting Index Total Ducks
Southern Alberta											
Stratum 26	24,614	93,220	3.787	57,690	5.672(134)	5.862(94)	5.750(228)	1,309	3,273	2,618	6,639
Stratum 27	36,763	382,997	10.417	151,526	6.564(193)	5.913(127)	6.306(320)	1,945	3,501	1,945	9,531
Stratum 28	13,235	47,058	3.555	19,814	5.315(19)	6.667(9)	5.750(28)	619	2,322	1,703	4,334
Subtotal[1/]	74,612	523,275	7.013	229,030	6.232	5,966	6.117	3,873	9,096	6,266	20,504
Southern Saskatchewan											
Stratum 19	37,911	136,769	3.608	18,034	4.585(41)	3.154(39)	3.888(80)	33,040	60,157	5,134	66,607
Stratum 20	20,151	300,460	14.910	24,701	4.938(16)	4.556(9)	4.800(25)	14,879	36,691	3,467	40,591
Stratum 21	18,570	47,335	2.549	25,974	6.320(25)	5.071(14)	5.872(39)	8,739	9,710	2,913	16,507
Stratum 22	25,243	117,291	4.646	47,936	5.194(36)	3.778(27)	4.587(63)	18,699	28,218	2,040	36,037
Stratum 23	11,345	16,891	1.488	5,042	4.333(6)	4.000(2)	4.250(8)	1,513	4,286	756	5,042
Subtotal[1/]	113,220	618,746	5.465	121,687	5.255	4.133[2/]	4.786	76,870	139,062	14,310	164,784
Southern Manitoba											
Stratum 24	11,088	169,986	15.330	10,951	5.429(14)	6.000(7)	5.619(21)	13,628	28,047	4,259	35,044
Stratum 25	27,640	204,996	7.416	23,801	5.667(9)	--	5.667(9)	6,142	14,588	768	16,123
Subtotal[1/]	38,728	374,982	9.682	34,752	5.592	6.000	5.652	19,770	42,635	5,027	51,167
Southern Prairie Provinces											
Total[1/]	226,560	1,517,003	6.696	385,469	5.866	5.303	5.656	100,513	190,793	25,603	236,455

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A7. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1961.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size II	Brood Size III	Brood Size Total	Late Nesting Index Mallards	Late Nesting Index Dabblers	Late Nesting Index Divers	Late Nesting Index Total Ducks
Southern Alberta											
Stratum 26	24,614	56,568	2.298	42,917	5.326(86)	5.578(111)	5.467(197)	281	1,683	1,122	3,366
Stratum 27	36,763	214,937	5.846	226,219	5.961(180)	5.924(199)	5.941(379)	584	1,167	584	1,945
Stratum 28	13,235	30,495	2.304	10,836	4.333(12)	5.230(13)	4.800(25)	155	1,393	1,084	2,786
Subtotal[1]	74,612	302,000	4.048	279,972	5.801	5.844	5.824	1,020	4,243	2,790	8,097
Southern Saskatchewan											
Stratum 19	37,911	51,078	1.347	18,839	5.040(25)	4.522(46)	4.704(71)	3,715	5,837	1,725	7,960
Stratum 20	20,151	50,558	2.508	7,078	5.500(8)	7.000(1)	5.667(9)	4,478	8,523	1,156	9,678
Stratum 21	18,570	41,024	2.209	31,800	4.824(17)	4.415(41)	4.534(58)	7,040	7,040	1,214	8,253
Stratum 22	25,243	40,117	1.589	9,519	4.857(7)	3.429(7)	4.143(14)	5,440	5,440	0	7,139
Stratum 23	11,345	10,336	0.911	4,538	6.667(3)	4.625(8)	5.181(11)	504	2,521	0	2,521
Subtotal[1]	113,220	193,113	1.706	71,774	4.960[2]	4.316[2]	4.679	21,177	29,361	4,095	35,551
Southern Manitoba											
Stratum 24	11,088	48,794	4.400	12,107	5.351(37)	6.750(8)	5.600(45)	4,502	10,830	3,650	15,271
Stratum 25	27,640	79,440	2.874	20,474	6.000(10)	4.750(5)	5.642(14)	3,890	6,756	4,095	12,899
Subtotal[1]	38,728	128,234	3.311	32,581	5.759	5.493	5.626	8,392	17,586	7,745	28,170
Southern Prairie Provinces											
Total[1]	226,560	623,347	2.751	384,327	5.641	5.529	5.594	30,589	51,190	14,630	71,818

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A8. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1962.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	72,556	2.948	31,697	5.672(67)	5.124(89)	5.359(156)	748	935	468	1,590
Stratum 27	36,763	357,731	9.730	124,370	6.091(131)	5.360(158)	5.692(289)	192	384	192	1,153
Stratum 28	13,235	39,163	2.959	11,764	5.333(15)	5.111(27)	5.190(42)	464	929	774	1,703
Subtotal[1]	74,612	469,450	6.292	167,831	5.959	5.298	5.594	1,404	2,248	1,434	4,446
Southern Saskatchewan											
Stratum 19	37,911	62,621	1.652	10,348	5.375(48)	4.714(21)	5.174(69)	3,847	8,624	531	9,287
Stratum 20	20,151	104,506	5.186	6,357	NA[3]	NA[3]	NA[3]	5,420	11,082	430	11,824
Stratum 21	18,570	29,858	1.608	4,855	5.364(11)	4.833(6)	5.176(17)	971	2,670	0	2,670
Stratum 22	25,243	46,916	1.859	9,519	6.150(20)	6.571(7)	6.259(27)	1,360	1,360	0	1,360
Stratum 23	11,345	12,353	1.088	4,538	4.800(5)	4.000(1)	4.667(6)	504	1,008	0	1,260
Subtotal[1]	113,220	256,254	2.263	35,617	5.536[2]	5.452[2]	5.449[2]	12,102	24,744	961	26,401
Southern Manitoba											
Stratum 24	11,088	104,158	9.394	5,536	5.485(33)	5.000(8)	5.390(41)	5,293	8,092	548	9,674
Stratum 25	27,640	121,242	4.386	11,216	4.916(12)	5.000(6)	4.944(18)	1,335	3,472	534	5,074
Subtotal[1]	38,728	225,400	5.820	16,752	5.104	5.000	5.091	6,628	11,564	1,082	14,748
Southern Prairie Provinces											
Total[1]	226,560	951,104	4.198	220,200	5.826	5.300	5.532	20,134	38,556	3,477	45,595

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.
3/ Not Available.

