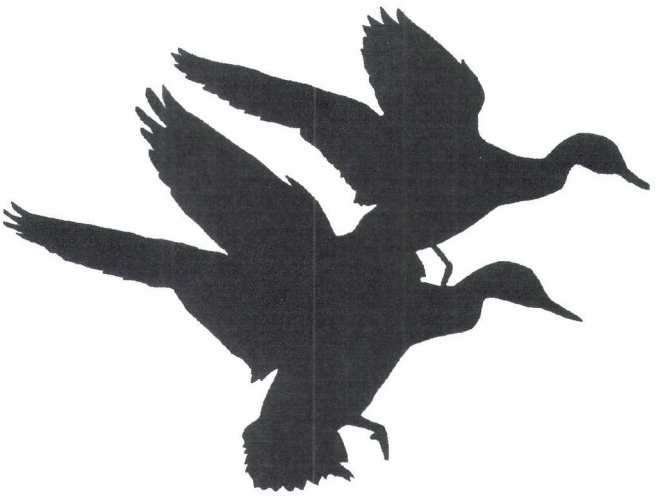
BLACK DUCK JOINT VENTURE

A sub-plan of the North American Waterfowl Management Plan

1997 PROGRESS REPORT



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For more information, please contact Brigitte Collins, BDJV Coordinator at the Canadian Wildlife Service, 49 Camelot Drive, Nepean, Ontario K1A 0H3

1.0 INTRODUCTION

The goal of the Black Duck Joint Venture (BDJV) is to implement a cooperative international program of population monitoring and research. The program will provide information required to improve the management of black ducks. The primary objectives, as stated in the BDJV Strategic Plan (1993), are to:

i) provide statistically reliable indices of population trends and relative densities of black ducks and other waterfowl species throughout the primary breeding range of black ducks,

ii) determine the distribution and derivation of the harvest of black ducks and mallards from throughout the breeding range, along with their harvest and survival rates,

iii) determine, through research, the important factors influencing population status and dynamics of black ducks.

The purpose of this report is to describe the progress made in 1997 toward meeting those objectives.

2.0 SURVEYS

2.1 Helicopter Plot Surveys

Helicopter survey procedures are described in the draft BDJV Operational Plan (1992). In 1990 and 1991, the survey comprised 229-100 km^2 plots distributed throughout the Boreal Shield and Atlantic Highlands Ecozones. Sample size decreased during the subsequent four years due to decreasing budgets and revised precision requirements.

In 1996, efforts were made to reduce costs while maintaining the precision of the BDJV helicopter survey and increasing its representativeness by (a) reducing plot size from 10 X 10 km to 5 X 5 km and (b) imposing a new survey design based on a rotating sample in which a portion of the plots are retained from one year to the next while other plots are discarded and replaced. These changes allow for annual coverage of a larger number of plots, thus increasing the dispersion of the sample. The sample was allocated to provide a 10% coefficient of variation (cv) for the central part of the black duck range (Boreal Shield and Atlantic Highland Ecoregions), with a 15% cv for each of 4 survey strata (Figure 1).

The 1997 sample continued with this revised sampling regime and consisted of a total of 151 plots distributed as follows: Atlantic Highlands- 39 (Stratum 1); Eastern Boreal Shield- 40 (Stratum 2), Central Boreal Shield- 40 (Stratum 3), and Western Boreal Shield- 32 (Stratum 4). Surveys were delayed by a few days in each region due to late spring conditions with delays in snow melt ranging from 1-2 weeks. Special surveys of plots covered in 1988 were also undertaken in the Hudson Bay Lowlands of northern Ontario.

2.2 Population Estimation

Population estimates for each stratum and overall were calculated for each year using the standard equations for a stratified random sample. The results for both indicated pairs and total individuals are shown in Tables 1 and 2 respectively.

[1] Collins, Brian. February, 1998. Analysis of 1997 Black Duck Breeding Ground Survey (memorandum). Migratory Bird Populations Division, National Wildlife Research Centre, Hull, P.Q.

Figure 1. Survey Strata and Plot Distribution for the 1997 Helicopter Survey

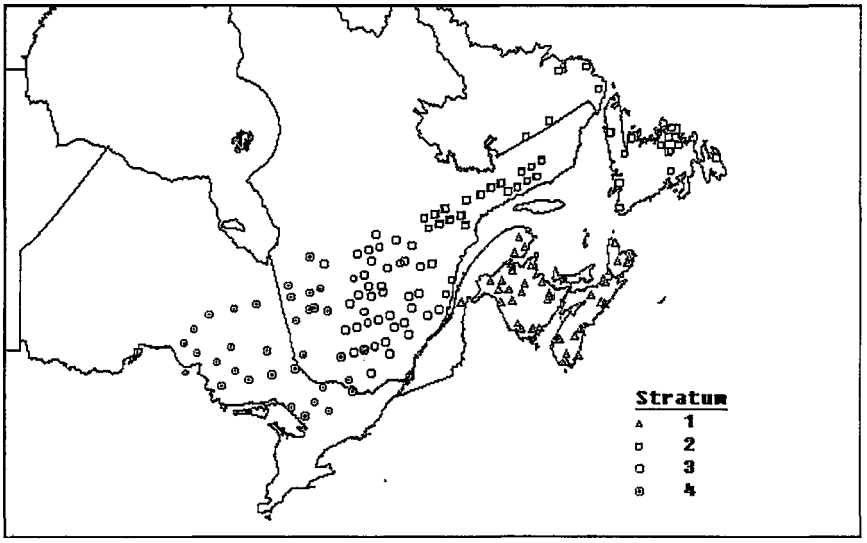


Table 1. Estimated Number of Indicated Pairs and Standard Error. From *Collins*, February, 1998.

Year	Stratum 1	Stratum 2	Stratum 3	Stratum 4	TOTAL
1990	14547 ± 3238	18216 ± 3465	34845 ± 5751	101787 ± 40957	169395 ± 41630
1991	15052 ± 2530	15519 ± 3215	31612 ± 5379	79424 ± 8725	141608 ± 11036
1992	13832 ± 2402	14027 ± 2347	29816 ± 3941	81352 ± 13256	139028 ± 14232
1993	12319 ± 1799	12983 ± 3017	32690 ± 10561	79495 ± 15784	137487 ± 19313
1994	15215 ± 2077	12229 ± 3492	16345 ± 5643	53627 ± 6786	97416 ± 9716
1995	15652 ± 5635	11482 ± 2921	14435 ± 3852	58604 ± 13440	100173 ± 15355
1996	22876 ± 2240	9239 ±1566	24751 ± 3540	63761 ± 9820	120627 ± 10791
1997	18746 ± 2600	14379 ± 2898	30355 ± 3248	60291 ± 8991	123771 ± 10322

Table 2. Estimated Number of Indicated Total Individuals and Standard Error. From *Collins*, February, 1998.

Year	Stratum 1	Stratum 2	Stratum 3	Stratum 4	TOTAL
1990	105171 ± 38521	39560 ± 9024	71846 ± 10214	201260 ± 63668	417837 ± 75652
1991	56548 ± 13716	37662 ± 11027	54962 ± 9889	94847 ± 10486	244020 ± 22748
1992	63464 ± 10390	29808 ± 6484	52807 ± 6745	104100 ± 14690	250179 ± 20280
1993	56625 ± 6443	31265 ± 10443	87952 ± 28177	99053 ± 19810	274894 ± 36565
1994	61322 ± 10084	27515 ± 11223	31133 ± 10298	73185 ± 10045	193156 ± 20847
1995	63336 ± 14194	18106 ± 3899	47549 ± 13814	75569 ± 15873	204560 ± 25680
1996	80332 ± 8995	20569 ±3246	62345 ± 9817	117113 ± 17329	280358 ± 22094
1997	73164 ± 10140	32474 ± 6131	69350 ± 11414	99763 ± 15267	274750 ± 22445

2.3 Trend Analysis

A test for trend was done using the estimating equations technique (Link and Sauer, 1994)[1]. The data used for trend estimation was selected using the same criteria used in route-regression analyses done in previous years. The 1990 data for Ontario were discarded due to changing survey methodology. The data for Nova Scotia and New Brunswick was partitioned into two subsets (1990-1992) and (1993-1997) due to a change in observer in 1993. The resulting estimates of trend for indicated pairs and total individuals showed no significant trend. Most analyses showed a numerical decline with the exception of Stratum 1 indicated pairs and total individuals and total individuals in Stratum 3 which showed numerical increases (Table 3).

Table 3. Estimated trends 1990-1997 for black duck indicated pairs and total individuals. Adapted from *Collins,* February, 1998

	Range-wide	Stratum 1	Stratum 2	Stratum 3	Stratum 4
Indicated Pairs	-3.1	7.3	-7.1	-3.1	-4.3
Total Individuals	-2.2	1.6	-2.3	1.4	-2.7

2.4 Fixed-Wing Surveys

Fixed-wing aircraft surveys were also conducted in 1997. Surveys were expanded to cover Maine and Eastern Canada and results of this experimental survey are presented in Appendix A. Survey results for Michigan and Minnesota are shown in Appendix B. The eighth year of fixed-wing survey results for eastern Ontario, southern Québec and northern New York are described in Appendix C.

2.5 Ground Survey

Another survey of relevance to the BDJV is the ground count that is conducted annually in Prince Edward Island. One hundred randomly selected wetlands covering a wide range of habitat types are surveyed four times each summer. The number of early and late breeding species, and their productivity are estimated annually. 1997 was the fifteenth consecutive year of the ground-based survey of breeding waterfowl in Prince Edward Island. There has been an overall decline in the number of breeding pairs of black ducks since the beginning of the survey. However, the trend since 1989 (when further restrictions on hunting in PEI were imposed) shows a stable breeding pair index. Preliminary results of the brood survey suggest that 1997 was a good production year for black ducks (Bateman, pers. comm.).

2.6 Mid-winter Inventory

Mid-winter inventories show that black ducks gradually declined from the late 1950s until about 1980, when the population stabilized at a low level (Appendix D). The total mid-winter population estimate for black ducks in the Atlantic Flyway in 1997 (204,297) was similar to the 1996 estimate. The population estimate for the Mississippi Flyway was lower than in 1996. It should be noted that there were incomplete surveys conducted in the Mississippi Flyway, and the estimates for some states were not comparable with other years[1].

[1]Gamble, K., and Peterson. 1997. Mississippi Flyway waterfowl harvest and population survey data- 1997. U.S. Fish and Wildl Serv., Office of Mig. Bird Mgmt., Golden, CO.

3.0 BANDING

Recoveries of banded birds can be used to determine the distribution and derivation of the harvest of individuals from throughout the breeding range, and their harvest and survival rates. Black ducks were captured at about 35 banding stations distributed across eastern Canada.

A total of 5,295 black ducks were banded in 1997 which is substantially higher than the 1996 effort when 3,737 black ducks were banded. The banding sites in Canada are illustrated on the map in Appendix E. The BDJV extends many thanks to those provinces which contribute to the banding effort. The total number of black ducks banded throughout the Atlantic Flyway States in 1997 was 1,415.[1] Much of the eastern Canada banding effort is possible due to Atlantic Flyway Eastern Cooperative Banding Program funds and the Mississippi Flyway banding fund. A summary of 1997 banding results is presented in Appendix E. A final report on the pre-season banding activities in eastern Canada and the northeastern United States is provided annually at the summer meeting of the Atlantic Flyway Technical Section.[1]

4.0 RESEARCH

The research component of the BDJV addresses important information gaps in our knowledge needed to improve the management of black ducks, and to provide necessary information to the habitat oriented joint ventures. It remains unclear to what extent productivity, mortality, habitat change, hybridization and ecological competition with mallards have affected the status of black duck populations. Research funded by the BDJV is intended to assess the relative importance of these factors.

Extensive research into the factors affecting the decline of the black duck has been undertaken over the past 10 years. In order to provide effective information to waterfowl population managers, the Technical Committee believes that the results to date require an in-depth examination and synthesis by an outside source. Early in the year, a task force was struck to (1) assemble existing information needed to manage black duck populations by identifying potential data sources, and to develop terms of reference for a Post-Doctoral position to synthesize available data sets and, (2) develop a proposal for work to be done by the Post-Doctorate that will incorporate existing data into a simplified black duck population model. The one-year contract was awarded to Dr. Mark Miller who will work closely with the principal investigator, Dr. Michael Conroy (University of Georgia) and research scientists Dr. James Nichols and Dr. John Sauer, at the Department of the Interior, Patuxent Wildlife Research Center. Results on the development of competing models for predicting the response of black duck populations to management are expected in early 1998. More information on the this project can be found on the University of Georgia website: *http://www.uga.edu/~gacoop/blackduck.html.*

Given that the research program would be under evaluation in 1998, no new research projects were funded in 1997. However, funding was provided for ongoing research initiatives. The objectives and status of these projects are presented in Appendix F. A compilation of all publications and products resulting from BDJV supported research in the U.S. and Canada are listed in Appendix G.

[1]West Virginia Division of Natural Resources, July, 1997, Annual Report of Cooperative Banding Program.

5.0 BUDGET

Allocation of 1997 BDJV funds (the upper value is in Canadian dollars, and the lower in U.S. dollars using 1.37 for conversion).

Organization	Surveys	Research	Banding	TOTAL
Canadian Wildlife Service	218 ,700	34, 400		253, 100 Cdn.
	159, 635	25, 109		184, 744 U.S.
U.S. Fish and Wildlife Service	229, 256		109, 600	338, 856 Cdn.
	167,340		80 ,000	247,340 U.S.
Patuxent Wildlife Research Center		402, 643		402, 643 Cdn.
		293, 900		293, 900 U.S.
Atlantic Waterfowl Council:			256, 190	256, 190 Cdn.
			187, 000	187, 000 U.S.
Mississippi Flyway Council:			17, 810	17, 810 Cdn.
			13, 000	13, 000 U.S.
Total Funding Received:	**$447, 956.42**	**$437, 043**	**$383, 600**	**$1, 268,599 Cdn.**
	$326, 975.45	**$319, 009**	**$280, 000**	**$ 925, 984 U.S.**

1997 Program Notes

Best of Luck...

The Black Duck Joint Venture Management Board and Technical Committee members wish to thank the following for their hard work and dedication to the Joint Venture as they pursue new endeavours:

Keith McAloney, Canadian Wildlife Service, Sackville, NB
Pat Kehoe, Department of Natural Resources and Energy, Fredericton, NB
Bruce Pollard, Ducks Unlimited Canada, Winnipeg, MB
Jerry Martz, Department of Natural Resources, Lansing, MI

Welcome Aboard!

