CANADA LAND INVENTORY

LAND CAPABILITY CLASSIFICATION FOR WILDLIFE — UNGULATES

SUMMARY REPORT

The Canada Land Inventory

Report No. 17

1980

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SUMMARY REPORT

INTRODUCTION

BACKGROUND TO THE CANADA LAND INVENTORY PROGRAM

The Canada Land Inventory (CLI) is a cooperative federal/provincial program. It was initiated under the Agricultural and Rural Development Act (ARDA) of 1961 to provide a basis for land use planning and management at the federal, provincial, and regional levels of government. The inventory covers about 2.5 million square kilometres of Canada's settled areas (Map 1). It uses a multidisciplinary approach and maps land capabilities for wildlife (ungulates and waterfowl), forestry, agriculture, and recreation; present land use for selected map sheets within the CLI area is also mapped.

A COMPUTERIZED LAND DATA BANK

The Canada Land Data System (CLDS) is a computerized data bank and analytical system which was developed as part of the CLI program to facilitate use of the data for land use planning and management. CLDS, through its main component, the Canada Geographic Information System (CGIS), permits CLI ungulate capability and other sector data to be transformed to numeric data for analysis. The use of other data sets along with those of the CLI enables the planner, manager, or researcher to analyse potential land use conflicts and to evaluate alternative plans for allocating land in response to demands for wildlife, forestry, agriculture, and recreation.

The information and related implications derived from the tables and the map in this report deal with the CLI data for wildlife — ungulates.

THE LAND CAPABILITY CLASSIFICATION SYSTEM FOR WILDLIFE

The wildlife classification system, for both ungulates and waterfowl, was developed in cooperation with the Canadian Wildlife Service and provincial wildlife agencies. After initial discussions, a tentative classification was formulated and reviewed at regional and national meetings in 1964 and 1965. Finally, at the Federal/Provincial Wildlife Conference in July 1965, the system was adopted. Field surveying and mapping were started, and only minor changes in the classification system were required to produce a national rating of wildlife lands. The classification system for both ungulates and waterfowl is detailed by N.G. Perret in CLI Report Number 7, "Land Capability Classification for Wildlife"; the classification system as it applies to ungulates, abstracted from Perret (1969), is presented on pages 3 to 5.

Map 1: Canada Land Inventory area
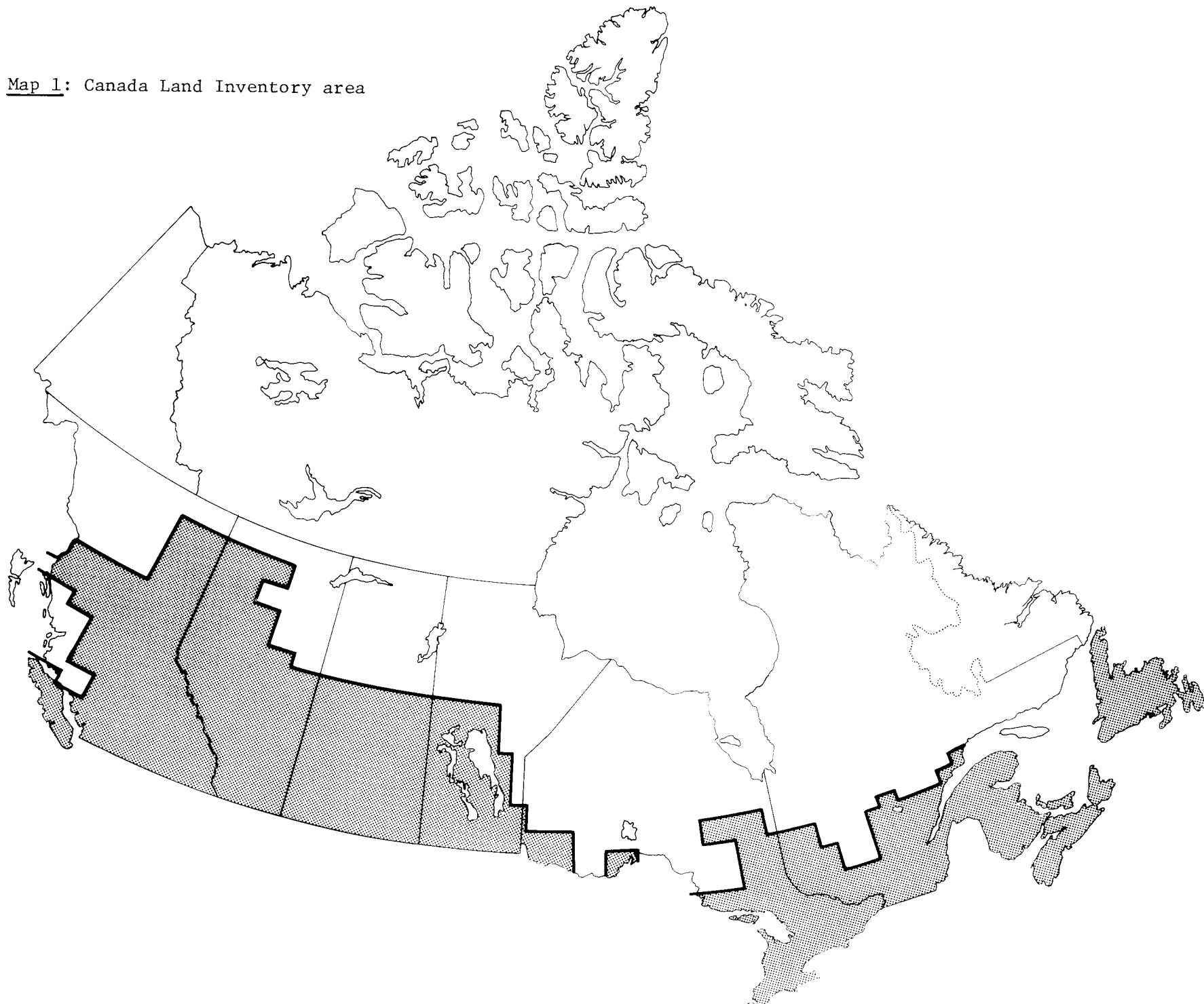
The wildlife sector of the Canada Land Inventory is characterized by the great diversity of wildlife species, their different habitat requirements, and their mobility and other behavioural attributes. One national series of maps cannot effectively represent the capability of land to produce or support all species of wildlife. For this reason, capability ratings in the Canada Land Inventory are restricted to ungulates and waterfowl. The classification system is the same for both groups, with slight modifications due to their different habitat requirements. Categories used in the CLI classification system for ungulates are outlined below.