Appendix Table A9. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1963.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	179,427	7.290	56,568	6.449(107)	5.772(136)	6.070(243)	748	2,057	655	2,712
Stratum 27	36,763	687,410	18.698	188,289	6.247(174)	6.201(194)	6.222(368)	584	1,362	584	5,252
Stratum 28	13,235	78,791	5.953	14,086	4.300(10)	4.756(37)	4.659(47)	464	1,084	464	1,548
Subtotal[1/]	74,612	945,628	12.674	258,943	6.185	6.029	6.103	1,796	4,503	1,703	9,512
Southern Saskatchewan											
Stratum 19	37,911	227,796	6.009	11,675	5.040(25)	5.067(30)	5.055(55)	10,348	21,227	3,582	25,871
Stratum 20	20,151	240,513	11.935	8,378	5.750(16)	4.957(23)	5.282(39)	3,178	9,967	867	12,134
Stratum 21	18,570	92,971	5.007	15,293	5.917(12)	5.091(11)	5.522(23)	4,127	11,895	485	14,322
Stratum 22	25,243	115,591	4.579	7,479	7.750(4)	5.250(4)	6.500(8)	2,380	7,139	1,360	10,879
Stratum 23	11,345	41,598	3.666	3,277	5.000(3)	4.500(2)	4.800(5)	3,025	5,294	756	6,050
Subtotal[1/]	113,220	718,469	6.346	46,102	5.588[2/]	5.052[2/]	5.467	23,058	55,522	7,050	69,256
Southern Manitoba											
Stratum 24	11,088	157,576	14.211	11,620	5.149(74)	4.945(73)	5.048(147)	5,232	11,073	4,624	21,902
Stratum 25	27,640	169,295	6.125	21,882	6.667(12)	4.944(18)	5.633(30)	6,142	13,436	0	15,739
Subtotal[1/]	38,728	326,871	8.440	33,502	6.141	4.944	5.430	11,374	24,509	4,624	37,641
Southern Prairie Provinces											
Total[1/]	226,560	1,990,968	8.788	338,547	6.100	5.789	5.951	36,228	84,534	13,377	116,409

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A10. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1964.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	104,346	4.239	37,868	5.670(112)	5.347(49)	5.571(161)	935	3,086	1,122	4,395
Stratum 27	36,763	252,089	6.857	198,209	6.222(279)	5.479(98)	6.029(377)	389	584	1,362	2,723
Stratum 28	13,235	78,636	5.942	11,610	5.636(22)	5.400(5)	5.592(27)	2,012	3,870	1,238	5,418
Subtotal[1/]	74,612	435,071	5.831	247,687	6.110	5.455	5.938	3,336	7,540	3,722	12,536
Southern Saskatchewan											
Stratum 19	37,911	99,238	2.618	15,389	4.970(33)	5.333(15)	5.083(48)	7,828	15,920	1,857	18,176
Stratum 20	20,151	267,670	13.283	15,601	5.649(37)	6.727(11)	5.900(48)	4,622	8,378	3,178	12,712
Stratum 21	18,570	33,499	1.804	20,876	6.150(20)	6.188(16)	6.167(36)	5,826	5,826	0	6,554
Stratum 22	25,243	93,493	3.704	14,619	5.412(17)	7.000(5)	5.773(22)	3,060	4,080	5,440	11,219
Stratum 23	11,345	13,110	1.156	1,008	8.500(2)	--	8.500(2)	2,017	2,017	0	2,017
Subtotal[1/]	113,220	507,010	4.478	67,493	5.597[2/]	6.295[2/]	5.767[2/]	23,353	36,221	10,475	50,678
Southern Manitoba											
Stratum 24	11,088	224,074	20.209	12,716	5.683(63)	5.263(19)	5.585(82)	4,989	10,221	3,833	19,895
Stratum 25	27,640	222,655	8.056	13,820	4.667(12)	4.000(3)	4.533(15)	4,607	13,436	1,536	16,507
Subtotal[1/]	38,728	446,729	11.535	26,536	5.154	5.263[2/]	5.038	9,596	23,657	5,369	36,402
Southern Prairie Provinces											
Total[1/]	226,500	1,388,810	6.130	341,716	5.934	5.606	5.834	36,285	67,418	19,566	99,616

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A11. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1965.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	263,764	10.716	34,408	6.359(64)	5.815(54)	6.110(118)	4,582	20,477	6,078	27,770
Stratum 27	36,763	704,332	19.159	84,613	6.500(66)	6.271(59)	6.392(125)	7,002	27,232	8,753	41,626
Stratum 28	13,235	127,241	9.614	13,003	5.928(14)	5.066(15)	5.482(29)	2,632	9,133	2,167	11,300
Subtotal[1/]	74,612	1,095,337	14.680	132,024	6.407	6.034	6.229	14,216	56,842	16,998	80,696
Southern Saskatchewan											
Stratum 19	37,911	289,090	7.625	12,869	6.563(32)	6.667(18)	6.600(50)	20,033	56,518	3,715	60,763
Stratum 20	20,151	214,078	10.624	5,634	5.667(12)	4.500(2)	5.500(14)	4,478	7,367	1,156	9,678
Stratum 21	18,570	112,391	6.052	14,079	5.615(13)	4.250(8)	5.095(21)	9,224	14,565	1,942	17,720
Stratum 22	25,243	211,463	8.377	12,239	6.500(12)	5.667(6)	6.222(18)	6,800	14,279	2,040	17,679
Stratum 23	11,345	88,743	7.822	2,521	7.500(4)	4.750(4)	6.125(8)	5,294	16,387	1,008	17,647
Subtotal[1/]	113,220	915,765	8.088	47,342	6.135[2/]	5.486[2/]	5.899	45,829	109,116	9,861	123,487
Southern Manitoba											
Stratum 24	11,088	140,662	12.686	4,989	5.161(31)	6.000(1)	5.188(32)	9,065	16,244	3,164	23,606
Stratum 25	27,640	249,527	9.028	18,043	5.687(16)	--	5.687(16)	4,607	9,213	1,919	12,668
Subtotal[1/]	38,728	390,189	10.075	23,032	5.573	--	5.579	13,672	25,457	5,083	36,274
Southern Prairie Provinces											
Total[1/]	226,560	2,401,291	10.599	202,398	6.249	5.889[2/]	6.078	73,717	191,415	31,942	240,457