The Joint Venture wishes to welcome aboard three new members:

Mark Petrie, Ducks Unlimited Inc., Memphis, TN
Melody Hartman, Department of Natural Resources, Bloomington, IN
Randy Milton, Department of Natural Resources, Kentville, NS

Evaluation Plan

A draft version of the Joint Venture Evaluation Plan was circulated to members of the Continental Evaluation Team in December 1997. Comments on the draft are anticipated following the finalization of the NAMWP 1998 Update.

NAWMP Black Duck Population Goal and the 1998 Update

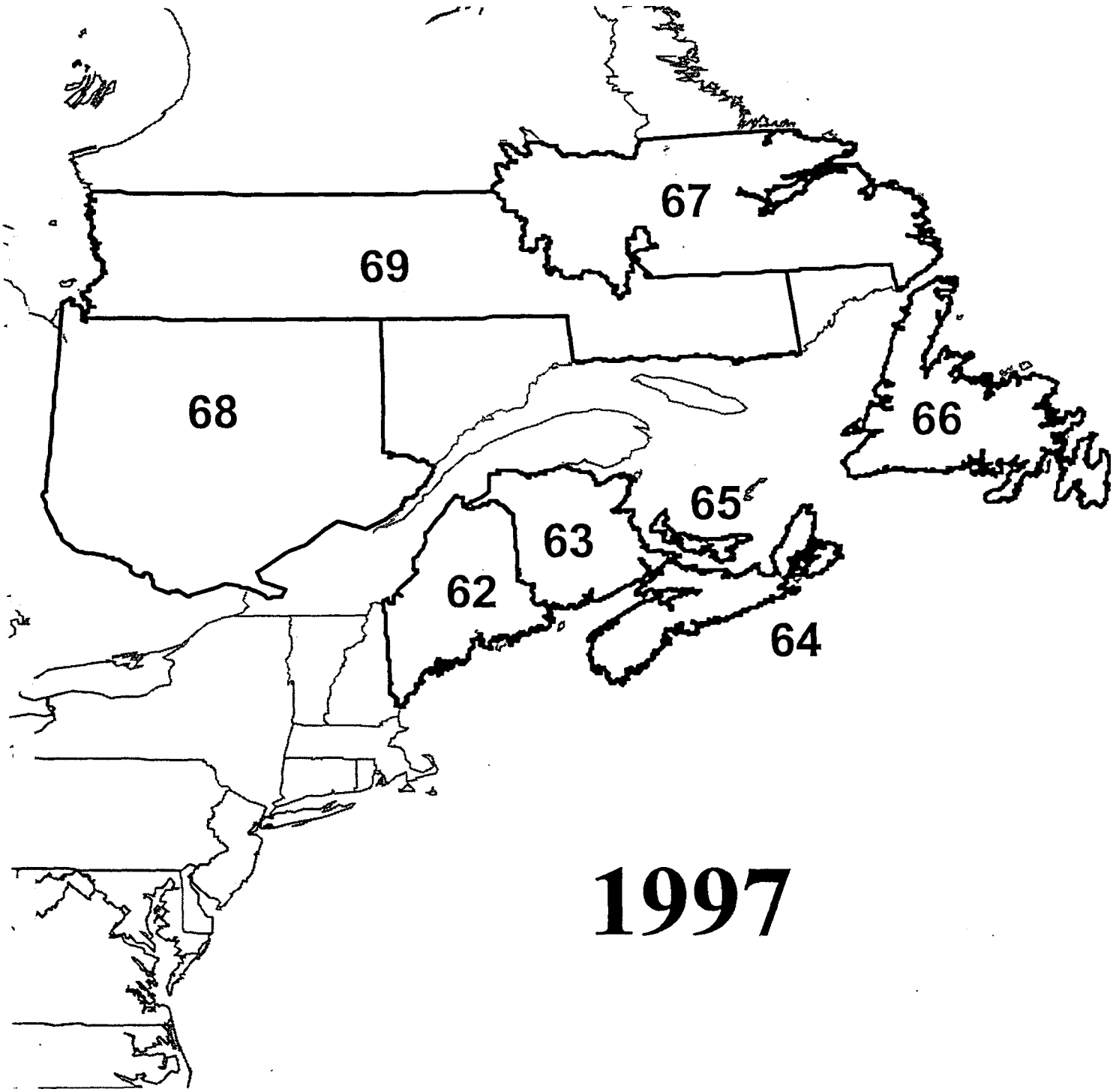
As part of the North American Waterfowl Management Plan 1998 Update, the BDJV Technical Committee and Management Board agreed that the stated population target of 385,000 black ducks in the combined Atlantic and Mississippi Flyways would remain unchanged. The current goal is based upon the Midwinter Inventory surveys and the Technical Committee hopes to develop a population goal based on breeding ground surveys which would be used in future phases of the Plan.

Québec Regional BDJV Website

The Québec Region Canadian Wildlife Service has developed a Black Duck Joint Venture website which emphasizes banding, surveys and research in the Québec Region. There are plans to add other topics to the site such as a detailed distribution map of predicted breeding pair densities based on LANDSAT TM habitat data as well as linking the site to other relevant sites. The site is located at http://www.qc.ec.gc.ca/faune/sauvagine/html/bdjv.html.

APPENDIX A

MAINE
EASTERN CANADIAN & MARITIME AREAS



1997

Map prepared by:

D. Alan Davenport
Office of Migratory Bird Management
U. S. Fish and Wildlife Service
Laurel, MD 20708

TITLE Experimental Waterfowl Breeding Population Survey Maine, the Maritime provinces, and Central Quebec

STRATA SURVEYED 62, 63, 64, 65, 66, 67, 68

DATA SUPPLIED BY United States Fish and Wildlife Service
&
Canadian Wildlife Service

Crew 1	Pilot/Observer	J. Goldsberry	USFWS
	Observer	A. Davenport	USFWS
Crew 2	Pilot/Observer	T. Curtis	USFWS
	Observer	L. Breton	CWS

ABSTRACT

This survey is still in the development stage and the strata, transect, and segments have been reviewed and changed during the past year. It is likely that more changes will occur in the future, and little comparison can be made at this point. Data is presented for informational purposes only.

METHODS

The procedures followed in conducting the survey are contained in the *Standard Operating Procedures for Aerial Waterfowl Breeding Ground Population and Habitat Survey,* Section III, revised April 1987. Changes in survey design were made in stratum 62, 66, and 67 where additional transect was added. Stratum 68 was split into with additional area added to form Strata 68, and 69. In strata 62, and 66 one additional transect was added. In stratum 67 two additional transect were added. Stratum 68 was divided into two separate strata with the original western section being retained having 14 transects,. The eastern section of 68 and addition northern areas were combined to form Stratum 69 with eight transects. All crews were experienced crews and had conducted the Aerial Waterfowl Breeding Ground Population Surveys in the past. Crew one, flew Strata 62, 63, 64, 65, 66, and 67, using a Partenavia twin engine aircraft. Crew two flew Strata 68, and 69 using a Cessna 185 on Amphibious Floats. Weather caused some delays in the survey in both crew areas. Crew two experienced some delay due to aircraft mechanical problems. The crew finally had to stop the survey due to forest fires with the resulting that the area was restricted to only fire fighting aircraft. As a result of the above problems crew two was unable to survey the new stratum. Crew one, during the 1997, survey expimented with a new data entry program developed by Jack Hodges (USFWS, Waterfowl Investigations, Juneau). AK. This new program is designed to link GPS data to observations so that each observation has a lattitude, longitude, and time attached. Preliminary data indicates that this is a very valuable alternative to present data entry system utilizing segment only entry. A separate report is being prepared on this expirement.

WEATHER AND HABITAT

Snow fall was heavy across the eastern boreal forests during the winter of 1996-97. Winter like conditions continued well into spring in most locations delaying the advance of spring by two to three weeks. Spring weather patterns were wet and cold with rain, sleet, and snow occurring into late May, and in some locations early June. Snow cover to varying degrees was present into late May and early June in the northern and higher elevations of the survey areas of Quebec, Maine, New Brunswick, Newfoundland Island and Labrador. Conditions although delayed were somewhat better in western areas of Quebec, and in southern areas of Maine, New Brunswick, and Nova Scotia. Because of the late spring and above normal runoff much of the prime waterfowl nesting sites were flooded, forcing waterfowl to select fewer suitable sites. In the higher elevation and more northern areas lingering snow cover limited the availability of good alternate sites. Early nesting species will be hampered by these conditions. If the cold wet conditions continue nesting success and brood survival will be limited across much of the eastern survey area.

BREEDING POPULATION ESTIMATES

The survey is the second year of this survey with changes in survey design. The data is presented for information purposes and only limited. Several years of data will be required before any meaningful comparisons can be made. Information on population estimates can be seen in the tables provided with this report.

CONCLUSIONS

Weather still seems to be the largest challenge in conducting this survey. Several changes were made to the survey design for this years survey. Additional changes will probably be required in the next couple of years which should provide a good long-term waterfowl breeding population survey of eastern Canada boreal and maritime habitats.

Waterfowl Breeding Population Survey Eastern Canada

Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum for Maine, the Maritime provinces, and Northern Quebec.

	Stratum (1997)							
Species/Ponds	62	63	64	65	66	67	68	1997 Total
Ducks								
Dabblers								
Mallard	20.5	6.4	6.3	0.9	2.6	1.5	15.9	54.1
Am. black duck	54.4	50.2	41.0	5.1	27.7	83.0	104.5	365.9
Gadwall	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.8
Am. wigeon	0.0	0.0	2.7	0.0	0.0	0.0	0.0	2.7
Am. green-winged teal	23.7	12.3	0.0	0.0	6.0	48.0	33.6	123.7
Blue-winged teal	1.8	0.0	0.0	0.0	0.0	0.0	0.0	1.8
N. shoveler	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N. pintail	0.6	0.0	0.0	0.0	1.5	0.0	0.0	2.2
Subtotal	101.1	69.7	50.0	6.0	37.8	132.5	154.0	551.0
Divers								
Redhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canvasback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scaups	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.4
Ring-necked duck	87.7	20.4	8.0	1.6	27.8	101.3	163.0	409.8
Goldeneyes	2.5	4.7	4.0	2.1	0.0	32.0	97.8	143.1
Bufflehead	5.2	0.4	0.8	0.6	0.0	1.0	0.0	8.0
Ruddy Duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	95.4	25.5	12.8	4.2	28.2	134.3	260.9	561.3
Miscellaneous								
Oldsquaw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	89.9	0.0	5.5	0.0	0.0	0.0	0.0	95.4
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	85.7	85.7
Mergansers	36.2	38.2	9.1	4.5	12.9	48.9	113.0	262.7
Subtotal	126.1	38.2	14.6	4.5	12.9	48.9	198.7	443.7
Total Ducks	322.5	133.3	77.4	14.7	78.9	315.6	613.6	1556.0
Canada Goose	9.6	1.4	0.7	0.5	72.7	100.1	6.2	191.2
Am. coot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 1. Survey design for Maine, and Eastern Canada 1997

	STRATUM							
	62	63	64	65	66	67	68	69
SURVEY DESIGN								
Square miles in stratum	32,202	27,874	21,179	2,225	42,248	84,608	140,308	130,608
Square miles in sample	306	266	216	27	180	230	630	360
Lineal miles in sample	1,224	1,062	864	108	720	918	2,520	1,440
Number of transects in sample	10	8	10	3	7	5	14	8
Number of segments in sample	68	59	48	6	40	51	140	80
Expansion factor	105.2352	104.7894	98.0509	82.4074	234.7111	367.8608	222.7111	362.8000

This is a preliminary survey design subject to review. Data is based on information obtained from GIS.

APPENDIX B

MICHIGAN SPRING BREEDING WATERFOWL SURVEY RESULTS

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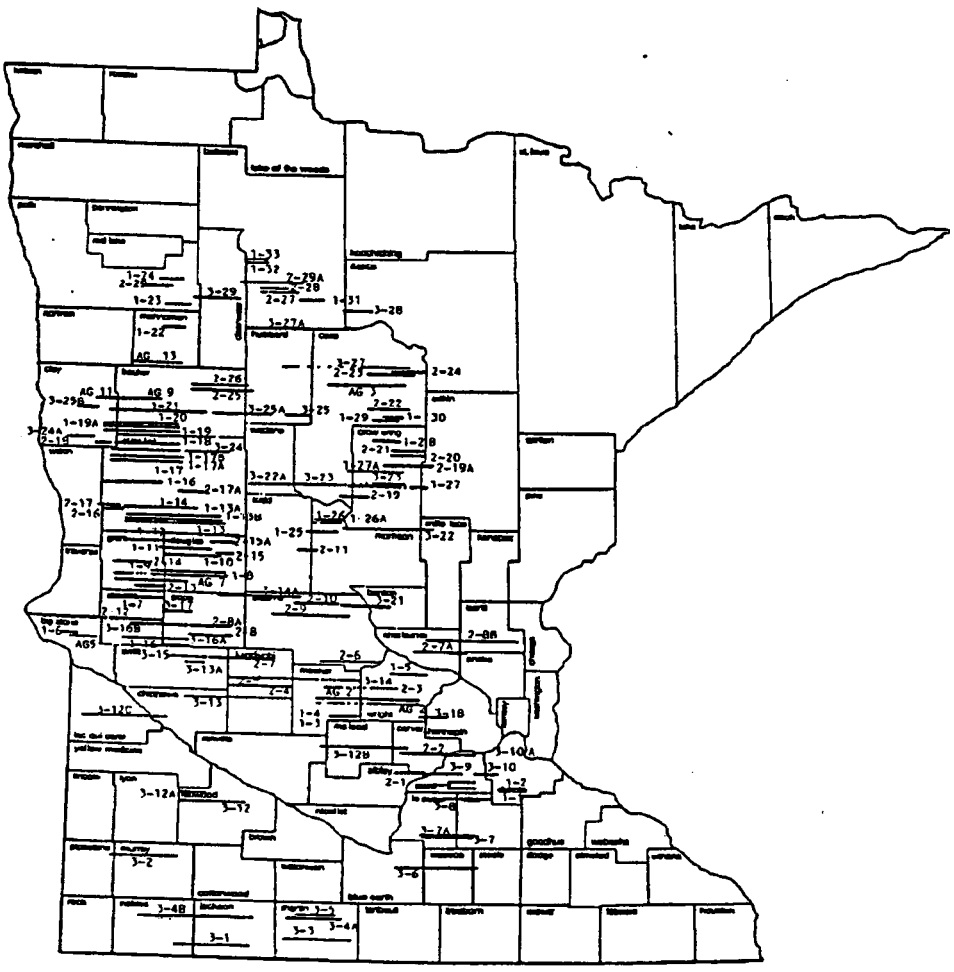
Species	SLP Population	NLP Population	UP Population	SLP Population Variance	NLP Population Variance	UP Population Variance	State Population	State Variance	State Coefficient of Variation (%)	State 95% CI Lower Limit	State 95% CI Upper Limit
Mallard	301,604	63,626	80,043	2304076843	432192640.2	698401340	445,273	3434670823	13.16	330,405	560,140
Blue-winged Teal	39,314	3,271	4,071	490708071.9	4962240.355	14258336.95	46,656	509928649.2	48.40	2,396	90,916
Wood Duck	152,780	26,081	97,383	3490730666	337130665.6	5822102208	276,245	9649963540	35.56	83,706	468,784
Black Duck	772	1,393	0	302875.962	978855.4615	0	2,165	1281731.424	52.28	-54	4,384
Green-winged Teal	3,227	0	0	5928641.494	0	0	3,227	5928641.494	75.46	-1,546	7,999
Shoveler	2,129	0	0	4346450.546	0	0	2,129	4346450.546	97.94	-1,958	6,215
Widgeon	0	0	0	0	0	0	0	0	#DIV/0!	0	0
Pintail	649	585	0	403865.61	317408.0341	0	1,234	721273.6441	68.80	-430	2,899
Gadwall	1,113	0	0	617510.874	0	0	1,113	617510.874	70.63	-428	2,653
Canvasback	0	0	0	0	0	0	0	0	#DIV/0!	0	0
Redhead	0	0	0	0	0	0	0	0	#DIV/0!	0	0
Scaup	10,386	33,991	9,582	43395548.1	883622447.3	86329462.7	53,959	1013347458	58.99	-8,434	116,352
Ring-necked Duck	18,542	2,676	48,855	57987693.85	5681183.724	625466612.2	70,073	689135489.8	37.46	18,620	121,526
Goldeneye	6,438	0	4,136	23670995.8	0	14043364.68	10,575	37714360.47	58.07	-1,462	22,612
Bufflehead	7,953	13,376	2,825	11266794.44	75755714.52	7518356.224	24,154	94540865.18	40.25	5,097	43,212
Merganser	5,350	568	2,783	5335196.418	131412.8211	1203801.205	8,701	6670410.444	29.68	3,639	13,763
DUCK TOTAL	550,257	145,568	249,679	6,438,771,154	1,740,772,568	7,269,323,482	945,503	15,448,867,205	13.15	429,552	1,461,454
Coots	0	0	0	0	0	0	0	0	#DIV/0!	0	0
Canada geese	223,782	18,988	13,331	1763873141	98352642.54	24474934.81	256,101	1886700718	16.96	170,966	341,236
Swan	5,672	880	0	32175283.24	775052.4926	0	6,553	32950335.73	87.60	-4,698	17,804
								0	#DIV/0!	0	0
Ind. breeding pairs Canada geese (excluding groups)	0	0	0	0	0	0	0	0	#DIV/0!	0	0
Canada geese excluding groups and pairs without nests or broods)	0	0	0	0	0	0	0	0	#DIV/0!	0	0