Capability Classes

Environmental factors are considered when assigning a capability class to a unit of land. The class boundary is determined by biological and physical characteristics of the land which are significant to ungulates. Thus, the capability class is an expression of the environmental factors which control the numbers of ungulates or waterfowl which can be produced and supported on a unit of land.

Capability Subclasses

For all classes (except CLASS 1), factors which limit the production of wildlife are shown as subclasses. The degree of limitation and, to a lesser extent, the kind of limitation determine the class designation. Subclasses are outlined in Appendix 1.

Indicator Species

Indicator species (see Appendix 2) show the species which a unit of land is capable of producing and supporting. The first species indicates the major species in the area; the other indicator species may be as important as or less important than the major species, but all were considered in arriving at the class and subclass.

Basis of Classification

In general, all wildlife have similar needs; all individuals of each species must have sufficient quantity and quality of food, protective cover, and space for survival, growth, and reproduction. The ability of the land to meet these needs is determined by the individual requirements of the species or group under consideration, the physical characteristics of the land, and other factors which influence the plant and animal communities.

Standardized criteria and procedures must be used to ensure uniformity in any land classification system. All wildlife capability maps have been prepared as follows:

1. The land surface is separated into units based on biological and physical characteristics which are recognized as significant for wildlife.

2. Each land unit is assigned a class based on all known or inferred relevant information about the unit (parent material, soil profile, depth, moisture, fertility, landforms, climatic factors, vegetation, etc.) which reflect the quantity and quality of food and cover available to wildlife.

3. Classifications are based on the natural state of the land under good, feasible wildlife management practices.

4. Location, access, ownership, distance from cities or roads, present condition, present vegetative cover and wildlife production, and excessive or insufficient hunting pressures are not considered when assigning a capability class to a land unit. These do not limit the capability of the land and are therefore used only as additional information.

5. CLASS is determined by the severity of limitation and SUBCLASS denotes the factor which causes the limitation. Although class and limitations may change as additional information about the land becomes available, they are unlikely to change significantly due to improved management techniques, since these require costly and continuing practices.

LAND CLASSIFICATION FOR UNGULATES

CAPABILITY CLASSES

The CAPABILITY CLASS denotes the ability of land to produce and support wild ungulates. The capability class level is determined by the degree of limitations which affect the quantity and/or quality of habitat for the animals.

CLASS 1 - Lands having no significant limitations to the production of ungulates. Capability on these lands is very high. They provide a wide variety and abundance of food plants and other habitat elements.

CLASS 1W - Lands in this special class are CLASS 1 areas which are winter ranges upon which animals from surrounding areas depend.

CLASS 2 - Lands having very slight limitations to the production of ungulates. Capability on these lands is high but less than CLASS 1. Slight limitations are due to climatic or other factors which have a slight adverse effect on the habitat.

CLASS 2W - These are CLASS 2 lands which serve as necessary winter ranges for animals from surrounding areas.

CLASS 3 - Lands having slight limitations to the production of ungulates. Capability on these lands is moderately high, although productivity may be reduced in some years. Slight limitations are due to characteristics of the land which affect the quantity and quality of habitat or to climatic factors which limit the mobility of ungulates or the availability of food and cover.

CLASS 3W - These are CLASS 3 lands which serve as necessary winter ranges for animals from surrounding areas.

CLASS 4 - Lands having moderate limitations to the production of ungulates. Capability on these lands is moderate. Limitations are similar to those in CLASS 3, but the degree of limitation is greater.

CLASS 5 - Lands having moderately severe limitations to the production of ungulates. Capability on these lands is moderately low. Limitations are usually a combination of two or more of climate, soil moisture, fertility, soil depth to bedrock or other impervious layer, topography, flooding, exposure, or adverse soil characteristics.

CLASS 6 - Lands having severe limitations to the production of ungulates. Capability on these lands is very low. Limitations are so severe that they are easily recognized. For example, soil depth may be negligible or climatic factors so extreme that ungulate populations are severely reduced.

CLASS 7 - Lands having limitations so severe that there is little or no ungulate production. Capability on these lands is negligible or non-existent. Limitations are so severe that ungulate production is precluded or nearly precluded.

Appendix 3 outlines the conventions used in preparing wildlife capability maps. The appendix also presents some examples of ungulate capability symbols.

SALIENT POINTS RESULTING FROM CLI DATA ANALYSIS

Tables 1 to 6 reveal a number of significant facts about the extent and location of lands capable of supporting ungulate populations.

1. Of the total land area of Canada, 26.5% (244 598 453 hectares) is classified for ungulate capability.

2. Of the total area classified for ungulates, the majority is rated as classes 3, 4, and 5 (22.5%, 28.9%, and 18.8% respectively, and a total of 70.2%). Only 19.8% is high capability (classes 1, 2, 1W, 2W, and 3W), with class 2 (11.6%) comprising the greater portion. Most provinces follow this trend, although class 2 lands for Quebec and Newfoundland are 43.8% and 19.3% respectively.

3. Winter ranges on which animals from surrounding areas depend (classes 1W, 2W, and 3W) are relatively rare — only 6.7% of the total classified lands of Canada; over half of this (3.7% of Canada's classified lands) occur in the province of British Columbia. Although small in total area, these lands are critical for the winter survival of both year-round resident ungulates and animals from surrounding areas.

4. Although the Canada Land Inventory land capability classification for ungulates includes seven indicator species, the majority of the high capability land applies only to deer and/or moose.

   a) Deer - 12.4% of the classified lands have high capability for deer, and these lands are spread through all provinces except Newfoundland.

   b) Moose - 11.9% of the classified lands have high capability for moose, and these are spread through all provinces except Saskatchewan.

   c) Elk - 3.9% of the classified lands have high capability for elk, and these are limited to the provinces of Alberta, Manitoba, Saskatchewan, and British Columbia.

   d) Caribou - Although seven provinces have high capability lands for caribou (Nova Scotia and New Brunswick have none and Prince Edward Island was not classified), only 1.7% of all classified lands have high capability for caribou, and over three-quarters are found in the province of Newfoundland.

   e) Antelope - Only 0.4% of the classified lands have high capability for antelope, and these are found only in Alberta and Saskatchewan.

   f) Mountain Sheep - Only 0.3% of the classified lands have high capability for mountain sheep, and these are entirely in Alberta and British Columbia.

   g) Goat - Only 0.3% of the classified lands have high capability for goat, and these are all in British Columbia and Alberta.

