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CANADA LAND INVENTORY



ACID DEPOSITION ON PRIME RESOURCE LANDS IN EASTERN CANADA

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Canada Land Inventory

Report No. 18

1986

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ACID DEPOSITION ON PRIME RESOURCE LANDS IN EASTERN CANADA

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SUMMARY

In Eastern Canada, the majority of the prime resource lands designated under the Canada Land Inventory (CLI) are located within wet sulphate deposition zones of greater than or equal to 20 kg/ha/yr -- a level which is currently thought to be detrimental to a variety of environmental resources. Prime lands subject to these high deposition levels include:

- . 84% of the prime lands for agriculture;
- . 96% of the prime lands for forestry;
- . 70% of the prime lands for outdoor recreation; and
- . 74% of the prime lands for waterfowl.

ACKNOWLEDGEMENTS

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Larry Li undertook the initial analyses of patterns of prime resource lands and acid deposition. Robert van Wyngaarden further refined and expanded the statistical analyses and compiled the data tables in the appendices.

Marg Poulin typed most of the report, and figures and appendices 8 and 9 were prepared by Rick Allen of the Conservation and Protection Drafting Division. The final manuscript was edited by Karen Lochhead.

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INTRODUCTION

The long range transport of airborne pollutants involves a variety of acidic substances, including sulphates and nitrates, which are deposited in the form of gases, solids, or liquids (wet deposition). Wet sulphate deposition has traditionally been used as a benchmark indicator of acidic pollution. A synopsis of wet sulphate deposition measurements to-date (1980-1982) indicates that the spatial distribution of this pollution has not changed appreciably since comprehensive monitoring began in 1980. Southern Ontario, southern Quebec, and the Atlantic provinces receive deposition levels which are greater than or equal to 20 kg/ha/yr -- a level above which various ecosystem components are believed to be threatened. While Canada has implemented emission controls to reduce deposition levels to a target of 20 kg/ha/yr, the United States has not. Consequently, these deposition patterns are expected to persist.

The area receiving high wet sulphate deposition coincides with the area of Eastern Canada which is mapped and described under the Canada Land Inventory (CLI) program (Lands Directorate, 1981). This report identifies the extent of "prime lands" for agriculture, forestry, outdoor recreation, and waterfowl which may be at risk due to acid deposition. It provides two important perspectives, by tabulating and analyzing CLI data by wet sulphate deposition zones for Eastern Canada as a whole, and for the individual provinces.

DEFINITIONS

"Prime lands" must be defined both technically and geographically:

1. Technically, prime lands have a high capability rating as assigned by the Canada Land Inventory. Of the seven-class rating system used for CLI, only the first order classes (i.e. classes 1, 2, and 3) represent prime lands. All CLI capability class definitions are provided in Appendix 1.
2. Geographically, the CLI study area in Eastern Canada includes only the southern, most heavily settled area of the region (Figure 1). However, the CLI study area was intended to encompass the most productive areas of Canada, which in Ontario and Quebec occur from the St. Lawrence River and the Great Lakes northward to the Canadian Shield. Only a very small area of prime lands occurs north of the CLI boundary. In Ontario, for example, the Ontario Land Inventory (OLI) identified less than 1% class 3, and no class 1 or 2, lands for forestry north of the CLI boundary (Pierce, pers. comm.). The waterfowl classification represents the only exception to this pattern, since the CLI study bounds do not encompass the many small lakes common to the Canadian Shield, or the wetlands of the Hudson Bay Lowlands, which also provide prime lands for waterfowl.

Reference to "Eastern Canada" in this report includes the total area of the provinces of Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island, based on the assumption that almost all of the prime lands have been identified despite the limited coverage of the CLI. Only about 2% of the area of Eastern Canada receiving greater than or equal to 20 kg/ha/yr of wet sulphate is located north of the CLI boundary. Thus, this analysis encompasses almost all of the prime resource land areas receiving significant wet sulphate deposition.

Newfoundland is excluded from statistical analyses because it was not considered in the CLI capability for waterfowl classification, and because Canada Land Data System (CLDS) data reports have not been produced by tertiary watershed division (i.e. those of Inland Waters Directorate, Environment Canada) for this province. The relationship of wet sulphate deposition and prime lands in Newfoundland is discussed in the Results section.

METHODS

The raw data files of the Canada Land Inventory were used as the basis of the analyses. These data are housed in the CLDS and have been reformatted according to wet sulphate deposition zones.

The CLDS files consist of map units and field descriptions derived primarily from 1:50 000 scale mapping. For Eastern Canada, this resulted in approximately 5 000 map units and accompanying descriptions for each CLI sector (i.e. agriculture, forestry, outdoor recreation, and waterfowl). These map data are organized according to Inland Waters Directorate tertiary-level watershed divisions and to provincial boundaries. For this study, these aggregations of map units were organized according to wet sulphate deposition isopleths, based on data collected in 1980 and defining five deposition zones: 0-<10; 10-<20; 20-<30; 30-<40; and \geq 40 kg/ha/yr (Figure 2). Although not identical to isopleths based on more recent data, the concentrations of wet sulphate deposition in southern Ontario, southern Quebec, and the Atlantic provinces remain essentially the same as those for 1980 (Summers and Barrie, 1985).

RESULTS

The results present two distinct perspectives on prime lands potentially at risk from acid deposition. Firstly, a regional perspective summarizes, for all of Eastern Canada, prime lands for agriculture, forestry, outdoor recreation, and waterfowl which are receiving wet sulphate deposition levels greater than or equal to 20 kg/ha/yr. Secondly, the provincial perspective profiles each of the six provinces in Eastern Canada, describing patterns and trends between individual

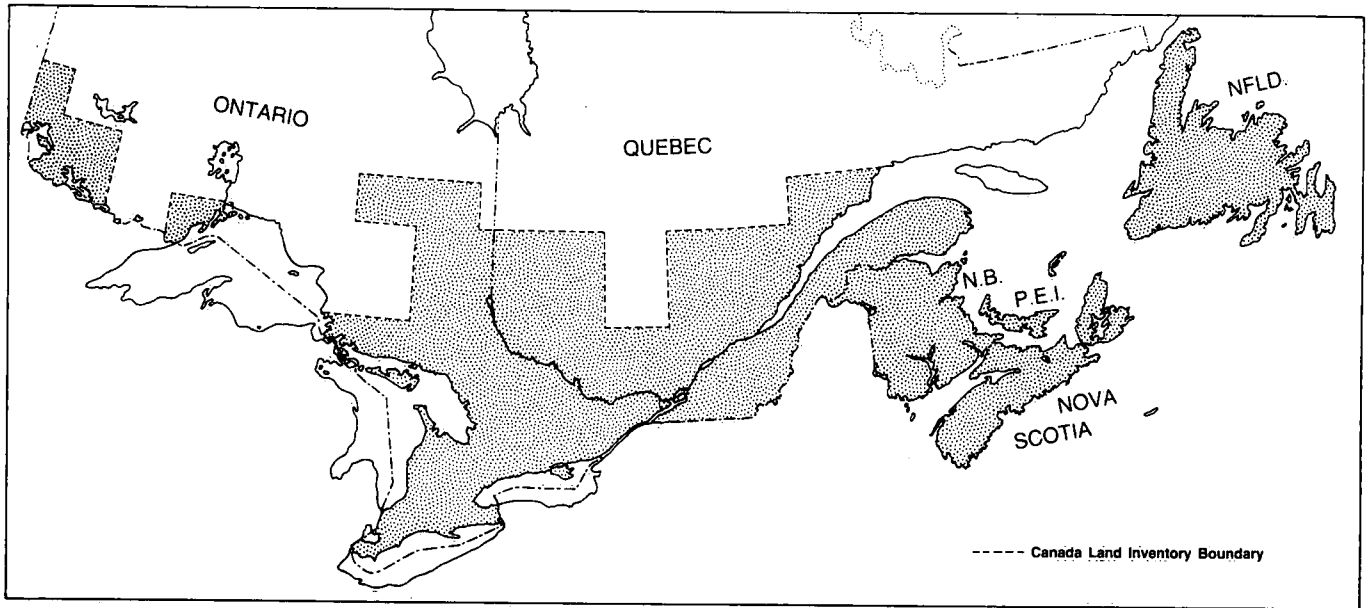


Figure 1: Canada Land Inventory study area in Eastern Canada

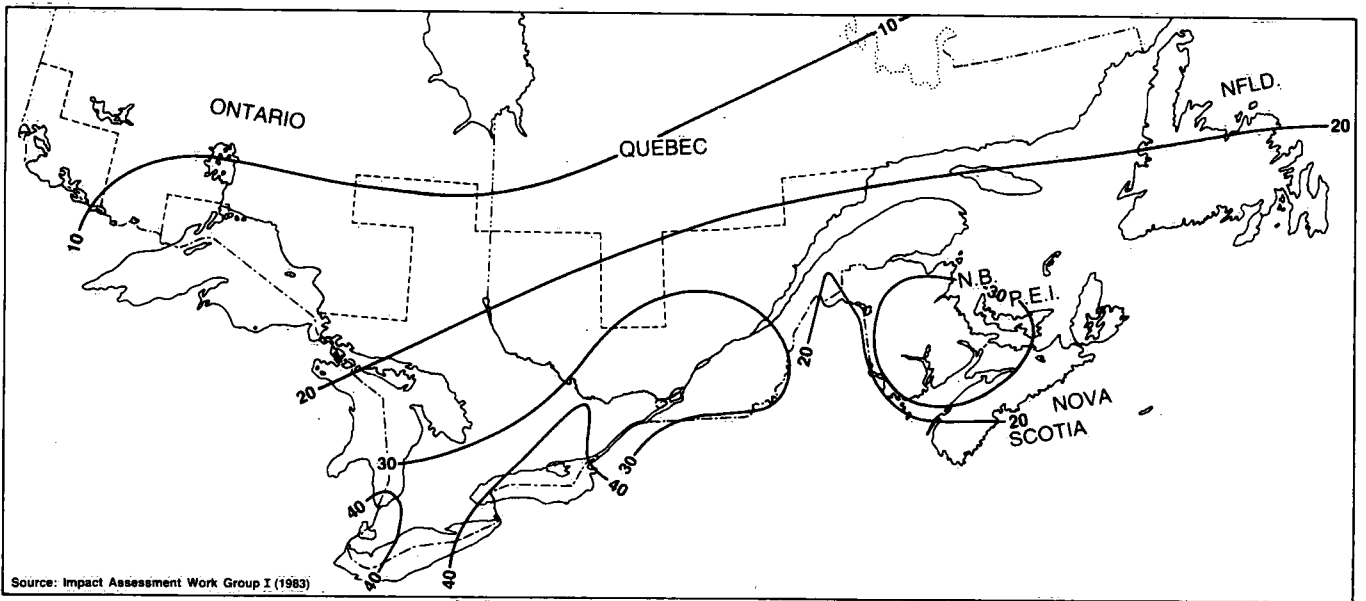


Figure 2: Wet sulphate deposition (1980) in kg/ha/yr

capability classes and each of the highest wet sulphate deposition zones (20-<30, 30-<40, and \geq 40 kg/ha/yr). Appendices 3-7 present the data tables upon which this discussion is based.

Eastern Canada Perspective

Overview

Prime lands occupy a minor proportion of Eastern Canada's total land area of 2 378 080 km² (237 808 000 ha -- see Appendix 2). They vary from 1% for outdoor recreation and for waterfowl to 7% for forestry (Figure 3). The majority of these prime lands are subject to wet sulphate deposition levels greater than or equal to 20 kg/ha/yr. This level of sulphate deposition affects 96% of all prime lands for forestry, 84% of all prime lands for agriculture, 74% of all prime lands for waterfowl, and 70% of all prime lands for outdoor recreation (Figure 3, Table 1).

These percentages reflect the concentration of both prime lands and high wet sulphate deposition levels in the southern part of Eastern Canada. Indeed, a much greater proportion of prime lands falls within the highest deposition zones than can be accounted for by the proportion of CLI area in those deposition zones. For example, while approximately 70% of the total CLI area receives wet sulphate depositions of greater than or equal to 20 kg/ha/yr, 96% of prime lands for forestry and 84% of prime lands for agriculture receive these levels. Figure 4 also illustrates this skewed or biased distribution of prime lands compared to high deposition zones.

