



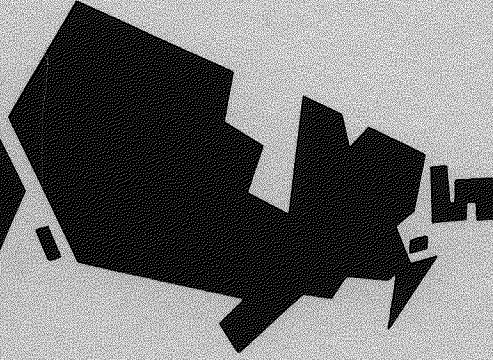
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CANADA LAND INVENTORY



LAND CAPABILITY FOR
WILDLIFE - WATERFOWL

SUMMARY REPORT

The Canada Land Inventory

Report No. 16

1981

Canada

CANADA LAND INVENTORY

LAND CAPABILITY CLASSIFICATION FOR WILDLIFE -- WATERFOWL

SUMMARY REPORT

INTRODUCTION

Under the Canada Land Inventory (CLI) program, roughly 25% of Canada (2.3 million sq. km) was surveyed for its capability to support waterfowl. Less than 8% of this area is prime waterfowl area (classes 1 to 3) for breeding and migration, yet roughly 50% of the ducks in North America come from these areas. Most of the breeding areas are in the prairie provinces.

Only a small proportion of the area surveyed (1.5% or 38 760 sq. km) is suitable for resting and concentration areas during migration; most of this occurs in pockets across the country. Important areas are along major shorelines - the Atlantic, Pacific, lower Great Lakes Gulf of St. Lawrence and the St. Lawrence River. These and other facts about the physical capability of Canada's land resources are now available from an analysis of Canada Land Inventory (CLI) Data.

BACKGROUND TO THE CANADA LAND INVENTORY PROGRAM

The CLI began in 1963 as a cooperative federal-provincial program; its purposes was to assess and document the physical capability and use of land within the settled areas of Canada. The complete inventory area covers approximately 1 million square miles and encompasses the regions of Canada that have significant human population; those include the Island of Newfoundland, the Maritimes and the settled parts of Quebec, Ontario and the Western Provinces (Refer to Map 1). Areas outside the present CLI boundaries contain significant areas of land capable of wildlife production (Refer to Table 1).

The CLI program consisted of mapping and assessing the lands of Canada for agriculture capability, forestry capability, recreation capability, wildlife (waterfowl and ungulates) capability and present land use.

Each province classified its land according to the national classification systems. The wildlife data have been prepared by the provincial and federal government departments responsible for resource development. The waterfowl capability data were compiled by federal officials of the Canadian Wildlife Service.

To facilitate the use of data for land planning and resource studies, a computerized data bank and analytical system were developed as part of the CLI program. The system, known as the Canada Geographic Information System (CGIS), permits all CLI data to be transformed to numeric data for analysis.

After fifteen years of field studies and mapping programs, which have involved the cooperative participation of more than 100 provincial and federal agencies, several universities, non-governmental organizations and private companies, the CLI is nearing completion. As the map data are analyzed through the CGIS, a national picture of actual and potential land use emerges. The results provide data concerning land capability for waterfowl for 9 provinces.



Map 1 CLI area / région ITC

Tables 2 to 6 present a summary of waterfowl, land and water capability information. Knowledge of the CLI land classification system is required to fully understand the tables.

THE WILDLIFE LAND CLASSIFICATION SYSTEM¹

The Wildlife Sector of the Canada Land Inventory has some unique aspects, particularly the great diversity of wildlife species, their different environmental requirements, and their mobility and other behavioral attributes. One national series of maps cannot effectively represent the capability of land to produce or support all species of wildlife. For this reason, the capability inventory is restricted to two main groups of species which occur across Canada: ungulates, which are the responsibility of the provincial governments, and waterfowl which by treaty are the responsibility of the federal government. The classification system used is the same for both groups, with slight modifications due to their different environmental requirements. This report will deal only with waterfowl.

LAND CAPABILITY FOR WATERFOWL

The CLI rating system distinguishes two forms of "land" use by waterfowl -- breeding areas and migration routes. Requirements for breeding relate mainly to small bodies of water and the associated uplands. Those for migration relate mainly to large water bodies. Staging areas are a combination of the two.

For the purposes of the CLI classification, waterfowl can be divided into three groups--ducks, geese, and swans. The surveyed area includes all of the major duck breeding areas in Canada. Areas important to geese and swans, which nest further north, as far as Banks and Baffin Islands, are not shown. All waterfowl migrate through the survey area in the spring and fall. Use, and the capability for use of those areas by waterfowl is related to geological history, availability of water and its quality, plant cover and weather patterns.