1997
WATERFOWL BREEDING POPULATION SURVEY FOR MINNESOTA



Minnesota
DEPARTMENT OF NATURAL RESOURCES

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

TITLE: Waterfowl Breeding Population Survey for Minnesota

STRATA SURVEYED: Minnesota Strata 1, 2, and 3

DATES: 6-21 May 1997

DATA SUPPLIED BY: Minnesota Department of Natural Resources (MnDNR)
U.S. Fish and Wildlife Service (USFWS)

Air Crew

Pilot/Observer - Dick Stoltman, Conservation Officer Pilot
MnDNR, Division of Enforcement

Observer - Jeff Lawrence, Waterfowl Staff Specialist
MnDNR, Section of Wildlife

Ground Crew

Crew Leaders - Sean Kelly, Asst. Chief, Migratory Bird & Refuge Biology
USFWS, Region III, Twin Cities, Minnesota
- Brad Ehlers, Refuge Operations Specialist
USFWS, Sherburne National Wildlife Refuge
- Jeanne Holler, Wildlife Biologist
USFWS, Sherburne National Wildlife Refuge
- Rich Papasso, Asst. Refuge Manager,
USFWS, Big Stone National Wildlife Refuge
- Eric Rozowski, Forestry Technician
USFWS, Big Stone National Wildlife Refuge
- Kurt Svensgaard, Biological Technician
USFWS, Tamarac National Wildlife Refuge

Assistants - Joe Artmann, Wildlife Biologist
USFWS, Region III, Twin Cities, Minnesota
- Catherine Hanson, Fire Technician
USFWS, Sherburne National Wildlife Refuge
- Tim Loose, Refuge Operations Specialist
USFWS, Sherburne National Wildlife Refuge
- Stephen Revering, Forestry Technician
USFWS, Big Stone National Wildlife Refuge
- Gary Tischer, Refuge Operations Specialist
USFWS, Agassiz National Wildlife Refuge

ABSTRACT: The number of breeding waterfowl in a portion of Minnesota is estimated annually as a part of an overall inventory of North American breeding waterfowl. The survey consists of aerial observations supplemented by more detailed ground tallies of selected routes to determine the proportion of birds seen from the air. Procedures used are similar to those used elsewhere on the breeding grounds. The 1997 aerial survey was completed in 9 days of flight time. Pond numbers decreased 6% compared to 1996 but remained 31% above the 10-year (1987-96) average. The Mallard population (407,419) was 29% greater that in 1996, but this difference was not significant ($P = 0.28$). Mallard numbers were 115% > the long-term (1968-96) average. The blue-winged teal population estimate (253,408) was 12% < the 1996 estimate; this difference

was not significant (P = 0.70). Other ducks (excl''ding sca..p) w..r.. 27% .. 1996, 19% < the 10 year average, but remained 32% > than the long-term average. Total ducks (excluding scaup) were unchanged (-2%).

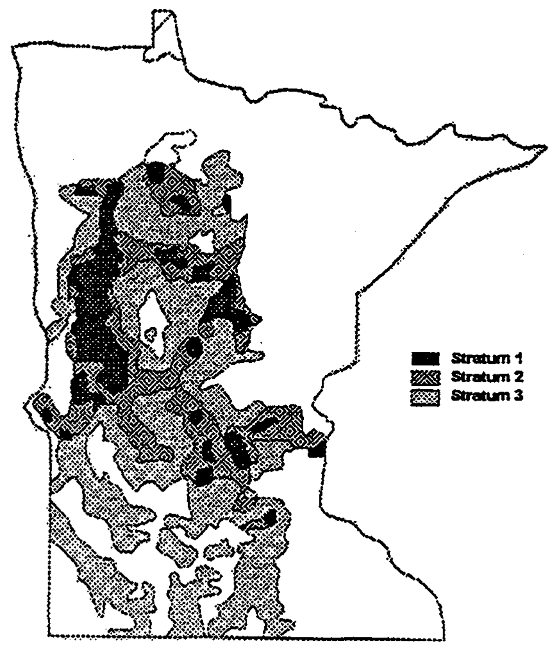


Fig. 1. Location of waterfowl breeding population survey strata in Minnesota.

METHODS: The aerial survey is based on a sampling procedure which used three survey strata. The strata cover 39% of the state area and are defined by lake basin (≥10 acres) density exclusive of the infertile northeastern lake region. The strata are as follows (Fig. 1):

Stratum I: high density, 21 or more lake basins per township.

Stratum II: moderate dens'ty, 11 to 20 lake basins per township.

Stratum III: low density, 2 to 10 lake basins per township.

Areas with less than two basins per township were not surveyed. Strata boundaries were based upon "An Inventory of Minnesota Lakes" (Minnesota Conserv. Dept. 1968:12).

Basic procedures used in conducting this survey are contained in the "Standard Operating Procedures for Aerial Waterfowl Breeding Ground Populations and Habitat Surveys in North America." (USFWS/CWS 1987). Changes in survey methodology were noted in the 1989 Minnesota Waterfowl Breeding Population Survey report. Pond and waterfowl data for 1968-74 were calculated from Jessen (1969-72) and Maxson and Pace (1989).

All aerial transects were flown in Strata I-III ....g .. ..5 (..0.. R). V......ty corr ction factors were d riv from int iv ground surveys of selected routes flown by the aerial crew. Ground routes each, originally included approximately 100 water areas; however, drainage has reduced the number of wetlands on most of the routes.

Wetlands were only counted out of the observer's side of the plane (0.125 mile wide tran ct) and the correction fac or obtained in 1989 was used to adjust previous data (1968-88) that was obtained by the observer counting wetlands on both sides of the plane (0.25 mile wide transect).

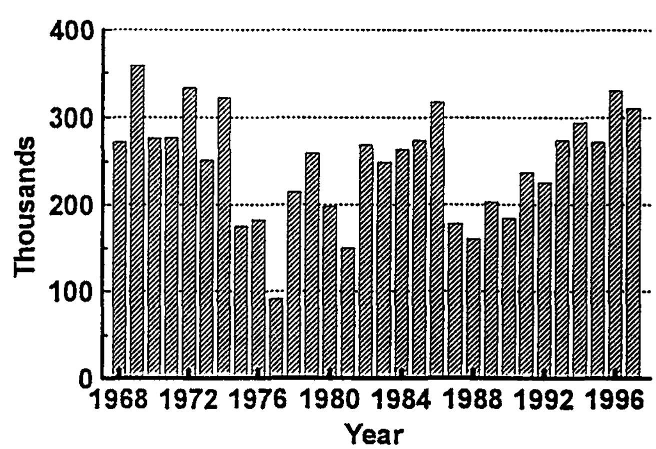


Fig. 2. Ponds (Type II-V) observed during the waterfowl breeding population survey in Minnesota, 1968-97.

Th_ SAS c_mp_t_ p_ _g_am _as mo_fie_ _ 1992 to ob_ain s_n_rd errors for mallard and blue-winged teal breeding population estimates. These calculations were based upon SAS computer code written by Graham Smith, USFWS-Office of Migratory Bird Management. Estimates for 1996 and 1997 were compared using two-tailed Z-tests. In the past, a ±10% difference in breeding population estimates between two years was considered a change. Calculating SE's indicated that the change must be considerably >10% before a statistically significant difference is detected.

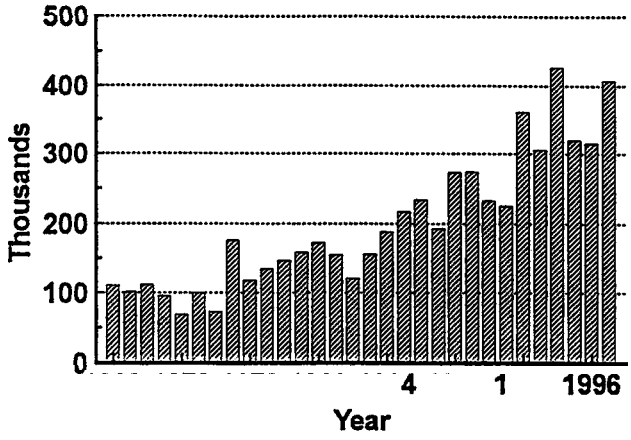


Fig. 3. Mallard population estimates (adjusted for visibility) during waterfowl breeding population surveys in Minnesota, 1968-95.

SURVEY CHRONOLOGY: The 1997 aerial survey began on 6 May in southern Minnesota, and was concluded on 21 May. Aerial transects were flown on 6, 8-10, and 17-21 May. Transects were not flown on 11-16 May due to personal reasons. The survey was completed in 9 days of flight time.

WEATHER AND HABITAT CONDITIONS:
Temperatures remained below normal during much of May (Appendix A). Most of the surveyed area in Minnesota had below normal precipitation during April-May (Appendix A). Extremes in 1 April-25 May precipitation were -3.26 inches below normal at Becker and +2.32 inches above normal at Crookston. Topsoil moisture levels were lower than last year, with 37% of the state rated short or very short on May 23. Temporary wetlands (Type I, 1997 n =30,700, 1996 n = 148,000) declined 79% and were not abundant as they have been since 1993; however, seasonal and permanent wetlands were in good condition. Extreme flooding in the Red River Valley delayed crop planting in 1997. Planting was delayed in this portion of the state in 1996, too.

Pond numbers decreased 6% from 1996, but ----i--d 27% -b--- th- l--- t--- (1968-96) average (Table 1, Fig. 2). Wetland conditions were in good shape throughout the state. Nesting cover appeared to be in fair condition; although the cool conditions may have delayed growth. In addition, approximately half of the Conservation Reserve Program acres that had been available as nesting habitat were taken out of the program in 1997. This was due to voluntary removal of acreage by landowners and some fields not meeting the new CRP sign-up criteria. The Crop Report reported that Alfalfa was in poor condition due to winterkill and cool growing temperatures.

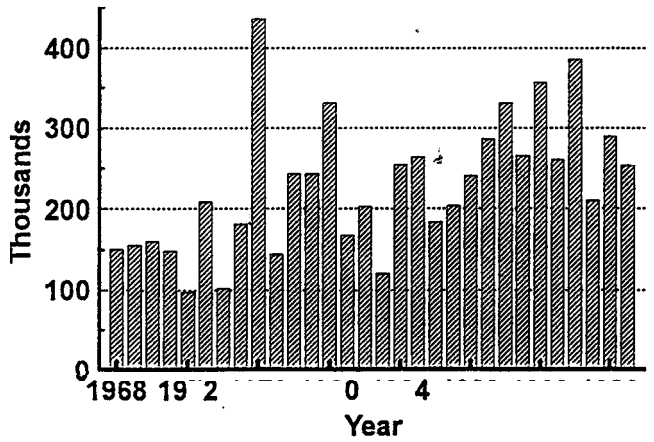


Fig. 4. Blue-winged teal population estimates (adjusted for visibility) during waterfowl breeding population surveys in Minnesota, 1968-97.

WATERFOWL POPULATIONS: The 1997

waterfowl breeding population survey indicated numbers of mallards increased while blue winged-teal and other ducks declined (Tables 2-6). The mallard population estimate (pop. est. = 407,413, SE = 65,771) increased 29% compared to 1996 (Table 6, Fig. 3), but this change was not significant ($Z = 1.092$, $P = 0.28$). The mallard Visibility Correction Factor (VCF) was 22-23% > than the long-term and 10-year average (Table 6). Mallard numbers in 1997 were 81% above the duck plan objective of 225,000.

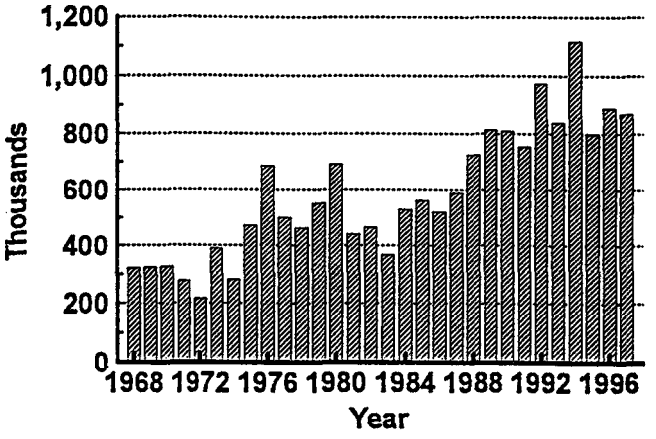


Fig. 5. Total duck (excluding scaup) population estimates (adjusted for visibility) during waterfowl breeding population surveys in Minnesota, 1968-97.