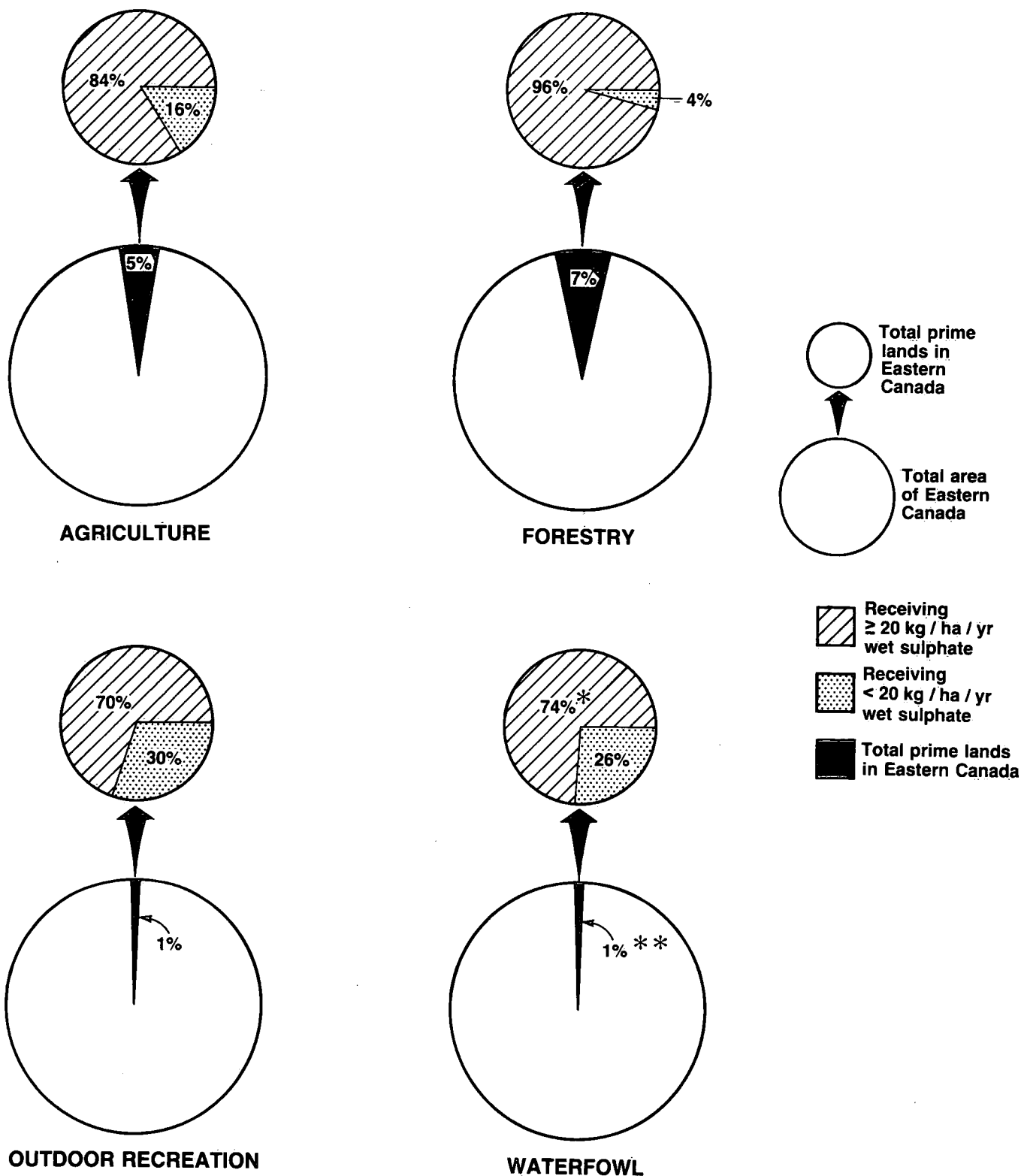
Agriculture

Prime lands for agriculture cover 5% (12 332 774 ha) of the total area of Eastern Canada (Appendix 3a). The fertile St. Lawrence Lowlands Region of Ontario and Quebec accounts for about 2/3 of this total. The remainder of the prime lands are located in scattered pockets in northern Ontario and in the Maritime Plain, Chaleur Uplands, and the Annapolis Lowland of the Appalachian Region of the Atlantic Provinces (Figure 5).

The entire lowland area south of the Canadian Shield in Ontario and Quebec, as well as the total area of the Atlantic Provinces, is also characterized by the highest wet sulphate deposition values in Eastern Canada. As a result, 84% of the prime lands for agriculture are receiving deposition levels of greater than or equal to 20 kg/ha/yr; more than half of the prime lands are receiving 30 to less than 40 kg/ha/yr,

¹"Regions" discussed in the following text refers to the Major Physiographic Regions of Canada (Appendix 8). Geographical features and place names referenced in this text are shown on a map in Appendix 9.

Figure 3: Percentage of prime lands receiving ≥ 20 kg / ha / yr of wet sulphate compared to percentage of Eastern Canada classified as prime lands



* Includes total land and water area classified as "prime" capability for waterfowl.

** Includes only land portion of total land / shallow water classified as "prime" capability for waterfowl.

Sources: CLI data were compiled using Canada Land Data System Reports R002190, R002240, R002290, and R002420. See Appendix 2 for area totals.

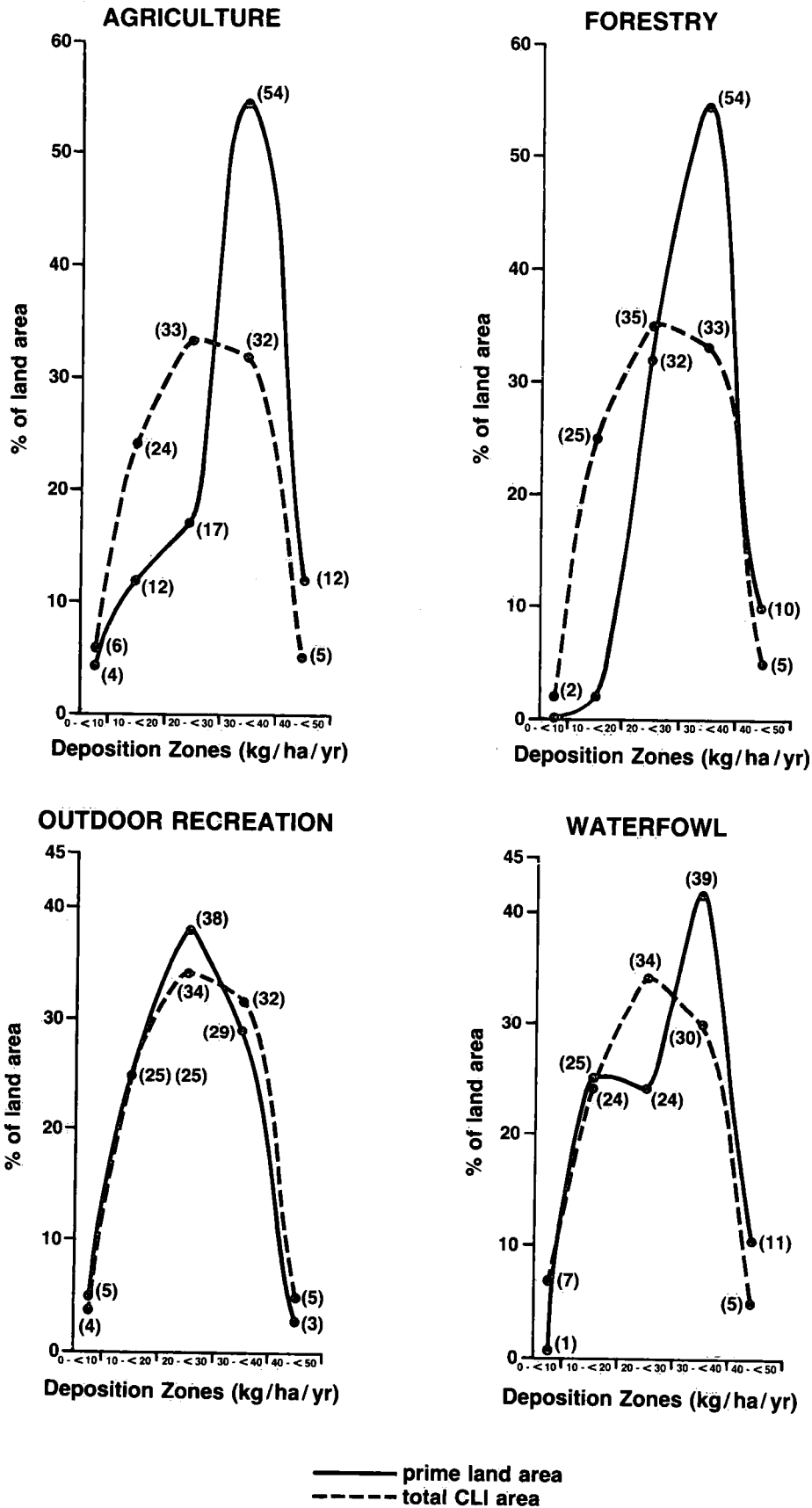
Table 1: Areas and percentages of prime lands in Eastern Canada for each CLI sector within wet sulphate deposition zones

CLI Sector	Wet sulphate deposition (kg/ha/yr)	Area of prime lands (000's of ha)	% ¹ of prime lands in:	
			(a) individual deposition zones; and (b) zones receiving greater than or equal to 20 kg/ha/yr	(a) (b)
Agriculture	0-<10	543	4	
	10-<20	1 474	12	
	20-<30	2 150	17	
	30-<40	6 671	54	84
	≥40	<u>1 494</u>	<u>12</u>	
	Total	12 332	99	
Forestry	0-<10	35	0	
	10-<20	740	4	
	20-<30	5 492	31	
	30-<40	9 444	54	96
	≥40	<u>1 786</u>	<u>10</u>	
	Total	17 497	99	
Outdoor Recreation	0-<10	133	5	
	10-<20	695	25	
	20-<30	1 051	38	
	30-<40	801	29	70
	≥40	<u>93</u>	<u>3</u>	
	Total	2 773	100	
Waterfowl	0-<10	27	1	
	10-<20	646	25	
	20-<30	615	24	
	30-<40	1 005	39	74
	≥40	<u>291</u>	<u>11</u>	
	Total	2 584	100	

¹ Figures may not total 100% due to rounding. Subtotals for <20 kg/ha/yr and ≥20 kg/ha/yr are recalculated using area figures in appendices rather than summing percent figures in table.

Source: Compiled using unpublished Canada Land Data System data reports R002190, R002240, R002290, and R002420.

Figure 4: Percentage of total prime land area, compared to percentage of total CLI area, within wet sulphate deposition zones for each CLI sector for Eastern Canada



Source: Compiled using Canada Land Data System reports R002190, R002240, R002290, and R002420. The total CLI area varies for each sector because of differences in methodology used in the CLI classification (e.g. waterfowl includes shallow water whereas the other sectors do not).

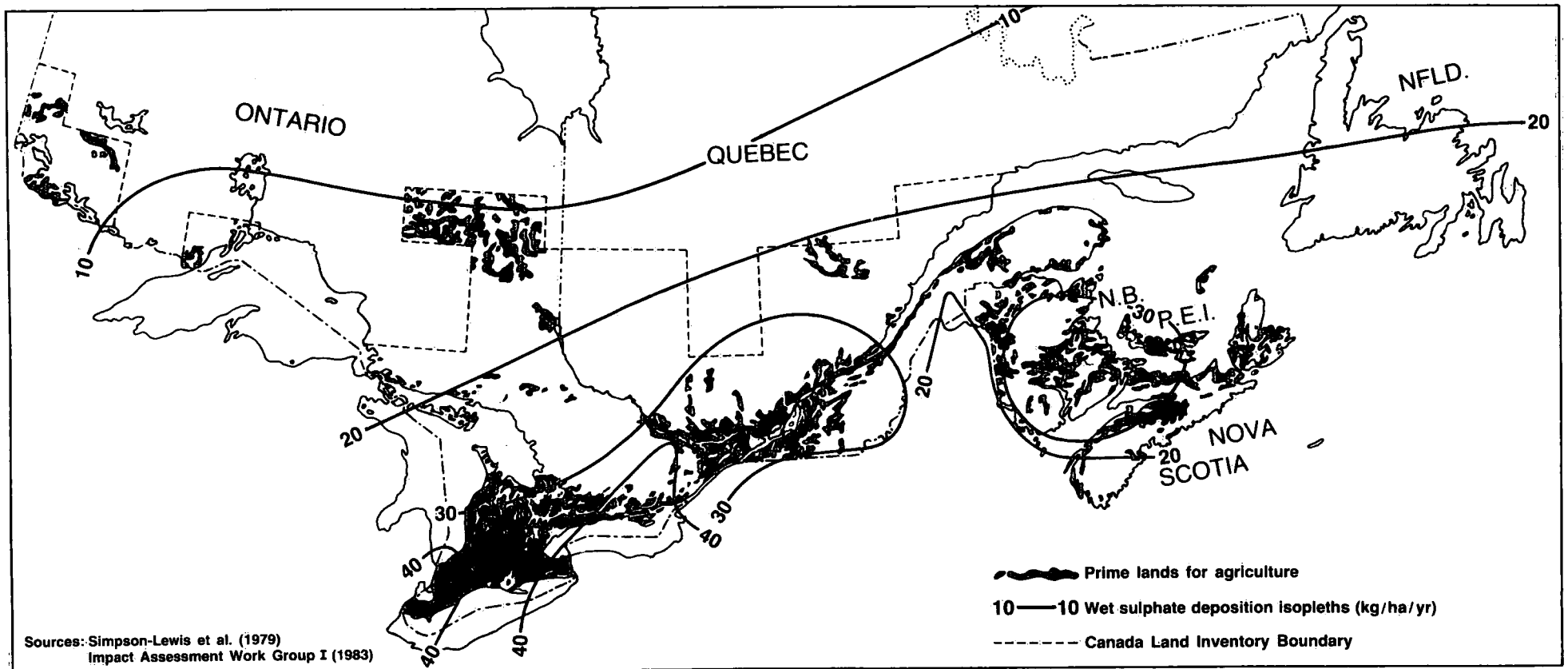


Figure 5: Prime lands for agriculture in Eastern Canada within wet sulphate deposition zones

and 12% are receiving greater than or equal to 40 kg/ha/yr (Table 1). The only prime lands for agriculture not subject to the highest levels of deposition are located in northern Ontario (Figure 5).