Of the seven ungulate indicator species, antelope, mountain sheep, and goat have particularly restricted ecological niches. Each is found in only two provinces and only a small percentage of land in each province has a high capability rating:

Antelope - 1.5% in Alberta and 0.7% in Saskatchewan;
Mountain Sheep - 1.1% in Alberta and 0.4% in British Columbia;
Goat - 0.9% in British Columbia and 0.4% in Alberta.

These lands, therefore, are especially important for the continued health of populations of these species in Canada.

THE SPATIAL DISTRIBUTION OF CANADA'S HIGH UNGULATE CAPABILITY LANDS

Although the Canada Land Inventory covers only 26.5% of Canada, it includes most of the high ungulate capability lands. Map 2 indicates lands within the Canada Land Inventory area "that have high capability for production of ungulates" (classes 1 and 2) along with "lands that have great importance for wintering ungulates" (classes 1W, 2W, and 3W). This map, which is a reduction of a compilation of 1:1 000 000 scale maps of ungulate capability, displays a number of patterns which warrant discussion. For convenience, these will be discussed relative to the published 1:1 000 000 scale CLI maps of land capability for ungulates, and in a west to east fashion. This will be followed by comments on the spatial distribution of high ungulate capability lands for the country as a whole.

BRITISH COLUMBIA

British Columbia's high ungulate capability lands are largely in valleys throughout the mountainous central portion of the province and on Vancouver Island, as well as in river valleys and lowlands of the northeastern portion of the province. These areas provide the best food and cover for ungulates. Many of the valleys are particularly important for wintering ungulates.

ALBERTA

Alberta has one very extensive area of high ungulate capability lands. From a line drawn roughly from Edmonton south to Red Deer, this area extends east to the Saskatchewan border and covers over 40 000 square kilometres. It represents lands having a mixture of grassland and woodland, which supplies ungulates with an abundance of both food and cover. Throughout all the rest of the CLI-mapped portion of Alberta, river valleys have a high capability because of their great importance for wintering ungulates. Many areas in the foothills of the Rocky Mountains are also very important for wintering ungulates. The southeastern portion of the province is mostly grassland and, apart from river valleys and the Cypress Hills, has virtually no high ungulate capability lands.

SASKATCHEWAN

Saskatchewan has relatively few high ungulate capability lands (only 9.4% of the CLI-mapped lands). This is mainly because the predominant vegetation cover is grassland, especially in the southern portion of the province; although this type of vegetation provides suitable food in the spring and summer months, it provides little when the ground is snow-covered, and it affords little cover at any time of year. Most of the high ungulate capability lands occur as scattered patches within a band which extends from about the middle of the province along the Alberta border southeasterly toward the Manitoba border. In this region, north of the area of almost pure grassland, groves of trembling aspen and willow are interspersed with the grassland, providing both abundant food and cover for ungulates. A few river valleys throughout the province have great importance for wintering ungulates.

Map 2: High ungulate capability lands
         (classes 1, 2, 1W, 2W, and 3W)
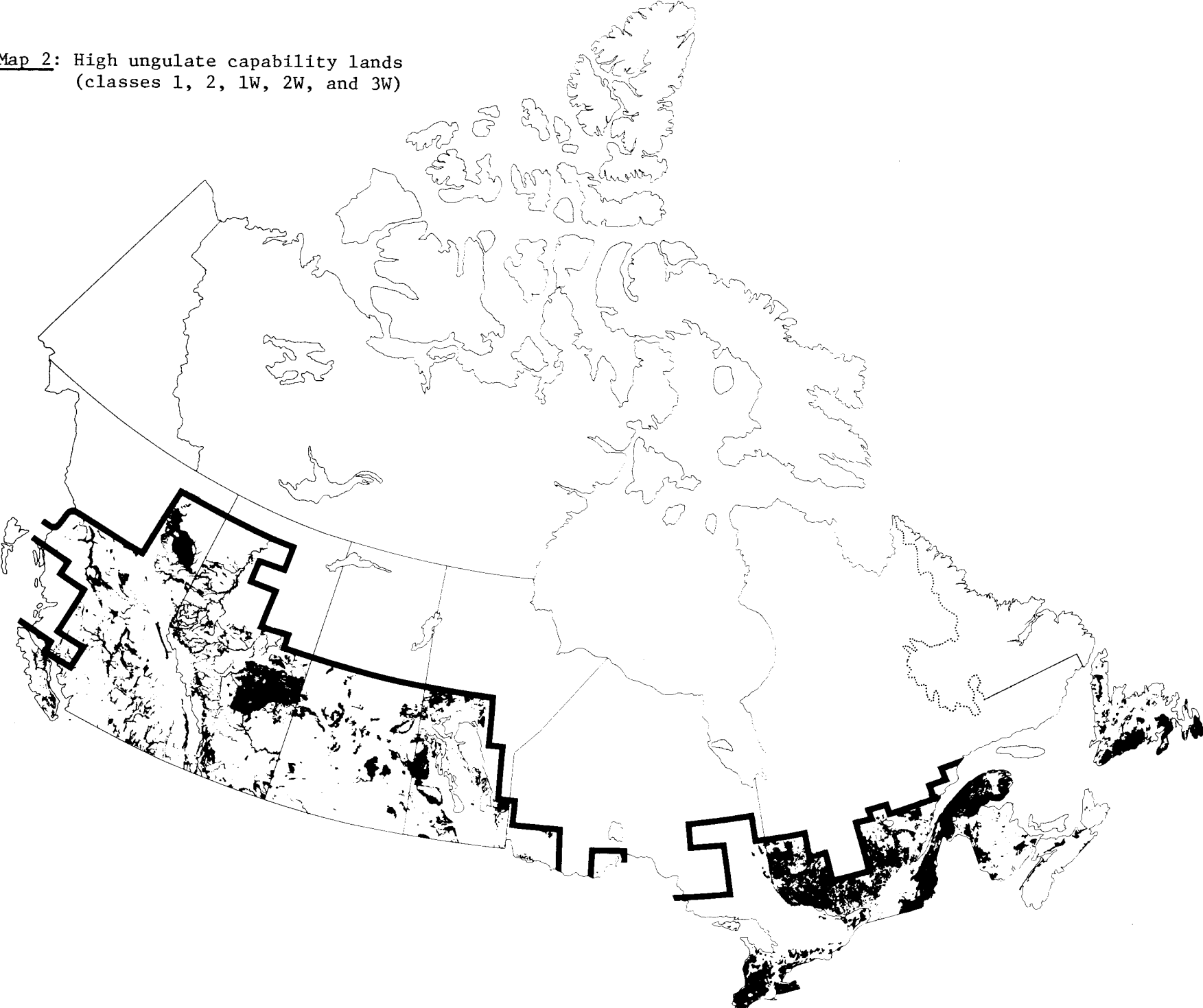
MANITOBA

Most of Manitoba's high ungulate capability lands occur in wooded upland sites or in areas where there are mixtures of grassland and woodland. A few river valleys also have high capability, especially for wintering ungulates.

