Statistics Canada Statistique Canada

Catalogue 11509E

# Human Activity and the Environment

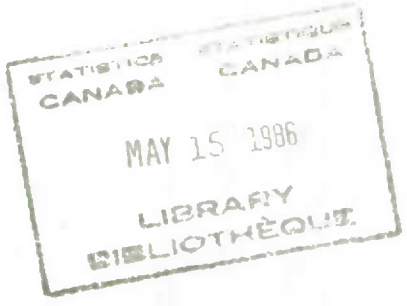
## A Statistical Compendium



Canada

# Human Activity and the Environment

## A Statistical Compendium




Statistics Canada
Structural Analysis Division
Analytical Studies Branch

Published under the authority of the Minister of Supply and Services Canada



March 1986
3-0001-504

Price: Canada, $45.00
Other Countries, $55.00

Payment to be made in Canadian funds or equivalent

Catalogue 11-509E

ISBN 0-660-11711-8

Ottawa

## Photographic Credits by Page

Cover: Masterfile,
Photothèque
9. Photothèque
11. Regional Industrial Expansion
21. Regional Industrial Expansion
33. Regional Industrial Expansion
41. Regional Industrial Expansion
61. Regional Industrial Expansion
63. Photothèque
105. Photothèque
123. Regional Industrial Expansion
141. Photothèque
143. Photothèque
153. Regional Industrial Expansion
171. Photothèque
173. Lands Directorate, Environment Canada
185. Regional Industrial Expansion
197. Regional Industrial Expansion
207. Photothèque
213. Photothèque
215. Lands Directorate, Environment Canada
223. Photothèque
239. Photothèque
247. Photothèque
255. Lands Directorate, Environment Canada
261. Regional Industrial Expansion
285. Photothèque
287. Photothèque
313. Photothèque
329. Photothèque

# Preface

The purpose of *Human Activity and the Environment* is to provide a statistical overview of Canada's physical environment with particular reference to the interactions between humans and other elements of the natural system. The compendium focuses on the activities of people in consuming resources, in building and reshaping landscapes, and in generating wastes, as well as on the impacts of these activities on the land, water and air and plants and animals.

Statistics Canada, Environment Canada, and other Federal and Provincial Government agencies collect a large volume of statistical information about human activities and the relationship between people and the physical environment. The data, however, are usually scattered among many separate data bases and publications and are often organized in a fashion which does not readily lend itself to integrated description or analysis of the environment. The data can also be technically complex, and are often difficult to interpret. By bringing together a selection of these statistics and re-organizing then in a way which enhances their value from an environmental perspective, it is anticipated that this information will become more accessible and useful to members of the public who are interested in the environment. At the same time, we believe that *Human Activity and the Environment* will be a useful source book for those who require a guide to more detailed statistics on particular topics.

This is the second publication with this title, the first having been published in 1978. This edition follows a new format and offers expanded coverage of many topics.

*Human Activity and the Environment* was prepared in the Office of the Senior Adviser on Integration — H.J. Adler, Director, A.M. Friend, Environmental Adviser. The project was managed by Bruce Mitchell.

Major contributions to this report were made by the following staff:

Phillip Fong
Pierre Fournier
Frank Jones
Jocelyn Lapierre
Darrell Piekarz
Douglas Trant
Brenda Trower
Edward Wannell
Margaret Williams

Research support services were provided by Elizabeth Scott, Marlene Coulas, Connie Sundin, Shalom Perel, Sheldon Rosenstock and Mabel Fredericks.

A number of Divisions and Subdivisions in Statistics Canada supplied statistics or provided other forms of assistance during the compilation process. These included the Agriculture Division, CANSIM Division, Census Operations Division, Geocartographics Subdivision, Manufacturing and Primary Industries Division, the Small Area Data Program and Transport and Communications Division.

The contributions of Environment Canada and other Federal and Provincial Government agencies who provided data contained herein are gratefully acknowledged. These are credited in the sources on particular tables, charts and maps.

The Geographical Research Division of Energy Mines and Resources Canada played a major role in the preparation of a number of the maps.

Special thanks go to the following individuals outside Statistics Canada for their generous assistance:

P. Bird, J. Brennan, K. Brickley, B. Brickman, F. Cadoret, D. Caverson, L. Churchland, D. Coote, B. Cromie, C. Dauphine, L. Desilets, J. Dumanski, T. Furmanczyk, J. Gannon, D. Gierman, C. Gossen, G. Gross, W. Gummer, E. Haber, W. Hiles, T. Hsu, E. Huffman, R. Krueger, M. Lamb, M. Lebeau, D. McCone, J. McTaggart-Cowan, I. Marshall, A. Martell, D. Muir, F. Norstrom, N. Novakowski, D. Phillips, T. Polfeldt, F. Quinn, T. Ruthman, J. Seguin, A. Sheffield, D. Stewart, K. Suns, D. Tate, B. Turris, L. Warren, R. Wetmiller, S. Wendt, S. Whitlow, E. Wiken, J. Zwartendyk.

The following units in Statistics Canada made substantial contributions during the publication phase for which we are most grateful: Graphic and Chart Design Services, Text Production Services, Publishing Services, and Geocartographics Subdivision.

The publication was designed by Rachel Penkar. Diane Joanisse coordinated text production. Jacques Fontaine prepared the charts.

Responsibility for the compendium now rests with the Structural Analysis Division — R.B. Hoffman, Director. Comments and inquiries about the publication should be addressed to the Structural Analysis Division, 24th Floor, R.H. Coats Building, Ottawa, Ontario K1A 0T6.