Productive agricultural land in Eastern Canada also extends to class 4; 78% of this class 1-4 land is associated with the greater than or equal to 20 kg/ha/yr deposition zones (Table 2).

Forestry

Prime lands for forestry have a somewhat similar geographical distribution to those for agriculture. However, in Ontario and Quebec the prime lands for forestry extend north into the southern fringe of the Laurentian Region of the Shield, and south and east into the Appalachian Region (in Quebec). Together, Ontario and Quebec contribute 97% of the total area of prime lands for forestry (17 497 977 ha) in Eastern Canada (Figure 6, Appendix 3b).

Since the highest wet sulphate deposition isopleths follow a similar pattern to prime lands, 96% of the prime lands for forestry identified are within zones receiving greater than or equal to 20 kg/ha/yr. The 30 to less than 40 kg/ha/yr zone extends over half of the prime lands for forestry, and 10% are within the greater than or equal to 40 kg/ha/yr zone (Table 1).

On lands where similar land capabilities exist for forestry and agriculture, forestry usually cannot compete, displacing actual commercial forest use to class 4 and 5 lands. It is therefore necessary to consider all potential commercial forest lands (i.e. classes 1 to 5) receiving wet sulphate deposition of greater than or equal to 20 kg/ha/yr. Inclusion of these classes almost triples the total area under consideration -- 80% of this area is receiving wet sulphate depositions greater than or equal to the target level of 20 kg/ha/yr (Table 3).

Outdoor Recreation

Only 1% (2 772 444 ha) of Eastern Canada has been classified as prime lands for outdoor recreation (Appendix 3c). Distinct from the other sectors, these prime lands are generally located in the more scenic or dramatic and commonly least disturbed landscapes of the Laurentian Region of the Shield in Ontario and Quebec and the Appalachian Region of the Atlantic provinces. In the settled St. Lawrence Lowlands Region, only shorelines and coastlines are favoured for outdoor recreation (Figure 7).

The outdoor recreation sector has the lowest percentage of its prime lands (70%) receiving greater than or equal to 20 kg/ha/yr of wet sulphate (Table 1). This reflects the more ubiquitous nature of their distribution throughout the CLI area, compared to prime lands for other sectors, which tend to be more concentrated in the south. However, the proximity of prime lands for outdoor recreation to the southern most heavily settled area is clear when the entire expanse of Eastern Canada

Table 2: Areas and percentages of productive lands for agriculture (classes 1-4) in Eastern Canada within wet sulphate deposition zones

Wet sulphate deposition (kg/ha/yr)	Area of productive lands for agriculture (000's of ha)	% ¹ of prime lands in:	
		(a) individual deposition zones; and (b) zones receiving greater than or equal to 20 kg/ha/yr	
		(a)	(b)
0-<10	860	4	
10-<20	3 550	18	
20-<30	3 887	19	
30-<40	10 105	50	78
<u>>40</u>	<u>1 620</u>	<u>8</u>	
Total	20 022	99	

¹ Figure does not total 100% due to rounding. Subtotals for <20 kg/ha/yr and ≥ 20 kg/ha/yr are calculated using area figures in table, rather than summing percent figures.

Source: Compiled using unpublished Canada Land Data System data report R002190.

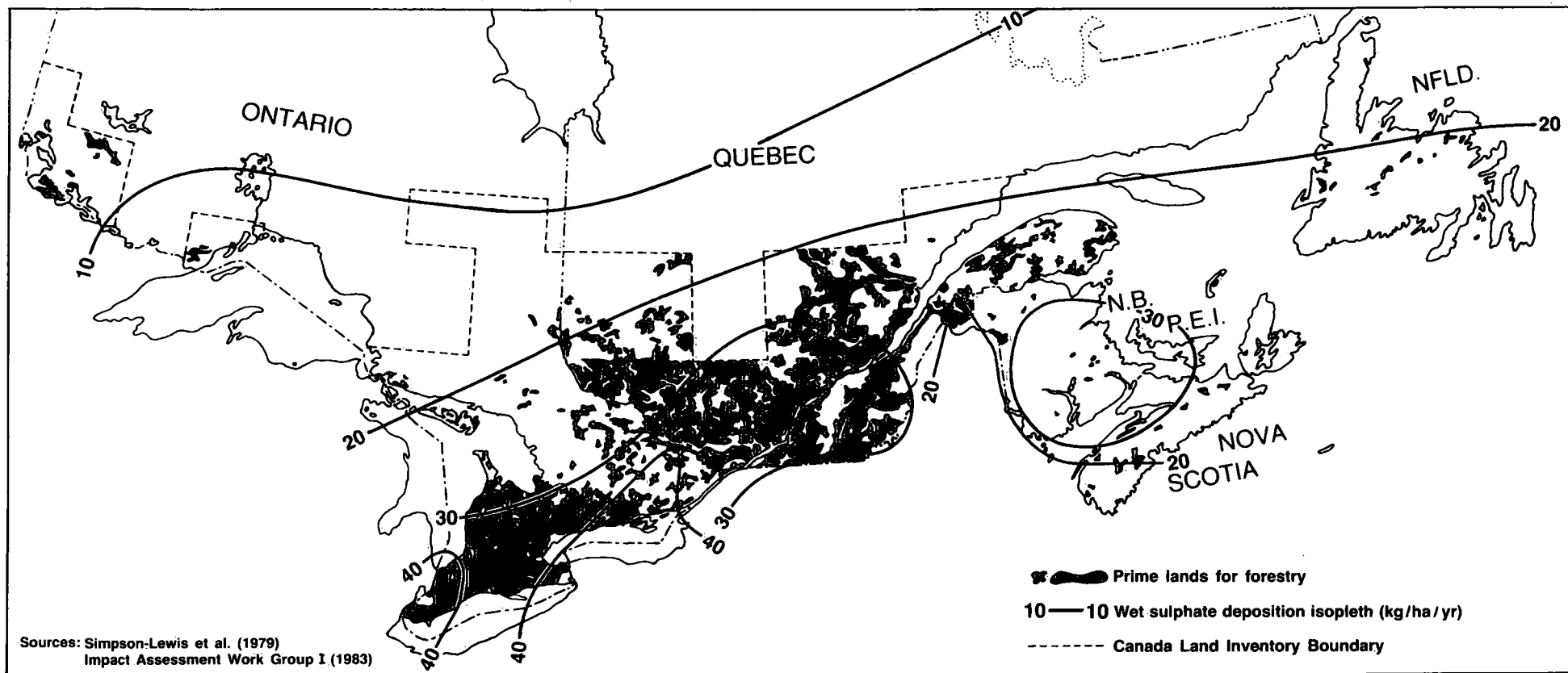


Figure 6: Prime lands for forestry in Eastern Canada within wet sulphate deposition zones

Table 3: Areas and percentages of commercial lands for forestry (classes 1-5) in Eastern Canada within wet sulphate deposition zones

Wet sulphate Deposition (kg/ha/yr)	Area of commercial lands for forestry (000's of ha)	% ¹ of prime lands in: (a) individual deposition zones; and (b) zones receiving greater than or equal to 20 kg/ha/yr	
		(a)	(b)
0-<10	596	1	
10-<20	9 382	18	
20-<30	18 646	37	
30-<40	19 378	38	80
≥40	<u>2 807</u>	<u>6</u>	
Total	50 809	100	

¹ Subtotals for <20 kg/ha/yr and ≥20 kg/ha/yr are calculated using area figures in table, rather than summing percent figures.

Source: Compiled using unpublished Canada Land Data System data report R002420.

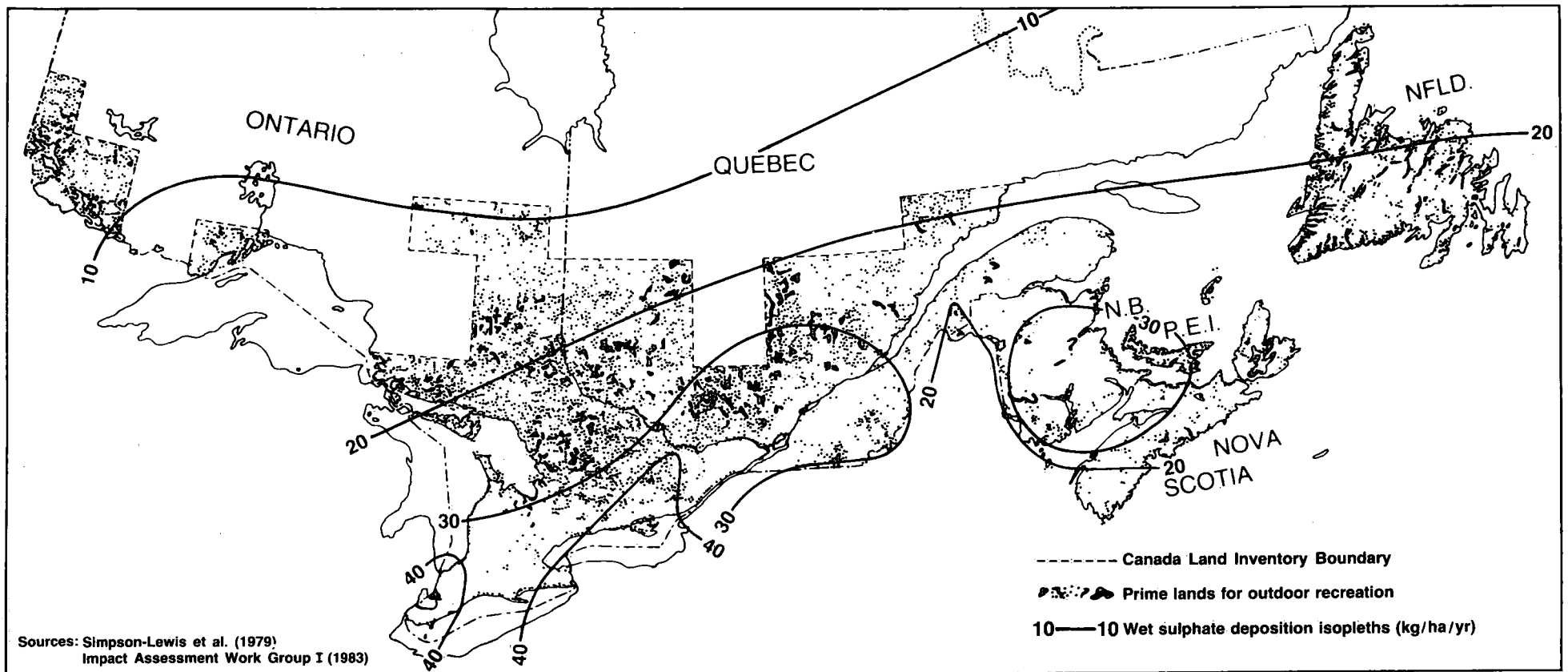


Figure 7: Prime lands for outdoor recreation in Eastern Canada within wet sulphate deposition zones

is considered (Figure 7).