Blue-winged teal numbers (pop. est. = 253,408, SE = 67,526) decreased 12% compared to 1996, but this difference was not significant ($Z = 0.381$, $P = 0.70$). The estimate was 11% > the 1968-96 average (Table 6, Fig. 4). The blue-winged teal VCF was 53% above the 10-year average. Blue-winged teal VCF's have been high since water conditions improved in 1993. Blue-winged teal were 16% below the duck plan population objective of 300,000. Flocks of teal were observed in early May suggesting that the migration was delayed due to the late spring phenology. This was similar to the delayed migration suggested in 1995 and 1996.

Other duck numbers (excluding scaup) were lower than in 1996 (-27%) and the 10-year average (-19%); but, remained 32% above the long term average. Scaup numbers were 51% < 1996. This report continues to use that other duck VCF for scaup, although this overestimates the number of migrant scaup in the state. Although a few scaup breed in Minnesota, for the most part it is considered a nonbreeding duck for survey purposes. We will examine better methods to estimate scaup numbers prior to next years report. Total ducks excluding scaup were unchanged (-2%) compared to 1996 (Table 6, Fig. 5); but were 51% above the 1968-96 average. The problems of calculating the other duck VCF have been discussed by Maxson and Pace (1989). This method has been used for several years in Minnesota; however, the USFWS (Smith 1995) has developed better methods to calculate VCF's for less commonly observed species. These changes will be incorporated into the Minnesota survey in the future.

Canada goose numbers (uncorrected for visibility) were unchanged (-1%) compared to 1996 and were 154% above the long-term average (Table 6, Fig. 6). The VCF for Canada geese is > 1.0 (i.e., the air crew does not see all Canada geese) and perhaps the VCF should be applied to the count to provide a more reasonable estimate of goose numbers; however, the population estimate demonstrates greater variability when the VCF is used (Table

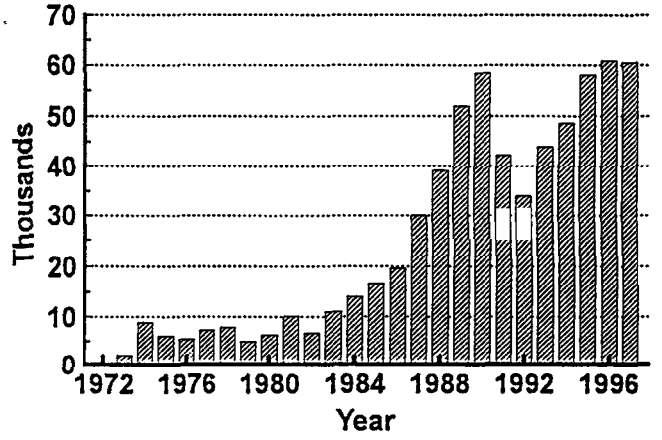


Fig. 6. Canada geese observed (unadjusted for visibility) during waterfowl breeding population surveys in Minnesota, 1972-97.

6). Minnesota DNR flew approximately 1,500 miles of additional transects during May in areas poorly sampled by the current waterfowl survey to obtain better estimates of Canada goose densities in the state. Steve Maxson, Wetland Wildlife Populations and Research Group will present results from that survey, which uses goose numbers from these transects, in a separate report.

SUMMARY: Habitat conditions were good to excellent throughout much of the surveyed areas. Duck numbers were similar to last year and populations remained relatively high compared to the recent past (since 1968). Canada goose numbers remained at record high levels.

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Submitted by: Jeff Lawrence,
Waterfowl Staff Specialist
12 June 1997

Table 1. Estimated number of May ponds (Type II-V) during the Minnesota waterfowl breeding population survey, 1968-97.

Year	Number of ponds[a]
1968	272,000
1969	358,000
1970	276,000
1971	277,000
1972	333,000
1973	251,000
1974	322,000
1975	175,000
1976	182,000
1977	91,000
1978	215,000
1979	259,000
1980	198,000
1981	150,000
1982	269,000
1983	249,000
1984	264,000
1985	274,000
1986	317,000
1987	178,000
1988	160,000
1989	203,000
1990	184,000
1991	237,000
1992	225,000
1993	274,000
1994	294,000
1995	272,000
1996	330,000
1997	310,000
10-year average (1987-96)	236,000
Long-term average (1968-96)	244,000
Change from:	
1996	-6
10-year average	31
Long-term average	27

a - correction factor from 1989 (123,000/203,000=0.606) used to adjust 1968-88 pond numbers. Ponds counted on 0.125 mile wide transect after 1988.

Table 2. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), 1986-1997[1].

	Year											
Species	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Dabblers:												
Mallard	18,943	30,713	32,769	26,659	29,686	25,854	28,770	23,327	22,160	20,494	25,104	26,992
Black Duck	55	1,440	0	0	0	56	0	0	56	0	0	0
Gadwall	388	499	916	722	2,694	2,721	2,777	778	444	1,055	1,083	611
American Wigeon	0	0	111	83	222	0	56	0	0	194	0	0
Green-winged Teal	55	0	0	0	0	56	0	111	278	0	278	56
Blue-winged Teal	14,346	22,654	17,467	14,218	23,771	15,940	15,274	10,358	9,164	7,609	6,720	6,387
Northern Shoveler	498	831	278	722	778	1,777	1,000	111	278	111	1,277	1,500
Northern Pintail	388	111	500	222	444	389	222	611	167	167	167	111
Wood Duck	2,437	14,789	11,580	8,303	14,468	10,775	10,941	11,636	7,359	6,831	6,498	9,497
Subtotal	37,110	71,037	63,621	50,929	72,063	57,568	59,040	46,932	39,906	36,461	41,127	45,154
Divers:												
Redhead	748	1,800	1,277	2,638	3,305	2,555	3,499	1,416	1,972	639	722	778
Canvasback	942	1,357	722	2,888	1,972	2,305	2,111	2,777	3,166	3,860	1,166	1,333
Scaup	3,046	1,883	2,860	14,024	8,970	9,858	23,854	6,748	19,661	7,192	13,829	3,416
Ring-necked Duck	858	499	528	1,500	1,638	1,777	4,721	2,222	3,582	1,583	3,166	2,694
Goldeneye	0	0	56	167	56	0	222	111	222	111	167	0
Bufflehead	0	0	56	583	0	333	722	0	444	56	278	0
Ruddy Duck	886	323	666	722	1,500	361	500	1,250	639	167	139	528
Hooded Merganser	111	0	0	0	139	0	444	222	111	278	611	555
Large Merganser	0	0	0	0	0	56	111	0	56	0	0	56
Subtotal	6,591	5,862	6,165	22,522	17,580	17,245	36,184	14,746	29,853	13,886	20,078	9,360
Total Ducks	43,701	76,899	69,786	73,451	89,643	74,813	95,224	61,678	69,759	50,347	61,205	54,514
Other:												
Coot	1,662	1,163	3,777	22,799	27,326	11,108	11,386	1,166	528	611	3,055	5,054
Canada Goose	7,256	8,059	12,024	14,663	16,523	9,803	10,914	13,135	12,802	14,413	12,774	10,330

[1] Estimates expanded for coverage but not for visibility.

Table 3. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), 1986-1997[1].

Species	Year											
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Dabblers:												
Mallard	28,227	50,260	41,085	42,896	39,682	39,215	45,585	37,111	42,896	42,896	48,507	54,643
Black Duck	0	0	0	0	0	0	0	0	0	0	0	0
Gadwall	0	0	584	1,344	2,805	1,870	2,045	1,286	1,403	1,052	935	468
American Wigeon	0	0	3,507	0	234	701	351	0	117	0	468	351
Green-winged Teal	0	234	117	117	0	0	0	351	117	0	935	234
Blue-winged Teal	16,481	29,455	30,039	25,189	31,208	24,663	26,766	18,818	19,227	10,636	13,851	13,792
Northern Shoveler	1,169	701	1,695	2,338	2,104	3,857	1,636	1,286	935	818	1,636	2,571
Northern Pintail	234	818	468	701	701	701	234	351	468	234	117	234
Wood Duck	5,260	10,052	14,494	10,578	14,903	8,065	11,221	9,468	9,409	6,662	8,708	11,338
Subtotal	51,371	91,520	91,989	83,163	91,637	79,072	87,838	68,671	74,572	62,298	75,157	83,631
Divers:												
Redhead	351	701	1,169	1,636	4,325	1,519	3,097	2,279	3,799	1,403	1,110	1,987
Canvasback	234	0	935	584	234	117	0	584	1,052	0	234	701
Scaup	1,461	5,552	3,857	25,598	25,189	13,383	22,208	877	14,085	7,831	21,916	18,935
Ring-necked Duck	467	1,461	2,104	3,214	2,513	2,104	2,922	3,156	3,331	1,403	7,714	3,565
Goldeneye	351	234	468	935	351	818	351	584	701	701	1,753	818
Bufflehead	117	0	0	701	234	0	526	117	234	0	117	117
Ruddy Duck	409	0	2,162	3,390	1,227	4,558	1,227	3,390	409	117	58	117
Hooded Merganser	584	0	234	0	0	0	351	584	468	117	234	468
Large Merganser	0	0	0	0	0	0	117	0	0	0	0	0
Subtotal	3,974	7,948	10,929	36,058	34,073	22,499	30,799	11,571	24,079	11,572	33,136	26,708
Total Ducks	55,345	99,468	102,918	119,221	125,710	101,571	118,637	80,242	98,651	73,870	108,293	110,339
Other:												
Coot	3,740	1,169	2,338	3,740	11,630	5,552	11,162	5,201	1,461	526	7,013	5,026
Canada Goose	2,513	4,675	5,143	10,227	11,279	8,591	7,305	9,409	12,565	12,682	13,559	16,364

[1] Estimates expanded for coverage but not for visibility.

Table 4. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), 1986-1997[1].

	Year											
Species	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Dabblers:												
Mallard	61,158	84,908	81,689	54,807	71,511	63,246	69,771	63,333	73,425	79,166	79,862	78,993
Black Duck	0	0	0	0	174	0	0	0	0	0	0	0
Gadwall	1,044	0	1,914	5,220	8,787	2,262	2,436	1,218	2,610	3,306	3,306	2,436
American Wigeon	0	0	1,827	174	957	696	522	348	1,218	0	1,044	348
Green-winged Teal	174	1,566	0	522	0	348	0	348	174	0	957	348
Blue-winged Teal	37,408	50,371	53,677	50,893	52,198	50,893	51,067	35,494	41,932	29,492	36,625	25,316
Northern Shoveler	5,481	3,306	3,654	6,264	23,663	5,568	11,048	1,914	2,784	5,307	12,701	11,049
Northern Pintail	2,436	174	3,219	696	696	1,914	870	1,218	696	174	870	522
Wood Duck	6,786	30,449	21,662	23,141	25,055	17,747	24,185	25,229	23,228	16,355	27,926	14,268
Subtotal	114,487	170,774	167,642	141,717	183,041	142,674	159,899	129,102	146,067	133,800	163,291	133,280
Divers:												
Redhead	609	696	609	2,175	3,219	2,610	6,438	1,827	2,958	7,134	1,044	1,044
Canvasback	0	0	174	174	1,044	696	0	348	696	174	1,392	0
Scaup	1,740	2,871	3,828	32,276	5,916	17,486	20,009	4,176	23,924	13,397	29,840	8,787
Ring-necked Duck	1,218	2,349	1,566	2,088	2,088	3,480	3,654	2,871	5,568	1,044	12,875	3,654
Goldeneye	1,044	174	522	870	609	696	1,044	696	783	1,479	1,914	522
Bufflehead	0	0	0	1,392	0	552	696	348	696	0	1,044	174
Ruddy Duck	3,567	2,175	1,566	1,305	1,218	9,396	6,786	1,218	2,175	2,349	1,740	348
Hooded Merganser	0	0	174	0	174	348	348	348	696	1,044	1,566	696
Large Merganser	0	0	0	0	0	0	348	0	174	174	0	0
Subtotal	8,178	8,265	8,439	40,280	14,268	35,264	39,323	11,832	37,670	26,795	51,415	15,225
Total Ducks	122,665	179,039	176,081	181,997	197,309	177,938	199,222	140,934	183,737	160,595	214,706	148,505
Other:												
Coot	7,482	1,914	59,940	24,794	11,918	47,587	62,463	12,179	12,788	3,828	182,953	24,620
Canada Goose	9,830	17,225	21,923	27,056	30,623	23,837	15,746	21,314	23,228	30,971	34,537	33,755

[1] Estimates expanded for coverage but not for visibility.

Table 5. Minnesota waterfowl breeding populations by species for Strata I-III combined, 1986-1997[1].

	Year											
Species	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Dabblers:												
Mallard	108,328	165,881	155,543	124,362	140,879	128,315	144,126	123,771	138,481	142,556	153,473	160,628
Black Duck	55	1,440	0	0	174	56	0	0	56	0	0	0
Gadwall	1,432	499	3,414	7,286	14,286	6,853	7,258	3,282	4,457	5,413	5,324	3,515
American Wigeon	0	0	5,445	257	1,413	1,397	929	348	1,335	194	1,512	699
Green-winged Teal	229	1,800	117	639	0	404	0	810	569	0	2,170	638
Blue-winged Teal	68,235	102,480	101,183	90,300	107,177	91,496	93,107	64,670	70,323	47,737	57,196	45,495
Northern Shoveler	7,148	4,838	5,627	9,324	26,545	11,202	13,684	3,311	3,997	6,236	15,614	15,120
Northern Pintail	3,058	1,103	4,187	1,619	1,841	3,004	1,326	2,180	1,331	575	1,154	867
Wood Duck	14,483	55,290	47,736	42,022	54,426	36,587	46,347	46,333	39,996	29,848	43,132	35,103
Subtotal	202,968	333,331	323,252	275,809	346,741	279,314	306,777	244,705	260,545	232,559	279,575	262,065
Divers:												
Redhead	1,708	3,197	3,055	6,449	10,849	6,684	13,034	5,522	8,729	9,176	2,876	3,809
Canvasback	1,176	1,357	1,831	3,646	3,250	3,118	2,111	3,709	4,914	4,034	2,792	2,034
Scaup	6,247	10,306	10,545	71,898	40,075	40,727	66,071	11,801	57,670	28,420	65,585	31,138
Ring-necked Duck	2,543	4,309	4,198	6,802	6,239	7,361	11,297	8,249	12,481	4,030	23,755	9,913
Goldeneye	1,395	408	1,046	1,972	1,016	1,514	1,617	1,391	1,706	2,291	3,834	1,340
Bufflehead	117	0	56	2,676	234	885	1,944	465	1,374	56	1,439	291
Ruddy Duck	4,862	2,498	4,394	5,417	3,945	14,315	8,513	5,858	3,223	2,633	1,937	993
Hooded Merganser	695	0	408	0	313	348	1,143	1,154	1,275	1,439	2,411	1,719
Large Merganser	0	0	0	0	0	56	576	0	230	174	0	56
Subtotal	18,743	22,075	25,533	98,860	65,921	75,008	106,306	38,149	91,602	52,253	104,629	51,293
Total Ducks	221,711	355,406	348,785	374,669	412,662	354,322	413,083	282,854	352,147	284,812	384,204	313,358
Other:												
Coot	12,884	4,246	66,055	51,333	50,874	64,247	85,011	18,546	14,777	4,965	193,021	34,700
Canada Goose	19,599	29,959	39,090	51,946	58,425	42,231	33,965	43,858	48,595	58,066	60,870	60,449

[1] Estimates expanded for coverage but not for visibility.