CAPABILITY CLASSES

The basic unit of the classification system is the capability class which denotes the ability of land or water to support or produce waterfowl. The capability class level is determined by the degree of limitation which affects the quality and/or quantity of habitat for the waterfowl.

In the CLI classification of land capability for waterfowl, land and water units are grouped into seven classes according to their potential and limitations to produce and support wildlife. The most highly rated units, those having no significant limitations are designated Class 1. Units with no significant potential are designated Class 7. Units designated 2 to 6 indicate, in declining order, capability of the land to support waterfowl. Special modifiers are used to designate areas that are important for support rather than the production of birds. A summary description of the waterfowl classification follows.

1

Abstracted from CLI Report No.7 "Land Capability Classification for Wildlife" 1970 Reprinted 1973.



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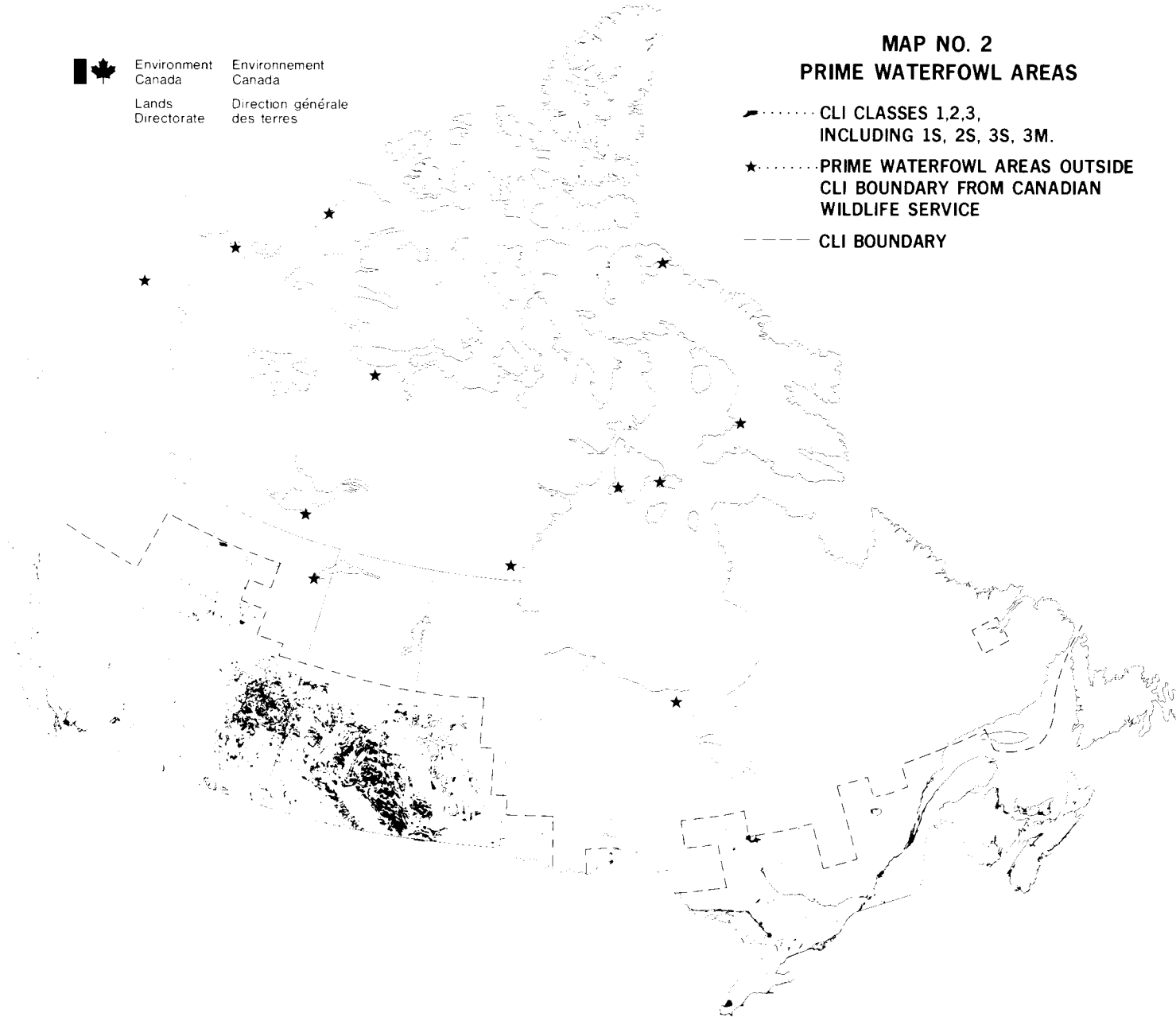
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MAP NO. 2 PRIME WATERFOWL AREAS

▲..... CLI CLASSES 1,2,3,
INCLUDING 1S, 2S, 3S, 3M.