Ivan Fellegi,
Chief Statistician of Canada

## Symbols and Abbreviations

| | |
|---|---|
| .. | figures not available |
| ... | figures not appropriate or not applicable |
| -- | amount too small to be expressed |
| p | preliminary |
| ppm | parts per million |
| mg | milligram |
| ug | microgram |
| km | kilometre |
| ha | hectare |

## Prefixes of the International System of Units

| Prefix | Multiplying Factor | |
|---|---|---|
| peta | $10^{15}$ | 1 000 000 000 000 000 |
| tera | $10^{12}$ | 1 000 000 000 000 |
| giga | $10^{9}$ | 1 000 000 000 |
| mega | $10^{6}$ | 1 000 000 |
| kilo | $10^{3}$ | 1 000 |
| hecto | $10^{2}$ | 100 |
| deca | $10^{1}$ | 10 |
| deci | $10^{-1}$ | 0.1 |
| centi | $10^{-2}$ | 0.01 |
| milli | $10^{-3}$ | 0.001 |
| micro | $10^{-6}$ | 0.000 001 |
| nano | $10^{-9}$ | 0.000 000 001 |
| pico | $10^{-12}$ | 0.000 000 000 001 |

**Note:**

In some tables, individual items will not add to totals due to rounding.

# Table of Contents

# Introduction

## The Publication's Purpose

Human activities take place in conjunction with, not in isolation from, the many processes operating in nature. People are only one agent of change in a continually evolving environmental system. However, given the scale of many of the transformations initiated by human activity and the rapidity with which they take place, they tend to produce significant and highly visible impacts on the environment. We depend on the resources of this environment for our continued well-being, and, therefore, have a vested interest in preserving clean air, clean and abundant water, and healthy ecological systems by ensuring that our activities do not impose undue pressures on these elements. Monitoring the stresses our activities place on natural systems and the state of the environment is crucial here because it provides us with the information necessary to prepare appropriate actions to counter undesirable changes.

In Canada, a number of Federal and Provincial government agencies are involved in environmental research and monitoring. Other government departments, most notably Statistics Canada, collect a variety of economic and social information which serve as inputs for environmental studies and which supplement monitoring statistics.

The purpose of this publication is to provide a convenient overview of human activities from an environmental perspective by bringing together a wide variety of statistics from these various government monitoring activities and special studies. Many of these data were drawn from special purpose data bases and technical reports. Assembling these statistics in a compendium makes this information available to a much wider audience.

At the same time, for the person interested in more specific information, *Human Activity and the Environment* can serve as a source book pointing to where more detailed statistics on particular topics can be found.

This publication also illustrates the environmental dimension of certain data series, particularly those of Statistics Canada, which were not originally collected for environmental applications. There are several ways in which this has been done.

First, statistics are reorganized into geographic units which are relevant for studying changes in natural systems; i.e. a wide range of data in this publication is organized by drainage basins and ecozones as well as by provinces.

Second, data are rearranged into categories which detail more clearly the nature of human-environment interactions. For example, the ways in which different crops are grown have some relation to the kind of stresses placed on the environment. As a result, statistics from the Census of Agriculture are regrouped according to cropping practices used by the farmer.

Illustrating the flexibility of the existing data bases may stimulate other researchers to develop further linkages of data for analytical purposes. In-depth analysis, however, was considered to be beyond the scope of this publication.

## Organizing Environmental Statistics

The *STRESS*[1] statistical framework provides the organizing principles for this publication. It offers a way of sorting environmental information into a manageable number of groups by categorizing the relationships between humans and the other elements of the ecosystem.[2]

This framework can be neatly summarized by describing its three basic elements.

The first is that both people and nature are agents of change in the environment. Both human actions and events in nature impose stresses on the environment, that is, create impetus for change in natural systems. These stresses are placed on both the physical (soil, water, air) and biological (animals, plants, humans) elements of the environmental system.

The second major element of the framework is that the components of the environment respond, i.e. change in character, due to these stresses.

The third element is that people have the ability to modify the character and decrease the intensity of the stresses their activities place on the environment.

To illustrate: an industry is located near a river. Wastes are created as by-products of the manufacturing process and these are disposed of by discharging them into the water of the river. Release of these wastes places a *stress* on the water, (i.e. an impetus for change) and results in a modification of the river's physical composition. This change is a physical *response* to the emission of wastes. In turn, this may have an effect on the plants and animals living in the water and might result, for example, in the death of fish. This change in the number of fish is a biotic *response* to the emission of wastes. People may realize that these alterations of the river's characteristics are undesirable because they affect drinking water quality and ultimately human health. Consequently, actions may be taken to modify the stresses which have been created. These actions might include modifying the industrial process or choosing alternative methods of waste disposal.

The *STRESS* framework provides an alternative to more traditional methods of organizing environmental statistics; for example, by media elements, air, water and land, or by activity sectors, agriculture, forestry, fisheries and mining. By integrating the media approach and the activity approach around a

[1] *STRESS* is the acronym for the Stress-Response Environmental Statistical System. For more information refer to: A. Friend and D. Rapport, *Towards a Comprehensive Framework for Environmental Statistics. A Stress-Response Approach*, Catalogue 11-510, Statistics Canada, 1979 and A. Friend, "Conceptual Frameworks and a Unified Approach to Environmental Statistics," in the *Canadian Statistical Review*, Statistics Canada, October 1981.

[2] Man is in fact seen to be only one of the many elements of this all-encompassing natural system. Kenneth Boulding is one of many who argues that the world must be viewed as a total system of interacting parts and that there is no such thing as an "environment" if that is defined as a natural entity distinct from the human race and its activities. He feels that it makes sense to divide the universe into parts that have some degree of independent dynamic pattern if one keeps in mind that everything is the environment of something else. see K. Boulding, *Eco-dynamics*, Sage Publications, Beverly Hills, California, 1978, page 31.

theme of stresses imposed on the environment and the environment's responses to those pressures, the *STRESS* approach organizes statistics in a way which reflects the dynamic elements of environmental processes. Hopefully, this will contribute to improved data interpretation and the further refinement of indicators of environmental change.