Table 6. Estimated waterfowl populations during the Minnesota Waterfowl breeding population survey, 1968-97.

	Mallard				Blue-winged teal				Other ducks (exc. scaup)		
Year	Unadjusted population index	Visibility correction factor	Adjusted population index	Standard error	Unadjusted population index	Visibility correction factor	Adjusted population index	Standard error	Unadjusted population index	Visibility correction factor	Adjusted population index
1968[1]	41,030	2.04	83,701		61,943.00	2.44	151,141		41,419	2.08	86,152
1969[1]	53,167	1.67	88,789		45,180.00	3.45	155,871		34,605	2.27	78,553
1970[1]	67,463	1.69	113,945		31,682.00	5.06	160,343		30,822	1.62	49,932
1971[1]	47,702	1.65	78,470		42,445.00	3.49	148,218		29,520	1.71	50,450
1972[1]	49,137	1.27	62,158		49,386.00	1.96	96,895		34,405	1.69	58,127
1973[2]	56,607	1.76	99,832		53,095.00	3.92	208,292		33,155	2.45	81,362
1974[2]	44,866	1.62	72,826		39,402.00	2.59	102,169		38,266	2.79	106,609
1975	55,093	3.19	175,774		45,948.00	3.95	181,375		34,585	3.31	114,459
1976	69,844	1.69	117,806		89,370.00	4.87	435,607		39,022	3.35	130,669
1977	60,617	2.21	134,164		37,391.00	3.86	144,187		18,633	11.95	222,748
1978	56,152	2.61	146,781		28,491.00	8.53	242,923		22,034	3.30	72,798
1979	61,743	2.57	158,704	28,667.7	46,708.00	5.21	243,167	62,225.8	39,749	3.79	150,545
1980	83,775	2.05	171,957	22,311.5	50,966.00	6.49	330,616	40,570.5	47,322	3.97	188,020
1981	79,562	1.95	154,844	16,401.7	64,546.00	2.59	167,258	23,835.1	30,947	3.80	117,667
1982	51,655	2.33	120,527	17,077.6	42,772.00	4.75	203,167	34,503.1	32,726	4.32	141,501
1983	73,424	2.12	155,762	15,419.3	42,728.00	2.81	119,980	20,809.1	32,240	2.84	91,400
1984	94,514	1.99	188,149	24,064.5	89,896.00	2.82	253,821	33,285.5	40,326	2.18	87,709
1985	96,045	2.26	216,908	32,934.5	90,453.00	2.91	263,607	33,369.0	35,018	2.35	82,383
1986	108,328	2.16	233,598	30,383.5	68,235.00	2.69	183,338	28,204.1	38,900	2.67	103,851
1987	165,881	1.16	192,289	23,499.9	102,480.00	1.99	203,718	32,289.4	76,746	2.51	192,947
1988	155,543	1.75	271,718	38,674.5	101,183.00	2.38	240,532	39,511.7	81,514	2.61	212,988
1989	124,362	2.19	272,968	26,507.8	90,300.00	3.16	285,760	39,834.0	88,109	2.89	254,887
1990	140,879	1.65	232,059	26,315.5	107,177.00	3.09	330,659	44,455.1	124,531	1.97	245,152
1991	128,315	1.75	224,953	28,832.4	91,496.00	2.90	265,138	42,056.5	93,784	2.81	263,619
1992	144,126	2.50	360,870	43,621.1	93,107.00	3.83	356,679	53,618.8	109,779	2.33	255,774
1993	123,771	2.47	305,838	31,102.5	64,670.00	4.02	260,070	36,306.8	82,612	3.28	271,263
1994	138,482	3.08	426,455	66,240.1	70,324.00	5.48	385,256	82,579.9	85,671	3.55	303,847
1995	142,557	2.24	319,433	48,123.5	47,737.00	4.40	210,043	40,531.4	66,096	4.05	267,668
1996	153,473	2.05	314,816	53,460.8	57,196.00	5.05	288,913	64,064.1	107,950	2.64	285,328
1997	160,629	2.54	407,413	65,771.2	45,496.00	5.57	253,408	67,525.9	76,095	2.72	207,316
10-year average (1987-96)	141,739	2.08	292,140		82,567.00	3.63	282,677		91,679	2.86	255,347
Long-term average (1968-96)	92,004	2.06	189,521		63,665.76	3.82	228,233		54,155	3.14	157,531
% change from:											
1996	5	24	29		-20	10	-12		-30	3	-27
10-year avg.	13	22	39		-45	53	-10		-17	-5	-19
Long-term avg.	75	23	115		-29	46	11		41	-13	32

[1]Calculated from data in Waterfowl breeding ground survey reports, 1968 through 1972, from Minn. Game Res. Quarterly Reps. 1968 and 1969 other duck VCF is total duck VCF.
[2]Calculated from data in Maxson and Pace (1989).

Table 6. cont.

Year	Scaup			Total ducks (exc. scaup)		Total ducks		Canada geese		
	Unadjusted population index	Visibility correction factor	Adjusted population index	Unadjusted population index	Adjusted population index	Unadjusted population index	Adjusted population index	Unadjusted population index	Visibility correction factor	Adjusted population index
1968	22,834	2.08	47,495	144,392	320,994	167,226	368,488			
1969	9,719	2.27	22,062	132,952	323,213	142,671	345,275			
1970	12,105	1.62	19,610	129,967	324,219	142,072	343,829			
1971	5,713	1.71	9,764	119,667	277,137	125,380	286,901			
1972	12,062	1.69	20,379	132,928	217,181	144,990	237,560	366		
1973	10,633	2.45	26,093	142,857	389,486	153,490	415,580	1965		
1974	18,378	2.79	51,201	122,534	281,605	140,912	332,806	8835		
1975	9,563	3.31	31,649	135,626	471,608	145,189	503,257	5,997		
1976	22,494	3.35	75,323	198,236	684,082	220,730	759,405	5,409		
1977	2,971	11.95	35,517	116,641	501,099	119,612	536,616	7,279		
1978	14,774	3.30	48,812	106,677	462,502	121,451	511,314	7,865		
1979	92,134	3.79	348,948	148,200	552,416	240,334	901,364	4,843		
1980	12,602	3.97	50,070	182,063	690,593	194,665	740,663	6,307		
1981	19,844	3.80	75,451	175,055	439,769	194,899	515,220	10,156		
1982	21,556	4.32	93,204	127,153	465,195	148,709	558,399	6,600		
1983	9,551	2.84	27,077	148,392	367,142	157,943	394,219	11,081		
1984	15,683	2.18	34,111	224,736	529,679	240,419	563,790	14,051		
1985	7,409	2.35	17,430	221,516	562,898	228,925	580,328	16,658		
1986	6,247	2.67	16,678	215,463	520,787	221,710	537,465	19,599		
1987	10,306	2.51	25,910	345,107	588,954	355,413	614,864	29,960		
1988	10,545	2.61	27,553	338,240	725,238	348,785	752,791	39,057	1.36	53,004
1989	71,898	2.89	207,991	302,771	813,615	374,669	1,021,606	51,946	1.88	97,898
1990	40,075	1.97	78,892	372,587	807,870	412,662	886,761	58,425	1.37	80,147
1991	40,727	2.81	114,480	313,595	753,710	354,322	868,191	42,231	4.18	176,465
1992	66,071	2.33	153,939	347,012	973,323	413,083	1,127,262	33,965	2.43	82,486
1993	11,801	3.28	38,750	271,053	837,172	282,854	875,921	43,858	2.08	91,369
1994	57,670	3.55	204,536	294,477	1,115,558	352,147	1,320,095	48,595	1.60	77,878
1995	28,421	4.05	115,096	256,390	797,144	284,811	912,241	58,065	2.08	120,775
1996	65,585	2.64	173,351	318,619	889,057	384,204	1,062,408	60,870	3.92	238,708
1997	31,138	2.72	84,834	282,220	868,137	313,358	952,971	60,449	2.59	156,817
10-year average (1987-96)	40,310	2.86	114,050	315,985	830,164	356,295	944,214	46,697	2.32	113,192
Long-term average (1968-96)	25,151	3.14	75,565	209,824	575,284	234,975	650,849	23,759	2.32	113,192
% change from:										
1996	-53	3	-51	-11	-2	-18	-10	-1	-34	-34
10-year avg.	-23	-5	-26	-11	5	-12	1	29	12	39
Long-term avg.	24	-13	12	35	51	33	46	154	12	39

Appendix A. Temperature and precipitation at select cities in, or adjacent to, Minnesota May Waterfowl Survey Strata, 21 April-25 May 1997 (Source: Minnesota Agricultural Statistics Service, 1997 Minnesota Weekly Crop Reports).

		Temperature for week ending:															
		April 27		May 4		May 11		May 18		May 25		Total weekly precip. (in)					Precip. depart. from normal
Regio	City	Avg.[a]	Depart.[b]	Avg.	Depart.	Avg.	Depart.	Avg.	Depart.	Avg.	Depart.	April 2	May 4	May 11	May 18	May 2	1Apr-25 May
NW	Crookston	47.3	1.7	44.0	-4.9	51.0	-0.8	44.9	-9.8	50.2	-7.1	0.01	0.15	0.51	0.17	0.70	2.32
NC	Grand Rapids	46.2	1.5	45.8	-1.8	47.8	-2.5	43.2	-9.7	49.8	-5.5	0.04	0.00	0.57	0.92	0.75	-1.45
	Itasca	43.4	0.2	42.0	-4.4	47.8	-1.6	41.6	-10.7	47.5	-7.4	0.00	0.09	0.78	0.42	1.34	-0.05
WC	Alexandria	47.1	-0.1	47.8	-2.6	49.8	-3.6	46.7	-9.4	51.4	-7.2	0.00	0.02	0.60	0.20	0.17	-2.45
	Fergus Falls	49.6	3.0	48.0	-1.9	53.9	1.0	49.8	-5.9	54.4	-3.9	0.00	0.00	0.60	0.20	1.19	0.65
	Montivideo	50.0	-0.8	47.7	-6.1	51.6	-5.0	50.8	-8.5	55.0	-6.7	0.06	0.43	0.04	0.10	0.37	-1.37
	Morris	49.3	1.9	46.6	-3.9	52.4	-0.9	48.8	-7.3	54.6	-4.0	0.00	0.26	0.43	0.33	0.27	-0.46
C	Becker	49.6	2.0	47.6	-2.9	54.1	0.9	47.0	-8.7	54.6	-3.4	0.00	0.00	0.58	0.67	0.03	-3.26
	Hutchinson	49.7	0.5	48.2	-4.1	53.8	-1.3	48.4	-9.4	55.9	-4.4	0.07	0.61	0.34	0.10	0.05	-2.68
	Staples	46.4	1.3	45.0	-3.2	51.3	0.1	44.2	-9.8	51.5	-5.0	0.10	0.00	0.55	0.31	0.60	-2.50
	St. Cloud	47.8	0.2	47.0	-3.5	51.0	-2.2	47.0	-8.7	53.2	-4.8	0.00	0.11	0.40	0.33	0.11	-3.23
	Willmar	50.0	1.5	47.6	-4.1	53.0	-1.5	48.4	-8.9	55.4	-4.4	0.03	0.38	0.36	0.10	0.19	-3.24
EC	Aitkin	46.1	0.5	46.2	-2.2	51.8	0.8	38.6	-14.9	46.8	-9.1	0.03	0.00	0.38	0.25	0.93	-2.31
	Cambridge	46.8	-1.5	47.2	-4.1	50.4	-3.6	46.6	-10.0	52.7	-6.3	0.00	0.00	0.52	0.43	0.08	-3.12
	Msp Airport	48.6	-1.7	49.0	-4.1	52.8	-2.9	50.2	-8.0	55.8	-4.9	0.03	0.33	0.54	0.36	0.40	-2.56
SW	Pipestone	48.4	-0.1	45.6	-5.8	52.8	-1.3	49.6	-7.0	55.6	-3.5	0.09	1.39	0.50	0.50	0.43	-0.30
	Redwood Falls	51.0	-0.2	50.9	-3.3	53.7	-3.3	51.0	-8.6	56.8	-5.4	0.00	1.22	0.17	0.09	0.14	-2.12
	Worthington	47.2	-1.1	46.1	-4.9	52.8	-0.7	49.2	-6.9	56.7	-2.0	0.01	1.38	0.98	1.41	1.21	2.06
SC	Faribault	47.3	-1.8	47.0	-4.9	52.3	-2.2	48.2	-8.9	55.0	-4.6	0.07	0.69	0.44	0.18	1.20	-2.12
	Waseca	49.8	1.0	47.2	-4.6	53.8	-0.8	49.3	-8.0	56.1	-3.8	0.03	0.72	0.64	0.32	1.69	-0.59
	Winnebago	49.8	1.0	47.2	-4.7	52.4	-2.4	49.2	-8.3	56.2	-3.9	0.00	0.90	0.75	0.22	2.55	-0.29