★..... PRIME WATERFOWL AREAS OUTSIDE
CLI BOUNDARY FROM CANADIAN
WILDLIFE SERVICE

----- CLI BOUNDARY



CLASS 1 - Lands having no significant limitations to the production of waterfowl
Capability on these lands is very high. They provide a wide variety and abundance of important habitat elements; the soils are fertile and have good water holding characteristics and topography is well suited to the formation of wetlands. Predominant water areas of these lands are both shallow and deep permanent marshes, and deep, open water bodies with well-developed marsh edges.

CLASS 1S - Lands in this special class are Class 1 areas that also serve as important migration stops for waterfowl.

CLASS 2 - Lands having very slight limitations to the production of waterfowl
Capability on these lands is high. Slight limitations are due to climate, or fertility or permeability of soils. Topography tends to be more undulating than rolling; a higher proportion of the water areas consists of small temporary ponds or deep open water areas with poorly developed marsh edges.

CLASS 2S - Lands in this special class are Class 2 areas that also serve as important migration stops for waterfowl.

CLASS 3 - Lands having slight limitations to the production of waterfowl
Capability on these lands is moderately high but productivity may be reduced in some years because of occasional droughts. Slight limitations are due to climate or to characteristics of the land that affect the quality and quantity of habitat. The lands have a high proportion of both temporary and semi-permanent shallow marshes poorly interspersed with deep marshes and bodies of open water.

CLASS 3S - Lands in This special class are Class 3 areas that also serve as important migration stops for waterfowl.

CLASS 3M - Lands in this special class may not be useful for waterfowl production but are important as migration or wintering areas.

CLASS 4 - Lands having moderate limitations to the production of waterfowl
Capability on these lands is moderate. Limitations are similar to those in Class 3 but the degree of limitation is greater. Water areas are predominantly temporary ponds, or deep, open waters in poorly developed marsh edges, or both.

CLASS 5 - Lands having moderately severe limitations to the production of waterfowl. Capability on these lands is low. Limitations are usually a combination of two or more of the following factors: climate, soil moisture, permeability, fertility, topography, salinity, flooding, or poor interspersion of water areas.

CLASS 6 - Lands having severe limitations to the production of waterfowl
Capability on these lands is very low. Limitations are easily identified. They may include aridity, salinity, very flat topography, steep-sided lakes, extremely porous soils, and soils containing few available minerals.

CLASS 7 - Lands having such severe limitations that almost no waterfowl are produced. Capability on the lands is negligible or non-existent. Limitations are so severe that waterfowl production is precluded or nearly precluded.

SUBCLASS

A Series of subclasses designate the specific nature of limitations inherent in each class. (Refer to Appendix 1 for definitions of subclasses)