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A12. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1966.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	187,281	7.609	49,088	7.230(139)	6.080(125)	6.686(264)	6,452	19,074	4,582	24,497
Stratum 27	36,763	339,425	9.232	154,249	7.032(217)	6.067(163)	6.618(380)	7,975	29,371	8,364	46,294
Stratum 28	13,235	66,562	5.029	13,622	6.100(20)	6.400(25)	6.266(45)	2,786	8,514	1,548	10,062
Subtotal[1/]	74,612	593,268	7.951	216,959	7.019	6.091	6.612	17,213	56,959	14,494	80,853
Southern Saskatchewan											
Stratum 19	37,911	239,869	6.327	32,372	6.064(78)	5.463(54)	5.818(132)	14,859	39,536	3,184	45,108
Stratum 20	20,151	238,201	11.821	10,689	5.520(25)	4.667(9)	5.294(34)	4,622	6,934	3,322	13,001
Stratum 21	18,570	149,018	8.025	24,989	6.091(44)	5.579(19)	5.937(63)	5,044	11,921	6,419	21,321
Stratum 22	25,243	379,070	15.017	21,758	6.381(21)	5.188(16)	5.865(37)	15,299	38,077	3,400	44,536
Stratum 23	11,345	72,860	6.422	6,807	6.250(8)	6.250(4)	6.250(12)	4,538	13,362	1,008	15,127
Subtotal[1/]	113,220	1,079,018	9.530	96,615	6.095	5.334[2/]	5.832	44,362	109,830	17,333	139,093
Southern Manitoba											
Stratum 24	11,088	180,877	16.313	10,769	6.034(58)	4.500(12)	5.771(70)	5,111	9,552	1,947	15,879
Stratum 25	27,640	231,101	8.361	20,730	5.333(18)	4.428(7)	5.080(25)	1,536	4,991	2,303	11,901
Subtotal[1/]	38,728	411,978	10.638	31,499	5.573	4.453	5.316	6,647	14,543	4,250	27,780
Southern Prairie Provinces											
Total[1/]	226,560	2,084,264	9.200	345,073	6.628	5.730	6.275	68,222	181,332	36,077	247,726

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A13. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1967.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	200,617	8.151	53,639	6.570(86)	5.649(57)	6.203(143)	4,764	17,292	4,588	22,585
Stratum 27	36,763	416,822	11.338	125,498	6.025(78)	4.925(40)	5.652(118)	7,300	30,245	5,910	37,198
Stratum 28	13,235	108,202	8.175	22,600	6.279(43)	5.413(29)	5.930(72)	4,489	8,669	1,393	11,145
Subtotal[1]	74,612	725,641	9.726	201,737	6.198	5.172	5.830	16,553	56,206	11,891	70,928
Southern Saskatchewan											
Stratum 19	37,911	192,638	5.081	25,340	5.481(27)	5.286(28)	5.382(55)	15,257	46,169	3,317	51,609
Stratum 20	20,151	132,318	6.566	16,323	5.516(31)	6.600(5)	5.667(36)	2,600	8,812	1,011	10,112
Stratum 21	18,570	86,431	4.654	24,072	5.292(24)	5.182(11)	5.257(35)	1,834	12,839	1,376	16,736
Stratum 22	25,243	164,547	6.519	26,178	5.417(12)	5.273(11)	5.348(23)	4,760	12,919	2,720	20,398
Stratum 23	11,345	44,624	3.933	3,530	5.500(2)	6.500(4)	6.167(6)	1,260	11,093	2,521	14,370
Subtotal[1]	113,220	620,558	5.481	95,443	5.419[2]	5.488[2]	5.419	25,711	91,832	10,945	113,225
Southern Manitoba											
Stratum 24	11,088	108,052	9.745	10,343	5.950(40)	7.000(1)	5.976(41)	4,015	8,213	1,278	10,221
Stratum 25	27,640	168,911	6.111	20,730	4.909(11)	4.000(2)	4.769(13)	2,687	9,213	2,687	14,588
Subtotal[1]	38,728	276,963	7.151	31,073	5.256	--	5.171	6,702	17,426	3,965	24,809
Southern Prairie Provinces											
Total[1]	226,560	1,623,162	7.164	328,253	5.883	5.274	5.649	48,966	165,464	26,801	208,962

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A14. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1968.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size II	Brood Size III	Brood Size Total	Late Nesting Index Mallards	Late Nesting Index Dabblers	Late Nesting Index Divers	Late Nesting Index Total Ducks
Southern Alberta											
Stratum 26	24,614	90,339	3.670	26,819	4.620(50)	4.286(21)	4.521(71)	4,411	12,880	7,411	21,526
Stratum 27	36,763	223,982	6.092	87,142	5.826(69)	5.400(30)	5.696(99)	8,170	26,891	3,064	35,742
Stratum 28	13,235	65,943	4.982	6,501	3.461(13)	4.125(8)	3.714(21)	4,334	8,669	2,322	13,003
Subtotal[1/]	74,612	380,264	5.097	120,462	5.430	5.083	5.328	16,915	48,440	12,797	70,271
Southern Saskatchewan											
Stratum 19	37,911	88,492	2.334	23,881	4.795(44)	4.571(35)	4.696(79)	7,297	19,105	2,786	22,687
Stratum 20	20,151	54,458	2.703	8,523	5.214(14)	3.667(3)	4.941(17)	1,589	5,056	289	6,067
Stratum 21	18,570	66,256	3.568	25,677	4.667(33)	3.667(12)	4.400(45)	5,502	14,673	4,127	22,697
Stratum 22	25,243	117,291	4.646	16,999	6.188(16)	4.800(10)	5.654(26)	7,139	14,619	680	15,299
Stratum 23	11,345	15,883	1.400	4,034	6.200(5)	6.000(6)	6.090(11)	1,513	4,286	504	5,798
Subtotal[1/]	113,220	342,380	3.024	79,114	5.170	4.380[2/]	4.904	23,040	57,739	8,386	72,548
Southern Manitoba											
Stratum 24	11,088	51,531	4.648	7,057	4.974(38)	3.500(6)	4.773(44)	2,373	5,232	2,677	8,274
Stratum 25	27,640	109,024	3.944	8,062	4.777(9)	5.000(1)	4.800(10)	1,536	5,758	0	5,758
Subtotal[1/]	38,728	160,555	4.146	15,119	4.869	3.500[2/]	4.787	3,909	10,990	2,677	14,032
Southern Prairie Provinces											
Total[1/]	226,560	883,199	3.898	214,695	5.295	4.713	5.134	43,864	117,169	23,860	156,851

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A15. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1969.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	121,570	4.939	46,758	5.593(59)	6.163(49)	5.852(108)	2,117	15,174	5,646	21,879
Stratum 27	36,763	257,973	7.017	144,520	6.687(134)	6.463(80)	6.603(214)	5,983	22,784	11,046	35,671
Stratum 28	13,235	41,021	3.099	16,099	5.454(22)	5.000(35)	5.175(57)	2,477	11,764	3,715	16,873
Subtotal[1/]	74,612	420,564	5.637	207,377	6.345	6.282	6.323	10,577	49,722	20,407	74,423
Southern Saskatchewan											
Stratum 19	37,911	357,017	9.417	56,783	5.698(149)	5.371(89)	5.576(238)	14,196	63,019	5,174	68,591
Stratum 20	20,151	227,656	11.297	13,434	6.290(31)	6.111(9)	5.952(42)	9,823	26,001	2,311	29,035
Stratum 21	18,570	125,401	6.753	63,963	6.022(91)	5.000(61)	5.612(152)	6,878	23,155	6,419	32,555
Stratum 22	25,243	186,985	7.407	35,697	5.744(39)	5.514(35)	5.635(74)	9,179	26,518	2,380	29,578
Stratum 23	11,345	63,028	5.555	8,068	5.529(17)	3.000(4)	5.047(21)	6,051	15,379	756	17,144
Subtotal[1/]	113,220	960,087	8.480	177,945	5.861	5.320[2/]	5.605	46,127	154,072	17,040	176,903
Southern Manitoba											
Stratum 24	11,088	167,493	15.106	8,031	6.375(48)	5.727(11)	6.254(59)	9,369	19,956	3,590	26,830
Stratum 25	27,640	186,186	6.736	17,275	6.312(16)	3.000(2)	5.944(18)	4,223	7,294	2,687	14,588
Subtotal[1/]	38,728	353,679	9.132	25,306	6.332	5.727[2/]	6.042	13,592	27,250	6,277	41,418
Southern Prairie Provinces											
Total[1/]	226,560	1,734,330	7.655	410,628	6.134	5.830	5.994	70,296	231,044	43,724	292,744