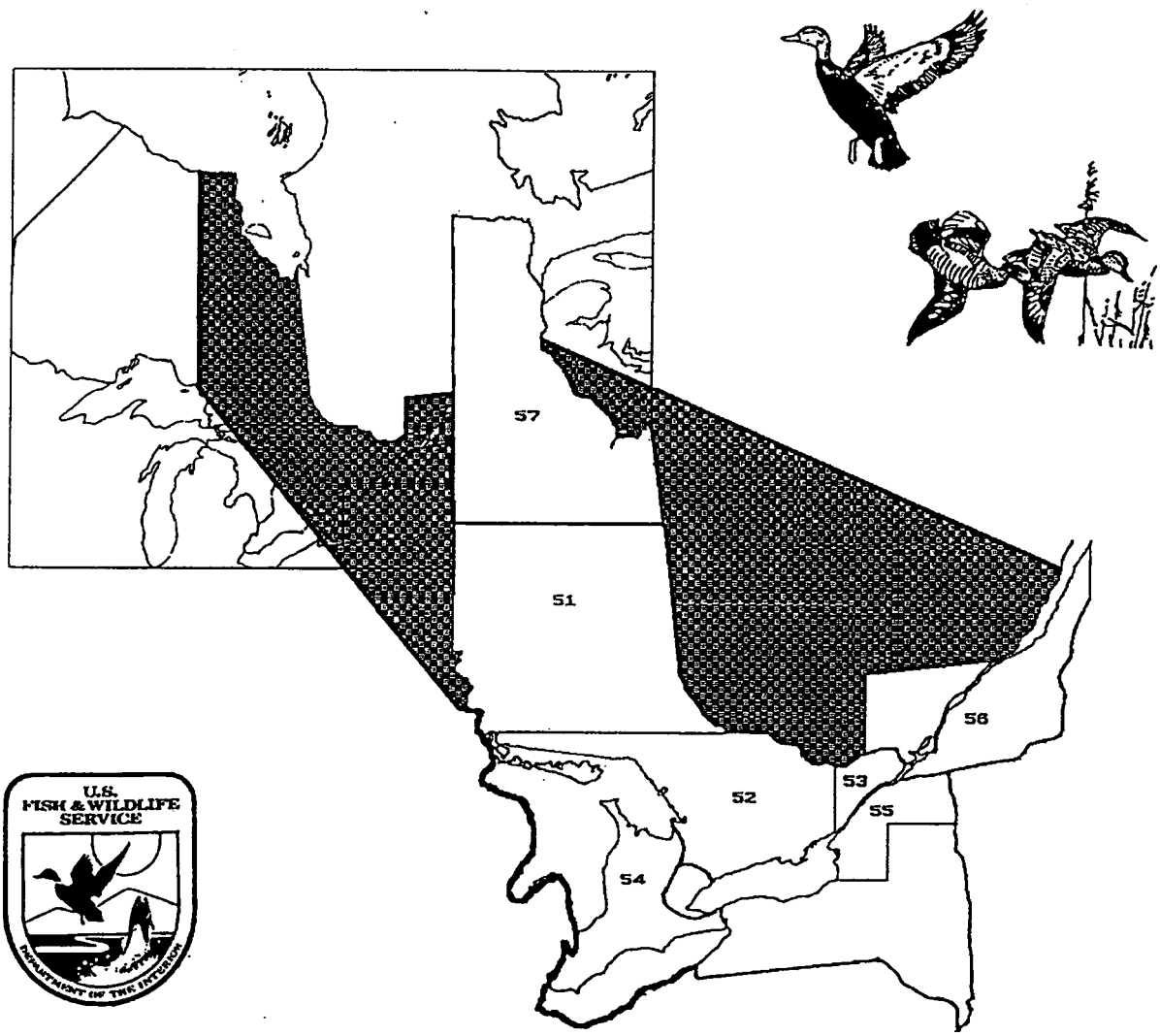
[a] Average temperature (F) for the week ending on the date shown.

APPENDIX C

WATERFOWL BREEDING POPULATION SURVEY

ONTARIO, QUEBEC, AND NEW YORK

1997



TITLE Waterfowl Breeding Population Survey Ontario, Southern Quebec, and Northern New York

STRATA SURVEYED 51, 52, 53, 54, 55, 56

DATA SUPPLIED BY United States Fish and Wildlife Service

Aerial Crews		
Crew 1	Pilot/ Observer	W. Butler, USFWS
	Observer	R. Jessen, USFWS
Crew 2	Pilot/ Observer	R. King, USFWS
	Observer	E. Frank Smith, USFWS
Helicopter Crew		
	Observer	D. Melvin, USFWS
	Observer	B. Cruz, USFWS

ABSTRACT

This is the eighth year of surveys to determine the waterfowl breeding population of eastern Ontario, southern Quebec, and northern New York. A late winter with heavy snow and a cold wet spring delayed the breeding season by at least two weeks. Total duck populations were down -35.4% from 1996 and down -28.5% from the long-term mean. Canada Goose populations were also down -30.3%, and -71.8% from 1996 and the long-term mean. It is important to note that these estimates for Canada Goose are quite variable because they include birds nesting within the strata and migrants which move to more northern nesting areas.

METHODS

The procedures followed in conducting the survey are contained in the *Standard Operating Procedures for Aerial Waterfowl Breeding Ground Population and Habitat Survey,* Section III, revised April 1987. All crews were experienced crews and at least one member had conducted the Aerial Waterfowl Breeding Ground Population Surveys in the past. Stratum 51 was flown by crew one, Strata 52, 53, 54, 55, and 56 were flown by crew two. Crew one used a Cessna 185 amphibious float plane and crew two used a Cessna 182 aircraft on wheels. Visibility corrections were obtained in Stratum 51 by crew three using a Bell Jet Ranger Helicopter. This is a continuing study of visibility bias correction for eastern survey crews, and this is the forth crew to be assessed in this stratum. Data from this assessment is used to correct for visibility bias during the current year. Data from this assessment will be presented at a later date. The survey was delayed for several days due to adverse weather and high wind conditions.

WEATHER AND HABITAT

Snow fall was heavy across the survey area throughout the winter of 1996-97. Winter conditions persisted well into April and delayed spring conditions by at least two weeks across the survey area. Snow fall was particularly heavy along the St. Lawrence River valley with Quebec City, receiving the most snow in recent history. Spring brought cold temperatures with periods of rain, sleet, and high winds. All of these conditions resulted in a seasonal delay of at least two weeks and a resulting delay in nesting. The late season and heavy run off caused some flooding and may have adversely affected early nesting species. Again for the second year water conditions should not be a problem even in the well-drained areas. This should provide suitable nesting and brood cover.

BREEDING POPULATIONS

The 1997 data shows a total breeding population of 880,200 ducks for Strata 51, 52, 53, 54, 55, and 56. This breeding population estimate is -35.4% below 1996, and -28.5% below the long-term mean. Dabbling duck were -29.8% below 1996 levels and -30.1% below the mean. Mallards decline -25.4% below 1996 and -10.6% below the long-term mean. Black ducks also declined -34.2% below 1996 and -49.25 below the mean. Only Pintail 126.1% showed an increase from 1996 but still remained -31.5% below the mean. Diving ducks overall showed a decline from 1996 and the long-term mean of -18.2% and -09.2% respectively. Redheads were 61.3% above 1996 levels but remained below the mean. Scaup was 332.8% above 1996 and 215.1% above the mean. This increase in Scaup no doubt represents the delayed season and a concentration of Scaup moving through this area for more northern and western breeding grounds. Miscellaneous species also indicated a decline of -65.3% from 1996 and -52.4% from the mean. Canada Goose population levels also declined -30.3% form and -71.8% from the mean. Canada Goose population numbers fluctuate in this area because in addition to the nesting birds the area also serves as a staging area for Canada Geese that nest in the Ungava region of Quebec. This year the Ungava received less than normal snow fall and the nesting habitat was available early allowing the geese to migrate much sooner than last year. This probably explains the decline in numbers from last year.

CONCLUSIONS

The production from this area will probably be less than last year, due to the decline in nesting birds and the delayed spring. Favorable brood condition could lessen this decline.

Table 1. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparisons against the previous year and the long-term mean for Eastern Ontario, Southern Quebec, and New York.

	Stratum (1997)									% Change From	
Species/Ponds	51	52	53	54	55	56	1997 Total	1996 Total	1990-1996 Mean	1996	1990-1996 Mean
Ducks											
Dabblers											
Mallard	62.2	50.6	20.1	36.6	21.4	42.6	233.5	313.1	261.3	-25.4%	-10.6%
Am. black duck	29.7	12.8	2.1	2.5	1.7	19.9	68.6	104.3	135.0	-34.2%	-49.2%
Gadwall	0.0	0.0	0.0	0.5	0.5	1.8	2.7	6.6	8.9	-59.4%	-69.9%
Am. wigeon	8.8	6.6	0.0	2.4	0.0	2.0	19.8	31.5	23.6	-37.1%	-16.1%
Am. green-winged teal	53.5	5.0	2.0	6.4	1.6	19.4	87.9	138.4	82.7	-36.5%	6.3%
Blue-winged teal	0.0	7.0	2.8	5.1	0.0	0.0	14.9	16.1	98.9	-7.9%	-85.0%
N. shoveler	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	1.3	-100.0%	-100.0%
N. pintail	0.0	0.0	0.0	0.4	0.0	3.1	3.5	1.5	5.1	126.1%	-31.5%
Subtotal	154.2	82.0	26.9	53.8	25.2	88.7	430.9	613.9	616.8	-29.8%	-30.1%
Divers											
Redhead	0.0	0.0	0.0	2.4	0.0	0.6	3.0	1.8	3.9	61.3%	-23.9%
Canvasback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	--	-100.0%
Scaups	6.5	16.1	0.0	2.0	0.0	2.6	27.1	6.3	8.6	332.8%	215.1%
Ring-necked duck	171.2	21.5	1.7	2.0	2.0	9.4	207.8	214.1	187.9	-2.9%	10.6%
Goldeneyes	62.0	6.2	0.0	7.3	0.0	1.9	77.4	121.5	103.7	-36.3%	-25.3%
Bufflehead	11.0	1.9	0.0	0.0	0.2	1.2	14.3	47.1	51.9	-69.6%	-72.4%
Ruddy Duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2	4.2	-100.0%	-100.0%
Subtotal	250.7	45.7	1.7	13.6	2.3	15.7	329.7	403.1	362.9	-18.2%	-9.2%
Miscellaneous											
Oldsquaw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	--	-100.0%
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.5	-100.0%	-100.0%
Scoters	3.2	0.0	0.0	0.0	0.0	0.0	3.2	0.2	5.0	1210.2%	-35.5%
Mergansers	81.4	15.3	0.9	6.1	0.0	12.6	116.4	340.9	243.9	-65.8%	-52.3%
Subtotal	84.7	15.3	0.9	6.1	0.0	12.6	119.6	344.6	251.4	-65.3%	-52.4%
Total Ducks	489.6	143.0	29.6	73.5	27.4	117.0	880.2	1361.6	1231.1	-35.4%	-28.5%
Canada Goose	10.6	15.5	6.0	52.2	6.2	5.3	95.7	137.2	339.6	-30.3%	-71.8%
Am. coot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6	8.2	-100.0%	-100.0%

Survey design for Ontario, Southern Quebce and Nothern New York, May 1997

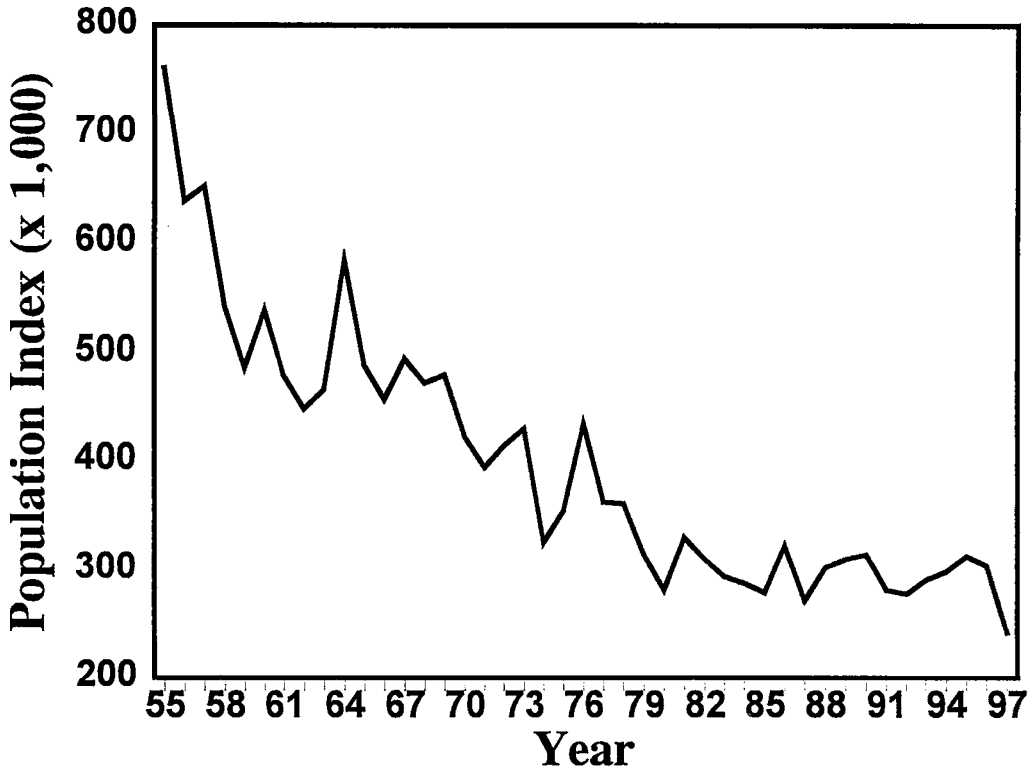
STRATUM	51	52	53	54	55	56
Survey Design						
Square miles in stratum	78,680	28,266	4,259	12,245	4,149	21,721
Square miles in sample	378	180	54	189	54	234
Lineal miles in sample	1,512	720	216	756	216	936
Number of transects in sample	6	4	4	10	5	9
Number of segments in sample	84	40	12	42	12	52
Expansion factor	208.1481	157.0333	78.8704	64.7894	76.8333	92.8248
Current Year Coverage						
Square miles in stratum	78,680	28,266	4,259	12,245	4,149	21,721
Square miles in sample	337.5	180	45	166.5. 5	54	212
Lineal miles in sample	1,350	720	180	666	216	162
Number of transects in sample	6	4	4	9	5	9
Number of segments in sample	75	40	10	37	12	47
Expansion factor	233.1259	157.0333	94.64444	73.5435	76.8333	102.6998

Appendix 1. Long-term trend in adjusted waterfowl breeding population estimates (thousands) for Eastern Ontario, Southern Quebec, and New York.