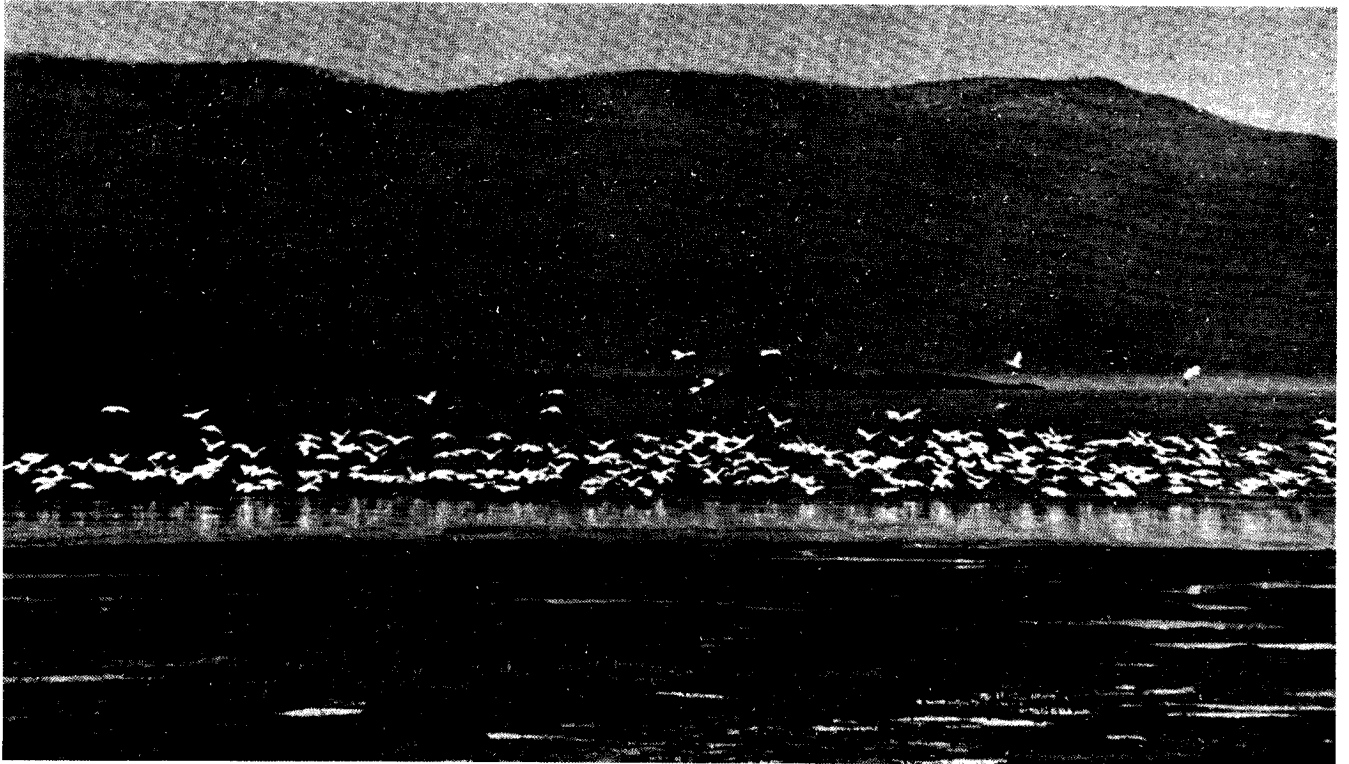


Figure 1: The tidal marshes at Cap Tourmente near the city of Quebec are important feeding and resting areas for Greater Snow Geese during spring and autumn migrations. This area is Class 3M.



Figure 2: A Class 1 marsh which also serves as an important migration stop is illustrated in these photographs. The marsh, a barrier beach pond, is highly productive because of fertile waters and abundance of excellent cover and food plants. Class 1S.



SOME OBSERVATIONS ON THE AREA OUTSIDE THE CLI AREA

Although the CLI covers only about 25% of the country it includes almost all of the high capability areas for ducks. Much of the remaining area which is used by ducks is either in the mountains, where there are very few suitable waterbodies, or part of the Canadian Shield. In the latter area, water bodies are mainly deep, with steeply inclined shorelines and acid water conditions that preclude growth of a good variety of aquatic plants. Capability ratings would be mainly classes 5, 6 and 7.

There are many lowland areas north of the CLI boundary that are important for geese and swans. Major areas include Old Crow Flats, the Mackenzie, Slave Ellice and Peace-Athabasca river deltas, Banks Island, Foxe Basin and The Hudson Bay lowlands and many smaller areas (See map No.2). These areas would be rated as classes 1 or 2 for waterfowl. Most of the remainder of the area would generally be class 6 and 7.

Thus, although the Canada Land Inventory covers only 25% of the country, it does not include, nor was it intended to include, all of the high capability areas for waterfowl. There is probably as much land of high capability for waterfowl north of the CLI area as has been mapped under the program. These areas may be mapped separately, often using the same system, on an as needed basis. An example is the Mackenzie Valley.

SOME SIGNIFICANT FACTS RESULTING FROM CLI DATA ANALYSIS

Tables 1 to 5, and map no. 2 reveal a number of significant facts about the extent and location of land and water capable of supporting waterfowl.

- of the area surveyed, about 6% of the land is of very great importance to North American waterfowl production, while a further 2% is equally important during migration.
- more than 80% of the high capability production areas (Classes 1, 2 and 3) is located in south central Saskatchewan and adjacent parts of Manitoba and Alberta. This is a reflection of the high productivity of the numerous sloughs and potholes lakes in this area.
- approximately 2% of the CLI area (49,393 sq. km.) has high capability for migration or for over-wintering waterfowl (Classes 1S, 2S, 3S, 3M). These areas are concentrated along the east and west coasts, the St. Lawrence River and the shores of the Great Lakes.
- 2.5% of the area surveyed (63,982 sq. km.) has slight limitations to the production of waterfowl (Class 3). Most of this is located in the prairie provinces.
- in all but the prairie provinces, the most significant percentage of important waterfowl habitat is migration routes (Class 3M).
- more than 85% of the area surveyed, (2,153,544 sq. km.) has severe limitations to the production of waterfowl.
- Saskatchewan is the only province with more than 50% of the area surveyed rated as class 5 or better.