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A16. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1970.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Southern Alberta											
Stratum 26	24,614	115,041	4.674	35,995	6.282(39)	5.132(53)	5.620(92)	4,588	15,880	4,411	20,468
Stratum 27	36,763	457,494	12.444	77,093	5.519(77)	5.311(74)	5.417(151)	8,745	37,741	15,879	59,833
Stratum 28	13,235	38,389	2.901	8,049	5.667(12)	5.214(14)	5.423(26)	3,096	9,597	2,012	11,610
Subtotal[1/]	74,612	610,924	8.188	121,137	5.755	5.251	5.477	16,429	63,218	22,302	91,911
Southern Saskatchewan											
Stratum 19	37,911	568,230	14.989	52,936	5.682(107)	5.007(135)	5.306(242)	41,260	163,451	14,992	180,565
Stratum 20	20,151	396,810	19.692	11,267	6.438(16)	5.000(3)	6.211(19)	14,445	22,390	2,167	25,568
Stratum 21	18,570	278,320	14.988	27,511	4.967(30)	5.439(41)	5.239(71)	18,570	61,441	9,400	71,987
Stratum 22	25,243	414,767	16.431	32,977	5.939(33)	4.778(27)	5.417(60)	35,357	63,915	6,459	71,734
Stratum 23	11,345	70,087	6.177	6,303	4.888(9)	3.500(2)	4.636(11)	5,546	16,891	6,303	23,698
Subtotal[1/]	113,220	1,728,214	15.264	130,994	5.623	5.045[2/]	5.365	115,178	328,088	39,321	373,552
Southern Manitoba											
Stratum 24	11,088	225,162	20.307	8,917	5.533(15)	--	5.533(15)	7,040	14,197	2,816	20,885
Stratum 25	27,640	191,546	6.930	12,967	5.705(17)	--	5.705(17)	5,915	12,284	1,820	15,924
Subtotal[1/]	38,728	416,708	10.760	21,884	5.635	--	5.635	12,955	26,481	4,636	36,809
Southern Prairie Provinces											
Total[1/]	226,560	2,755,846	12.164	274,015	5.683	5.145	5.437	144,562	417,787	66,259	502,272

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table A17. A Summary of July Production Survey Statistics for the southern Prairie Provinces, 1971.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size II	Brood Size III	Brood Size Total	Late Nesting Index Mallards	Late Nesting Index Dabblers	Late Nesting Index Divers	Late Nesting Index Total Ducks
Southern Alberta											
Stratum 26	24,614	148,389	6.029	44,464	5.750(56)	4.805(41)	5.351(97)	6,176	19,056	7,234	28,760
Stratum 27	36,763	458,896	12.483	70,725	6.706(34)	6.067(45)	6.342(79)	8,870	31,978	12,371	55,786
Stratum 28	13,235	42,259	3.193	9,442	6.040(25)	4.786(14)	5.590(39)	6,037	13,777	3,870	17,956
Subtotal[1/]	74,612	649,544	8.706	124,631	6.315	5.520	5.932	21,083	64,811	23,475	102,502
Southern Saskatchewan											
Stratum 19	37,911	335,923	8.861	74,030	5.785(144)	5.023(171)	5.317(315)	31,443	88,757	11,277	107,331
Stratum 20	20,151	233,579	11.591	17,334	5.868(38)	4.500(10)	5.583(48)	8,523	16,034	578	18,057
Stratum 21	18,570	159,106	8.568	43,708	5.741(54)	4.407(59)	5.044(113)	5,502	29,345	5,044	39,433
Stratum 22	25,243	323,704	12.824	33,327	5.833(18)	4.600(40)	4.983(58)	13,529	43,227	2,970	53,786
Stratum 23	11,345	41,850	3.689	12,353	6.000(8)	4.550(20)	4.964(28)	5,042	13,866	1,261	16,135
Subtotal[1/]	113,220	1,094,162	9.664	180,832	5.806	4.714	5.213	64,039	191,229	21,130	234,742
Southern Manitoba											
Stratum 24	11,088	188,202	16.974	5,749	5.625(16)	4.250(4)	5.350(20)	9,739	17,600	704	21,355
Stratum 25	27,640	217,479	7.868	10,464	4.357(14)	5.500(2)	4.500(16)	6,597	13,194	1,820	15,469
Subtotal[1/]	38,728	405,681	10.475	16,213	4.807	--	4.801	16,336	30,794	2,524	36,824
Southern Prairie Provinces											
Total[1/]	226,560	2,149,387	9.487	321,676	5.953	5.043	5.471	101,458	286,834	47,129	374,068

1/ Brood size weighted according to brood index for each stratum.

Appendix Table B1. A Summary of July Production Survey Statistics for Northern Canada for 1959, 1960, 1962, 1963, 1964 and 1965.