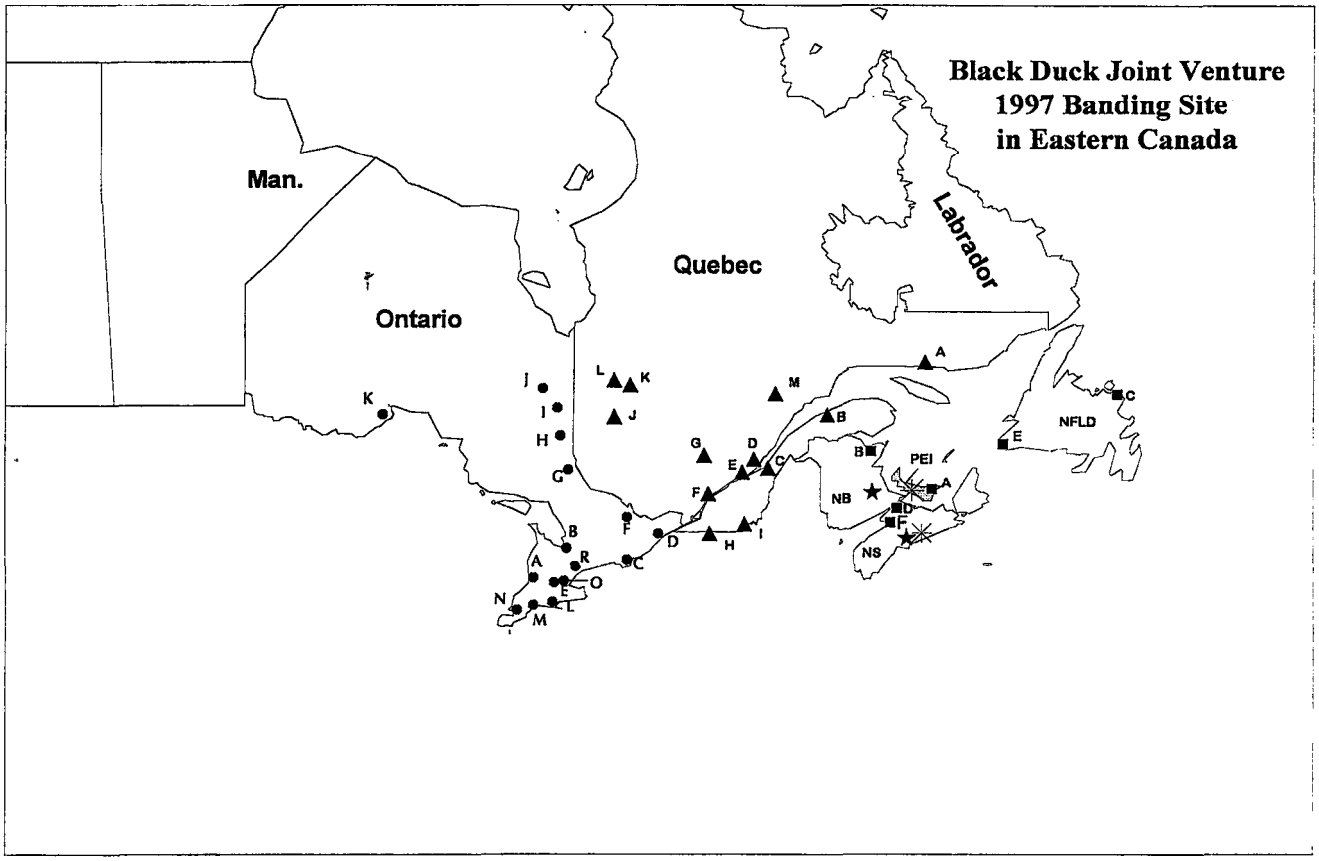
Species/Ponds	1990	1991	1992	1993	1994	1995	1996	1997
Ducks								
Dabblers								
Mallard	208.6	169.8	362.2	333.8	238.6	202.8	313.1	233.5
Am. black duck	160.9	126.0	160.3	124.6	116.3	152.6	104.3	68.6
Gadwall	11.2	7.4	4.9	1.9	0.0	30.6	6.6	2.7
Am. wigeon	31.0	45.4	15.4	9.4	18.9	13.8	31.5	19.8
Am. green-winged teal	47.1	42.2	43.8	47.4	169.2	90.7	138.4	87.9
Blue-winged teal	135.7	43.5	65.6	288.6	81.9	60.5	16.1	14.9
N. shoveler	2.2	2.2	0.0	1.0	1.1	0.5	2.4	0.0
N. pintail	25.6	3.4	2.0	0.4	1.1	1.4	1.5	3.5
Subtotal	622.3	439.9	654.3	807.0	627.0	552.9	613.9	430.9
Divers								
Redhead	4.7	3.6	0.7	4.5	5.8	6.1	1.8	3.0
Canvasback	3.3	4.4	1.5	3.0	4.6	2.1	0.0	0.0
Scaups	10.9	5.1	9.9	6.8	16.7	4.7	6.3	27.1
Ring-necked duck	92.1	158.1	251.6	248.1	163.5	187.6	214.1	207.8
Goldeneyes	73.3	138.4	241.0	90.2	55.0	6.5	121.5	77.4
Bufflehead	99.9	94.1	59.0	13.1	33.4	17.0	47.1	14.3
Ruddy Duck	0.0	12.0	0.0	5.1	0.0	0.0	12.2	0.0
Subtotal	284.2	415.7	563.6	370.7	279.0	223.9	403.1	329.7
Miscellaneous								
Oldsquaw	10.6	0.0	0.0	3.8	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0
Scoters	1.9	6.4	3.0	0.0	18.3	5.0	0.2	3.2
Mergansers	157.5	263.9	128.1	164.9	358.4	293.6	340.9	116.4
Subtotal	170.0	270.3	131.1	168.7	376.8	298.6	344.6	119.6
Total Ducks	1076.5	1125.9	1349.1	1346.5	1282.8	1075.4	1361.6	880.2
Canada Goose	366.3	862.1	157.0	232.1	289.4	332.8	137.2	95.7
Am. coot	4.1	19.0	6.1	5.1	2.4	5.2	15.6	0.0

APPENDIX D

Black Duck Population Estimates
From Mid-Winter Surveys 1955-1997



APPENDIX E



Ontario

A Wingham
B Midhurst
C Napanee
D Cornwall
E Cambridge
F Pembroke
G North Bay
H Temagami
I Kirkland Lake
J Timmins
K Thunder Bay
L Long Point
M Alymer
N Lake St. Clair
O Mountsberg Conservation Area

Quebec

A Baie J. Beetz
B Isle Verte
C Montmagny
D Cap Tourmente
E Duchesnay/ Lac Beauport
F Lac St. Pierre
G La Tuque
H Baie Missisiquoi
I Sherbrooke
J Riviere Piche
K Lac Parent
L Lac des Hauters
M St-Flugence (Saguenay)

Atlantic Region

A PEI
B Bathurst, NB
C Carmanville, NF
D NS/NB Border Marsh
E Codroy, NF
F Belleisle, NS
★ Provincial Pre-season Banding
✳ Provincial Winter Banding

CWS ATLANTIC REGION BANDING REPORT

1997 Pre-season Banding Report by: M.C. Bateman and R.J. Hicks

Banding Station Location: Atlantic Region

Crew Members: C. McAleenan, J. Hudson, G. Brinson, C. Faulkner, I. Walker, T. Mackinnon, S. Gaudet and R. Hicks.

Results: Note that when age and sex were not given for an individual, the total also includes birds not included in the other columns.

Species	AHYM	AHYF	HYM	HYF	LM	LF	Total
Black Duck	**148**	**132**	**610**	**574**	**38**	**50**	**1,553**
Mallard	19	19	59	60	19	33	209
Mallard X Black Duck	1	2	18	8	0	5	34
Wood Duck	70	6	1	1	0	0	78
Northern Pintail	1	1	4	10	0	0	16
Ring-necked Duck	4	13	19	29	45	49	160
American Wigeon	2	6	17	34	28	34	121
Blue-winged Teal	30	39	105	107	19	17	317
Green-winged Teal	51	132	455	363	9	24	1,034
Canada Goose	157	201	3	5	0	0	366
Gadwall	0	5	5	4	12	23	49
Shoveler	0	0	1	1	0	3	5
Greater Snow Goose	1	3	0	0	0	0	4
Total							**3,946**

New Brunswick Department of Natural Resources and Energy
BANDING REPORT

1997 Pre-season Banding Report by: Staff

Banding Station Location: Saint John River Wetlands

Crew Members: New Brunswick DNRE Staff

Results: Note that when age and sex were not given for an individual, the total also includes birds not included in the other columns.

Species	AHYM	AHYF	HYM	HYF	LM	LF	Total
Black Duck	**26**	**50**	**294**	**210**	**10**	**6**	**596**
Mallard	25	25	73	50	0	1	174
Mallard X Black Duck	3	2	22	3	0	0	30
Wood Duck	121	7	11	1	2	2	144
Northern Pintail	0	1	8	7	0	0	16
Ring-necked Duck	2	1	8	4	3	4	22
American Wigeon	1	0	1	0	0	0	2
Blue-winged Teal	20	7	37	26	0	0	90
Green-winged Teal	32	32	44	42	0	0	150
Total							**1,224**

Nova Scotia Department of Natural Resources
BANDING REPORT

1997 Pre-season and Winter Banding Report by: Randy Milton

Banding Station Locations: Musquodoboit Harbour, Halifax Co., McElmon's Pond, Colchester Co., Sullivan's Pond, Halifax Co., Eastern Shore Islands, Halifax/Guysborough Co.

Crew Members: Staff- Nova Scotia Department of Natural Resources.

Results: Results do not include recaptures from previous years.

Species	AHYM	AHYF	HYM	HYF	Total
Black Duck (Jan/Feb)	**117**	**71**	**0**	**0**	**188**
Black Duck- pre-season	3	8	69	58	138
Mallard . (Jan/Feb)	6	1	0	0	9
Mallard X Black (Jan/Feb)	1	2	0	0	3
Mallard X Black Pre-season	0	0	2	0	2.
Green-winged Teal Pre-season	0	1	8	1	10.
Common Eider (May-June)	0	182	0	0	182.
Common Eider (August)	330	2	0	0	332.
Total					**864**

Prince Edward Island Department of Fish and Wildlife
BANDING REPORT

1997 Winter Banding Report by: Staff

Banding Station Locations: Bayview, Cardigan, Ellen's Creek, Grand River, Marshfield, Mill River, Souris River and Vernon.

Crew Members: Staff

Results:

Species	Male	Female	Unknown	Total
Black Duck	**414**	**165**	**17**	**596**
Black Duck- Mallard Hybrid	6	1	0	7
Mallard	18	7	0	25
Total				628

CWS QUÉBEC REGION BANDING REPORT

1997 Pre-season Banding Report by: P. Dupuis

Banding Station Location: Québec Region

Crew Members: L. Breton, M. Paquin, S. Gagnon, M. Bourque, M. Labonté, J.M. Côté, H. Jacob, J. Bachand, J. Landry, M. Castilloux, J. Sauro, G. Kelly, P. Messier, and R. Angers.

Results: Note that when age and sex were not given for an individual, the total includes birds not included in the other columns.

Species	AHYM	AHYF	HYM	HYF	LM	LF	Total
Black Duck	**188**	**108**	**782**	**565**	**43**	**27**	**1,716**
Mallard	906	249	1366	826	58	49	3,459
Mallard X Black Duck	15	1	27	25	2	1	71
Wood Duck	303	18	65	46	12	4	448
Northern Pintail	12	39	21	17	1	1	91
Ring-necked Duck	4	5	15	12	0	1	37
American Wigeon	0	1	2	2	0	0	5
Blue-winged Teal	15	11	66	75	2	3	172
Green-winged Teal	251	185	386	304	2	2	1,131
Gadwall	0	1	0	1	0	0	2
Shoveler	0	0	0	1	0	0	1
Canada Goose	18	18	0	0	0	0	85[1]
Total							**7,218.**

[1] ASY, 21 males and 28 females included in the total banded.

ONTARIO 1997 BANDING RESULTS

Includes all birds banded under programs or stations in Ontario that were at least partially supported by the Atlantic Flyway Cooperative Banding Program.

Station	Mallard	Black Ducks	Mallard-Black Hybrid	Wood Ducks	Blue-Winged Teal	Green-Winged Teal	Ring-Necked Duck	Other	TOTAL
ALYMER	950	**15**	5	160	7	1	0	26	1,164
CAMBRIDGE	2,181	**49**	8	99	197	0	2	11	2,547
WINGHAM	1,067	**15**	1	35	12	0	0	1	1,131
MIDHURST	713	**75**	4	2	2	0	0	29	825
NAPANEE	324	**6**	1	0	1	0	0	0	332
CORNWALL	642	**91**	7	20	2	2	0	6	770
PEMBROKE	44	**24**	0	0	0	1	0	0	69
THUNDER BAY	1,346	**172**	15	2	8	9	3	22	1,577
TIMMINS	476	**64**	3	1	8	88	6	6	652
KIRKLAND LAKE	1,009	**178**	21	46	109	40	10	20	1,433
TEMAGAMI	69	**320**	4	23	0	0	0	0	416
NORTH BAY	401	**70**	13	2	0	0	0	0	486
AIR BOAT	703	**195**	6	193	224	149	151	230	1,851
MOUNTSBERG, C.A	214	**1**	0	43	0	1	306	230	795
CWS-LONDON	1,272	**17**	4	249	1,370	202	0	2	3,116.
TOTALS	11,411	**1,292**	92	875	1,940	493	478	583	17,164

The Atlantic Flyway states banded significantly more ducks in 1997 than in 1996. Total ducks banded increased 22% (+3,523) and black ducks banding increased 31% (+337) in 1997. Preseason Canada goose banding declined 20% (-1,319) while June Canada goose banding decreased 30% (-2,678) from 1996 to 1997. State totals are as follows:

STATE	TOTAL* DUCKS		BLACK DUCKS		CANADA GEESE		JUNE CANADA GEESE	
	1996	1997	1996	1997	1996	1997	1996	1997
North Carolina	1,297	1,651	0	0	12	176	769	23
New York	4,367	4,550	125	199	1,163	1,371	525	475
Delaware	443	642	45	16	6	0	0	142
Maine	555	658	342	383	0	0	0	0
Pennsylvania	3,758	5,122	55	128	784	374	1,470	1,553
New Jersey	814	836	14	22	1,380	1,393	3,040	1,965
South Carolina	729	497	0	0	250	0	0	0
Maryland	719	1,550	249	340	0	112	0	0
Florida	927	1,007	0	0	0	0	0	0
Georgia	87	103	0	0	0	309	452	194
Virginia	45	471	36	21	837	1,033	1,532	568
Connecticut	0	156	0	5	831	0	379	100
Massachusetts	1,395	1,749	168	254	1,165	17	493	0
Vermont	868	614	20	57	150	261	0	0
New Hampshire	292	233		26	125	64	307	409
West Virginia	26	6	0	0	43	217	0	960
Rhode Island	0	0	0	0	0	0	0	0
Total	16,322	19,845	1,078	1,415	6,746	5,427	8,967	6,289

*Total ducks includes black ducks

APPENDIX F

1997 ANNUAL PROGRESS REPORTS

Project Title: A landscape-level evaluation of habitat use by breeding Black Ducks in the Maritime Provinces.