NOTES ON DERIVATIONS OF TABLES

- Most waterfowl species require not only water but also the adjacent uplands for nesting and feeding during certain periods of their life cycle. Because the land involved is often only a narrow strip of shoreline, it is difficult to depict and to measure accurately. In many cases, the minimum distance that could be shown is greater than the actual distance, particularly in lower classes.
- Percentages of the entire country are based only on land proportions, assuming that the water areas follow the same proportions.
- No relative percentages of water areas were calculated since the CLI rating includes salt water as well as fresh. It is impractical to prepare a base map of all water in Canada for comparison.
- Percentages of surveyed area are based on the totals of land and water areas (Table 5, 6).
- The area of coverage for this sector of the CLI does not always correspond to the area of coverage for other sectors such as agriculture. Differences in total land area and the area of available coverage are due to variation in the area inventoried for each sector or to variation in the mechanical measurement and totalling of the areas. Waterfowl capability was not mapped in Newfoundland.

CLI WATERFOWL CAPABILITY COVERAGE OF CANADA,
by Province

Province	A. Total Land Area (sq.km.) ¹	B. Available Coverage (Land) ² (sq.km)	C. Available Coverage (Water) ³ (sq.km)	D. Percentage Land Land (B/A)
Newfoundland	370,485	(4)	(4)	0 - A
Prince Edward Island	5,634	5,634 (5)	1,057 (5)	100
Nova Scotia	53,034	53,034 (5)	5,261 (5)	100
New Brunswick	71,421	71,421 (5)	3,156 (5)	100
Quebec	1,356,791	287,020	23,353	21.2
Ontario	891,194	275,309	31,332	30.9
Manitoba	548,495	216,324	51,918	39.4
Saskatchewan	570,269	370,199	14,869	64.9
Alberta	644,389	478,750	12,027	74.3
British Columbia	930,528	600,139	36,869	64.5
Yukon	478,034	--- (6)	-- (6)	--
N.W.T.	3,246,390	--- (6)	-- (6)	--
CANADA	9,220,330	2,357,830	179,842	

- 1) Areas of provinces from Canada Year Book, 1978-79, except for N.B., N.S. and P.E.I. where CLI data were used.
- 2) Figures for all CLI waterfowl coverage, Classes 1-7, and unclassified land areas within CLI boundaries, from provincial data available to 1978. A total of 2,357,830 sq. km. was on the CLDS system by July 1978.
- 3) Water coverage includes fresh and saltwater.
- 4) Waterfowl capability was not mapped in Newfoundland.
- 5) Coverage of CLI territory is complete within these provinces.
- 6) The Yukon and N.W.T. are not covered by the CLI.

Table 2

CLI CLASSIFICATION OF CAPABILITY FOR WATERFOWL
LAND portion
by Province and CLI Class

Province	1	1S	2	2S	3	3S	3M	4	5	6	7	Unclassified Land in CLI Area
	(in sq. km.)											
Newfoundland (1)	--	--	--	--	--	--	--	--	--	--	--	--
Prince Edward Island	10	32	8	19	1	2	336	0	0	11	5,141	74
Nova Scotia	2	3	11	0	127	42	770	367	1,971	5,364	44,195	182
New Brunswick	0	0	64	84	253	59	564	652	2,600	2,699	64,336	110
Quebec	7	155	60	147	298	113	704	753	4,762	30,724	248,252	1,045
Ontario	0	200	31	178	729	629	1,249	6,429	25,833	33,182	198,878	7,971
Manitoba	1,074	41	4,112	526	8,967	1,152	1,055	21,829	43,897	74,284	46,216	13,171
Saskatchewan	6,225	324	25,894	530	50,286	1,380	965	82,353	101,103	71,524	29,421	194
Alberta	24,635	283	6,994	531	20,696	36	462	28,417	56,560	234,230	110,632	2,573
British Columbia	34	7	459	50	1,227	500	2,054	1,818	4,592	29,570	559,593	235
N.W.T. and Yukon	--	--	--	--	--	--	--	--	--	--	--	--
CANADA (2)	24,688	1,045	37,633	2,065	82,584	3,913	8,159	142,618	241,318	481,588	1,306,664	25,555

1) Not covered by CLI Waterfowl

2) Does not include NFLD., N.W.T. and Yukon

Table 3

CLI CLASSIFICATION OF CAPABILITY FOR WATERFOWL
 WATER PORTION
 by Province and CLI Class