Waterfowl

Prime lands for waterfowl appear to be scarcest -- less than 1% (2 584 354 ha) of the total land and freshwater area of Eastern Canada (Appendix 3d). The shorelines of lakes Ontario, Erie, St. Clair, and St. Jean, the Trent, Ottawa, and St. Lawrence rivers, and Georgian Bay combine to provide most of the inland prime lands for waterfowl (Figure 8). Shorelines along major river systems, tidal lagoons, mud flats, and saltwater marshes along the extensive coastlines are prime lands for waterfowl in the Atlantic provinces. Primarily, these prime lands satisfy seasonal migration requirements, and very little (7%) is used for waterfowl production (based on calculations using data in Appendix 3d).

The shorelines of Georgian Bay and Lake Abitibi in Ontario, the lower St. Lawrence River, and Nova Scotia, are the only areas of wetlands receiving less than 30 kg/ha/yr although these lands fall primarily within the 20 to less than 30 kg/ha/yr deposition zone. The greater than or equal to 40 kg/ha/yr zone coincides with relatively extensive high capability areas in Ontario, measuring 11% (291 467 ha) of the total prime lands for waterfowl, in the vicinity of Lake St. Clair in the southwest and the upper St. Lawrence River in the southeast of the province (Figure 8, Appendix 3d). In total, 74% of the prime lands for waterfowl receive greater than or equal to 20 kg/ha/yr of wet sulphate (Table 1).

Provincial Perspectives

Overview

Figure 9 presents a comparison of prime lands and their relationship to wet sulphate deposition levels for each of the provinces of Eastern Canada. In general, Ontario and Quebec differ from the Atlantic provinces both in the extent of their prime lands relative to their large land areas, and in the variable proportion of those lands receiving greater than or equal to 20 kg/ha/yr of wet sulphate. The Atlantic provinces are more typically characterized by greater proportions of prime lands relative to their total land area, with a higher percentage of these lands receiving greater than or equal to 20 kg/ha/yr of wet sulphate.

Ontario

Wet sulphate depositions of greater than or equal to 20 kg/ha/yr occur in the southern 15% of the province's 89 119 000 ha (Figure 2). The highest deposition zones, 30 to less than 40 and greater than or equal to 40 kg/ha/yr, occur in the St. Lawrence Lowlands Region and the extreme southeast and southwest portions of the province, respectively. The latter is unique in that it is the only area in Eastern Canada receiving wet sulphate depositions of greater than or equal to 40 kg/ha/yr.

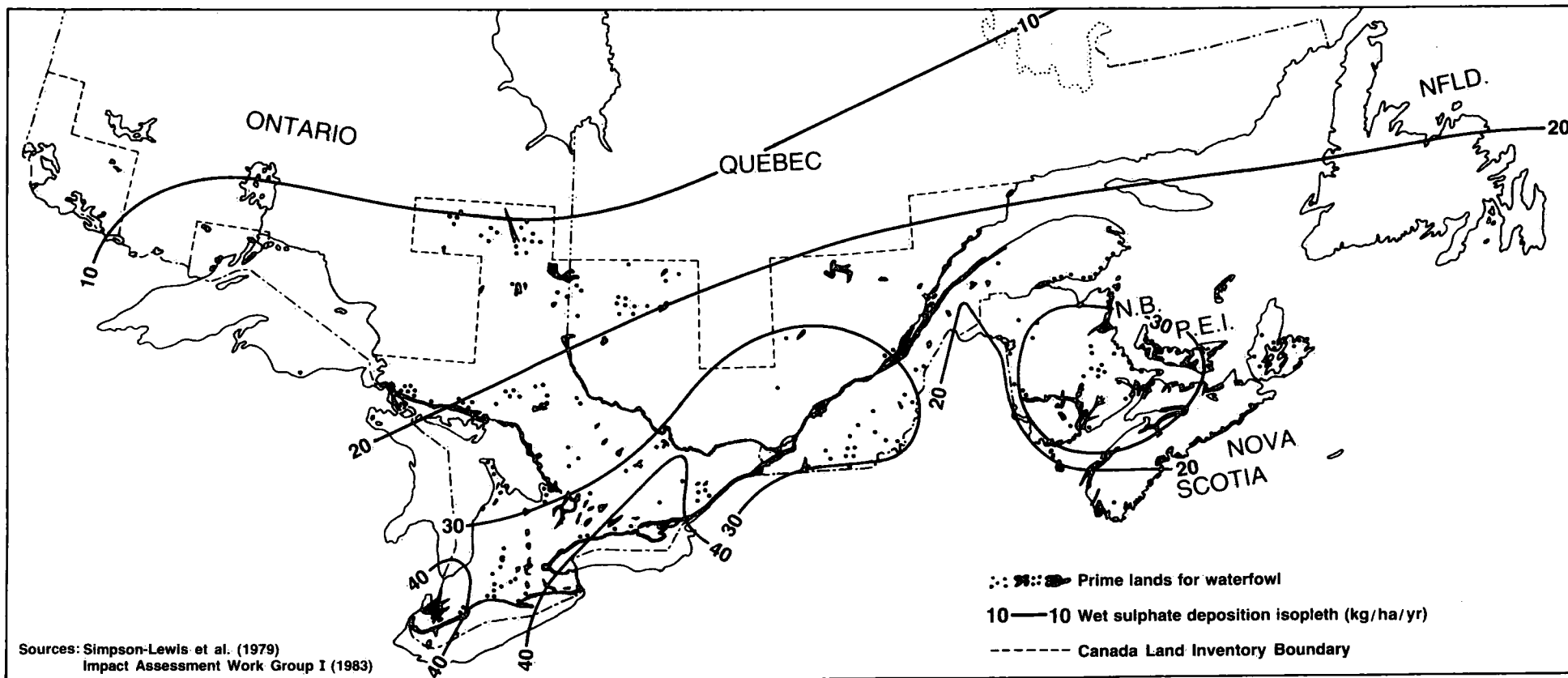
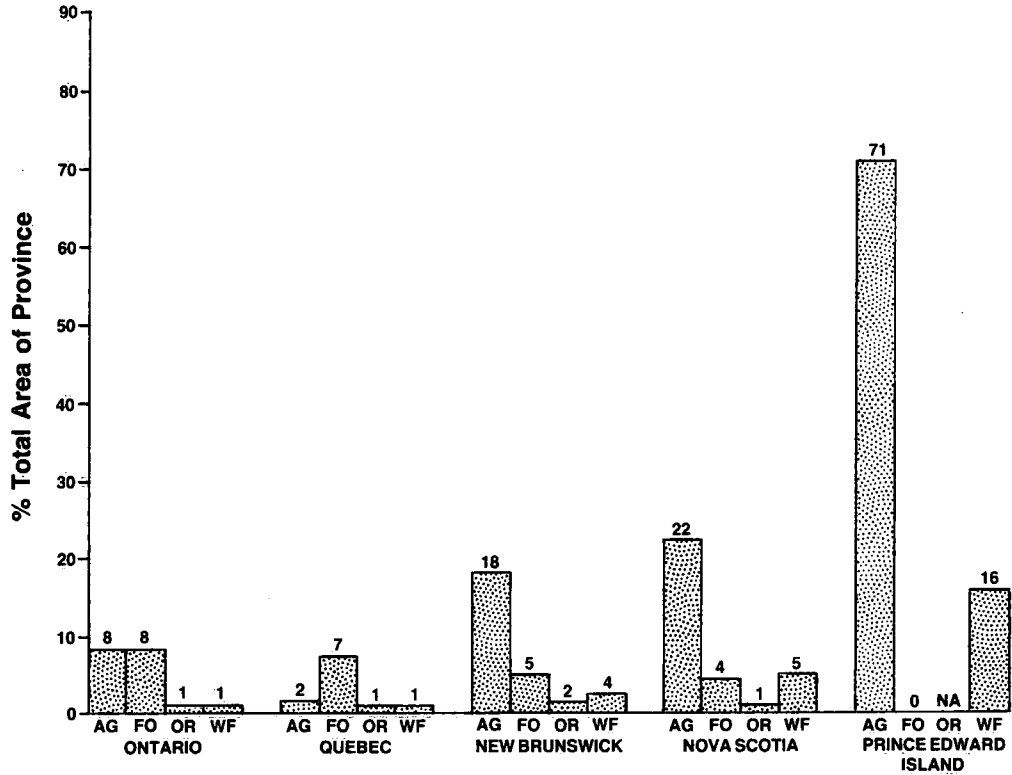


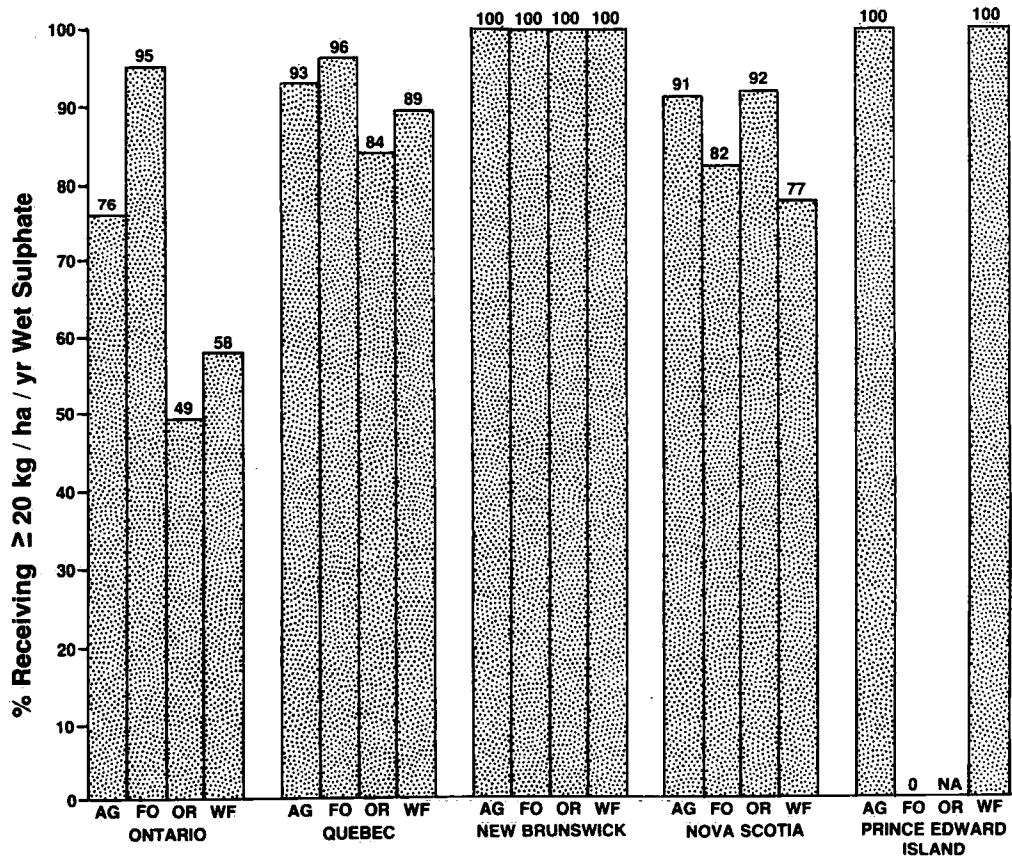
Figure 8: Prime lands for waterfowl in Eastern Canada within wet sulphate deposition zones

Figure 9:

a) Lands classified as prime lands for each CLI sector as a percentage of the total area of each province



b) Prime lands receiving greater than or equal to 20 kg / ha / yr of wet sulphate as a percentage of all prime lands for each CLI sector for each province



LEGEND: AG = Agriculture; FO = Forestry; OR = Outdoor Recreation; WF = Waterfowl.

Sources: CLI data were compiled using Canada Land Data System Reports R002190, R002240, R002290, and R002420. See Appendix 2 for provincial area statistics used in calculations.

Southern Ontario, and particularly the St. Lawrence Lowlands Region, is the area in which most of the province's prime lands occur. They occupy between 1% and 8% of the total provincial land area (Figure 9). Agricultural activities are generally concentrated on the deeper moraines south of the Canadian Shield, with scattered pockets across northern Ontario. Prime lands for forestry are concentrated in the southern lowland as well as the southern fringe of the Canadian Shield. The Niagara Escarpment marks the southwestern limit of the most favoured land for outdoor recreation, aside from the Great Lakes shorelines and major river systems, such as the Trent and Rideau. Prime lands for waterfowl include the narrow margin of marshes and shallow waters along lakes Huron (Georgian Bay), St. Clair, Erie, and Ontario, and the Ottawa and Trent rivers. Figures 5 through 8 illustrate the relative locations of these prime lands and wet sulphate deposition zones, which result in between 49% and 95% of Ontario's prime lands being subject to high levels of this acid deposition (Table 4b).