Investigator: Alan R. Hanson

Objective: To create predictive models of expected Black Duck pair densities for large geographic regions based on landscape-level habitat characteristics.

General Description of the Study: This study will investigate the ability of landscape-level habitat data such as number and type of wetlands, ecological land classification, and soil and water chemistry, to explain differences in the number of Black Duck pairs observed among BDJV Survey plots. Geographical Information Systems (GIS) and statistical procedures will be used to establish relationships between habitat characteristics and the number of Black Duck pairs observed in the survey plots. Relationships between habitat and Black Duck pair densities within survey plots will be used to create models that estimate pair densities in larger geographic regions e.g., provincial population estimates. My research will also evaluate the relative importance of different eco-geographical regions, wetland types, and managed versus unmanaged habitat, to breeding Black Ducks.

Report on Progress: During the summers of 1996 and 1997, water samples were collected from over 860 wetlands in the 50 survey plots and analyzed at Environment Canada's water quality labs. Currently soil and water chemistry data are being integrated with wetland inventory data. Predictive models to be prepared during the fall of 1998.

Partners:
Eastern Habitat Joint Venture
New Brunswick Department of Natural Resources & Energy
Nova Scotia Department of Natural Resources
University of Western Ontario
Environment Canada
Ducks Unlimited Canada

Funding Received to date: FY97: $5,200 (BDJV)

Start Date: July 1996
End Date: March 1999

ANNUAL PROGRESS REPORT FOR 1997

Project Title: Beaver pond management assessment program: Long term monitoring of waterfowl and non-waterfowl populations on beaver ponds in eastern Ontario.

Investigators:
- T. Shane Gabor, Research Biologist, Institute for Wetland and Waterfowl Research Ducks Unlimited Canada
- Henry R. Murkin, Research Scientist, Institute for Wetland and Waterfowl Research Ducks Unlimited Canada and Adjunct Professor, Department of Renewable Resources, McGill University
- Joel Ingram, Biologist, Ducks Unlimited Canada

Objectives:
The objectives of the study are;
1.To determine waterfowl (primarily black duck, mallard, wood duck and hooded merganser) density changes and habitat use on landscapes with managed and unmanaged beaver ponds.
2. To determine the abundance and habitat use of selected non-waterfowl species on landscapes with managed and unmanaged ponds.
3. To compare beaver abundance and distribution and habitat change resulting from beaver activity on managed and unmanaged landscapes.

General Description of the Study: In 1993, a long-term monitoring program was initiated to evaluate changes in waterfowl densities and habitat quality on landscapes with and without beaver pond management in eastern Ontario. Pair and brood surveys were conducted to determine the effects of beaver pond enhancement on waterfowl productivity and non-waterfowl abundance and habitat use. Beaver abundance, distribution and their effect on habitat quantity and quality will be determined.

Report on Progress (for ongoing work): From 1993-1997, pair and brood surveys were conducted on the study areas. Aerial photography was employed to determine habitat use. Data from the 1993-1997 field seasons has been analysed and a final report will be forwarded to the BDJV by September 30, 1998.

Partners: BDJV, DUC/IWWR, CWS, NAWCA, OMNR, NE Research Group-NBS.

Funding Received to date:

BDJV:	$49,000
IWWR/DUC:	$393,700
CWS:	$40,000
NAWCA:	$46,000
OMNR :	$15,000

Beginning Date:March 1, 1993
Ending Date: September 30, 1998

Progress Report---FY97 Research

Project Title: Breeding ecology of the American black duck (Anas rubripes) in the Bloodsworth-South Marsh-Deal Island complex.

Investigators: G. M. Haramis and D. G. Jorde, U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, Maryland 20708

Objective: Determine the breeding productivity and principal ecological relationships of nesting American black ducks on island saltmarsh habitats of mid Chesapeake Bay.

General Description: An initiative by the Department of Defense (U.S. Navy) to include its 5,400 acre Bloodsworth Island Shore and Bombardment Range under cooperative management by the North American Waterfowl Management Plan has resulted in our participation to conduct research on the breeding ecology of the American black duck in the Bloodsworth archipelago. This series of 3 large, offshore islands remains some of the most valuable wild lands and wildlife habitat in the Chesapeake Bay, and is one of the last strongholds for a formerly large southern breeding black duck population endemic to the Chesapeake Bay. Island nesting black ducks have never been studied at this location and few management guidelines are available. Because of live ordinance on Bloodsworth Island, comparative study of black ducks was conducted in 1995 and 1996 on Martin National Wildlife Refuge on Smith Island.

Report on Progress: Data based on 56 female and 10 male American black ducks radiomarked during 1995-1996. Findings suggest this study site is a harsh environment resulting in a weak nesting effort and poor hatching success because of predation (red fox, gulls)and flooding of nests from storm tides. Lack of freshwater may affect duckling growth; the status of widgeon grass (*Ruppia maritima*), which has declined, might be affecting resident American black ducks on this island complex.

Partners: Department of Defense - Navy, Blackwater National Wildlife Refuge, Maryland Department of Natural Resources, and the University of Maryland.

Funding Received to Date: FY97 funding US: $5,000.

Start Date: October 1994
End Date: October 1997

Progress Report---FY97 Research

Project Title: Variables affecting the black duck decline and current status of black ducks and mallards in southern Ontario.

Investigators: Jerry R. Longcore, Daniel G. McAuley

Objective: To revisit several data bases relating to mallard and black duck occurrence and harvest in

southern Ontario during the period of the black duck decline from the late 1960s to 1983.

General Description of the Study: The project will involve the evaluation of several sets of existing data relative to wetland availability, habitat change, human population changes, black duck and mallard harvests, sex and age of harvested ducks and hunter numbers. Relationships among variables will be examined to determine which one (or ones) most plausibly explains the decline in the black duck population before harvest restrictions were implemented in 1983.

Report on Progress: Several data sets have been obtained and preliminary analyses have been completed. Further analyses required before tentative results can be verified.

Partners: Canadian Wildlife Service, Atlantic and Quebec Regions
University of Quebec at Montreal
Office of Migratory Bird Management, US Fish & Wildlife Service

Funding Received to date: Part of total RWO funding, which began in 1990. FY97 funding US: $47,700.

Start Date: FY90
End Date: FY98

Progress Report—FY97 Research

Project Title: An evaluation of visibility bias of waterfowl broods from helicopters over beaver pond habitat in eastern Ontario.

Investigators: Jerry R. Longcore, Daniel G. McAuley

Objective: (a) To determine the reliability of helicopters in counting waterfowl broods in forested wetlands of Nova Scotia and Ontario, and (b) to assess behavior of broods in response to the helicopter over the wetland.

General Description of the Study: Although helicopter surveys for breeding pairs produce results similar to those of ground surveys, the results for broods is not as reliable. To determine the reliability of helicopter surveys in detecting broods simultaneous ground and helicopter counts were conducted in Nova Scotia and Ontario.

Report on Progres: Some data from this study in Ontario was exposed in a presentation by T. Shane Gabor at the 59th Midwest Wildlife Conference and in the published Abstract:

Gabor, T.S., J.R. Longcore, and H.R. Murkin. 1997. Visibility bias of helicopter waterfowl brood surveys on beaver pond habitat in eastern Ontario. Midwest Wildlife Conference 59: 174.

A manuscript discussing the behavioral responses of waterfowl species to the approach and presence of the helicopter, including data from another field season in Ontario, is in preparation. Publication of the behavior manuscript will complete this project.

Partners: Institute for Waterfowl and Wetland Research, Ducks Unlimited. (Bruce Pollard, Nova Scotia; T. Shane Gabor, Ontario)

Funding Received to date: Part of total RWO funding, which began in 1990.
FY97 funding US: $1,000.

Start Date: FY90
End Date: FY98

Progress Report---FY97 Research

Project Title: Survival of juvenile male and female black ducks during staging and migration to the Atlantic Coast wintering areas

Investigators: Jerry R. Longcore, Daniel G. McAuley

Objective: To determine survival and habitat use by black ducks and mallards during staging and migration form Quebec, Nova Scotia, and Vermont to mid-Atlantic wintering areas.

General Description of the Study: The project employed telemetry to document black duck mortalities from all causes at 3 locations (Quebec, Nova Scotia, Vermont/Quebec border)over 2 years in conjunction with the CWS and Provincial fish and wildlife agencies, and to determine Kaplan-Meier survival estimates by location, sex and age classes.

Report on Progress: The manuscript from data obtained in this study for American black ducks was submitted to the Journal of Wildlife Management. It is now being revised for resubmission. Some of the data obtained for mallards during this study was presented at the First North American Duck Sumposium & Workshop.

Longcore, J.R., D.G. McAuley, and C.M. Bunck. 1997. Survival and fates of staging juvenile, female mallards in the Vermont / Quebec border region. Page 59 *in* A.D. Afton and R. Helm, eds. First North American Duck Symposium & Workshop. Baton Rouge, LA (Abstract).

Partners: Canadian Wildlife Service, Atlantic and Quebec Regions
University of Quebec at Montreal
Office of Migratory Bird Management, US Fish & Wildlife Service

Funding Received to date: Part of total RWO funding, which began in 1990.
FY97 funding US: $4,000.

Start Date: FY90
End Date: FY98

Progress Report---FY97 Research

Project Title: Landscape-level determinants of the distribution and abundance of black ducks wintering in habitats along the Atlantic coast.

Investigators: Dennis G. Jorde; Jerry R. Longcore

Objective: To determine landscape level changes in habitat used by black ducks wintering in the Atlantic Flyway with a primary focus on coastal wintering areas, but will include inland sites (e.g.. Reservoirs, lakes) were black ducks previously and currently concentrate in large numbers (e.g. >10% of the Atlantic Flyway population).

General Description of the Study: The project is focused on assembling, examining and interpreting existing data on black duck populations and Atlantic Coast habitats collected by federal and state agencies during mid-winter inventories and at other times.

Report on Progress: Mid-Winter Inventory data have been verified for most Atlantic Flyway states; more work is needed for Georgia and Florida data sets. Analysis of habitat changes and responses in Mid-Winter Inventory numbers can not begin until the entire data set has been verified. No products to report.

Funding Received to date: FY97 funding US: $108,100. .

Start Date: FY96
End Date: FY99

Progress Report---FY97 Research

Project Title: Body condition and muscle protein of wintering black ducks on wildlife refuges.

Investigators: Dennis G. Jorde, Perry S. Barboza.

Objective: To enhance scientific understanding of the natural and human-induced processes that influence the function of waterbirds in the biological systems of wetlands.

General Description of the Study: Reports in the literature suggest that measures of body condition of waterfowl might be used to assess individual viability for survival and reproduction, and to indicate the quality of habitat supporting ducks in the wild. This aspect would be evaluated by a series of experiments to achieve the following: Measure the effect of feeding frequency on body composition, food intake, and digestion and establish relations between direct measures of whole-body fuel metabolism and indirect measures of body composition and muscle protein metabolism. Measure the effects of dietary energy dilution with fibre and ash on body and muscle composition, food intake and digestion of birds fed intermittentlly over winter. Assess the effect of exercise on energy expenditure and measures of body and muscle composition in ducks held in flight cages from autumn to spring. Apply indirect methods of muscle and body composition to wild birds in refuges along migratory flyways.

Report on Progress: The effects of dietary energy dilution on body and muscle composition, food intake and digestion were measured with birds fed intermittently during winter. Validation studies of procedures and techniques have been completed. Analyses of data collected in the first experiment are in progress. The next experiment is being set up.

Funding Received to date: FY97 funding US: $77,800.

Start Date: FY97
End Date: FY98

Progress Report---FY97 Research

Project Title: Developing models of black duck populations

Investigators: James. D. Nichols, James E. Hines, Mark Miller

Objective: The primary objective is to develop predictive models of population response to management activity, based on demographic estimates and environmental covariates.

General Description of the Study: The NAWMP and the adaptive harvest management working group of the U.S. Fish and Wildlife Service, with cooperation of Canadian Wildlife Service, are modeling harvest and environmental effects on midcontinent mallards; designing actively adaptive approaches for habitat management in the Lower Mississippi and Prairie Pothole Joint Ventures; and considering how effects can be assessed at multiple geographic scales. The proposed black duck population modeling will cooperate with these efforts to develop model structures in which competing hypotheses about influences of habitat on environmental change on black ducks can be addressed.

Report on Progress: New project.

Funding Received to date: FY97 funding US: $20,000.

Start Date: FY97
End Date: FY98

Progress Report---FY97 Research

Project Title: Breeding ecology of the American black duck (Anas rubripes) in the Bloodsworth-South Marsh-Deal Island complex.

Investigators: G. M. Haramis and D. G. Jorde, U.S. Geological Survey, Patuxent Wildlife Research Center, Laurel, Maryland 20708

Objective: Determine the breeding productivity and principal ecological relationships of nesting American black ducks on island saltmarsh habitats of mid Chesapeake Bay.

General Description: An initiative by the Department of Defense (U.S. Navy) to include its 5,400 acre Bloodsworth Island Shore and Bombardment Range under cooperative management by the North American Waterfowl Management Plan has resulted in our participation to conduct research on the breeding ecology of the American black duck in the Bloodsworth archipelago. This series of 3 large, offshore islands remains some of the most valuable wild lands and wildlife habitat in the Chesapeake Bay, and is one of the last strongholds for a formerly large southern

breeding black duck population endemic to the Chesapeake Bay. Island nesting black ducks have never been studied at this location and few management guidelines are available. Because of live ordinance on Bloodsworth Island, comparative study of black ducks was conducted in 1995 and 1996 on Martin National Wildlife Refuge on Smith Island.

Report on Progress: Data based on 56 female and 10 male American black ducks radiomarked during 1995-1996. Findings suggest this study site is a harsh environment resulting in a weak nesting effort and poor hatching success because of predation (red fox, gulls)and flooding of nests from storm tides. Lack of freshwater may affect duckling growth; the status of widgeon grass (*Ruppia maritima*), which has declined, might be affecting resident American black ducks on this island complex.

Partners: Department of Defense - Navy, Blackwater National Wildlife Refuge, Maryland Department of Natural Resources, and the University of Maryland.

Funding Received to Date: FY97 funding US: $5,000.

Start Date: October 1994
End Date: October 1997

APPENDIX G

PUBLICATIONS AND OTHER PRODUCTS RESULTING FROM BDJV SUPPORTED RESEARCH IN CANADA AND THE U.S.

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Daborn, G. / M. Brylinsky

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Laniel, J-P and J.B. Pollard. 1996. Impact of Atlantic dykeland wetland restoration on regional waterfowl populations. *In* Habitat Management in Floodplains and Tidal Marshes – Problems in Impoundments Proc. 2nd Québec EHJV Research Technical Workshop, February, Québec, QC

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