Province	1	1S	2	2S	3	3S	3M	4	5	6	7
	(in sq. km.)										
Newfoundland(1)	-	-	-	-	-	-	-	-	-	-	-
Prince Edward Island	2	7	0	3	0	0	906	0	0	0	139
Nova Scotia	0	0	0	0	14	17	2,360	70	285	1,152	1,363
New Brunswick	0	0	21	23	27	32	1,869	62	235	657	230
Quebec	11	125	13	69	84	50	5,542	170	1,402	12,903	2,984
Ontario	0	61	14	159	97	398	9,173	577	2,761	14,052	4,040
Manitoba	1	48	66	320	261	572	3,960	661	4,182	41,323	524
Saskatchewan	84	123	292	231	470	566	3,905	909	3,023	4,943	323
Alberta	555	237	572	454	816	22	940	1,272	1,943	5,067	149
British Columbia	17	0	13	12	97	82	1,946	228	960	11,127	22,387
N.W.T. and Yukon	-	-	-	-	-	-	-	-	-	-	-
CANADA	670	601	991	1,271	1,866	1,739	30,601	3,949	14,791	91,224	32,139

1) Not covered by CLI Waterfowl

Table 4

CLI CLASSIFICATION OF CAPABILITY FOR WATERFOWL
TOTAL LAND and WATER
by Province and CLI Class

Province	1	1S	2	2S	3	3S	3M	4	5	6	7	Unclassified Land CLI Area(1)
	(in sq. km.)											
Newfoundland(2)	-	-	-	-	-	-	-	-	-	-	-	-
Prince Edward Island	12	39	8	22	1	2	1,242	0	0	11	5,280	74
Nova Scotia	2	3	11	0	141	59	3,130	437	2,256	6,516	45,558	182
New Brunswick	0	0	85	107	280	91	2,433	714	2,835	3,356	64,566	110
Quebec	18	280	73	216	382	163	6,246	923	6,164	43,627	251,236	1,045
Ontario	0	261	45	337	826	1,027	10,422	7,006	28,594	47,234	202,918	7,971
Manitoba	1,075	89	4,178	846	9,228	1,724	5,015	22,490	48,079	115,607	46,740	13,171
Saskatchewan	6,309	447	26,186	761	50,756	1,946	4,870	83,262	104,126	76,467	29,744	194
Alberta	17,891	520	7,566	985	21,512	58	1,402	29,689	58,503	239,297	110,781	2,573
British Columbia	51	7	472	62	1,324	582	4,000	2,046	5,552	40,697	581,980	235
N.W.T. and Yukon	-	-	-	-	-	-	-	-	-	-	-	-
CANADA	25,358	1,646	38,624	3,336	84,450	5,652	38,760	146,567	256,109	572,109	1,338,803	25,555

1) Includes areas not in CLDS
2) Not covered by CLI Waterfowl

Table 5

PERCENTAGE DISTRIBUTION OF WATERFOWL CAPABILITY
 Total Land and Water
 by Province and CLI Class
 of Total CLI Area

Province	1	1S	2	2S	3	3S	3M	4	5	6	7	Un- class'd(1)
Newfoundland(2)		N/A	-	-	-	-	-	-	-	-	-	-
Prince Edward Island	.00	.00	.00	.00	.00	.00	.05	0	0	.00	.21	.00
Nova Scotia	.00	.00	.00	0	.01	.00	.12	.02	.09	.26	1.81	.01
New Brunswick	0	0	.00	.00	.01	.00	.10	.03	.11	.13	2.54	.00
Quebec	.00	.01	.00	.01	.02	.01	.25	.04	.24	1.72	9.90	.04
Ontario	0	.01	.00	.01	.03	.04	.41	.28	1.13	1.86	8.00	.31
Manitoba	.04	.00	.17	.03	.37	.07	.20	.89	1.89	4.55	1.84	.52
Saskatchewan	.25	.02	1.03	.03	2.00	.08	.19	3.28	4.10	3.01	1.17	.01
Alberta	.70	.02	.30	.04	.85	.00	.05	1.17	2.30	9.42	4.37	.10
British Columbia	.00	.00	.02	.00	.05	.02	.16	.08	.22	1.60	22.93	.01
Yukon and N.W.T.(3)	-	-	-	-	-	-	-	-	-	-	-	-
CANADA	1.00	.06	1.52	.13	3.33	.22	1.53	5.78	10.09	22.57	52.76	1.01

1) Includes urban areas, most nat. parks & military reserves.

2) Not mapped for waterfowl.

3) Not included in the CLI area.

(.00 indicates very small areas.)