Table 4a presents the distribution of prime lands in Ontario, by class, within wet sulphate deposition zones. Prime lands are notably concentrated in the 30 to less than 40 kg/ha/yr zone in nearly all of the classes, and a high percentage of class 1 lands in all sectors receive greater than or equal to 20 kg/ha/yr. Table 4a also reveals a consistent association between capability class and wet sulphate deposition: with the exception of waterfowl, the higher the class, the higher the total percentage of land receiving greater than or equal to 20 kg/ha/yr.

When additional classes are added to produce a "productive" area total for agriculture and a "commercial" area total for forestry, the proportion of total area receiving greater than or equal to 20 kg/ha/yr is reduced to 64% and 65% respectively (Appendices 4a and 5a; these percentages are based upon calculations using areas for classes 1-4 in the appendices rather than summing the percentages which already include errors due to rounding).

Quebec

Although no wet sulphate deposition values greater than or equal to 40 kg/ha/yr of wet sulphate were measured in Quebec in 1980, a large core area of 30 to less than 40 kg/ha/yr values covers 8 736 000 ha of southern Quebec (Figure 2). This zone contains between one-third and two-thirds of the Quebec prime lands (Table 5b). A band which roughly parallels this core area to the north receives 20 to less than 30 kg/ha/yr, resulting in a range of 84%-96% of all prime land areas receiving more than the target level of 20 kg/ha/yr of wet sulphate (Table 5b). Table 5a reveals that the highest deposition values are again associated with the highest capability classes, as in Ontario.

These high values are a consequence of the relative position of the 1%-7% of the province containing prime lands and the 15% of the total provincial area receiving greater than or equal to 20 kg/ha/yr of wet sulphate. Agriculture is primarily restricted to the St. Lawrence Lowlands Region between Montreal and Quebec City, and in a narrow strip along the Gaspé peninsula. Prime lands for forestry also occupy these

Table 4:

a) Percentage of all prime lands for each CLI sector and class within the wet sulphate deposition zones for Ontario

CLI Sector	Class	% of prime lands within each wet sulphate deposition zone			
		20-<30	30-<40	>40	Total
Agriculture	1	3	78	19	100
	2	3	54	32	98
	3	4	30	12	47
Forestry	1	2	78	19	100
	2	5	67	28	99
	3	16	52	23	90
Outdoor Recreation	1	20	42	19	82
	2	22	32	14	62
	3	22	17	7	46
Waterfowl ²	1	NA ³	NA	NA	NA
	2	20	9	0	30
	3	12	48	13	72

b) Percentage of all prime lands for each CLI sector for the total of classes 1-3 within the wet sulphate deposition zones for Ontario

CLI Sector	% of class 1-3 prime lands within each wet sulphate deposition zone			
	20-<30	30-<40	>40	Total
Agriculture	4	52	21	76
Forestry	8	62	24	95
Outdoor Recreation	22	19	8	49
Waterfowl ²	11	24	23	58

¹ Total percents are calculated using area figures in appendices rather than summing percentages in table.

² Individual class percentages consider capability of lands for the production of waterfowl only. Aggregate percentages (1-3) consider capability of lands for production, migration, and wintering purposes.

³ "NA" means that no lands are rated in this class in this province.

Source: Compiled using unpublished Canada Land Data System data reports R002190, R002240, R002290, and R002420.

Table 5:

a) Percentage of all prime lands for each CLI sector and class within the wet sulphate deposition zones for Quebec

CLI Sector	Class	% of prime lands within each wet sulphate deposition zone			Total ¹
		20-<30	30-<40	≥40	
		(kg/ha/yr)			
Agriculture	1	5	95	0	100
	2	19	78	0	97
	3	38	52	0	90
Forestry	1	23	77	0	100
	2	32	68	0	100
	3	50	45	0	95
Outdoor Recreation	1	48	38	0	86
	2	45	40	0	85
	3	48	36	0	84
Waterfowl ²	1	88	12	0	100
	2	75	25	0	100
	3	34	33	0	68

b) Percentage of all prime lands for each CLI sector for the total of classes 1-3 within the wet sulphate deposition zones for Quebec

CLI Sector	% of class 1-3 prime lands within each wet sulphate deposition zone			Total
	20-<30	30-<40	≥40	
	(kg/ha/yr)			
Agriculture	30	63	0	93
Forestry	46	50	0	96
Outdoor Recreation	48	37	0	84
Waterfowl ²	41	48	0	89

¹Total percents are calculated using area figures in appendices rather than summing percentages in table.

²Individual class percentages consider capability of lands for the production of waterfowl only. Aggregate percentages (1-3) consider capability of lands for production, migration, and wintering purposes.

Source: Compiled using unpublished Canada Land Data System data reports R002190, R002240, R002290, and R002420.

core areas, but extend further north into the Laurentian Region of the Shield, southeast into the Appalachian Region, and northeast into the Gaspé peninsula. Prime lands for outdoor recreation predominate in the landscapes of the Laurentian and Appalachian regions, being restricted primarily to major river shorelines in the southern, most heavily settled portion of Quebec. The shorelines of the Ottawa and St. Lawrence rivers, Lac St. Jean, and the Iles de la Madeleine (Magdalen Islands) provide the prime lands for waterfowl in Quebec.

Calculations of total productive agricultural lands and total commercial forest lands also indicate a concentration (86% for both CLI sectors) of these capability ratings in the wet sulphate deposition zones of greater than or equal to 20 kg/ha/yr (Appendices 4b and 5b).

New Brunswick

The entire 7 146 000 ha of New Brunswick's land area receives greater than or equal to 20 kg/ha/yr wet sulphate deposition (Figure 2). More than half of that area (56%) lies within the 30 to less than 40 kg/ha/yr isopleth. Accordingly, 100% of New Brunswick's prime lands, which predominate in the Maritime Plain of the east and south-central part of the province and in the major river valleys, currently receive wet sulphate deposition values above the target level (Figure 9). Individual capability class distributions among the deposition zones are presented in Table 6.

When total commercial forest land is calculated, the area within the greater than or equal to 30 kg/ha/yr wet sulphate deposition zone increases to 54% (Appendix 5c). The total percent of productive agricultural lands receiving greater than or equal to 30 kg/ha/yr is equal to that of prime land (61%) (Appendix 4c).

Nova Scotia

The circular zone of 30 to less than 40 kg/ha/yr wet sulphate deposition values covers 965 000 ha (18%) of Nova Scotia in the Northumberland Strait area. This deposition level applies to 17% (forestry and outdoor recreation), 25% (waterfowl) and 34% (agriculture) of the province's prime lands. Prime lands for agriculture and waterfowl are high in this area because of the fertile, lowland nature of the Maritime Plain Region and the occurrence of numerous sheltered bays along the coast.

The majority (61%) of the remainder of Nova Scotia's 5 300 000 ha area is subject to 20 to less than 30 kg/ha/yr wet sulphate deposition levels, and encompasses an additional 52% to 76% of the prime lands, primarily within the vicinity of the Minas Basin and major river valleys. Only the southern portion of the province, approximately 1 123 000 ha (21% of the provincial area), is currently less than the target deposition. This area receives 10 to less than 20 kg/ha/yr of wet sulphate, and includes less than one-quarter of any of the total prime land areas (Figure 9, Table 7). Table 7 presents the individual capability class distributions by wet sulphate deposition zone.

Table 6:

a) Percentage of all prime lands for each CLI sector and class within the wet sulphate deposition zones for New Brunswick

CLI Sector	Class	% of prime lands within each wet sulphate deposition zone			Total ¹
		20-<30	30-<40	≥40	
Agriculture	1	NA ²	NA	NA	NA
	2	89	11	0	100
	3	32	68	0	100
Forestry	1	NA	NA	NA	NA
	2	NA	NA	NA	NA
	3	68	32	0	100
Outdoor Recreation	1	11	89	0	100
	2	79	21	0	100
	3	52	48	0	100
Waterfowl ³	1	0	100	0	100
	2	9	91	0	100
	3	15	85	0	100

b) Percentage of all prime lands for each CLI sector for the total of classes 1-3 within the wet sulphate deposition zones for New Brunswick

CLI Sectors	% of class 1-3 prime lands within wet sulphate deposition zone			Total ¹
	20-<30	30-<40	≥40	
Agriculture	39	61	0	100
Forestry	68	32	0	100
Outdoor Recreation	56	44	0	100
Waterfowl ³	22	78	0	100

¹Total percents are calculated using area figures in appendices rather than summing percentages in table.

²"NA" means that no lands are rated in the class in this province.

³Individuals class percentages consider capability of lands for the production of waterfowl only. Aggregate percentages (1-3) consider capability of lands for production, migration, and wintering purposes.

Table 7:

a) Percentage of all prime lands for each CLI sector and class within the wet sulphate deposition zones for Nova Scotia

CLI Sector	Class	% of prime lands within each wet sulphate deposition zone			Total ¹
		20-<30	30-<40	≥40	
		(kg/ha/yr)			
Agriculture	1	NA ²	NA	NA	NA
	2	30	69	0	99
	3	62	28	0	90
Forestry	1	NA	NA	NA	NA
	2	NA	NA	NA	NA
	3	65	17	0	82
Outdoor Recreation	1	95	5	0	100
	2	57	26	0	82
	3	79	15	0	94
Waterfowl ³	1	100	0	0	100
	2	84	10	0	100
	3	57	31	0	100

b) Percentage of all prime lands for each CLI sector for the total of classes 1-3 within the wet sulphate deposition zones for Nova Scotia

CLI Sector	% of class 1-3 prime lands within each wet sulphate deposition zone			Total ¹
	20-<30	30-<40	≥40	
	(kg/ha/yr)			
Agriculture	57	34	0	91
Forestry	65	17	0	82
Outdoor Recreation	76	17	0	92
Waterfowl ³	53	25	0	77

¹ Total percents are calculated using area figures in appendices rather than summing percentages in table.

² "NA" means that no lands are rated in this class within this province.

³ Individual class percentages consider capability of lands for the production of waterfowl only. Aggregate percentages (1-3) consider capability of lands for production, migration, and wintering purposes.

Figures quantifying the distribution of total productive agricultural lands among the wet sulphate deposition zones do not differ appreciably, while the total commercial forest calculations realize a shift of 5% more of the total area into the 30 to less than 40 kg/ha/yr deposition zone.

Prince Edward Island

Of Prince Edward Island's total land area of 564 000 ha, 82% falls within the 30 to less than 40 kg/ha/yr zone (Figure 2), with the remainder of its area receiving 20 to less than 30 kg/ha/yr. Although PEI has no lands rated as prime lands for forestry, 71% of the province is rated as prime lands for agriculture (Figure 9). An extensive coastal wetland system, comprising 16% of the island's total area, is prime lands for waterfowl (Figure 9). These figures account for 85% of the prime lands for agriculture and 90% of the prime lands for waterfowl receiving 30 to less than 40 kg/ha/yr of wet sulphate (Table 8b). Table 8a presents the distribution of prime lands by CLI class within each deposition zone.

The total productive agricultural lands (including an additional roughly 50 000 ha of class 4) are distributed similarly to the prime lands, within the deposition zones, with 85% receiving 30 to less than 40 kg/ha/yr of wet sulphate (Appendix 4e).

Newfoundland

Wet sulphate deposition levels of 20 to less than 30 kg/ha/yr predominate in insular Newfoundland (Figure 2). Only about a quarter of the island's total area, comprising the northern peninsula and the northern coastal margin, receives less than the target wet sulphate deposition level of 20 kg/ha/yr.

Although the province was partly mapped for soil capability for agriculture, no prime lands were identified. Scattered locations have been identified as class 3 lands for forestry. Most of these lie within the 20 to less than 30 kg/ha/yr zone (Figure 6). Consistent with the other provinces, prime lands for outdoor recreation are more evenly distributed (Figure 7), and substantial proportions of these lands are located in each of the two wet sulphate deposition zones which cover the province. Newfoundland was not included in the CLI land capability classification for waterfowl.