Location	Square Miles	Brood Index Total	Brood Size II	Brood Size III	Brood Size Total	Late Nesting Index Mallards	Late Nesting Index Dabblers	Late Nesting Index Divers	Late Nesting Index Total Ducks
1959									
Stratum 16	65,200	48,020	4.857(14)	4.520(25)	4.641(39)	16,559	18,215	4,968	24,010
Stratum 17	83,794	15,129	5.400(5)	4.857(7)	5.083(12)	13,966	13,966	8,147	24,440
Stratum 36	6,816	NOT FLOWN							
Stratum 48	66,220	24,952	4.769(13)	4.722(18)	4.742(31)	5,118	6,398	10,237	23,673
1960									
Stratum 16	65,200	22,392	4.917(12)	5.737(19)	5.419(31)	7,244	15,147	3,952	28,978
Stratum 17	83,794	19,397	5.667(12)	5.343(35)	5.426(47)	3,879	3,879	6,595	23,276
Stratum 36	6,816	11,302	4.780(41)	4.930(43)	4.857(84)	6,641	12,700	1,748	14,797
Stratum 48	66,220	10,754	4.857(7)	4.909(11)	4.889(18)	1,132	3,396	12,452	35,091
Subtotal 1/	222,030	63,845	5.110	5.335	5.232	18,896	35,122	24,747	102,142
1962									
Stratum 16	65,200	23,709	5.067(15)	3.334(3)	4.778(18)	14,489	24,368	24,368	50,053
Stratum 17	83,794	17,345	5.429(14)	4.556(9)	5.087(23)	4,591	4,591	9,183	19,386
Stratum 36	6,816	5,127	4.955(22)	5.091(11)	5.000(33)	15,030	21,437	5,127	27,729
Stratum 48	66,220	13,273	5.400(10)	3.500(2)	5.083(12)	6,925	7,502	29,431	42,704
Subtotal 1/	222,030	59,454	5.237	4.679 2/	4.956	41,035	57,898	68,109	139,872
1963									
Stratum 16	65,200	34,905	5.286(35)	3.200(5)	5.025(40)	19,758	33,588	21,075	57,956
Stratum 17	83,794	14,897	5.105(19)	3.714(7)	4.731(26)	9,310	14,431	14,897	37,707
Stratum 36	6,816	8,505	4.813(48)	4.000(1)	4.796(49)	5,127	8,505	4,894	14,448
Stratum 48	66,220	20,775	5,409(22)	4.667(3)	5.320(25)	10,387	12,119	15,581	30,008
Subtotal 1/	222,030	79,082	5.233	3.354 2/	5.022	44,582	68,643	56,447	140,119
1964									
Stratum 16	65,200	80,347	5.634(82)	5.348(23)	5.571(105)	15,806	25,026	19,758	47,418
Stratum 17	83,794	36,221	5.146(41)	4.600(20)	4.967(61)	7,652	10,713	17,345	33,160
Stratum 36	6,816	15,380	5.928(97)	5.385(13)	5.864(110)	5,360	10,952	7,107	19,574
Stratum 48	66,220	34,782	5.500(32)	4.200(10)	5.190(42)	6,689	10,033	10,033	26,756
Subtotal 1/	222,030	166,730	5.528	4.950	5.388	35,507	56,724	54,243	126,908
1965									
Stratum 16	65,200	18,440	5.800(15)	5.000(5)	5.600(20)	11,196	16,465	17,123	36,881
Stratum 17	83,794	13,874	4.714(7)	5.600(5)	5.083(12)	6,572	7,302	13,874	23,367
Stratum 36	6,816	2,447	4.769(13)	4.000(3)	4.625(16)	6,292	13,049	11,185	26,448
Stratum 48	66,220	17,890	5.500(14)	4.750(8)	5.227(22)	3,462	5,771	6,925	17,890
Subtotal 1/	222,030	52,561	5.364	5.077 2/	5.291	27,522	42,587	49,107	104,586

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table B2. A Summary of July Production Survey Statistics for the Northwest Territories and Northern Canada, 1966.

Location	Square Miles	Brood Index Total	Brood Size			Late Nesting Index			
			II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Northwest Territories									
Stratum 07	50,462	49,839	6.500(2)	4.667(3)	5.400(5)	0	0	0	9,968
Stratum 08	57,821	48,691	5.000(11)	4.250(4)	4.800(15)	0	0	0	27,051
Stratum 09	11,733	57,361	4.500(4)	6.000(3)	5.143(7)	0	3,476	12,168	15,644
Stratum 10	70,562	115,940	5.733(30)	6.000(10)	5.800(40)	0	0	1,901	28,510
Stratum 11	4,935	24,492	6.346(26)	6.750(12)	6.474(38)	0	0	0	2,742
Subtotal[1/]	195,513	296,323	5.625[2/]	6.132[2/]	5.498	0	3,476	14,069	83,915
Northern Canada									
Stratum 15	1,625	7,397	5.600(10)	5.833(6)	5.688(16)	719	2,876	3,287	6,986
Stratum 16	65,200	33,993	5.667(24)	4.938(16)	5.375(40)	10,588	16,161	14,489	33,993
Stratum 17	83,794	36,651	5.071(28)	5.308(13)	5.146(41)	3,547	8,276	13,596	24,237
Stratum 36	6,816	16,778	5.645(76)	4.864(22)	5.469(98)	5,127	8,855	7,340	17,477
Stratum 48	66,220	20,546	5.933(15)	5.500(10)	5.760(25)	2,777	3,332	11,106	18,880
Subtotal[1/]	223,656	115,365	5.518	5.202	5.405	22,758	39,500	49,818	101,573
Northwest Territories and Northern Canada									
Total[1/]	419,169	411,688	5.595	5.071	5.472	22,758	42,976	63,887	185,480

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table B3. A Summary of July Production Survey Statistics for the Northwest Territories and Northern Canada, 1967.

Location	Square Miles	Brood Index Total	Brood Size			Late Nesting Index			
			II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Northwest Territories									
Stratum 07	50,462	17,444	7.000(2)	--	7.000(2)	0	0	4,984	9,968
Stratum 08	57,821	5,410	6.500(2)	--	6.500(2)	0	1,353	16,230	17,583
Stratum 09	11,733	26,073	7.000(4)	--	7.000(4)	3,476	3,476	5,215	8,691
Stratum 10	70,562	118,791	5.613(31)	5.000(1)	5.594(32)	0	0	7,603	23,758
Stratum 11	4,935	20,654	6.824(34)	--	6.824(34)	0	0	548	1,645
Subtotal[1/]	195,513	188,372	5.792[2/]	--	5.775[2/]	3,476	4,829	34,580	61,645
Northern Canada									
Stratum 15	1,625	4,726	8.182(11)	--	8.182(11)	3,082	7,602	1,130	11,403
Stratum 16	65,200	61,365	5.167(18)	3.800(5)	4.870(23)	10,227	10,227	13,637	23,864
Stratum 17	83,794	60,160	5.583(36)	5.167(18)	5.444(54)	7,878	14,324	7,878	25,783
Stratum 36	6,816	28,779	6.525(99)	5.780(50)	6.275(149)	9,671	15,263	7,573	23,419
Stratum 48	66,220	42,512	5.250(4)	3.500(4)	4.375(8)	3,270	3,270	13,080	16,351
Subtotal[1/]	223,656	197,542	5.674[2/]	4.729[2/]	5.224	34,128	50,686	43,298	100,820
Northwest Territories and Northern Canada									
Total[1/]	419,169	385,914	5.732	4.729	5.493	37,604	55,515	77,878	162,465

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table B4. A Summary of July Production Survey Statistics for the Northwest Territories and Northern Canada, 1968.