Table 4

CLI CLASSIFICATION OF CAPABILITY FOR WATERFOWL
TOTAL LAND and WATER
by Province and CLI Class

Province	1	1S	2	2S	3	3S	3M	4	5	6	7	Unclassified Land CLI Area(1)
	(in sq. km.)											
Newfoundland(2)	-	-	-	-	-	-	-	-	-	-	-	-
Prince Edward Island	12	39	8	22	1	2	1,242	0	0	11	5,280	74
Nova Scotia	2	3	11	0	141	59	3,130	437	2,256	6,516	45,558	182
New Brunswick	0	0	85	107	280	91	2,433	714	2,835	3,356	64,566	110
Quebec	18	280	73	216	382	163	6,246	923	6,164	43,627	251,236	1,045
Ontario	0	261	45	337	826	1,027	10,422	7,006	28,594	47,234	202,918	7,971
Manitoba	1,075	89	4,178	846	9,228	1,724	5,015	22,490	48,079	115,607	46,740	13,171
Saskatchewan	6,309	447	26,186	761	50,756	1,946	4,870	83,262	104,126	76,467	29,744	194
Alberta	17,891	520	7,566	985	21,512	58	1,402	29,689	58,503	239,297	110,781	2,573
British Columbia	51	7	472	62	1,324	582	4,000	2,046	5,552	40,697	581,980	235
N.W.T. and Yukon	-	-	-	-	-	-	-	-	-	-	-	-
CANADA	25,358	1,646	38,624	3,336	84,450	5,652	38,760	146,567	256,109	572,109	1,338,803	25,555

1) Includes areas not in CLDS
2) Not covered by CLI Waterfowl

Table 5

PERCENTAGE DISTRIBUTION OF WATERFOWL CAPABILITY
 Total Land and Water
 by Province and CLI Class
 of Total CLI Area

Province	1	1S	2	2S	3	3S	3M	4	5	6	7	Un- class'd(1)
Newfoundland(2)		N/A	-	-	-	-	-	-	-	-	-	-
Prince Edward Island	.00	.00	.00	.00	.00	.00	.05	0	0	.00	.21	.00
Nova Scotia	.00	.00	.00	0	.01	.00	.12	.02	.09	.26	1.81	.01
New Brunswick	0	0	.00	.00	.01	.00	.10	.03	.11	.13	2.54	.00
Quebec	.00	.01	.00	.01	.02	.01	.25	.04	.24	1.72	9.90	.04
Ontario	0	.01	.00	.01	.03	.04	.41	.28	1.13	1.86	8.00	.31
Manitoba	.04	.00	.17	.03	.37	.07	.20	.89	1.89	4.55	1.84	.52
Saskatchewan	.25	.02	1.03	.03	2.00	.08	.19	3.28	4.10	3.01	1.17	.01
Alberta	.70	.02	.30	.04	.85	.00	.05	1.17	2.30	9.42	4.37	.10
British Columbia	.00	.00	.02	.00	.05	.02	.16	.08	.22	1.60	22.93	.01
Yukon and N.W.T.(3)	-	-	-	-	-	-	-	-	-	-	-	-
CANADA	1.00	.06	1.52	.13	3.33	.22	1.53	5.78	10.09	22.57	52.76	1.01

1) Includes urban areas, most nat. parks & military reserves.

2) Not mapped for waterfowl.

3) Not included in the CLI area.

(.00 indicates very small areas.)

Table 6

PERCENTAGE DISTRIBUTION OF WATERFOWL CAPABILITY
TOTAL LAND and WATER
by Province

Province	1	1S	2	2S	3	3S	3M	4	5	6	7	Un- class'd(1)
Newfoundland(2)		N/A	-	-	-	-	-	-	-	-	-	-
Prince Edward Island	.18	.58	.12	.33	.01	.03	18.56	0	0	.16	78.95	1.11
Nova Scotia	.003	.01	.02	0	.24	.10	5.37	.75	3.87	11.18	78.15	.31
New Brunswick	0	0	.11	.14	.38	.12	3.26	.96	3.80	4.50	86.58	.15
Quebec	.003	.09	.02	.07	.12	.05	2.01	.30	1.99	14.06	80.95	.34
Ontario	0	.09	.01	.11	.27	.33	3.40	2.28	9.32	15.40	66.17	2.60
Manitoba	.40	.03	1.56	.32	3.44	.64	1.87	8.38	17.93	43.10	17.42	4.91
Saskatchewan	1.64	.12	6.80	.20	13.18	.51	1.26	21.62	27.04	19.86	7.72	.05
Alberta	3.65	.11	1.54	.20	4.38	.01	.29	6.05	11.92	48.76	22.57	.52
British Columbia	.01	.001	.07	.01	.21	.09	.63	.32	.87	6.37	91.13	.04
Yukon and N.W.T.(3)	-	-	-	-	-	-	-	-	-	-	-	-
CANADA	1.00	.06	1.52	.13	3.32	.22	1.53	5.78	10.09	22.57	52.72	1.01

1) Includes urban areas, not included in the CLI waterfowl classification

2) Not mapped for waterfowl.