ONTARIO

Almost all of Ontario's high ungulate capability lands are in southern Ontario and the easternmost tip of the province. Most of these lands are within the Deciduous Forest Region of Canada (Rowe, 1972), and almost all of the remaining high capability lands are within portions of the Great Lakes-St. Lawrence Forest Region which have cover predominantly of deciduous trees. In Ontario, the high ungulate capability lands correspond closely with high agriculture capability lands (CLI Rept. No. 10); for these areas, therefore, there is an obvious conflict between potential land uses.

High ungulate capability lands for Ontario are all rated at either 1 or 2. No lands in this province have been rated as classes 1W, 2W, or 3W (i.e., having "great importance for wintering ungulates").

QUEBEC

A very high proportion of Quebec's CLI-mapped lands (48.1%) have high ungulate capability ratings, especially on the southern side of the St. Lawrence River, on the Gaspé Peninsula, and in the southwestern portion of the province. Most of these high capability lands correspond to uplands of the Great Lakes-St. Lawrence Forest Region (Rowe, 1972); in the valleys of the St. Lawrence and Ottawa rivers, however, which are also within this forest region, lands are predominantly classes 4 and 5. Lands which correspond to the Boreal Forest Region (to the north of the Great Lakes-St. Lawrence Forest Region) are a variety of classes: high capability lands are common in the westernmost portion of the province, classes 4 and 5 predominate in the northeasternmost portion, and the central portions are mostly class 3.

THE ATLANTIC PROVINCES

One map at the scale of 1:1 000 000 covers all of New Brunswick, Nova Scotia, and the island of Newfoundland; Prince Edward Island was not classified for land capability for ungulates, and Labrador is not within the CLI area.

Most of New Brunswick's class 1 and 2 ungulate capability lands occur along the western edge of the province (i.e., along the border with the United States) and in the eastern portion of the province (near the Nova Scotia boundary). As well, many valleys and small patches of uplands throughout the province are rated as classes 1W, 2W, and 3W ("lands that have great importance for wintering ungulates"). Most of New Brunswick (79.8%), however, is rated as classes 3, 4, and 5.

Most of Nova Scotia (62.5%) is rated as class 4 or class 5 for ungulate capability. Only 4.4% of the province is rated as class 1 and class 2, and these lands are entirely along the Bay of Fundy and immediately south and southeast of Prince Edward Island. Classes 1W, 2W, and 3W are even rarer (only 2.8% of the province), and all of these lands are along bays northeast of the Bay of Fundy, along the Atlantic coast in the northeastern part of the province, and in valleys and coastal areas thoughout Cape Breton.

Newfoundland's best ungulate lands are mainly along the southern coast, particularly in the western half of the province, and along the Avalon Peninsula and the Burin Peninsula (and inland north of this peninsula); other prime ungulate lands occur in the interior of the Petit Nord Peninsula. Most of the province's high ungulate capability lands consist of a mixture of coniferous forest and tundra which is prime caribou range. Valleys in these areas are also prime moose wintering areas, and a southern coastal strip in the western half of the province has great importance for wintering caribou.

DISCUSSION

Although the lands indicated on Map 2 have a high potential for ungulate habitat, this may not reflect the actual production of animals. Despite an area's high physical capability, for instance, proximity to urban centres may restrict production because of hunting pressure, predation by dogs, highway kills, and noise disturbance or present land use may limit the availability of food or shelter. When combined with such non-physical information, CLI maps are thus very useful for identifying high potential ungulate habitat lands which, if properly managed or protected, could yield high production of animals.

Some high ungulate capability lands also have high capability for other land uses, such as agriculture. Thus, when CLI maps are used for regional land use planning, conflicts may occur. For instance, high ungulate and agriculture capabilities for the same area of land pose problems in planning for preferred land use — intensive agriculture is basically incompatible with wild ungulate production. When conflicts are encountered, planners must consider socioeconomic factors, present land use, proximity to cities, wildlife population data, etc. in their evaluations.

Although a nation-wide classification system was used, mapping was done through provincial agencies. National coordinators were appointed to ensure that the classification system was applied as uniformly as possible. However, since each province developed some variations to deal with regional physical and biological conditions, species, outlook, etc., some differences in application between provinces were inevitable. For this reason, detailed interprovincial comparisons are often difficult.

Map 2 shows the abundance of lands in Quebec which have high ungulate capability ratings (over 48.1% of the province's CLI-mapped lands). Almost all of these fall within the Great Lakes-St. Lawrence Forest Region. In Ontario, however, portions of the province which are within this same forest region (more than two-thirds of the CLI-mapped area) have virtually no high capability lands. On the eastern side of Quebec, a similar situation exists. New

Brunswick and Nova Scotia are both within the Acadian Forest Region, which is "closely related to the Great Lakes-St. Lawrence Forest Region" of Quebec and eastern Ontario (Rowe, 1972); however, as with Ontario, smaller portions of these provinces (20.3% and 7.3% respectively) have high ungulate capability.

In the northeastern portion of CLI-mapped Alberta, a large area of high ungulate capability lands extends along the Saskatchewan border but not into Saskatchewan for any distance. In addition, most Alberta river valleys are rated as having great importance for wintering ungulates, whereas few Saskatchewan river valleys have this rating. These observations may indicate slight variations in methodology between Alberta and Saskatchewan.

UNGULATE CAPABILITY AND LANDS OUTSIDE THE CLI AREA

Several large herds of ungulates, and particularly barren ground caribou, are found outside the CLI area, but the lands which they use would be mostly low capability. The highest capability lands outside the CLI area would be those which are of great importance for wintering ungulates — e.g., valleys with good browse for moose, open woodland for caribou, mountain foothills for mountain sheep, etc.