To measure these processes of stress and response, a number of categories of statistics corresponding to the elements of the framework have been established. These are shown in the column headings of Figure 1.

*Activity statistics,* as the name suggests, provide data about the actions and processes which ultimately generate environmental stresses. The particular sources of stress are termed stressors.

*Environmental stress statistics* are measures of the pressures placed on the environment by human activities and natural events and processes.

*Environmental response statistics* are measures of the change in state of physical and biological components of the natural system.

*Statistics on collective and individual human responses* provide information about actions taken to modify environmental stresses and responses.

In addition to these four categories of data detailing human-environment interactions, are a variety of *measures of stock.* These statistics describe the state of human activities and other physical and biological elements at particular points in time.

The statistics in the framework, and consequently in this publication, are further organized according to the *different kinds of stresses* imposed on the environment. There are five categories of stresses, four of which are directly related to human activities. This reflects the focus of the framework and *Human Activity and the Environment* on human-induced environmental change.

The five categories are presented in the row headings of Figure 1. These groups also serve as the central chapters of this compendium.

They are as follows:

*Natural Source Stress:* A variety of changes in the environment are brought about by climatic and geophysical events (earthquakes, floods, storms) as well as the long-term processes of climatic and geophysical change.

*Harvesting Stresses:* This category includes a variety of pressures associated with the removal of biomass from the environment. These items are consumed by people either as food or as inputs for our industries. Included here are forests, other vegetative cover including crops, and stocks of fish and wildlife. Problems occur when the rate of exploitation exceeds the regenerative capability of the resources. In respect to agricultural and forestry activity, problems relating to soil degradation and biomass sustainability are significant.

*Extraction and Depletion of Non-Renewable Resources:* This category covers the removal from the environment of substances which are finite in supply such as oil, natural gas and other minerals.

*Environmental Restructuring:* Stresses arise from construction and landscape modification activities. Expansion of cities and settled areas, construction of dams, development of mines and transport networks have direct impacts on wildlife habitat and stream drainage, for example, as well as indirect influences on micro-climates and on water quality.

*Generation of Waste Residuals:* Wastes are generated as by-products of the industrial and household activities of production and consumption. When these substances are disposed of into air, water or on land, they bring about changes in the physical and chemical characteristics of these media which may, in turn, affect the surrounding flora and fauna, as well as human living conditions.

## Organization of the Publication

This publication contains eight chapters. These correspond to the major elements of the *STRESS* framework (see Figure 1).

The first chapter, titled the **Natural Background** deals with natural sources of environmental stress and also provides a variety of information about Canada's physiography and climate.

The second chapter, **Population,** offers information on human population dynamics and distribution as background to subsequent chapters which focus on particular human engendered stresses. Population growth and change is a driving force behind human activities, and ultimately influences the strength and nature of human-induced pressures on the environment.

Chapters Three to Six present the four stress categories — **Harvesting, Extraction and Depletion of Non-Renewable Resources, Environmental Restructuring and Generation of Waste Residuals.** Each of these chapters is further subdivided according to the economic activities imposing these stresses. For example, Chapter Six, **Generation of Waste Residuals,** contains sections on Mining Activity, Manufacturing Activity, Thermal Energy Generation, Transportation, and Household Activities. It also contains a section on environmental stresses which arise from multiple sources.

Chapter Seven, **Biotic State,** presents statistics on environmental response and state. This subject is treated as a separate chapter rather than being integrated within the particular stress chapters as might be expected. Given the current state of environmental response statistics, it is impossible to make the cause-effect links necessary to relate more than a few biotic responses to particular stresses. There are two sections here, one dealing with wildlife populations and the other offering information on contaminants in animals.

The final chapter contains information on **Collective and Individual Human Responses** to environmental problems.

## Data Availability and Selection

Early in the process of collecting data for this publication, it became apparent that data availability and quality was extremely uneven and that it would be very difficult to prepare temporally and spatially comprehensive presentations for all subjects. Quality variations and gaps in the environmental data base arise for two reasons: (1) the limits of our understanding of environmental processes and the effects of human activities on them and (2) problems associated with the collection of environmental statistics including the high cost of scientific monitoring. Where data gaps exist, it is often possible to draw upon information from the social and economic statistical spheres to provide a picture of the human-environment interaction process. For many environmental concerns, however, no comprehensive and reliable data are available. Nevertheless, it is hoped that by making these gaps more widely known that interest to develop data for these subjects might be stimulated.

We were generally successful in bringing together many of the statistics sought on human activities. We were less successful in our search for measures of the environmental

Figure 1
**The Organizational Framework – STRESS**

| **Stressor Categories** | **Activity Categories** | **Activity Statistics[1]** | **Environmental Stress Statistics[1]** | **Environmental Response Statistics[1] (Chapter 7)** | **Human Response Statistics[1] (Chapter 8)** |
|---|---|---|---|---|---|
| Natural Source Stresses (part, Chapter 1) | Geophysical and meteorological events and processes | Floods, storms, earthquakes | Rates of erosion, landscape change | Changes in air, water, soil characteristics<br>Changes in biotic state | Environmental restructuring |
| Harvesting (Chapter 3) | Agriculture<br>Forestry<br>Fisheries | Production | Changes in soil characteristics<br>Depletion of stocks | Changes in biotic state including population size, regenerative capability | Conservation<br>Changes in methods of farming, harvesting<br>Legislation, fish quotas |
| Extraction and Depletion of Non-Renewable Resources (Chapter 4) | Metals and non-metallic minerals<br>Fossil fuels | Extraction | Depletion of resources<br>Substitution | Substitution for scarce resources leads to impacts indirectly from wastes and restructuring associated with use of substitutes | Conservation |
| Environmental Restructuring (Chapter 5) | Land conversion<br>Restructuring water systems<br>Transport networks<br>Resource development | Construction of homes, dams, reservoirs, railways, highways<br>Exploration for resources | Land converted, changed in character | Changes in air, water, soil characteristics (quality)<br>Changes in biotic state including species diversity, population size (due to habitat change) | Changes in rate and location of land conversions<br>Land use legislation<br>Park creation |
| Generation of Waste Residuals (Chapter 6) | Mining<br>Manufacturing<br>Energy generation<br>Transportation<br>Households | Production<br>Consumption<br>Vehicle movements | Waste generated<br>Emissions of wastes to air, water, soil<br>Disposal of toxics | Changes in air, water, soil characteristics (quality)<br>Changes in biotic state including species diversity, population size<br>Human health effects | Pollution abatement through process change, activity termination<br>Legislation<br>Conservation |
| Population (Chapter 2) (a background influence) | Population dynamics | Population growth, migration | | | Population control, resettlement |