Location	Square Miles	Brood Index Total	Brood Size			Late Nesting Index			
			II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Northwest Territories									
Stratum 07	50,462	54,823	5.333(9)	5.000(1)	5.300(10)	0	0	0	24,920
Stratum 08	57,821	77,095	3.857(7)	--	3.857(7)	0	0	20,559	92,514
Stratum 09	11,733	43,456	5.875(8)	4.000(2)	5.500(10)	0	1,738	3,476	5,215
Stratum 10	70,562	116,891	5.220(41)	6.167(6)	5.340(47)	0	1,901	4,752	19,957
Stratum 11	4,935	35,824	5.466(58)	5.429(14)	5.458(72)	0	0	1,828	2,559
Subtotal[1/]	195,513	328,089	5.033	5.995[2/]	5.019	0	3,639	30,615	145,165
Northern Canada									
Stratum 15	1,625	10,581	5.920(25)	4.769(13)	5.526(38)	0	0	103	103
Stratum 16	65,200	95,694	6.051(59)	5.563(32)	5.879(91)	8,761	12,130	6,739	18,869
Stratum 17	83,794	66,019	5.460(50)	4.846(39)	5.191(89)	5,643	6,207	9,028	18,057
Stratum 36	6,816	22,487	6.800(75)	5.345(55)	6.185(130)	4,194	7,107	3,728	11,302
Stratum 48	66,220	60,411	7.333(18)	5.462(13)	6.548(31)	10,843	10,843	6,196	20,137
Subtotal[1/]	223,656	255,192	6.623	5.302	5.872	29,441	36,287	25,794	68,468
Northwest Territories and Northern Canada									
Total[1/]	419,169	583,281	5.729	5.692	5.393	29,441	39,926	56,409	213,633

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table B5. A Summary of July Production Survey Statistics for the Northwest Territories and Northern Canada, 1969.

Location	Square Miles	Brood Index Total	Brood Size II	Brood Size III	Brood Size Total	Late Nesting Index Mallards	Late Nesting Index Dabblers	Late Nesting Index Divers	Late Nesting Index Total Ducks
Northwest Territories									
Stratum 07	50,462	14,952	7.000(2)	3.667(3)	5.000(5)	0	9,968	19,936	29,903
Stratum 08	57,821	35,166	5.625(8)	5.125(8)	5.375(16)	0	0	24,346	48,691
Stratum 09	11,733	34,764	4.500(8)	4.750(8)	4.625(16)	22,597	22,597	8,691	31,288
Stratum 10	70,562	151,102	5.232(56)	6.095(21)	5.468(77)	5,702	5,702	0	55,119
Stratum 11	4,935	22,482	5.568(37)	6.059(34)	5.803(71)	0	0	5,849	8,225
Subtotal[1/]	195,513	258,466	5.215[2/]	5.760[2/]	5.344	28,299	38,267	58,822	173,226
Northern Canada									
Stratum 15	1,625	12,122	5.486(35)	5.475(40)	5.480(75)	2,568	4,931	4,520	10,273
Stratum 16	65,200	109,897	5.802(81)	5.222(54)	5.570(135)	11,482	27,884	32,258	67,797
Stratum 17	83,794	111,725	5.141(64)	5.288(59)	5.211(123)	12,013	24,027	30,634	65,473
Stratum 36	6,816	29,128	5.777(94)	5.569(58)	5.697(152)	10,370	31,342	8,039	41,945
Stratum 48	66,220	49,265	5.793(29)	6.067(15)	5.886(44)	6,398	12,796	14,716	34,550
Subtotal[1/]	223,656	312,137	5.550	5.422	5.501	42,831	100,980	90,167	220,038
Northwest Territories and Northern Canada									
Total[1/]	419,169	570,603	5.398	5.575	5.430	71,130	139,247	148,989	393,264
Additional Information									
Stratum 14	153,546	187,667	5.292(41)	5.577(26)	5.403(67)	13,124	13,124	36,746	101,052

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table B6. A Summary of July Production Survey Statistics for the Northwest Territories and Northern Canada, 1970.

Location	Square Miles	Brood Index Total	Brood Size			Late Nesting Index			
			II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Northwest Territories									
Stratum 07	50,462	22,428	4.750(4)	--	4.750(4)	0	0	0	7,476
Stratum 08	57,821	71,048	5.455(11)	6.455(11)	5.955(22)	12,093	12,093	0	12,093
Stratum 09	11,733	83,435	5.625(16)	5.471(17)	5.545(33)	0	0	0	10,429
Stratum 10	70,562	112,139	5.417(24)	5.476(21)	5.444(45)	0	0	12,354	18,056
Stratum 11	4,935	20,563	5.773(22)	5.267(15)	5.568(37)	0	0	0	4,113
Subtotal 1/	195,513	309,613	5.512 2/	5.702 2/	5.609 2/	12,093	12,093	12,354	52,167
Northern Canada									
Stratum 15	1,625	12,944	5.792(24)	5.083(48)	5.319(72)	2,774	4,315	1,438	6,164
Stratum 16	65,200	52,488	6.375(24)	5.364(22)	5.891(46)	22,417	36,632	23,510	61,783
Stratum 17	83,794	77,869	4.846(13)	5.667(3)	5.000(16)	13,542	20,314	20,314	45,706
Stratum 36	6,816	23,070	6.070(57)	5.308(26)	5.831(83)	5,476	8,622	7,457	17,127
Stratum 48	66,220	31,066	6.615(13)	7.000(6)	6.737(19)	4,905	7,358	9,810	21,256
Subtotal 1/	223,656	197,437	5.737	5.747 2/	5.629	49,114	77,241	62,529	152,036
Northwest Territories and Northern Canada									
Total 1/	419,169	507,050	5.600	5.720	5.617	61,207	89,334	74,883	204,203
Additional Information									
Stratum 06	69,033	71,590	6.500(8)	5.750(8)	6.125(16)	0	0	0	6,136
Stratum 14	153,546	147,404	4.560(25)	4.926(27)	4.750(52)	8,189	10,919	17,743	28,662

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table B7. A Summary of July Production Survey Statistics for the Northwest Territories and Northern Canada, 1971.

Location	Square Miles	Brood Index Total	Brood Size			Late Nesting Index			
			II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Northwest Territories									
Stratum 07	50,462	37,379	5.714(7)	5.000(1)	5.625(8)	0	0	0	0
Stratum 08	57,821	41,607	5.250(8)	5.250(4)	5.250(12)	0	0	0	3,671
Stratum 09	11,733	65,705	4.900(20)	5.273(11)	5.032(31)	0	0	0	0
Stratum 10	70,562	157,755	6.108(37)	5.467(15)	5.923(52)	0	0	0	0
Stratum 11	4,935	28,513	5.641(39)	6.059(17)	5.768(56)	0	0	0	0
Subtotal 1/	195,513	330,959	5.676	5.483 2/	5.615	0	0	0	3,671
Northern Canada									
Stratum 15	1,625	10,478	6.200(15)	5.450(20)	5.771(35)	0	308	103	514
Stratum 16	65,200	52,321	5.400(15)	5.842(19)	5.647(34)	16,904	31,393	11,269	45,881
Stratum 17	83,794	70,252	5.500(24)	5.895(19)	5.674(43)	10,157	17,774	18,621	41,474
Stratum 36	6,816	19,574	6.189(53)	5.341(41)	5.819(94)	5,360	12,933	5,010	20,273
Stratum 48	66,220	27,329	5.200(5)	5.625(8)	5.462(13)	4,204	7,708	4,204	14,716
Subtotal 1/	223,656	179,954	5.543	5.752	5.656	36,625	70,116	39,207	122,858
Northwest Territories and Northern Canada									
Total 1/	419,169	510,913	5.629	5.578	5.629	36,625	70,116	39,207	126,529
Additional Information									
Stratum 06	69,033	58,486	5.474(19)	5.091(11)	5.333(30)	0	0	1,918	4,794
Stratum 14	153,546	69,277	6.556(18)	5.286(14)	6.000(32)	7,238	12,408	5,170	22,748