3) Not included in the CLI area.

APPENDIX 2SUBCLASSES

With the exception of Class 1 and Special Class 3M, the classes are divided into subclasses according to the nature of the limitations that determine the class level. The following subclasses are used to denote significant limiting factors that may affect either waterfowl or the ability of the land to provide suitable habitat conditions.

A - Aridity. The limitation is the inherent susceptibility of the land to periodic drought, which results in low water levels or premature drying of marshes and ponds during the breeding season. There is no aridity limitation if a high proportion of the basins in a land unit which go dry in late summer hold water through July in most years.

B - Free-flowing Water. The limitation is usually due to excess of swiftly-flowing water which inhibits the development of marsh habitat along a watercourse. It may also be due to a lack of flow through low-lying areas which results in habitat of poor quality. It may be due also to a lack of consistent flow in rapidly drained channels or intermittent stream courses.

C - Climate. The limitation is by adverse climatic factors which inhibit development of favorable habitat and restrict waterfowl production. This limitation is usually associated with high elevations in mountain areas where ponds and water bodies are ice-free for only a short period each year.

F - Fertility. The limitation is due to a lack of sufficient nutrients in the soil and/or water for optimum growth of vegetation essential to waterfowl production. This limitation is applied to areas such as coarse-textured sands and gravels, exposed tills, highly carbonated soils, leached grey wooded and podzolic soils, or deep peat soils. Indicators used to assess fertility include water quality measurements, abundance and diversity of aquatic vegetation and agricultural fertility ratings.

G - Landform. The limitation is a poor distribution or interspersions of natural basins or landforms which inhibit the development of optimum waterfowl habitat. This limitation, while closely associated with both topography and moisture-holding capacity of the soils, is used to designate those areas where a poor distribution and interspersions of small marshes result in reduced waterfowl production.

I - Inundation. The limiting factor is excessive fluctuation of water level or tidal action which adversely affects the habitat or the nesting success of waterfowl. It is used to indicate the shorelines of lakes which are subject to severe drawdown during the spring and summer and water-courses where runoff waters are very high during the spring nesting season and leave exposed gravel or mud bars later in the summer. The limitation is also used in areas, such as the shores of the Bay of Fundy, which are adversely affected by tidal waters.

J - Reduced Marsh Edge. The limitation are topographic or other features that adversely affect the width or development of optimum marsh conditions along the edges of water areas. Marsh edge refers to the zone extending from the normal full stage level to a water depth of three feet and is usually marked by the maximum extent of emergent vegetation. Steep gradients, which result in a marsh zone of less than 10 feet in width, are considered a limitation to the capability of the wetland. Shoreline development, the ratio of shoreline length to total area, is also considered on large lakes or marshes. A large marsh with small islands and an irregular shoreline has a higher capability for waterfowl production than does a marsh with a regular shoreline. Both shoreline features are used in considering the limitation due to reduced marsh edge.

M - Soil Moisture. The limitation is the poor water holding capacity of certain soils, which adversely affects the formation and permanence of water areas. It refers to the internal drainage patterns of the soil profile and includes coarse-textured and well-drained soils, such as loamy sands, sands and gravels, that are not influenced by seepage or subsurface moisture. Usually, granular soils fall in this category, but rock outcrops or shallow drift over rock may also be included.

N - Adverse Soil and Water Characteristics. The limitation is excessive salinity, alkalinity, acidity, lack of essential trace elements, or abundance of toxic elements which limits the development of plant and animal communities essential for waterfowl production. This subclass is used to designate very saline soils or saline or alkaline lakes or other areas where it has been demonstrated that these chemical factors are limiting waterfowl production.

R - Soil Depth. The limitation is the restriction of the rooting zone by bedrock or other impervious layers, which limits the development and growth of suitable plant communities. It applies to landforms such as severely eroded soils, rock outcrops and areas with a shallow layer of soil over rock. It also applies to the marshes in the Canadian Shield which have rocky shorelines.

T - Adverse Topography. The limitation is surface relief, slope or gradient, patterns of knolls and depressions or surface drainage patterns which adversely affect the capability of the land to support waterfowl. Areas with the same severe limitations are level, depressionless plains, very steep slopes or deeply dissected and well-drained moraines and plateaus.

Z - Water Depth. The limitation is deep or shallow waters which limit the development of optimum waterfowl habitat. Usually it is used to indicate large, deep water bodies which are mapped separately, but it may be used also to indicate large marshes or lakes which are uniformly shallow and choked with single stands of vegetation, such as cattail.

PHOTO CREDITS

- Province of Quebec, Film Bureau - Figure 1
G. Watson, Canadian Wildlife Service - Figure 2