[1] Examples of kinds of statistics in this category.

stresses brought about by these activities. However, the recasting of available activity statistics into environmentally appropriate geographic or functional classifications contributes to an understanding of these pressures. It was also difficult to compile meaningful presentations in the sections dealing with environmental responses. Human health, for example, is a subject which could have been included in the response section. However, existing data on mortality and morbidity are extremely difficult to relate to effects arising from conditions in the environment with any degree of statistical validity.

Statistics about the environment come from a variety of agencies at the three levels of government and, to a lesser extent, from business and academic sources. Most of these data are collected for purposes other than environmental analysis and tend to be oriented towards the needs of particular programs and policy objectives. For example, even where provincial or municipal statistics exist as in the areas of wildlife populations or land use, lack of comparable classification systems and concepts and differences in survey techniques make it difficult to put together a national presentation.

Approximately fifty percent of the statistics in this publication are derived from Statistics Canada sources and detail human activities which have an effect on the environment. The flexibility and quality of these data enables their recasting along more environmentally meaningful geographic and thematic lines while at the same time maintaining national coverage and definitional consistency.

Data of various kinds about the physical environment have been compiled for many years using solid statistical practices; for example, meterological records, geological information, and hydrological data. These data provide information on environmental processes and sources of natural environmental stresses.

In the past fifteen years, government efforts to implement environmental protection and conservation policies have focussed attention on data requirements to assess the state of the environment, particularly the quality of water and air. Most of our stress statistics and information on the state of the physical environment come from these sources.

Other statistics, particularly the response data, are derived from collection exercises carried out for very specific purposes, and have very limited geographic, temporal and subject matter coverage. Data of this kind are reliable for the use for which they are collected. For example, scientific detection of the presence or absence of a particular contaminant in fish tissue at a particular site at one point in time may be sufficient for the requirements of regulating that chemical. However, for a broader environmental assessment, additional reliable data on the level of the contaminant from a selection of sites is required.

In the course of compiling this publication, the selection of material to display particular themes was heavily dependent upon the advice of subject matter experts. On their advice a good deal of material which failed to contribute towards providing the broad picture was rejected.

However, a number of somewhat technically complex presentations have been included. In these cases, the analyses and assessments of the experts, as well as information about the methods of data collection, are provided in the footnotes and explanatory notes which accompany the item.

## Content Features

Because *Human Activity and the Environment* is primarily a compendium and a source book, extensive analysis of the data was not appropriate here. That task is left to the reader[1]. However, some comments about the statistics are necessary. Discussions of technical considerations are provided to assist the reader in interpreting the statistics. Technical points, whether data collection details, definitions or qualifications, are usually dealt with directly in the relevant table, graph or map either in the footnotes or in more extensive explanatory notes. Most chapters also contain technical boxes which present information to explain the data themselves, the way they were collected or their shortcomings. Technical boxes also present illustrative statistics from limited scientific studies. The technical boxes are shaded to indicate that they are somewhat different from the other material in the publication.

Another purpose served by text is to highlight certain statistics, particularly new data series which appear here for the first time. The summaries which follow provide this brief overview of chapter content and highlight some of the data. This is by no means intended to offer an exhaustive review.

Chapter 1

### Natural Background

**Environmental Geography:** This section introduces two geographic sets, drainage basins and ecozones, which are relevant for the presentation of statistics about the environment. Data are also displayed by provinces, reflecting the complementarity of natural activity space and administrative space and the requirement for information on both geographic bases for environmental assessment.

**Physiography and Climate:** A selection of information about these two background influences on human activities is presented. Table 1.2.10, the Climate Profile, provides a current summary of climate trends such as extreme heat, extreme cold, snowfall, rainfall, sunshine and growing season duration.

**Major Geophysical and Meteorological Events:** This section contains information on natural events as sources of environmental stress. These include earthquakes, storms and floods. The summaries were specially compiled from a variety of federal, provincial and private sources.

Chapter 2

### Population

Background statistics on population size and distribution by natural and administrative areas are presented here. These compilations highlight the degree to which human settlement is concentrated in a relatively restricted geographic space in Canada. Further, they identify the aquatic and ecological systems experiencing pressures arising from man's activities.

Chapter 3

### Harvesting

This is the first of four chapters dealing with human imposed stresses on the environment. It highlights three activities exploiting the renewable resource base, agriculture, forestry and fisheries.

**Agriculture:** This section begins with an overview of the agricultural resource base, as characterized by land capability information from Environment Canada's Canada Land Inventory, and by the climatic potential for growing crops in different parts of the country.

[1] Statistics Canada has been cooperating with Environment Canada to produce a national report on the state of the environment. *Human Activity and the Environment* and this new report share organizational philosophy as well as some data. *Human Activity and the Environment*, however, contains many detailed presentations while the State of Environment Report will provide an analysis of selected patterns and trends. Thus, the two publications can be viewed as complementary documents.