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table C1. A Summary of July Production Statistics for North Dakota, South Dakota, and Montana, 1966.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
North and South Dakota											
Stratum 29	7,821	12,166	1.555	869	10.000(1)	--	10.000(1)	0	0	0	0
Stratum 30	40,863	202,369	4.952	41,512	6.838(68)	5.800(40)	6.454(108)	14,529	28,280	1,297	37,361
Stratum 31	19,835	50,430	2.542	8,041	NA[3]	NA[3]	NA[3]	3,280	4,928	0	4,928
Stratum 32	15,830	35,178	2.222	3,283	6.333(3)	5.000(2)	5.800(5)	2,814	3,283	0	3,283
Stratum 33	24,587	76,493	3.111	11,747	7.547(42)	6.809(21)	7.301(63)	3,688	7,922	137	9,152
Stratum 34	27,300	67,600	2.476	13,867	8.083(12)	5.571(7)	7.158(19)	6,500	14,733	0	14,733
Subtotal[1]	136,236	444,236	3.261	79,319	7.220[2]	5.930[2]	6.704[2]	30,811	59,146	1,434	69,457
Montana											
Stratum 40	40,755	63,850	1.567	24,906	4.412(34)	3.923(13)	4.277(47)	1,811	5,887	0	6,113
Stratum 41	32,902	64,368	1.956	39,430	5.282(156)	5.300(30)	5.285(186)	1,436	4,047	0	4,178
Subtotal[1]	73,657	128,218	1.741	64,336	4.945	4.767	4.895	3,247	9,934	0	10,291
Dakotas and Montana											
Total[1]	209,893	572,454	2.727	143,655	6.201	5.409	5.894	34,058	69,080	1,434	79,748

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.
3/ Not Available.

Appendix Table C2. A Summary of July Production Statistics for North Dakota, South Dakota, and Montana, 1967.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
North and South Dakota											
Stratum 29	7,821	16,685	2.133	1,738	5.000(3)	4.000(1)	4.750(4)	1,390	4,171	0	4,519
Stratum 30	40,863	230,043	5.630	42,679	5.922(103)	4.847(59)	5.531(162)	17,405	50,398	1,362	57,511
Stratum 31	19,835	39,670	2.000	4,408	6.000(1)	3.500(2)	4.333(3)	4,959	6,061	0	6,061
Stratum 32	15,830	56,840	3.590	1,481	5.333(6)	6.000(1)	5.428(7)	555	1,666	370	2,037
Stratum 33	24,587	139,248	5.663	5,776	5.785(14)	4.571(7)	5.380(21)	11,708	27,943	781	30,441
Stratum 34	27,300	101,658	3.724	15,413	4.350(20)	3.833(6)	4.231(26)	5,903	10,494	328	11,150
Subtotal[1/]	136,236	584,144	4.288	71,495	5.526[2/]	4.578[2/]	5.209[2/]	41,920	100,733	2,841	111,719
Montana											
Stratum 40	40,755	67,534	1.657	13,194	4.296(27)	4.556(9)	4.361(36)	2,236	4,025	0	4,025
Stratum 41	32,902	57,570	1.750	32,672	5.244(86)	4.722(79)	4.994(165)	2,767	7,641	132	8,431
Subtotal[1/]	73,657	125,104	1.698	45,866	4.971	4.674	4.812	5,003	11,666	132	12,456
Dakotas and Montana											
Total[1/]	209,893	709,248	3.379	117,361	5.309	4.616	5.054	46,923	112,399	2,973	124,175

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table C3. A Summary of July Production Statistics for North Dakota, South Dakota, and Montana, 1968.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
North and South Dakota											
Stratum 29	7,821	20,508	2.622	348	--	--	--	0	0	0	0
Stratum 30	40,863	223,991	5.481	20,836	6.098(51)	5.235(17)	5.882(68)	9,714	16,754	282	21,963
Stratum 31	19,835	40,772	2.055	5,510	4.667(3)	4.667(6)	4.667(9)	3,306	4,408	0	4,408
Stratum 32	15,830	48,323	3.052	555	4.000(1)	--	4.000(1)	1,111	1,481	0	1,481
Stratum 33	24,587	90,543	3.682	8,274	6.000(19)	5.333(6)	5.840(25)	4,839	7,337	0	8,274
Stratum 34	27,300	56,732	2.078	14,429	4.462(13)	4.600(20)	4.545(33)	3,935	8,526	0	8,526
Subtotal 1/	136,236	480,869	3.530	49,952	5.537 2/	5.001 2/	5.345 2/	22,905	38,506	282	44,652
Montana											
Stratum 40	40,755	56,576	1.388	16,772	4.960(25)	4.167(30)	4.527(55)	671	4,696	0	4,696
Stratum 41	32,902	43,211	1.313	26,611	5.290(69)	4.616(73)	4.944(142)	2,767	6,455	527	7,377
Subtotal 1/	73,657	99,787	1.355	43,383	5.162	4.443	4.783	3,438	11,151	527	12,073
Dakotas and Montana											
Total 1/	209,893	580,656	2.766	93,335	5.363	4.742	5.084	26,343	49,657	809	56,725