Although only the Canada Land Inventory ungulate capability map series has been discussed in this report, other ungulate capability maps do exist. For example, the Alberta Land Inventory has mapped parts of Alberta outside the CLI area for ungulates. In the Saguenay-Lac-St-Jean area of Quebec, lands have been rated individually for moose, caribou, and white-tailed deer using the CLI system (see Jurdant et al., 1977, p.155-157). Lands in the James Bay development area, Quebec, have been rated for capability for moose using a three-class system (Jolicoeur, 1977).

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Thomasson, R.D. Ontario Land Inventory Methodology Series — wildlife. Ont. Min. Nat. Res., Toronto, Ont. 71p.

Table 1: CLI land capability classification for ungulates — coverage of Canada by province

Province	Total land area [1] (hectares)	CLI ungulate capability coverage (hectares) [2]	CLI capability coverage as a % of total land area
Newfoundland	37 048 500	10 484 373	28.3
Prince Edward Island	565 700	—	—
Nova Scotia	5 284 100	5 303 335	100.0
New Brunswick	7 709 200	7 125 179	92.4
Quebec	135 679 100	28 702 234	21.2
Ontario	89 119 400	27 530 925	30.9
Manitoba	54 849 500	20 376 310	37.1
Saskatchewan	57 026 900	37 019 475	64.9
Alberta	64 438 900	48 042 494	74.6
British Columbia	93 052 800	60 014 128	64.5
Yukon	53 184 400	—	—
Northwest Territories	324 639 000	—	—
CANADA	922 097 500	244 598 453	26.5

1   Areas of provinces are based on the Canada Year Book 1976-77. Areas in the Canada Year Book were presented in square kilometres and converted to hectares using the conversion: 1km^2 equals 100 ha.

2   Figures for all CLI ungulate coverage Classes 1-7 and unclassified land areas within CLI boundaries are taken from provincial data available to November 1979. This constitutes the complete coverage for this sector of CLI.

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; there is also a 13-hectare rounding error.

The Yukon and Northwest Territories are not covered by the CLI, and ungulate capability was not determined for Prince Edward Island.

Table 2: CLI land capability classification for ungulates — area (in hectares) by class for each province*

Province \ Class	1	1W	2	2W	3	3W	4	5	6	7	Unclassified
Newfoundland	671 484	306 630	2 026 541	146 619	3 530 939	51 411	3 046 472	264 250	60 941	23 652	355 436
Nova Scotia	12 215	0	223 420	0	1 307 575	148 762	1 957 041	1 359 921	228 956	8 662	56 786
New Brunswick	0	0	866 367	337 942	2 568 322	237 015	2 445 517	414 161	64 501	47 973	143 383
Quebec	0	0	12 584 112	222 742	6 416 394	985 470	6 983 391	915 570	350 360	41 312	202 880
Ontario	988 291	0	3 231 259	0	2 898 310	3	5 292 538	10 607 001	3 673 930	514 829	324 763
Manitoba	1 047 075	481 789	2 019 754	118 148	5 179 305	164 292	3 602 933	2 190 419	3 297 849	4 944	2 269 801
Saskatchewan	329 928	64 248	2 712 062	78 369	14 255 430	288 713	9 693 921	6 666 146	2 167 446	98 661	664 554
Alberta	630 304	701 815	4 641 063	1 400 533	10 622 122	1 645 113	16 022 784	8 722 717	1 736 791	8 961	1 910 296
British Columbia	2 347	302 431	163 026	2 665 780	8 304 362	5 998 255	21 738 247	14 674 035	4 279 778	1 360 856	525 013
CANADA	3 681 644	1 856 913	28 467 604	4 970 133	55 082 759	9 519 034	70 782 844	45 814 220	15 860 552	2 109 850	6 452 912

* Prince Edward Island was not classified for ungulate capability.

Table 3: CLI land capability classification for ungulates — % of the CLI-classified portion of each province*

Classe / Province	1	1W	2	2W	3	3W	4	5	6	7	8**
Newfoundland	6.4	2.9	19.3	1.4	33.7	0.5	29.1	2.5	0.6	0.2	3.4
Nova Scotia	0.2	0.0	4.2	0.0	24.7	2.8	36.9	25.6	4.3	0.2	1.1
New Brunswick	0.0	0.0	12.2	4.7	36.1	3.3	34.3	5.8	0.9	0.7	2.0
Quebec	0.0	0.0	43.8	0.8	22.4	3.4	24.3	3.2	1.2	0.1	0.7
Ontario	3.6	0.0	11.7	0.0	10.5	0.0	19.2	38.5	13.3	1.9	1.2
Manitoba	5.1	2.4	9.9	0.6	25.4	0.8	17.7	10.8	16.2	0.0	11.1
Saskatchewan	0.9	0.2	7.3	0.2	38.5	0.8	26.2	18.0	5.9	0.3	1.8
Alberta	1.3	1.5	9.7	2.9	22.1	3.4	33.4	18.2	3.6	0.0	4.0
British Columbia	0.0	0.5	0.3	4.4	13.8	10.0	36.2	24.4	7.1	2.3	0.9

* Prince Edward Island was not classified for ungulate capability
** Unclassified

Table 4: CLI land capability classification for ungulates — % of the total CLI area (by province) for each capability class

Province / Classe	1	1W	2	2W	3	3W	4	5	6	7	8*
Newfoundland	0.3	0.1	0.8	0.1	1.4	0.0	1.3	0.1	0.0	0.0	0.2
Nova Scotia	0.0	0.0	0.1	0.0	0.5	0.1	0.8	0.6	0.1	0.0	0.0
New Brunswick	0.0	0.0	0.4	0.1	1.1	0.1	1.0	0.2	0.0	0.0	0.1
Quebec	0.0	0.0	5.1	0.1	2.6	0.4	2.9	0.4	0.1	0.0	0.1
Ontario	0.4	0.0	1.3	0.0	1.2	0.0	2.2	4.3	1.5	0.2	0.1
Manitoba	0.4	0.2	0.8	0.0	2.1	0.1	1.5	0.9	1.4	0.0	0.9
Saskatchewan	0.1	0.0	1.1	0.0	5.8	0.1	4.0	2.7	0.9	0.0	0.3
Alberta	0.3	0.3	1.9	0.6	4.3	0.7	6.6	3.6	0.7	0.0	0.8
British Columbia	0.0	0.1	0.1	1.1	3.4	2.5	8.9	6.0	1.8	0.6	0.2
CANADA	1.5	0.7	11.6	2.0	22.4	4.0	29.2	18.8	6.5	0.8	2.7