CONCLUSIONS

Whether analyzed from the perspective of Eastern Canada as a whole, by individual CLI sectors, or by provinces, most prime resource lands in Eastern Canada receive wet sulphate deposition levels greater than or equal to 20 kg/ha/yr. As these prime lands are critical for a variety of productive or commercial purposes at local, regional, provincial, and national levels, this analysis reinforces the need to further qualify the

Table 8:

a) Percentage of all prime lands for each CLI sector and class within the wet sulphate deposition zones for Prince Edward Island

CLI Sector	Class	% of prime lands within each wet sulphate deposition zone ¹			
		20-<30	30-<40	≥40	Total
Agriculture	1	NA ²	NA	NA	NA
	2	19	81	0	100
	3	10	90	0	100
Forestry	1	NA	NA	NA	NA
	2	NA	NA	NA	NA
	3	NA	NA	NA	NA
Waterfowl ³	1	17	83	0	100
	2	9	91	0	100
	3	19	81	0	100

b) Percentage of all prime lands for each CLI sector for the total of classes 1-3 within the wet sulphate deposition zones for Prince Edward Island

CLI Sector	% of class 1-3 prime lands within each wet sulphate deposition zone			
	20-<30	30-<40	≥40	Total
Agriculture	16	85	0	100
Forestry	NA	NA	NA	NA
Waterfowl ³	10	90	0	100

¹Total percents are calculated using area figures in appendices rather than summing percentages in table.

²"NA" means that no lands are rated in this class within this province.

³Individual class percentages consider capability of lands for the production of waterfowl only. Aggregate percentages (1-3) consider capability of lands for production, migration, and wintering purposes.

resources which may be threatened, by researching the cause-and-effect relationships which may exist between wet sulphate deposition levels and the various resources for agriculture, forestry, outdoor recreation, and waterfowl. Equally, the analysis points to the need to investigate the social and economic effects which would exist if these resources were in part or in whole lost or degraded as a result of acid deposition. While cause-and-effect relationships remain uncertain, and further advances in sulphate emission controls in Eastern Canada are not taking place, the heartland of much of our renewable resource base may remain in jeopardy.

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APPENDICES

APPENDIX 1

Canada Land Inventory Capability Class Definitions

Soil Capability Classification for Agriculture

Class 1 - Soils in this class have no significant limitations for crops. They are deep, level or very gently sloping, well to imperfectly drained, and have a good water-holding capacity. They are easily maintained in good tilth and productivity, and damage from erosion is slight. They are moderately high to high in productivity for a wide range of field crops adapted to the region.

Class 2 - Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices. They are deep, have a good water-holding capacity, can be managed with little difficulty, and are moderately high to high in productivity for a fairly wide range of field crops. The moderate limitations of these soils may be: adverse regional climate; moderate effects of erosion; poor soil structure or slow permeability; low fertility which is correctable with limited application of fertilizer and lime; gentle to moderate slopes; or occasional overflow or wetness.

Class 3 - Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices. Under good management, these soils are fair to moderately high in productivity for a fairly wide range of field crops adapted to the region. Conservation practices are more difficult to apply and maintain. Limitations are a combination of two of those factors described under Class 2, or one of: moderate climatic limitations; moderately severe effects of erosion; intractable soil mass or very slow permeability; low fertility; moderate to strong slopes; frequent overflow or poor drainage, resulting in occasional crop damage; low water-holding capacity or slow in release of water; stoniness sufficiently severe to seriously handicap cultivation and necessitating some clearing; restricted rooting zone; or moderate salinity.

Class 4 - Soils in this class have severe limitations that restrict the range of crops, or require special conservation practices, or both. Such soils are suitable for only a few crops, or the yield for a range of crops is low, or the risk of crop failure is high. Limitations are a combination of two or more of those described in classes 2 and 3, or one of: moderately severe climate; very low water-holding capacity; low fertility which is difficult or unfeasible to correct; strong slopes; severe past erosion; very intractable mass of soil or extremely slow permeability; frequent overflow, with severe effects on crops; severe salinity, causing some crop failures; extreme stoniness requiring considerable clearing to permit annual cultivation; very restricted rooting zone, but more than 30 cm of soil over bedrock; or an impermeable layer. Limitations may seriously affect timing and ease of tillage, planting, harvesting, and maintenance of conservation practices. Soils have low to medium productivity for a narrow range of crops, but may have higher productivity for a specially adapted crop.

Class 5 - Soils in this class have very severe limitations that restrict their capability to produce perennial forage crops, and improvement practices are feasible. Soils have such serious soil, climatic, or other limitations that they are not capable of use for sustained production of annual field crops. These soils may be improved by the use of farm machinery for the production of native or tame species of perennial forage plants. Limitations are one or more of: severe climate; low water-holding capacity; severe past erosion; steep slopes; very poor drainage; very frequent overflow; severe salinity permitting only salt-tolerant forage crops to grow; and stoniness or shallowness to bedrock that make annual cultivation impractical. Some soils can be used for cultivated field crops, provided that unusually intensive management is used. Cultivated field crops may be grown in class 5 areas where adverse climate is the main limitation, but crop failures occur under average conditions. Some of the soils in this class are also adapted to special crops such as blueberries or orchard crops, which require soil conditions unlike those needed by the common crops.

Class 6 - Soils in this class are capable only of producing perennial forage crops, and improvement practices are not feasible. Soils have some natural sustained grazing capacity for farm animals but have such serious soil, climatic, or other limitations as to make impractical the application of improvement practices that can be carried out in class 5. Soils may be placed in this class because their physical nature prevents improvement through the use of farm machinery, or the soils are not responsive to improvement practices, or because of a short grazing season, or because stock-watering facilities are inadequate. Limitations are one or more of: very severe climate; very low water-holding capacity; very steep slopes; very severely eroded land with gullies too numerous and too deep for working with machinery; severely saline land producing only edible, salt-tolerant, native plants; very frequent overflow which allows less than ten weeks of effective grazing; water on the surface of the soil for most of the year; and stoniness or shallowness to bedrock that makes any cultivation impractical.

Class 7 - Soils in this class have no capability for arable culture or permanent pasture. The soils or lands in class 7 have limitations so severe that they are not capable of use for arable culture or permanent pasture. All classified areas (except organic soils) not included in classes 1 to 6 are placed in this class.

Land Capability Classification for Forestry

Class 1 - These lands have no important limitations to the growth of commercial forests. Soils are deep, permeable, of medium texture, moderately well to imperfectly drained, have good water-holding capacity and are naturally high in fertility. Their topographic position is such that they frequently receive seepage and nutrients from adjacent areas. They are not subject to extremes of temperature or evapotranspiration. Productivity is usually greater than 7.8 cubic metres per hectare per year. When required, this class may be subdivided on the basis of productivity into 1 (7.8 to 9.2 m³/ha/yr), 1a (9.2 to 12.0 m³/ha/yr), 1b (12.1 to 15.0 m³/ha/yr), 1c (15.1 to 18.0 m³/ha/yr), 1d (18.1 to 21.0 m³/ha/yr), and 1e (greater than 21.1 m³/ha/yr).

Class 2 - These lands have slight limitations to the growth of commercial forests. Soils are deep, well to moderately well drained, of medium to fine texture, and have good water-holding capacity. The most common limitations (all of a relatively slight nature) are: adverse climate; soil moisture deficiency; restricted rooting depth; somewhat low fertility; and the cumulative effects of several minor soil characteristics. Productivity is usually from 6.4 to 7.7 m³/ha/yr.

Class 3 - These lands have moderate limitations to the growth of commercial forests. Soils may be deep to somewhat shallow, well to imperfectly drained, of medium to fine texture, with moderate to good water-holding capacity. They may be slightly low in fertility or suffer from periodic moisture imbalances. The most common limitations are: adverse climate; restricted rooting depth; moderate deficiency or excess of soil moisture; somewhat low fertility; impeded soil drainage, exposure (in maritime areas); and occasional inundation. Productivity is usually from 4.9 to 6.4 m³/ha/yr.

Class 4 - These lands have moderately severe limitations to the growth of commercial forests. Soils are deep to moderately shallow, have excessive to imperfect to poor drainage, have coarse to fine texture, good to poor water-holding capacity, good to poor structure, and good to low natural fertility. The most common limitations are: deficiency or excess of soil moisture; adverse climate; restricted rooting depth; poor structure; excessive carbonates; exposure; and low fertility. Productivity is usually from 3.6 to 4.9 m³/ha/yr.

Class 5 - These lands have severe limitations to the growth of commercial forests. Soils are frequently shallow to bedrock, stony, excessively or poorly drained, and have coarse or fine texture, poor water-holding capacity, and low natural fertility. The most common limitations (often in combination) are: deficiency or excess of soil moisture; shallowness to bedrock; adverse regional or local climate; low natural fertility; exposure, particularly in maritime areas; excessive stoniness; and high levels of carbonates. Productivity is usually from 2.2 to 3.5 m³/ha/yr.

Class 6 - These lands have very severe limitations to the growth of commercial forests. The mineral soils are frequently shallow, stony, excessively drained, of coarse texture, and low in fertility. A large percentage of the land in this class is composed of poorly drained organic soils. The most common limitations (frequently in combination) are: shallowness to bedrock; deficiency or excess of soil moisture; high levels of soluble salts; low natural fertility; exposure; inundation; and stoniness. Productivity will usually be from 0.8 to 2.1 m³/ha/yr.

Class 7 - These lands have severe limitations which preclude the growth of commercial forests. Mineral soils are usually extremely shallow to bedrock, subject to regular flooding, or contain toxic levels of soluble salts. Actively eroding or extremely dry soils may also be placed in this class. A large percentage of the land is very poorly drained organic soils. The most common limitations are: shallowness to bedrock, excessive soil moisture, frequent inundation, active erosion, toxic levels of soluble salts, and

extremes of climate or exposure. Productivity is usually less than 0.8 m³/ha/yr.

Land Capability Classification for Outdoor Recreation

Class 1 - These lands have very high capability for outdoor recreation. They have natural capability to engender and sustain very high annual use based on one or more recreational activities of an intensive nature. They should be able to generate and sustain a level of use comparable to that evident at an outstanding and large bathing beach or a nationally known ski slope.

Class 2 - These lands have a high capability for outdoor recreation. They have natural capability to engender and sustain high annual use based on one or more recreational activities of an intensive nature.

Class 3 - These lands have a moderately high capability for outdoor recreation. They have natural capability to engender and sustain moderately high annual use based usually on intensive or moderately intensive activities.

Class 4 - These lands have moderate capability for outdoor recreation. They have natural capability to engender and sustain moderate annual use based usually on dispersed activities.

Class 5 - These lands have moderately low capability for outdoor recreation. They have natural capability to engender and sustain a moderately low total annual use based on dispersed activities.

Class 6 - These lands have low capability for outdoor recreation. They lack the natural quality and significant features to rate higher, but have the natural capability to engender and sustain low annual use based on dispersed activities.

Class 7 - These lands have very low capability for outdoor recreation. They have practically no capability for any popular types of recreation activity, but there may be some capability for very specialized activities with recreation aspects, or they may simply provide open space.

Land Capability Classification for Waterfowl

Class 1 - These lands have no significant limitations to the production of waterfowl. Capability 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 - These lands have very slight limitations to the production of waterfowl. Capability on these lands is high. Slight limitations are due to climate, 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 - These lands have 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. These 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. This class has no subclasses.

Class 4 - These lands have 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 with poorly developed marsh edges, or both.

Class 5 - These lands have moderately severe limitations to the production of waterfowl. Capability on these lands is low. Limitations are usually a combination of two or more of: climate; soil moisture; permeability; fertility; topography; salinity; flooding; or poor interspersions of water areas.

Class 6 - These lands have severe limitations to the production of waterfowl. Capability is identified and may include: aridity; salinity; very flat topography; steep-sided lakes; extremely porous soils; and soils containing few available minerals.

Class 7 - These lands have such severe limitations that almost no waterfowl are produced. Capability on these lands is negligible or non-existent. Limitations are so severe that waterfowl production is precluded or nearly precluded.

APPENDIX 2

Areas of Land Plus Water for the Provinces of Eastern Canada

	Land (km ² ; ha)		Total Land plus Water ¹ (km ² ; ha)	
Ontario	891 190;	89 119 000	1 068 580;	106 858 000
Quebec	1 356 790;	135 679 000	1 540 680;	154 068 000
New Brunswick	71 460;	7 146 000	76 180;	7 618 000
Nova Scotia	53 000;	5 300 000	66 320;	6 632 000
Prince Edward Island	5 640;	564 000	7 420;	742 000
Total	2 378 080;	237 808 000	2 759 180;	275 918 000

¹"Total Land and Water" for Ontario and Quebec represents total land and freshwater area; however, for the Atlantic provinces it includes shallow saltwater areas which were included in the CLI as waterfowl habitat.

Sources: Geographical Mapping Division, Energy, Mines and Resources Canada (Ontario and Quebec); Canada Land Inventory, Lands Directorate, Environment Canada (New Brunswick, Nova Scotia, Prince Edward Island). All figures have been rounded to the nearest 10 to reflect their approximate nature.