Following next are historical statistics drawn from the data bases of the Agriculture Division, Statistics Canada. These detail the significant increases in crop and livestock production since the beginning of the century and the corresponding increases in the scale of farm operations, the increasing use of fertilizers and pesticides and the growth of mechanization in the industry.

Tables, Charts and Maps 3.1.17 to 3.1.40 focus on the potential of agricultural activities to stress the environment. The data are largely new tabulations of statistics from several recent Agricultural Censuses. Data retabulations by drainage basins and ecozones point to particular locations where pressures may be arising from farming.

The cropping methods employed in farming dictate the surface area exposed to erosive forces of wind and rain. The use of summer fallowing techniques, that is leaving fields uncropped over the course of a year to build up soil moisture, is believed to result in extensive soil loss from erosion. Significant soil loss is also believed to result from the planting of certain crops such as corn and soybeans with wide separations between the rows. Special tabulations illustrate geographic and temporal cropping practice patterns. These data are complemented by information from Agriculture Canada on erosion risk.

Statistics on applications of fertilizers and pesticides which appear in this chapter could have been placed in the Generation of Waste Residuals Chapter with equal validity. They have been included in this section because their use contributes to the farmer's ability to maintain and increase productivity despite the decline in natural soil fertility that results from intensive agriculture activity.

**Forestry:** The Canada Forest Inventory, recently established by the Canadian Forestry Service, is the source for much of this section's information. The inventory offers a valuable picture of the distribution, character and state of Canada's forests.

Harvest and forest management statistics which follow the inventory information illustrate cutting, replanting and forest tending activities. Several styles of tree harvesting are used in forestry including clear-cutting and selective cutting. In certain situations clear-cutting seems to result in a significant degree of environmental stress by, for example, contributing to soil erosion problems. The limited data available on method of harvesting are presented here. However, potential exists for future data development in this area by incorporating slope, soil and climate factors with more detailed harvesting statistics.

Maps and Charts 3.2.15 to 3.2.21 portray other sources of stress on the forests including insects, disease and fire.

**Fisheries:** Overfishing, as well as the impact of other pressures such as pollution and climate change, can create problems for the long-term sustainability of marine resources.

Assessments of fish stocks are almost exclusively derived from fish catch statistics. Data on a variety of species in three aquatic regions, the Atlantic and Pacific Oceans and Inland Waters are included.

Notes at the beginning of the Fisheries section provide more detailed information on the relationship between catch statistics and estimates of stock. Data of these kind are used with other management tools and models by the Department of Fisheries and Oceans to set catch limits, the objective being to sustain the resource.

Chapter 4

## Extraction and Depletion of Non-Renewable Resources

This chapter examines the current and historical patterns of mineral extraction with a special focus on the rate of withdrawal in relation to the size of known reserves.

**Metals and Non-Metallic Minerals:** The data in this section offer a long-term perspective on mineral production in Canada, and illustrate the major increase in the rate of extraction which has taken place in the post war period. In addition, new tabulations present information on the total historical extraction of a number of metals and minerals. A major problem in assessing mineral depletion rates is the difficulty in determining the size of the available resource base. Technical Box 4.1.7 describes the concepts employed by Energy, Mines and Resources Canada in estimating mineral reserves, pointing out that these reserves are as much determined by economic and technical considerations as geological estimates of known quantities.

**Fossil Fuels:** This section contains statistics on energy consumption as well as information on oil, gas and coal production in Canada. The relation between production and reserves over time and geographic space is also examined for the three minerals.

Chapter 5

## Environmental Restructuring

The scope and nature of human activities involved in reshaping the environment for our social and economic well-being are portrayed here in four sections.

**Land Use and Land Conversion:** Land use statistics are not as well developed in Canada as in many other industrial countries perhaps because of the apparent territorial wealth of the country. This is deceptive, however, because important land based activities such as agriculture are severely restricted by climate and soil quality. Canada's good farmland, soils with moderate or no limitations for the growing of crops, account for only forty-three percent of all agricultural land, which in turn accounts for only eleven percent of Canada's land surface. In fact, the total area of our best land, Canada Land Inventory, class 1 (no cropping limitations) is less than the amount of land of equivalent quality in the State of Ohio.

This section focuses on the state of special lands such as high quality agriculture lands in heavily settled areas and the limited areas of land suitable for fruit growing. Information on land use change in urban areas is derived from special studies by the Lands Directorate, Environment Canada, while many of the fruitland statistics are the result of new tabulations. Two special studies of land conversion in the Niagara and Okanagan fruitlands complete the section.

**Restructuring of Water Systems:** Dam and reservoir construction and the rerouting of drainage systems are two of the methods by which aquatic systems are changed. Benefits derived include hydro-electric power, flood control, improved navigation, and improved water supplies.

On the negative side, however, valley bottoms, often prime wildlife habitats are flooded, and changes in water flow rates may have impacts on wildlife habitats downstream. This, for example, occurred in the Athabaska Delta of the Peace River after the Bennett Dam was constructed. Water transfers across basin boundaries may introduce new and undesirable species to those areas. For example, in the 1800s Lamprey were

believed to have been introduced to the Upper Great Lakes after the construction of the Welland Canal.

Tables 5.2.1 and Map 5.2.2 portray new compilations of large dams in Canada by drainage basins. The maps clearly indicate the move northward of dam building activities over time. Table 5.2.4 on reservoir construction and the amount of land flooded highlights the extent to which valley bottoms, often prime wildlife habitat, have been lost, especially in the past twenty-five years. Technical Box 5.2.7 illustrates the stream flow effects of river system modifications.