* Unclassified

Table 5: High ungulate capability lands (classes 1, 2, 1W, 2W, and 3W) as a % of the CLI-classified portion of each province

Province	Classes 1 and 2	Classes 1W, 2W, and 3W	Classes 1, 2, 1W, 2W, and 3W
Newfoundland	25.7	4.8	30.5
Nova Scotia	4.4	2.8	7.2
New Brunswick	12.2	8.1	20.3
Quebec	43.8	4.2	48.0
Ontario	15.3	0.0	15.3
Manitoba	15.0	3.8	18.8
Saskatchewan	8.2	1.2	9.4
Alberta	11.0	7.8	18.8
British Columbia	0.3	14.9	15.2

Table 6: CLI high ungulate capability lands (classes 1, 2, 1W, 2W, and 3W) — areas (in hectares) on a species basis

Province	Classes*	Antelope	Caribou	Deer	Elk	Goat	Moose	Mountain Sheep
Newfoundland	A	—	2 695 475	—	—	—	2 695 475	—
	B		504 555				504 555	
	A & B		3 200 030				3 200 030	
	C		30.5				30.5	
Nova Scotia	A	—	—	505 585	—	—	505 585	—
	B			0			0	
	A & B			505 585			505 585	
	C			9.5			9.5	
New Brunswick	A	—	—	867 071	—	—	854 709	—
	B			575 378			564 546	
	A & B			1 442 449			1 419 255	
	C			20.2			19.9	
Quebec	A	—	153 459	7 380 186	—	—	10 585 721	—
	B		0	1 185 727			283 964	
	A & B		153 459	8 565 913			10 869 685	
	C		0.5	29.8			37.9	
Ontario	A	—	7 348	4 080 967	—	—	320 764	—
	B		0	0			0	
	A & B		7 348	4 080 967			320 764	
	C		0.0	14.8			1.2	
Manitoba	A	—	1 452 090	1 902 214	1 173 839	—	2 123 362	—
	B		67 244	726 759	503 067		463 084	
	A & B		1 519 334	2 628 973	1 676 906		2 586 446	
	C		7.5	12.9	8.2		12.7	
Saskatchewan	A	31 558	7 740	2 946 956	910 750	—	—	—
	B	231 389	0	428 022	6 852			
	A & B	262 947	7 740	3 374 978	917 602			
	C	0.7	0.0	9.1	2.5			
Alberta	A	225 317	0	5 102 482	5 048 416	42 568	4 646 068	145 694
	B	490 418	32 699	2 820 895	2 567 684	167 688	2 344 608	364 259
	A & B	715 735	32 699	7 923 377	7 616 100	210 256	6 990 676	509 953
	C	1.5	0.1	16.5	15.9	0.4	14.6	1.1
British Columbia	A	—	77 182	58 256	47 874	17 509	35 163	58 081
	B		675 771	4 252 789	906 972	497 846	5 802 649	204 088
	A & B		752 953	4 311 045	954 846	515 355	5 837 812	262 169
	C		1.3	7.2	1.6	0.9	9.7	0.4
CANADA	A	256 875	2 941 204	20 941 503	6 007 040	60 077	19 643 485	203 775
	B	721 807	1 213 025	9 262 811	3 481 508	665 534	9 500 322	568 347
	A & B	978 682	4 154 229	30 204 314	9 488 548	725 601	29 143 807	772 122
	C	0.4	1.7	12.4	3.9	0.3	11.9	0.3

* A - Classes 1 and 2
  B - Classes 1W, 2W, and 3W
  A & B - Classes 1, 2, 1W, 2W, and 3W
  C - % of A & B in the CLI-classified portion of the province (or of the country for the national total line)

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APPENDIX 1

CAPABILITY SUBCLASSES

With the exception of CLASS 1, the classes are divided into subclasses according to the nature of the limitations which determine the class level. In most cases, the limitations do not have a direct effect on the animals, but rather they affect the ability of the land to produce suitable food and cover plants. For convenience, the subclasses are placed in two main groups: those relating to CLIMATE and those relating to inherent characteristics of the LAND.

CLIMATE

The following subclasses denote significant climatic factors which may affect either the animals themselves or the ability of the land to produce suitable food and cover.

A - Aridity. This restricts the development and growth of suitable food and cover plants. Although closely associated with soil moisture-holding capacity, aridity denotes areas of minimal precipitation where rainfall is not available for plant growth due to rapid runoff. It also denotes droughty areas where very low precipitation and a high rate of evapotranspiration retard the growth of browse species.

C - Climate. A combination of climatic factors (e.g., excessive cold and moisture) reduces the quantity, quality, or availability of food and cover or directly affects the production and survival of ungulates. It primarily denotes land units which have extreme weather conditions, very short growing seasons, or very high rainfall.

Q - Snow Depth. Prolonged periods of snow may reduce the mobility of ungulates and/or the availability of food plants. It is difficult to define the limitation or provide uniform standards for use across Canada because it may be due to one or more of the following factors of snow: depth, texture, size of granules, compressibility, density, and uniformity. Experience and knowledge of snow conditions on winter ranges will assist the surveyor in arriving at a decision as to whether snow limits the production or survival of ungulates.

U - Exposure or Aspect. Special climatic factors (e.g., exposure to prevailing winter winds or hot, dry summer winds) may adversely affect ungulates and their habitat. In most areas, this is a minor limitation; it can, however, be a major limitation to the production of food and cover plants in some coastal areas which are exposed to continuous strong gales.

LAND

The following subclasses are used to denote significant characteristics of the land which limit its usefulness for producing suitable food and cover. Some subclasses may also have a slight adverse effect on the animals themselves.

F - Fertility. Low availability of soil nutrients can considerably reduce the growth of food and cover plants. This limitation is applied to units of land where the quantity and quality of cover is affected by the uniform lack of nutrients. As ungulate production depends upon a variety of habitats, the associated ecotones or "edge" pockets of soils low in nutrients within a fertile soil area are not necessarily a limitation. Indicators used to assess fertility include diversity of food and cover plants and agricultural fertility ratings.

G - Landform. This limitation is a poor distribution or interspersion of landforms necessary for optimum ungulate habitat. It is applied to areas with a moderate amount of topographical relief but which are not irregular enough to provide the desired complex of aspect or "edge" for the respective ungulate species. It is applied also to areas which lack essential adjacent escape terrain, cover, or other special habitat requirements.

