Energy, Mines and Resources Canada / Énergie, Mines et Ressources Canada

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CANADA

THE POTENTIAL OF SOILS AND BEDROCK TO REDUCE THE ACIDITY OF ATMOSPHERIC DEPOSITION

Prepared by Environment Canada in cooperation with federal-provincial Long Range Transport of Airborne Pollutants (LRTAP) technical and coordinating committees in Canada.

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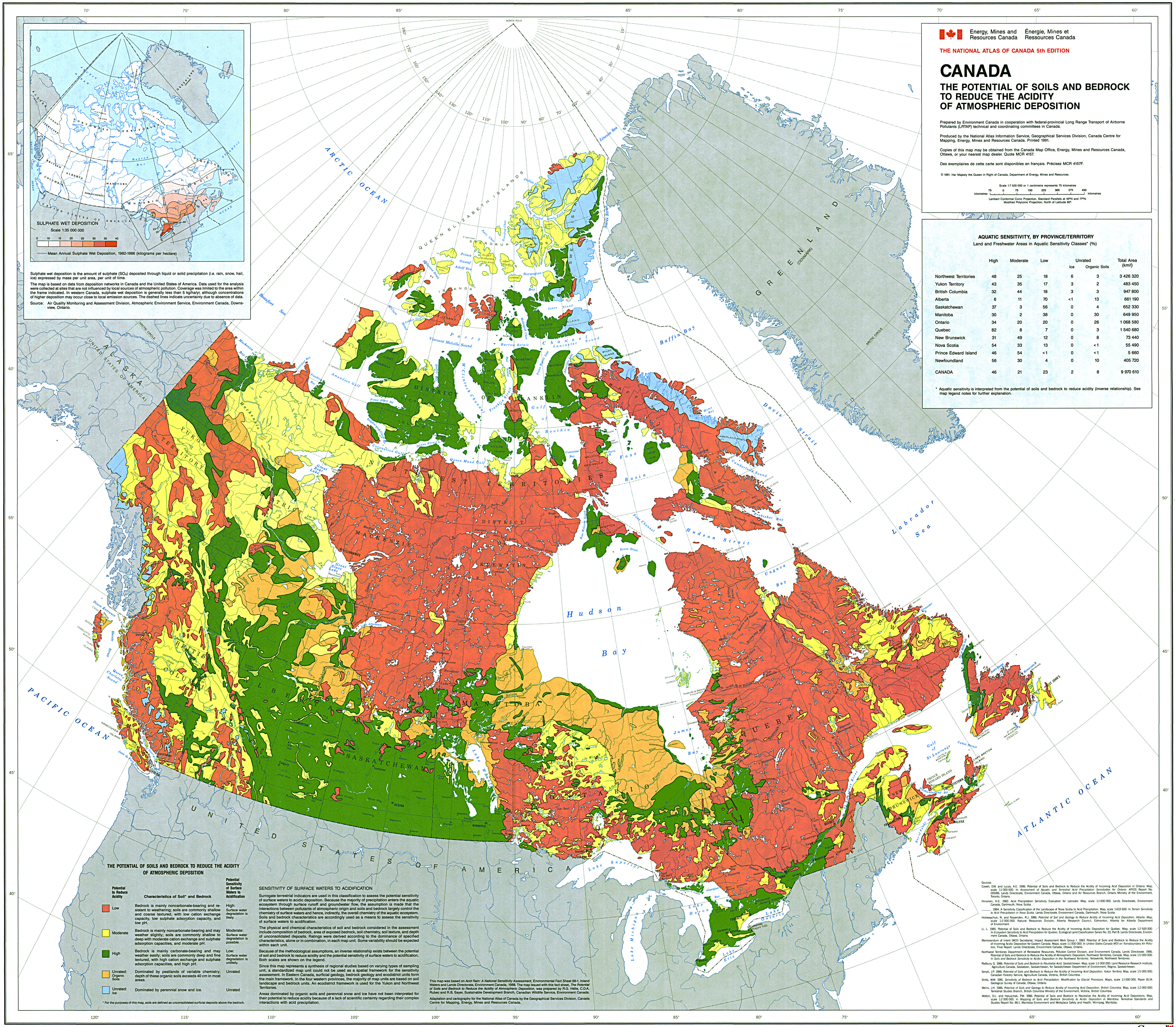
Scale 1:7 500 000 or 1 centimetre represents 75 kilometres

Lambert Conformal Conic Projection, Standard Parallels at 49°N and 77°N.
Modified Polyconic Projection, North of Latitude 80°.



Sulphate wet deposition is the amount of sulphate (SO_4) deposited through liquid or solid precipitation (i.e. rain, snow, hail, ice) expressed by mass per unit area, per unit of time.