**Transportation Networks:** The construction of rail lines, roads and airports has a direct impact on land use patterns. More importantly, however, are the indirect effects which may be brought about by the expansion of transport networks. The improved accessibility offered by new transport routes stimulate the development of a variety of other human activities, such as forestry and mining, particularly in remote northern areas. These newly introduced activities may then place their own particular stresses on local environments. Map 5.3.3 illustrates the northern expansion of the road network.

**Resource Development:** This section provides a summary of information from the Major Projects Inventory maintained by the Department of Regional Industrial Expansion. This includes resource development projects currently under construction or planned. The tables portray the location and scale of potential environmental impacts. The estimated capital cost provides a rough indicator of the project size.

## Chapter 6
## Generation of Waste Residuals

The generation of wastes is the inevitable by-product of production and consumption activity. The objective of this chapter is to abstract from the economic activity base those statistics relevant for analyses of environmental pollution. This includes, where available, data on pollutant emissions to air and discharges to water. This is the largest chapter in the compendium and contains five activity sections plus a section dealing with environmental stresses from multiple sources.

**Mining:** Mining activity produces large amounts of waste rock which can contribute to water, air and land pollution. In addition, the consumption of fossil fuels and the activities of smelters result in emissions to the atmosphere. The environmental stress potential of mining activity is portrayed through production statistics such as numbers of workers and fossil fuels purchased. The detailed statistics on generation of rock wastes offer more direct measures of stress.

**Manufacturing:** Manufacturing activity statistics are retabulated in this section into three categories according to the degree of stress the activity potentially imposes upon the environment's air or water systems. This work is an extension of the calculations presented for the first time in the earlier edition of *Human Activity and the Environment*. The note at the chapter's beginning discusses this retabulation process in detail.

Items 6.2.12 to 6.2.16 present a variety of stress statistics including pollutant loadings to water bodies by particular industries. Derived from Environment Canada data bases, many of these are new tabulations.

**Thermal Energy Generation:** The emission of substances such as sulphur dioxide from electric generation stations burning fossil fuels is a major source of environmental stress. The tables and charts illustrate the increasing share of thermal energy in the total Canadian power generation picture and provide information on the types of fuel being used.

Map 6.3.7 is a new compilation which illustrates the size and distribution of thermal generation stations in Canada.

Nuclear power generation has also become an environmental concern. A number of the tables and charts provide information on power generated from nuclear sources while Map 6.3.8 illustrates the location and capacity of individual plants in the Great Lakes Basin.

**Transportation Activity:** Large amounts of energy are consumed by the transportation sector, in part due to the sheer size of this country and the great distance between major centres of population. A variety of wastes are emitted, largely to the air, and include carbon monoxide, nitrogen oxides and lead. The section presents a variety of historical statistics on transportation activity followed by a selection of stress related data including information on aircraft noise, energy consumption and the use of lead in gasoline.

**Household Consumption and Municipal Wastes:** Data in this section are largely new compilations from Environment Canada's MUNDAT data base on municipal waterworks and waste water treatment systems. These data are organized by drainage basin and provide information on population served by type of waste water treatment as well as estimates of municipal pollution loadings to water. These are supplemented by selected data on residential heating and diffusion of "high energy" consuming household and recreational products.

**Multiple Source Stress:** This section summarizes complex data on pollution loadings and environmental quality. The term multiple source is employed because many environmental stresses are non-specific with respect to the source of stress. This does not mean that a predominant source cannot be identified, for example, sulphur dioxide emissions by thermal power stations, and metal smelting operations. However, particular sources might vary from area to area and many small emission sources can be involved in the overall pollution picture. Also, contaminants may be derived from natural sources, for example, forest fires, volcanic eruptions and dust storms.

The section is introduced by a series of national summary maps of air pollutant emissions compiled from Environment Canada's National Inventory of Emissions of Air Contaminants. Other data on loadings of air pollutants in selected urban areas are summarized by composite air quality indices.

The second part of the section focusses on water quality by abstracting statistics from Environment Canada's National Water Quality Data Base (NAQUADAT). Phosphorous loadings have been focussed on in particular since this is a widely monitored substance and is considered to contribute to serious water quality problems. These compilations are new and are one attempt to develop broadly comparable measures from a data base originally designed for site-specific monitoring.

Information on two high profile environmental issues, acid rain and spills of hazardous substances, complete this section. The acid rain information presents the level of acidic deposition in the context of the sensitivity to acidification of the receiving area.

## Chapter 7
## Biotic State

The information in this chapter portrays the responses of biological species to the pressures imposed on the environment by human activities and natural processes.

Most of the data are the product of scientific studies and as such tend to be site-specific rather than national in scope. They are also highly variable in terms of geographic and temporal comparability. This is a reflection of the high cost involved in obtaining these kinds of data and the different

purposes for which the information is collected.

Two sections make up the chapter. The first deals with the range, stock and status of wildlife while the second provides an indication of the degree to which contaminants in the environment have been picked up by biota.

**Wildlife:** Table and Maps 7.1.1 to 7.1.8 present newly compiled information on the range and diversity of bird and mammal species. Following these are recent maps showing distributions and population sizes of two species under varying pressures from human activities, the caribou and the polar bear.

Statistics on fur pelts taken and big game and migratory bird kills are used by wildlife biologists to estimate population sizes and population fluctuations. Tables and Charts 7.1.11 to 7.1.17 present these data. These are accompanied by the current lists of endangered species including comments about the factors which have contributed to the current low population levels in each case. Information on introductions of new species completes the section. Species introductions are actually a source of stress rather than a biotic response. The arrival of new species in new locations often produces changes in resident populations through competition for food and habitat. New species introductions may also have both positive and negative impacts on man's activities.