APPENDIX 3

**Prime Lands in Eastern Canada within
Wet Sulphate Deposition Zones**

3 a) Soil capability classification for agriculture

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 and total 'productive' area (including CLI class 4) within each deposition zone							
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Classes 1-4	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	4	ha	%
0 - <10	4 214 829	6	0	128 467	414 884	543 351	4	316 160	859 511	4
10 - <20	15 662 242	24	0	124 482	1 349 927	1 474 409	12	2 075 581	3 549 990	18
20 - <30	21 842 785	33	69 551	478 122	1 602 518	2 150 191	17	1 736 325	3 886 516	19
30 - <40	21 003 360	32	1 689 607	2 254 173	2 726 748	6 670 528	54	3 434 493	10 105 021	50
≥ 40	3 116 665	5	416 146	717 061	361 088	1 494 295	12	125 261	1 619 556	8
TOTAL	65 839 881	100	2 175 304	3 702 305	6 455 165	12 332 774	99	7 687 820	20 020 594	99

Note: Figures may not total 100% due to rounding.

3 b) Land capability classification for forestry

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 and total 'commercial' area (including CLI classes 4 and 5) within each deposition zone.									
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Class 5	Classes 4 and 5	Classes 1-5	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	ha	ha	%
0 - <10	1 449 147	2	0	3 953	31 498	35 451	0	118 610	442 317	560 927	596 378	1
10 - <20	15 460 441	25	0	33 666	706 255	739 921	4	3 388 633	5 253 401	8 642 034	9 381 955	18
20 - <30	21 844 400	35	70 677	637 979	4 783 538	5 492 194	31	8 556 016	4 597 848	13 153 864	18 646 058	37
30 - <40	21 003 363	33	980 442	3 177 070	5 286 976	9 444 488	54	5 919 803	4 013 621	9 933 424	19 377 912	38
≥ 40	3 116 666	5	191 180	875 452	719 291	1 785 923	10	536 409	485 055	1 021 464	2 807 387	6
TOTAL	62 874 017	100	1 242 299	4 728 120	11 527 558	17 497 977	99	18 519 471	14 792 242	33 311 713	50 809 690	100

Note: Figures may not total 100% due to rounding.

3 c) Land capability classification for outdoor recreation

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone				
			Class 1	Class 2	Class 3	Classes 1-3	
kg/ha/yr	ha	%	ha	ha	ha	ha	%
0 - <10	2 487 108	4	2 236	9 994	120 360	132 590	5
10 - <20	15 662 244	25	9 661	62 282	623 045	694 988	25
20 - <30	21 742 546	34	25 074	145 268	880 246	1 050 588	38
30 - <40	20 523 049	32	30 291	130 377	640 725	801 393	29
≥ 40	3 116 680	5	7 376	16 236	69 273	92 885	3
TOTAL	63 531 627	100	74 638	364 157	2 333 649	2 772 444	100

Note: Figures may not total 100% due to rounding.

3 d) Land capability classification for waterfowl

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone					
			Class 1	Class 2	Class 3	Classes 1S, 2S, 3S, 3M*	Classes 1-3 +1S, 2S, 3S, 3M	
kg/ha/yr	ha	%	ha	ha	ha	ha	ha	%
0 - <10	5 203 302	7	0	0	8 731	18 643	27 374	1
10 - <20	17 946 257	24	0	3 187	25 040	617 388	645 615	25
20 - <30	25 800 721	34	1 642	6 125	30 745	576 477	614 989	24
30 - <40	22 814 018	30	1 186	10 143	76 825	916 755	1 004 909	39
≥ 40	3 913 253	5	0	0	10 822	280 645	291 467	11
TOTAL	75 677 551	100	2 828	19 455	152 163	2 409 908	2 584 354	100

Note: Figures may not total 100% due to rounding.

* See Appendix 1 for definitions.

APPENDIX 4

**Soil Capability Classification for Agriculture within
Wet Sulphate Deposition Zones**

4 a) Ontario

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas and total 'productive' area (including CLI class 4) within each deposition zone							
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Classes 1-4	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	%
0 - <10	4 214 829	15	0	128 467	414 884	543 351	7	316 160	859 511	9
10 - <20	10 124 432	37	0	98 215	1 128 901	1 227 116	17	1 521 425	2 748 541	28
20 - <30	3 200 621	12	68 645	67 862	120 148	256 655	4	177 784	434 439	4
30 - <40	6 849 415	25	1 670 958	1 205 428	883 768	3 760 154	52	483 531	4 243 685	43
≥ 40	3 116 665	11	416 146	717 061	361 088	1 494 295	21	125 261	1 619 556	16
TOTAL	27 505 962	100	2 155 749	2 217 033	2 908 789	7 281 571	101	2 624 161	9 905 732	100

Note: Figures may not total 100% due to rounding.

4 b) Quebec

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas and total 'production' area (including CLI class 4) within each deposition zone							
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Classes 1-4	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0	0	0
10 - <20	4 414 664	17	0	24 985	121 754	146 739	7	509 293	656 032	14
20 - <30	12 174 145	48	906	169 541	489 389	659 836	30	589 295	1 249 131	26
30 - <40	8 736 129	34	18 649	702 341	660 999	1 381 989	63	1 458 797	2 840 786	60
≥ 40	0	0	0	0	0	0	0	0	0	0
TOTAL	25 324 938	99	19 555	896 867	1 272 142	2 188 564	100	2 557 385	4 745 949	100

Note: Figures may not total 100% due to rounding.

4 c) New Brunswick

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas and total 'productive' area (including CLI Class 4) within each deposition zone							
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Class 1-4	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0	0	0
10 - <20	0	0	0	0	0	0	0	0	0	0
20 - <30	3 156 161	44	0	142 685	371 915	514 600	39	762 841	1 277 441	38
30 - <40	3 989 727	56	0	18 174	779 634	797 808	61	1 270 121	2 067 929	62
≥ 40	0	0	0	0	0	0	0	0	0	0
TOTAL	7 145 888	100	0	160 859	1 151 549	1 312 408	100	2 032 962	3 345 370	100

Note: Figures may not total 100% due to rounding.

4 d) Nova Scotia

Wet sulphate zones	Area of CLI lands within each deposition zone		Prime land areas and total 'productive' area (including CLI class 4) within each deposition zone							
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Classes 1-4	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0	0	0
10 - <20	1 123 146	21	0	1 282	99 272	100 554	9	44 863	145 417	9
20 - <30	3 211 617	61	0	49 524	607 286	656 810	57	202 328	859 138	55
30 - <40	964 830	18	0	115 179	274 609	389 788	34	176 345	566 133	36
≥ 40	0	0	0	0	0	0	0	0	0	0
TOTAL	5 299 593	100	0	165 985	981 167	1 147 152	100	423 536	1 570 688	100

Note: Figures may not total 100% due to rounding.

4 e) Prince Edward Island

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas and total 'productive' area (including CLI class 4) within each deposition zone							
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Classes 1-4	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0	0	0
10 - <20	0	0	0	0	0	0	0	0	0	0
20 - <30	100 241	18	0	48 510	13 780	62 290	15	4 077	66 367	15
30 - <40	463 259	82	0	213 051	127 738	340 789	85	45 699	386 488	85
≥ 40	0	0	0	0	0	0	0	0	0	0
TOTAL	563 500	100	0	261 561	141 518	403 079	100	49 776	452 855	100

Note: Figures may not total 100% due to rounding.

APPENDIX 5

**Land Capability Classification for Forestry
within Wet Sulphate Deposition Zones**

5 a) Ontario

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 and total 'commercial' area (including CLI classes 4 and 5) within each deposition zone									
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Class 5	Classes 4 and 5	Classes 1-5	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	ha	ha	%
0 - <10	1 449 147	6	0	3 953	31 498	35 451	0	118 610	442 317	560 927	596 378	3
10 - <20	9 922 627	40	0	33 666	282 650	316 316	4	1 338 703	3 746 067	5 084 770	5 401 086	31
20 - <30	3 200 628	13	21 726	142 605	494 471	658 802	9	617 385	917 638	1 535 023	2 193 825	13
30 - <40	6 849 425	28	812 500	2 104 345	1 632 141	4 548 986	62	1 052 323	735 601	1 787 924	6 336 910	37
≥ 40	3 116 666	13	191 180	875 452	719 291	1 785 923	24	536 409	485 055	1 021 464	2 807 387	16
TOTAL	24 538 493	100	1 025 406	3 160 021	3 160 051	7 345 478	99	3 663 430	6 326 678	9 990 108	17 335 586	100

Note: Figures may not total 100% due to rounding.

5 b) Quebec

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 and total 'commercial' area (including CLI classes 4 and 5) within each deposition zone									
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Class 5	Classes 4 and 5	Classes 1-5	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0	0	0	0	0
10 - <20	4 414 667	17	0	0	386 768	386 768	4	1 754 547	1 042 113	2 796 660	3 183 428	14
20 - <30	12 175 750	48	48 951	495 374	3 909 222	4 453 547	46	5 283 733	1 392 554	6 676 287	11 129 834	49
30 - <40	8 736 117	34	167 942	1 072 725	3 502 497	4 743 164	49	2 549 490	1 044 793	3 594 283	8 337 447	37
≥ 40	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	25 326 534	99	216 893	1 568 099	7 798 487	9 583 479	99	9 587 770	3 479 460	13 067 230	22 650 709	100

Note: Figures may not total 100% due to rounding.

5 c) New Brunswick

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 and total 'commercial' area (including CLI classes 4 and 5) within each deposition zone										
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Class 5	Classes 4 and 5	Classes 1-5		
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	ha	ha	%	
0 - <10	0	0	0	0	0	0	0	0	0	0	0	0	0
10 - <20	0	0	0	0	0	0	0	0	0	0	0	0	0
20 - <30	3 156 169	44	0	0	248 630	248 630	68	1 594 518	1 091 805	2 686 323	2 934 953	46	
30 - <40	3 989 731	56	0	0	118 568	118 568	32	1 645 930	1 638 718	3 284 648	3 403 216	54	
≥ 40	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	7 145 900	100	0	0	367 198	367 198	100	3 240 448	2 730 523	5 970 971	6 338 169	100	

Note: Figures may not total 100% due to rounding.

5 d) Nova Scotia

Wet sulphate deposition zone	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 and total 'commercial' area (including CLI classes 4 and 5) within each deposition zone									
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Class 5	Classes 4 and 5	Classes 1-5	
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0	0	0	0	0
10 - <20	1 123 147	21	0	0	36 837	36 837	18	295 383	465 221	760 604	797 441	20
20 - <30	3 211 612	61	0	0	131 215	131 215	65	1 013 255	1 151 921	2 165 176	2 296 391	58
30 - <40	964 827	18	0	0	33 770	33 770	17	432 198	414 912	847 110	880 880	22
≥ 40	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5 299 586	100	0	0	201 822	201 822	100	1 740 836	2 032 054	3 772 890	3 974 712	100

Note: Figures may not total 100% due to rounding.

5 e) Prince Edward Island

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 and total 'commercial' area (including CLI classes 4 and 5) within each deposition zone										
			Class 1	Class 2	Class 3	Classes 1-3		Class 4	Class 5	Classes 4 and 5	Classes 1-5		
kg/ha/yr	ha	%	ha	ha	ha	ha	%	ha	ha	ha	ha	%	
0 - <10	0	0	0	0	0	0	0	0	0	0	0	0	0
10 - <20	0	0	0	0	0	0	0	0	0	0	0	0	0
20 - <30	100 241	18	0	0	0	0	0	47 125	43 930	91 055	91 055	18	
30 - <40	463 263	82	0	0	0	0	0	239 862	179 597	419 459	419 459	82	
≥ 40	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	563 504	100	0	0	0	0	0	286 987	223 527	510 514	510 514	100	

Note: Figures may not total 100% due to rounding.

APPENDIX 6

**Land Capability Classification for Outdoor Recreation
within Wet Sulphate Deposition Zones**

6 a) Ontario

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone				
			Class 1	Class 2	Class 3	Classes 1-3	
kg/ha/yr	ha	%	ha	ha	ha	ha	%
0 - <10	2 487 108	10	2 236	9 994	120 360	132 590	11
10 - <20	10 124 440	39	4 799	28 346	441 058	474 203	40
20 - <30	3 200 624	12	7 820	26 312	227 962	262 094	22
30 - <40	6 849 429	27	16 393	38 148	172 799	227 340	19
> 40	3 116 680	12	7 376	16 236	69 273	92 885	8
TOTAL	25 778 281	100	38 624	119 036	1 031 452	1 189 112	100

Note: Figures may not total 100% due to rounding.