I - Inundation. Excessive water level fluctuation or tidal action can adversely affect the habitat or survival of ungulates. This subclass denotes large tidal areas where food and cover production is limited by tides. It also indicates areas where water level fluctuations adversely affect the quantity or quality of the food and cover (e.g., river bottomlands or areas associated with hydroelectric developments).

M - Soil Moisture. Poor soil moisture conditions, either excessive or deficient, can adversely affect the development and growth of vegetation or limit the mobility of ungulates. In most instances, the subclass denotes areas where there is excess soil moisture due to poor internal drainage; it can, however, also denote areas of adequate precipitation with porous soils that have poor moisture-holding characteristics.

N - Adverse Soil Characteristics. This indicates excessive salinity or alkalinity, lack of essential trace elements, or abundance of toxic elements in the soil. Although used sparingly, this may be a major limitation on some ungulate ranges. It is used only where it has been demonstrated that adverse soil characteristics affect the growth or development of optimum vegetation or the health and survival of ungulate species.

R - Soil Depth. This indicates the restriction of rooting zones by bedrock or other impervious layers. It generally denotes large areas of shallow soils or exposed bedrock. Small areas of shallow soils or outcrops are not necessarily a limitation and, in fact, may enhance the capability of an ungulate range by prodiving a variety of habitat types and the associated ecotones.

T - Adverse Topography. This indicates excessive steepness or flatness of the land. It primarily denotes areas with such extreme slopes that the development of optimum vegetation is reduced or the use of the area by ungulates is restricted. Where used to denote flat landscapes, it is usually associated with other limitations such as poor distribution of landforms.

APPENDIX 2

UNGULATE INDICATOR SPECIES

The following letters symbolize ungulates for which capability ratings are assigned.

A - Antelope (pronghorn)

C - Caribou

D - Deer (white-tailed deer, Columbia
       black-tailed deer, mule deer)

E - Elk (wapiti)

G - Goat (mountain goat)

M - Moose

S - Mountain Sheep (bighorn sheep)

APPENDIX 3

CONVENTIONS

The conventions used in preparing wildlife capability maps are as important to the map user as they are to the field surveyor. This knowledge is important both for understanding the symbols used and for interpreting the map data. The following outlines the conventions used for mapping wildlife capability.

1. The map symbol consists of:

    a) a capability class indicated by large arabic numerals (from 1 to 7) or a special class denoted by the class numeral followed by a large, uppercase letter (W, S, or M).

    b) subclasses or limitations are denoted by small, uppercase letters placed after the class or special class. A maximum of three subclasses may be used on maps at the 1:50 000 scale and two subclasses on the published 1:250 000 scale maps.

    c) species of ungulates are indicated by uppercase italic letters placed below the class numeral. A maximum of three species indicators may be used with each class.

2. Map symbols are combined or complexed when individual areas are too small to be shown on the map. Complexes are used on the 1:50 000 computer maps only when small habitat units are dispersed throughout another major habitat type and are important enough by themselves to be identified. When reducing computer maps to the 1:250 000 scale for publication, complexing is used to show the association of small habitat units within a larger habitat type. A maximum of three classes may be used in a complex on the 1:250 000 scale maps and two classes on the 1:50 000 scale maps.

3. In addition to class, subclass, and indicator species, the complexed symbol will include numerals to indicate the approximate proportions, in tenths, of the classes within the complex. The proportion is indicated by a small arabic numeral placed after the class and above the subclass letters. Only those habitat units which make up 10% or more of the area will be shown in the complexed symbol.

4. Class symbols in a complex are placed in order of their relative proportion in the area. The class with the largest proportion is shown first.

EXAMPLES:

5^T_F An area of CLASS 5 with topography and soil fertility limitation to
$_D$ deer production.

$4^7_?3W^3_Q$ An area of which 70% is CLASS 4 for deer with limitation due to snow
$_D$ $_{EM}$ depth and topography and 30% is class 3 wintering area for elk and moose
     with slight limitation due to snow depth.

$1W^6 2W^4_R$ An important wintering area for deer and mountain sheep of which 60% is
$_{DS}$ $_{DS}$ CLASS 1 and 40% is CLASS 2 with slight limitation due to exposed bedrock.

     The color used for complexed areas on the maps is determined by the
     first digit of the symbol.

APPENDIX 4

EXAMPLES OF LANDS CLASSIFIED FOR UNGULATE CAPABILITY

Figure 4.1: The slopes leading to the river bottomland in this stereopair are a good example of Class 1W, deer habitat which also serves as a wintering area. The bottomland, with its meandering river, is limited by poor distribution of landforms and by spring flooding. It is Class $3\frac{G}{D}\frac{}{I}$.

Figure 4.2: This photograph illustrates the vegetation complex of an upland site in Manitoba. The area is Class 2 for moose, deer, and elk with limitations of poor distribution of landforms and excess moisture in the low areas. It is Class $2_M^G{}_M^M$.
$_D^{}$
$_E^{}$