**Contaminants and Biotic Response:** Ideally, this section should contain information on the effects of contaminants on population size and biological health (including human health). However, such effects are poorly understood by scientists and therefore few of these data are available. Instead, a carefully selected set of representative information about some of the contaminants most frequently linked to potential problems is presented. Statistics in this section may be difficult to interpret. Nevertheless, they have been used in the past to increase public awareness of the presence in nature of toxic substances produced by human activities, as well as the potential impacts these substances may have on human health. Careful reading of footnotes is important in interpreting the meaning and quality of the biological data contained in this section.

Chapter 8

## Collective and Individual Human Responses

This last chapter focuses on the actions of governments and individuals to improve, protect, or conserve the quality of the environment and the natural resource base. These actions have usually been taken in response to stresses on the natural system. The limited data presentation does not reflect the lack of positive steps taken in this domain but rather the scarcity of solid data on public and private expenditures and on the respective actions undertaken by individuals, institutions, industrial enterprises and governments in attaining environmental objectives.

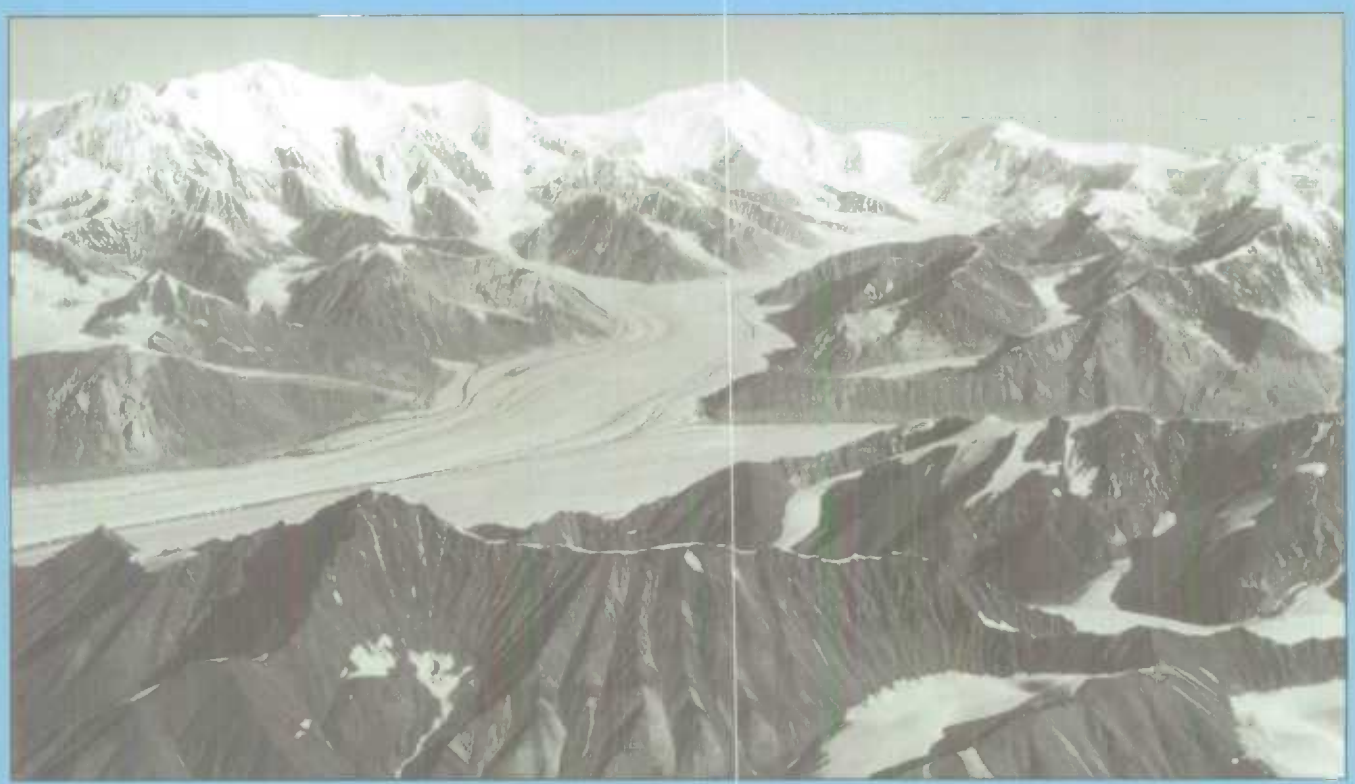
Three types of data included here are: (i) expenditures on environmental protection; (ii) establishment of protected areas (national and provincial parks); and (iii) public perceptions and attitudes about the environment. The table on federal and provincial environmental legislation found in Appendix 8 reveals the wide scope and extensive coverage of the legislative base in the environmental domain.

## Appendices

The appendices present additional details for a selection of variables for which summary information appeared elsewhere in the publication. For example, due to space considerations in the main body of the publication, drainage basin statistics are presented for basin aggregations called major drainage areas. The appendices contain the more detailed statistics for individual basins, as well as the provincial breakdowns. Statistics which appear by major drainage areas in the chapters but which are not disaggregated in the appendices are available by special request. There are eight appendices, each one corresponding to the chapter of the same number.