6 b) Quebec

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone				
			Class 1	Class 2	Class 3	Classes 1-3	
kg/ha/yr	ha	%	ha	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0
10 - <20	4 414 671	17	4 862	31 982	177 958	214 802	16
20 - <30	12 174 141	48	16 538	94 058	543 712	654 308	48
30 - <40	8 736 140	34	13 041	84 375	403 876	501 292	37
≥ 40	0	0	0	0	0	0	0
TOTAL	25 324 952	99	34 441	210 415	1 125 546	1 370 402	101

Note: Figures may not total 100% due to rounding.

6 c) New Brunswick

Wet sulphate deposition zones	Area of CLI lands within each depositions zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone				
			Class 1	Class 2	Class 3	Classes 1-3	
kg/ha/yr	ha	%	ha	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0
10 - <20	0	0	0	0	0	0	0
20 - <30	3 156 171	44	107	18 571	58 229	76 907	56
30 - <40	3 972 651	56	826	5 005	54 401	60 232	44
≥ 40	0	0	0	0	0	0	0
TOTAL	7 128 822	100	933	23 576	112 630	137 139	100

Note: Figures may not total 100% due to rounding.

6 d) Nova Scotia

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone				
			Class 1	Class 2	Class 3	Class 1-3	
kg/ha/yr	ha	%	ha	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0
10 - <20	1 123 133	21	0	1 954	4 029	5 983	9
20 - <30	3 211 610	61	609	6 327	50 343	57 279	76
30 - <40	964 829	18	31	2 849	9 649	12 529	17
≥ 40	0	0	0	0	0	0	0
TOTAL	5 299 572	100	640	11 130	64 021	75 791	101

Note: Figures may not total 100% due to rounding.

APPENDIX 7

**Land Capability Classification for Waterfowl
within Wet Sulphate Deposition Zones**

7 a) Ontario

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone					
			Class 1	Class 2	Class 3	Classes 1S, 2S, 3S, 3M*	Classes 1-3	
kg/ha/yr	ha	%	ha	ha	ha	ha	ha	%
0 - <10	5 203 302	16	0	0	8 731	18 643	27 374	2
10 - <20	11 681 480	35	0	3 127	14 059	495 592	512 778	40
20 - <30	4 703 888	14	0	901	9 704	123 474	134 079	11
30 - <40	7 512 588	23	0	420	39 312	270 094	309 826	24
≥ 40	3 913 253	12	0	0	10 822	280 645	291 467	23
TOTAL	33 014 511	100	0	4 448	82 628	1 188 448	275 524	100

Note: Figures may not total 100% due to rounding.

*See Appendix 1 for definitions.

7 b) Quebec

Wet Sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone					
			Class 1	Class 2	Class 3	Classes 1S, 2S, 3S, 3M*	Classes 1-3	
kg/ha/yr	ha	%	ha	%	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0
10 - <20	4 844 716	18	0	0	9 464	51 244	60 708	11
20 - <30	13 531 591	49	1 156	3 437	10 022	221 469	236 084	41
30 - <40	9 294 558	34	153	1 153	9 803	267 798	278 907	48
≥ 40	0	0	0	0	0	0	0	0
TOTAL	27 670 865	101	1 309	4 590	29 289	540 511	575 699	100

Note: Figures may not total 100% due to rounding.

* See Appendix 1 for definitions

7 c) New Brunswick

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone					
			Class 1	Class 2	Class 3	Classes 1S, 2S, 3S, 3M*	Classes 1-3	
kg/ha/yr	ha	%	ha	ha	%	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0
10 - <20	0	0	0	0	0	0	0	0
20 - <30	3 337 693	44	0	763	4 093	59 804	64 660	22
30 - <40	4 280 409	56	66	7 706	23 808	200 222	231 802	78
≥ 40	0	0	0	0	0	0	0	0
TOTAL	7 618 102	100	66	8 469	27 901	260 026	296 462	100

Note: Figures may not total 100% due to rounding.

*See Appendix 1 for definitions.

7 d) Nova Scotia

Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total prime classes 1-3 within each deposition zone					
			Class 1	Class 2	Class 3	Classes 1S,2S,3S,3M*	Classes 1 - 3	
kg/ha/yr	ha	%	ha	ha	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0
10 - <20	1 420 061	21	0	60	1 517	70 552	72 129	23
20 - <30	4 099 022	62	286	954	6 893	159 897	168 030	52
30 - <40	1 113 248	17	0	118	3 762	76 123	80 003	25
≥ 40	0	0	0	0	0	0	0	0
TOTAL	6 632 331	100	286	1 132	12 172	306 572	320 162	100

Note: Figures may not total 100% due to rounding.

*See Appendix 1 for definitions

7 e) Prince Edward Island

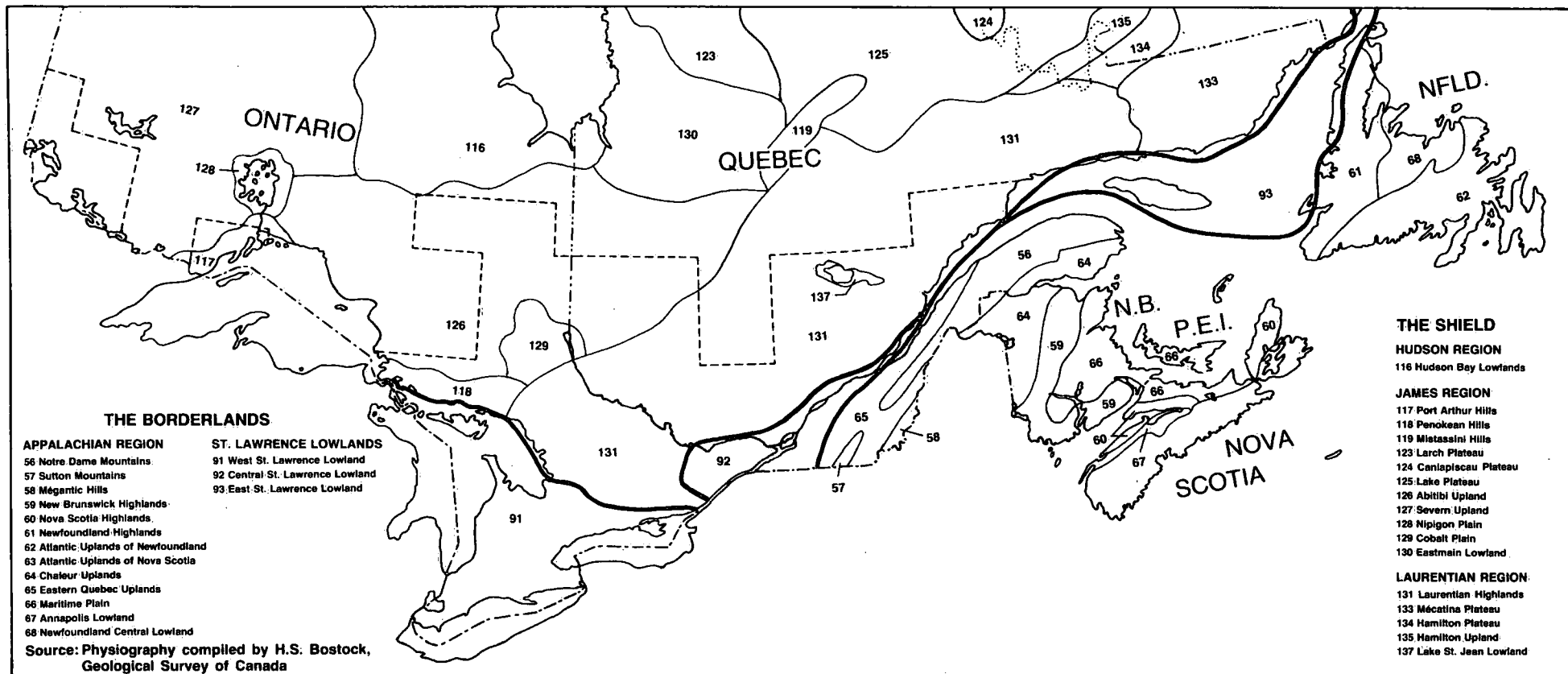
Wet sulphate deposition zones	Area of CLI lands within each deposition zone		Prime land areas for each CLI class and for total classes 1-3 within each deposition zone					
			Class 1	Class 2	Class 3	Classes 1S,2S,3S,3M*	Classes 1-3	
kg/ha/yr	ha	%	ha	ha	ha	ha	ha	%
0 - <10	0	0	0	0	0	0	0	0
10 - <20	0	0	0	0	0	0	0	0
20 - <30	128 527	17	200	70	33	11 833	12 136	10
30 - <40	613 215	83	967	746	140	102 518	104 371	90
≥ 40	0	0	0	0	0	0	0	0
TOTAL	741 742	100	1 167	816	173	114 351	116 507	100

Note: Figures may not total 100% due to rounding.

*See Appendix 1 for definitions.

APPENDIX 8

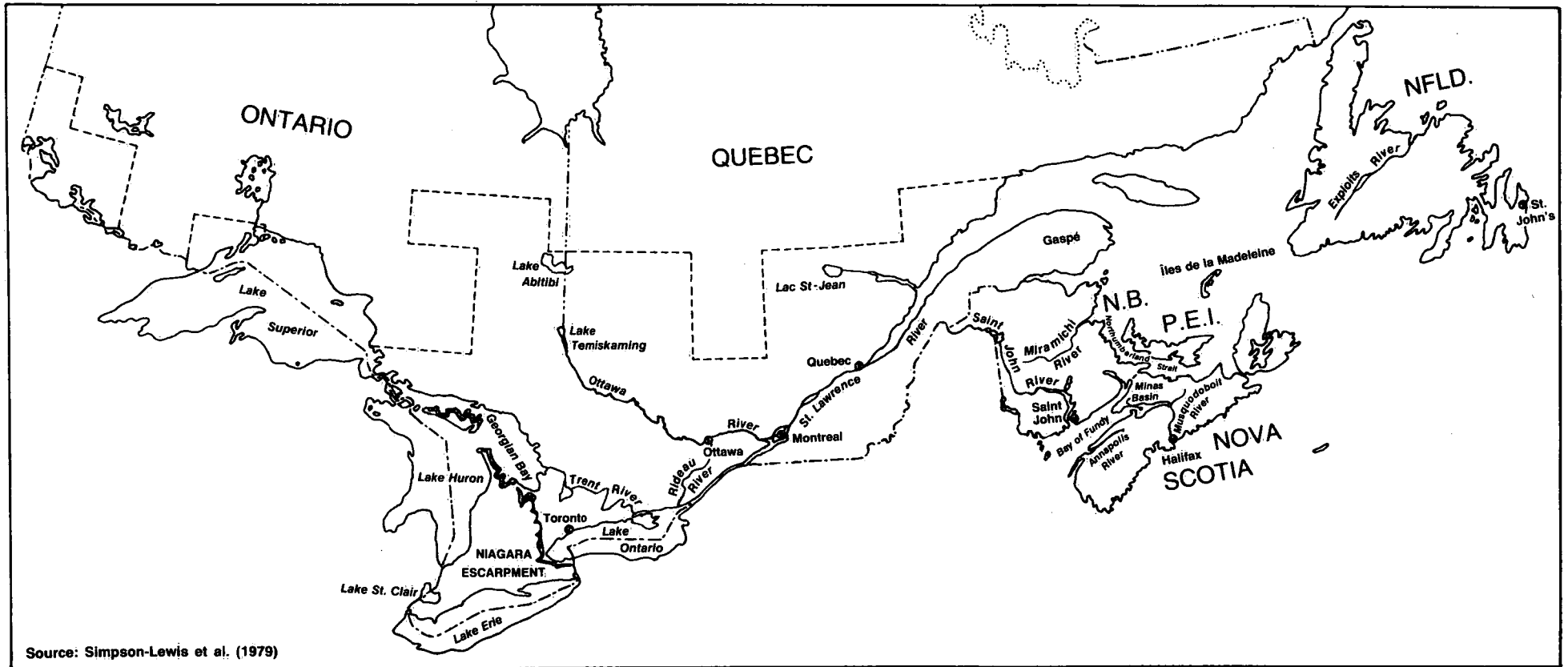
Physiographic Regions of Eastern Canada



Physiographic regions of Eastern Canada

APPENDIX 9

**Other Geographical Features and Place Names
Referenced in the Text**



Source: Simpson-Lewis et al. (1979)

Other geographical features and place names referenced in the text

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