Figure 4.3: The Class 3 slope in the foreground is moderately sloping with little variety of landforms, aspects, or cover types. The Class 5 ridges are south-facing and exposed to the desiccating effects of sun and wind, limiting available moisture. Effects of exposure are further amplified by rapid drainage due to coarse-textured soil material. The opposite slope, Class 3_{UC}^{G}, D lacks ideal landform variety, has an eastern exposure, and is somewhat limited by local climate.
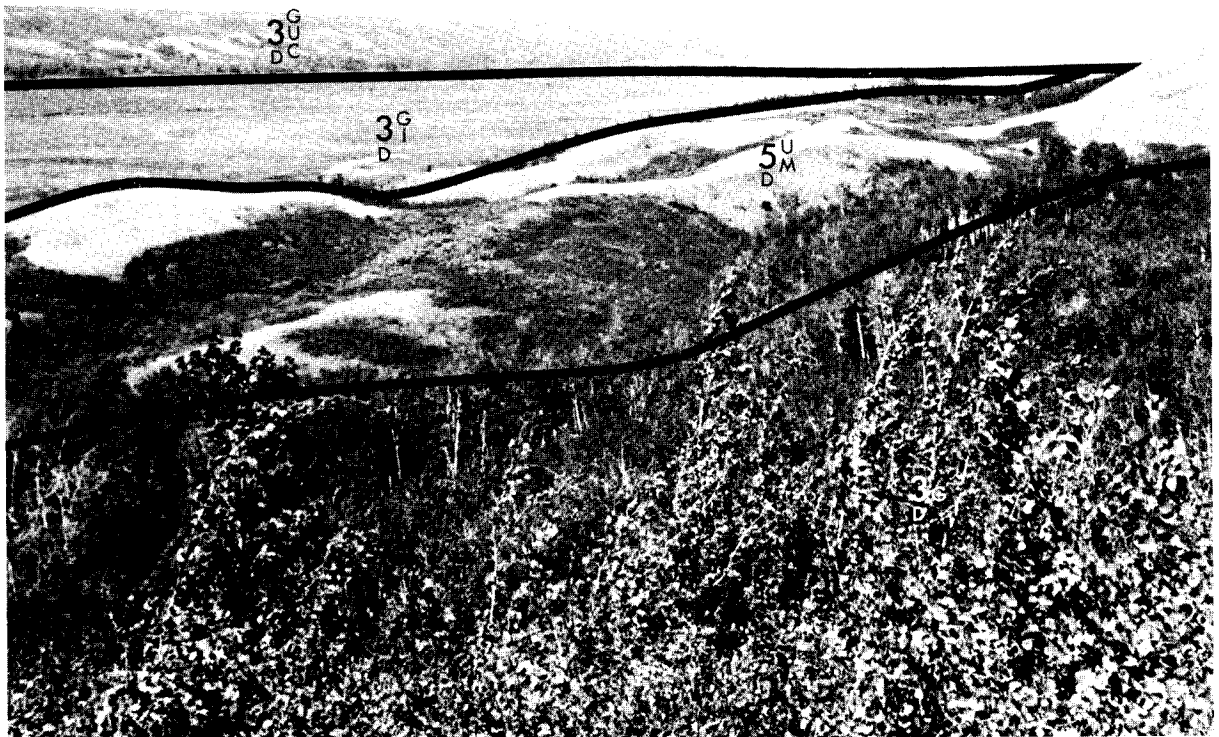
Figure 4.4: The plateau in this picture is a moderately good summering area for moose and deer. However, because of snow conditions and climate, few animals remain during the winter. It is Class $4^Q_{M}{}^C_{D}$. The mountain in the background has very little capability, but it does support the occasional mountain goat. Limitations are snow depth and exposed rock and shallow soils. Class $6^Q_{G}{}^R$.
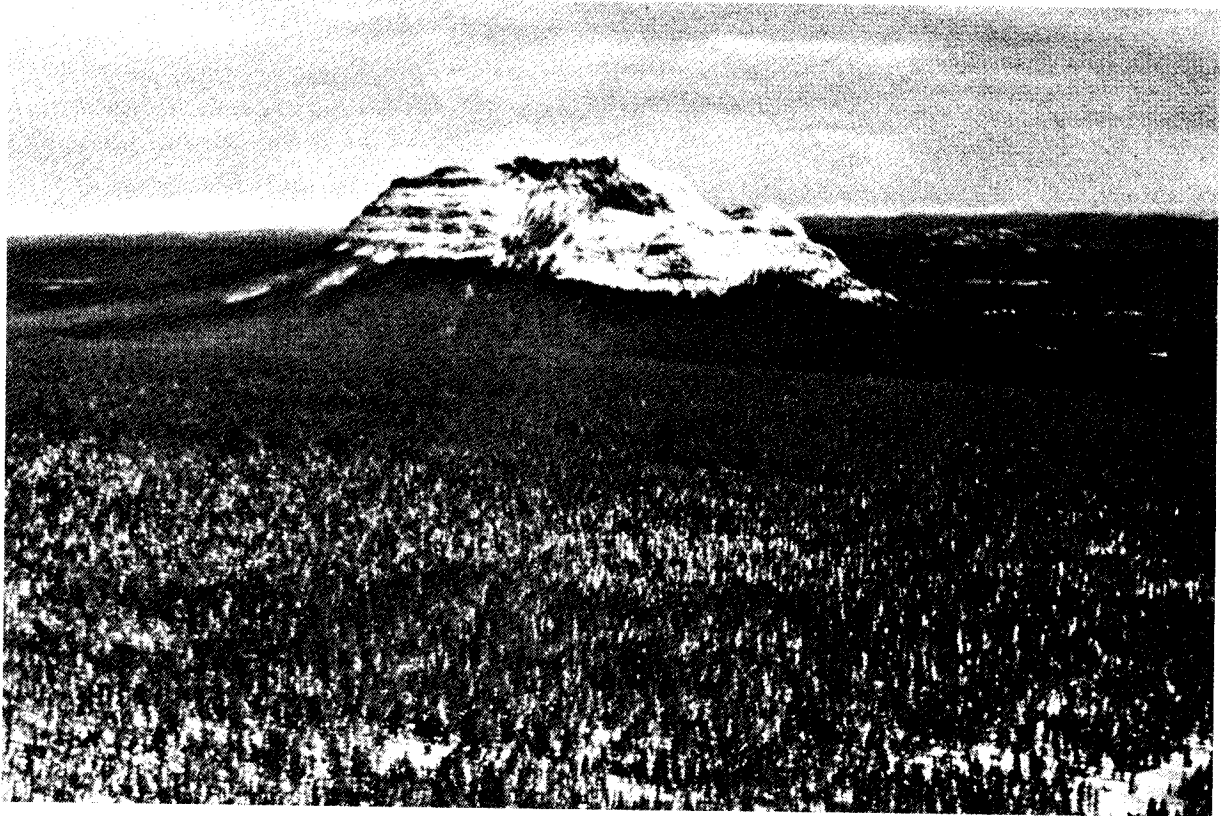
Figure 4.5: This portion of braided eskers, formed of gravelly textured fluvial material, supports only short prairie grasses. Capability Class $5^M_{D\,G}$ indicates moderately severe limitations due to deficient soil moisture and poor landform quality. The low areas between the eskers are Class $3^G_{D\,C}$. Limiting factors are poor landform variety and climate.

Figure 4.6: The Class 6 lands in this photograph are flat and arid, the native
vegetation being primarily mixed prairie grasses. The shallow ravine, although
arid and well-drained, provides better landform variety with some sites able
to support tree and shrub growth. The gravelly outwash channel is excessively
drained and the water-worked soils are inherently infertile.

Figure 4.7: The Class 7 unit has no capability for white-tailed deer production because salinity, related to poor drainage and adversely flat topography, precludes the growth of food and cover. The Class 6 land in the foreground is less salinized and better drained but supports only saline-tolerant and hydrophytic grasses and forbs. The gently rolling hills in the background, rated Class 5, are limited by excessive drainage and poor interspersion of landforms. Only the sheltered, north-facing aspects support tree growth.

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