The map is based on data from deposition networks in Canada and the United States of America. Data used for the analysis were collected at sites that are not influenced by local sources of atmospheric pollution. Coverage was limited to the area within the frame indicated. In western Canada, sulphate wet deposition is generally less than 5 kg/ha/yr, although concentrations of higher deposition may occur close to local emission sources. The dashed lines indicate uncertainty due to absence of data.

Source: Air Quality Monitoring and Assessment Division, Atmospheric Environment Service, Environment Canada, Downsview, Ontario.

AQUATIC SENSITIVITY, BY PROVINCE/TERRITORY

Land and Freshwater Areas in Aquatic Sensitivity Classes* (%)

	High	Moderate	Low	Unrated: Ice	Unrated: Organic Soils	Total Area (km^2)
Northwest Territories	48	25	18	6	3	3 426 320
Yukon Territory	43	35	17	3	2	483 450
British Columbia	32	44	18	3	3	947 800
Alberta	6	11	70	<1	13	661 190
Saskatchewan	37	3	56	0	4	652 330
Manitoba	30	2	38	0	30	649 950
Ontario	34	20	20	0	26	1 068 580
Quebec	82	8	7	0	3	1 540 680
New Brunswick	31	49	12	0	8	73 440
Nova Scotia	54	33	13	0	<1	55 490
Prince Edward Island	46	54	<1	0	<1	5 660
Newfoundland	56	30	4	0	10	405 720
CANADA	46	21	23	2	8	9 970 610

* Aquatic sensitivity is interpreted from the potential of soils and bedrock to reduce acidity (inverse relationship). See map legend notes for further explanation.

THE POTENTIAL OF SOILS AND BEDROCK TO REDUCE THE ACIDITY OF ATMOSPHERIC DEPOSITION

Potential to Reduce Acidity	Characteristics of Soil* and Bedrock	Potential Sensitivity of Surface Waters to Acidification
Low	Bedrock is mainly noncarbonate-bearing and resistant to weathering; soils are commonly shallow and coarse textured, with low cation exchange capacity, low sulphate adsorption capacity, and low pH.	High: Surface water degradation is likely.
Moderate	Bedrock is mainly noncarbonate-bearing and may weather slightly; soils are commonly shallow to deep with moderate cation exchange and sulphate adsorption capacities, and moderate pH.	Moderate: Surface water degradation is possible.
High	Bedrock is mainly carbonate-bearing and may weather easily; soils are commonly deep and fine textured, with high cation exchange and sulphate adsorption capacities, and high pH.	Low: Surface water degradation is unlikely.
Unrated: Organic Soils	Dominated by peatlands of variable chemistry; depth of these organic soils exceeds 40 cm in most areas.	Unrated
Unrated: Ice	Dominated by perennial snow and ice.	Unrated

* For the purposes of this map, soils are defined as unconsolidated surficial deposits above the bedrock.

SENSITIVITY OF SURFACE WATERS TO ACIDIFICATION

Surrogate terrestrial indicators are used in this classification to assess the potential sensitivity of surface waters to acidic deposition. Because the majority of precipitation enters the aquatic ecosystem through surface runoff and groundwater flow, the assumption is made that the interactions between pollutants of atmospheric origin and soils and bedrock largely control the chemistry of surface waters and hence, indirectly, the overall chemistry of the aquatic ecosystem. Soils and bedrock characteristics are accordingly used as a means to assess the sensitivity of surface waters to acidification.

The physical and chemical characteristics of soil and bedrock considered in the assessment include composition of bedrock, area of exposed bedrock, soil chemistry, soil texture, and depth of unconsolidated deposits. Ratings were derived according to the dominance of specified characteristics, alone or in combination, in each map unit. Some variability should be expected within each unit.

Because of the methodological assumptions, an inverse relationship exists between the potential of soil and bedrock to reduce acidity and the potential sensitivity of surface waters to acidification. Both scales are shown on the legend.

Since this map represents a synthesis of regional studies based on varying types of sampling unit, a standardized map unit could not be used as a spatial framework for the sensitivity assessment. In Eastern Canada, surficial geology, bedrock geology and ecodistrict units form the main framework. In the four western provinces, the majority of map units are based on soil landscape and bedrock units. An ecodistrict framework is used for the Yukon and Northwest Territories.

Areas dominated by organic soils and perennial snow and ice have not been interpreted for their potential to reduce acidity because of a lack of scientific certainty regarding their complex interactions with acid precipitation.

This map was based on *Acid Rain: A National Sensitivity Assessment,* Environmental Fact Sheet 88-1, Inland Waters and Lands Directorate, Environment Canada, 1988. The map issued with this fact sheet, *The Potential of Soils and Bedrock to Reduce the Acidity of Atmospheric Deposition*, was prepared by R.G. Hélie, C.D.A. Rubec and R.B. Sayer, Sustainable Development Branch, Canadian Wildlife Service, Environment Canada.

Adaptation and cartography for the National Atlas of Canada by the Geographical Services Division, Canada Centre for Mapping, Energy, Mines and Resources Canada.

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