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table C4. A Summary of July Production Statistics for North Dakota, South Dakota, and Montana, 1969.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
North and South Dakota											
Stratum 29	7,821	20,161	2.577	2,433	5.250(4)	--	5.250(4)	0	695	0	1,043
Stratum 30	40,863	433,902	10.618	34,352	6.704(108)	6.231(39)	6.578(147)	9,714	42,799	3,097	52,513
Stratum 31	19,835	75,164	3.789	12,527	5.769(13)	5.120(25)	5.342(38)	4,176	7,888	0	7,888
Stratum 32	15,830	75,910	4.795	4,999	6.000(13)	4.750(8)	5.523(21)	2,407	5,184	185	5,554
Stratum 33	24,587	192,325	7.822	16,391	6.416(48)	5.130(23)	6.000(71)	6,400	26,070	1,093	28,880
Stratum 34	27,300	89,064	3.262	20,136	5.500(16)	4.719(32)	4.979(48)	8,261	15,489	0	15,489
Subtotal[1/]	136,236	886,526	6.507	90,838	6.204[2/]	5.441[2/]	5.872[2/]	30,958	98,125	4,375	111,367
Montana											
Stratum 40	40,755	91,237	2.239	24,151	4.238(21)	5.085(47)	4.824(68)	5,367	7,379	224	7,603
Stratum 41	32,902	93,140	2.831	44,133	5.529(70)	5.413(184)	5.445(254)	7,509	15,941	0	15,941
Subtotal[1/]	73,657	184,377	2.503	68,284	5.072	5.297	5.225	12,876	23,320	224	23,544
Dakotas and Montana											
Total[1/]	209,893	1,070,903	5.102	159,122	5.718	5.379	5.594	43,834	121,445	4,599	134,911

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table C5. A Summary of July Production Statistics for North Dakota, South Dakota, and Montana, 1970.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size II	Brood Size III	Brood Size Total	Late Nesting Index Mallards	Late Nesting Index Dabblers	Late Nesting Index Divers	Late Nesting Index Total Ducks
North and South Dakota											
Stratum 29	7,821	23,173	2.963	386	--	7.000(1)	7.000(1)	386	386	0	2,317
Stratum 30	40,863	342,110	8.372	45,896	6.867(98)	5.962(52)	6.553(150)	17,598	41,250	2,675	51,950
Stratum 31	19,835	46,112	2.325	9,720	7.125(8)	6.053(19)	6.370(27)	678	678	678	1,356
Stratum 32	15,830	52,581	3.322	2,222	6.000(6)	4.000(2)	5.500(8)	1,296	3,333	185	4,073
Stratum 33	24,587	98,348	4.000	24,353	6.241(58)	5.428(7)	6.153(65)	10,303	21,231	2,029	26,694
Stratum 34	27,300	77,603	2.843	12,133	5.000(9)	4.545(11)	4.750(20)	6,067	14,914	0	14,914
Subtotal[1/]	136,236	639,927	4.697	94,710	6.471[2/]	5.644[2/]	6.174[2/]	36,328	81,792	5,567	101,304
Montana											
Stratum 40	40,755	78,267	1.920	17,666	5.521(23)	5.200(20)	5.372(43)	671	4,696	0	4,696
Stratum 41	32,902	59,415	1.806	28,456	5.477(65)	5.315(73)	5.391(138)	659	4,743	1,317	6,455
Subtotal[1/]	73,657	137,682	1.869	46,122	5.494	5.271	5.384	1,330	9,439	1,317	11,151
Dakotas and Montana											
Total[1/]	209,893	777,609	3.705	140,832	6.151	5.522	5.915	37,658	91,231	6,884	112,455

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table C6. A Summary of July Production Statistics for North Dakota, South Dakota, and Montana, 1971.

Location	Sq. Miles	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
					II	III	Total	Mallards	Dabblers	Divers	Total Ducks
North and South Dakota											
Stratum 29	7,821	9,733	1.244	348	4.000(1)	--	4.000(1)	348	348	0	348
Stratum 30	40,863	293,539	7.183	30,128	5.984(62)	4.174(23)	5.494(85)	12,389	29,424	845	32,662
Stratum 31	19,835	104,430	5.265	7,007	6.333(6)	6.600(5)	6.455(11)	1,582	3,617	0	3,617
Stratum 32	15,830	70,541	4.456	2,962	6.500(6)	5.000(2)	6.125(8)	2,962	5,740	0	5,740
Stratum 33	24,587	117,705	4.787	15,142	6.118(34)	4.059(17)	5.431(51)	6,400	19,357	0	21,231
Stratum 34	27,300	115,103	4.216	8,198	6.400(10)	4.000(6)	5.500(16)	3,607	4,919	0	4,919
Subtotal[1/]	136,236	711,051	5.219	63,785	6.132[2/]	4.403[2/]	5.615[2/]	27,288	63,405	845	68,517
Montana											
Stratum 40	40,755	Not Surveyed									
Stratum 41	32,902	Not Surveyed									
Subtotal[1/]	73,657	Not Surveyed									
Dakotas and Montana											
Total[1/]	209,893										

1/ Brood size weighted according to brood index for each stratum.
2/ Brood size data with sample size less than 5 not used in averages.

Appendix Table D1. A Summary of July Production Statistics for Minnesota, 1958-66.

Location	July Ponds	Ponds per Sq. Mile	Brood Index Total	Brood Size			Late Nesting Index			
				II	III	Total	Mallards	Dabblers	Divers	Total Ducks
Minnesota Stratum 35 (54,655 sq. miles)										
1958	217,001	3.970	17,004	5.307(13)	5.600(5)	5.388(18)	810	1,619	0	11,336
1959	79,266	1.450	3,835	4.333(3)	--	4.333(3)	1,278	1,278	0	1,278
1960	161,941	2.962	24,291	4.500(2)	3.000(1)	4.000(3)	0	20,243	0	20,243
1961	70,444	1.288	9,716	4.500(6)	4.000(2)	4.375(8)	4,049	6,478	0	10,526
1962	189,991	3.476	8,675	5.000(6)	3.000(1)	4.714(7)	9,543	13,881	1,735	18,218
1963	184,612	3.377	18,623	6.200(5)	4.667(3)	5.625(8)	5,668	8,097	3,239	12,955
1964	103,642	1.896	8,907	6.333(3)	4.000(1)	5.750(4)	0	3,239	0	7,287
1965	139,269	2.548	9,716	5.000(6)	3.667(3)	4.555(9)	11,336	12,146	2,429	19,433
1966	170,847	3.125	16,194	7.000(13)	8.250(4)	7.294(17)	2,429	4,858	0	8,907
9-Year Mean	146,335	2.677	12,996	5.596(57)	5.200(20)	5.494(77)	3,901	7,982	823	12,243

Appendix Table E1. A Summary of July Production Statistics for the Northwestern Ontario Boreal Forest.

Location	Brood Index Total	Brood Size			Late Nesting Index				
		II	III	Total	Mallards	Black Ducks	Dabblers	Divers	Total Ducks
Northwestern Ontario Stratum 18 (176,609 sq. miles)									
1960	25,570	4.933(15)	4.542(24)	4.692(39)	2,973	4,757	8,920	7,730	39,246
1962	26,632	5.762(21)	4.714(7)	5.500(28)	2,803	9,111	12,615	16,820	45,554
1963	19,347	5.200(25)	6.000(3)	5.286(28)	12,161	2,211	17,136	26,533	59,146
1964	19,206	5.333(18)	3.000(2)	5.100(20)	2,505	3,340	7,515	16,701	29,226
4-Year Mean	22,689	5.329(79)	4.611(36)	5.104(115)	5,111	4,855	11,547	16,946	43,293

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