# 1

# The Natural Background



# Contents

# 1.1 Environmental Geography

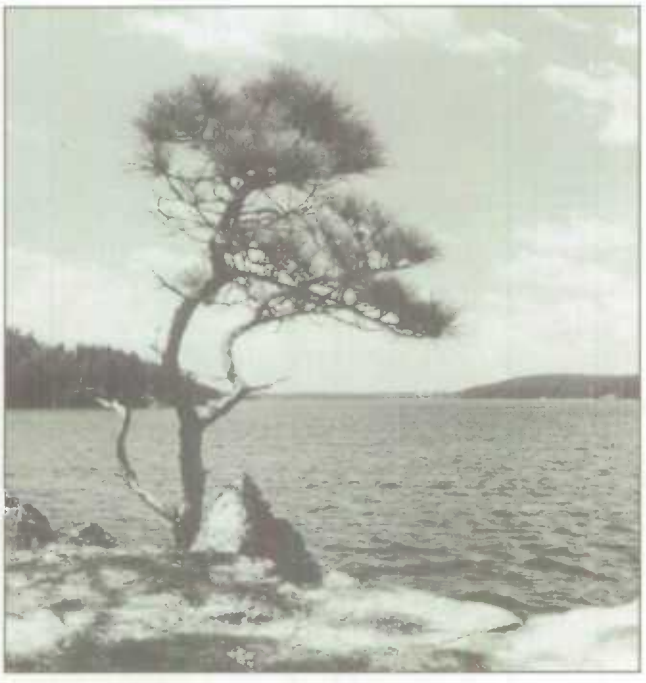
## Geographic Units for Environmental Statistics

Data to assess the state of the environment is sometimes more pertinent when organized by natural process space rather than by legal/jurisdictional space. In this publication we have introduced two natural spatial units employed in environmental analysis, drainage basins and ecozones.

Drainage basins are water catchment areas delineated by heights of land. These are the natural units for all statistics dealing with water — for direct measures such as stream flow, water use, water quality and associated flora and fauna information as well as indirect measures of human activity as depicted by socio-economic statistics. Although such activities as water use or water pollution can be associated with specific administrative units, their impacts will generally extend to other parts of the drainage basin downstream.

Ecozones are large natural regions delineated by distinctive sets of biotic resources (flora and fauna) and physical resources (soils, bedrock, physiography, climate). Since each ecozone comprises a distinctive assemblage of biophysical characteristics, they constitute large fairly homogeneous geographic spaces which are particularly valuable for monitoring the impact of natural and man-made stress on the environment.

Actions to resolve environmental problems are usually undertaken by political administrations such as municipalities, provinces or countries. Therefore, environmental data by administrative units are of interest for management purposes, planning remedial measures, and assessing the effectiveness of policies. Consequently in this publication each natural unit is usually subdivided into its provincial/territorial components. Thus, provincial/territorial statistics by natural units can be obtained by regrouping the drainage basin or ecosystem components (for example drainage basins in Manitoba).



### Drainage Basins

The drainage basin classification presented here is consistent with the system used by the Water Survey of Canada, Environment Canada[1]. Drainage systems can be differentiated by the natural hierarchy of stream branching. Canada is part of the North American continental hydrological system of which five basins at the apex of the hierarchy are found in Canada. These are: (i) Atlantic Ocean Basin, (ii) Hudson Bay and Ungava Bay Basin, (iii) Arctic Ocean Basin, (iv) Pacific Ocean Basin and (v) Gulf of Mexico Basin. In the case of the latter, a small area of the Mississippi-Missouri system extends into the southern portion of Alberta and Saskatchewan.

The drainage basin classification here is an expanded version of the set originally published in the 1978 edition of *Human Activity and the Environment*. The major concern in developing the classification system (and the associated data base) was its relevance for statistical analysis of the environmental impact of human actions on Canada's water resources and aquatic ecosystems. These areas were delineated from basic units referred to as sub-sub-basins in the Environment Canada classification. In areas with a high intensity of human activity such as the Toronto or Montreal area, the sub-sub-basin was retained. In areas with more or less continuous settlement and moderate population densities such as the Lower Ottawa River, several sub-sub-basins were aggregated. In areas of discontinuous settlement the basins correspond to the sub-basins of the Environment Canada classification and in sparsely settled Northern Canada, combinations of sub-basins are used.

Statistics are displayed for up to eighty-eight drainage basins which are further subdivided into provincial/territorial components.

Many tables present statistics for major drainage areas. These are groups of drainage basins and are designed for the illustration of broad patterns at a national scale. Data displayed by major drainage areas are usually available in the Appendix at the more detailed basin level, or otherwise upon request. It should be noted that any basin data can be grouped for user-specified areas or sorted by province.

## Ecozones

The ecozones presented here were delineated by Lands Directorate of Environment Canada. (see Table 1.1.2 for a brief description of ecozone biophysical characteristics).

Ecological land classification is a process of identifying areas which can be viewed as discrete systems with regard to the interplay of the landform, water, soil, vegetation, climate, wildlife and human factors which may be present. These can be further developed into a hierarchical system ranging from site-specific ecosystems (e.g. ponds, woodlots and meadows) to ecological zones encompassing large portions of the earth's surface (e.g. tundra, boreal forests, grasslands, deserts).

The Canada Committee on Ecological Land Classification has proposed a seven level hierarchy, ranging from the eco-element, a small area with specific characteristics, to eco-provinces and ecozones, generalized ecological units covering very large areas.

Ecological areas have been mapped at the more detailed level in various parts of Canada including Alberta, Québec, Saskatchewan, Yukon and the Northwest Territories. The ecozone classification here is one of the first attempts at a Canada-wide approach, although a number of regionalizations of Canada dealing with specific ecosystem elements have been carried out (for example, forest regions, physiographic regions, and wetland regions).

Several organizing conventions were followed by Lands Directorate in delineating these ecozones. Among these is a process termed complexing, which consists of grouping small, spatially proximate units that might otherwise be considered as separate entities. This facilitates examination of patterns at a broad level. The Montane Cordillera Ecozone is illustrative, being composed of many very distinct ecological entities ranging from semi-desert environments, through grasslands and forests to alpine areas.

Another convention followed in delineating boundaries was that in transition areas where classifying elements intermixed, dominant components were identified and their distribution used to assist in placing the boundary line. For example, in southeastern Ontario, a mix of boreal and hardwood forest is present on the Canadian Shield. In this case landform was deemed to have the greatest impact on activities, forest type was disregarded and the boundary of the Boreal Shield was placed to coincide with the southern limit of the Canadian Shield.

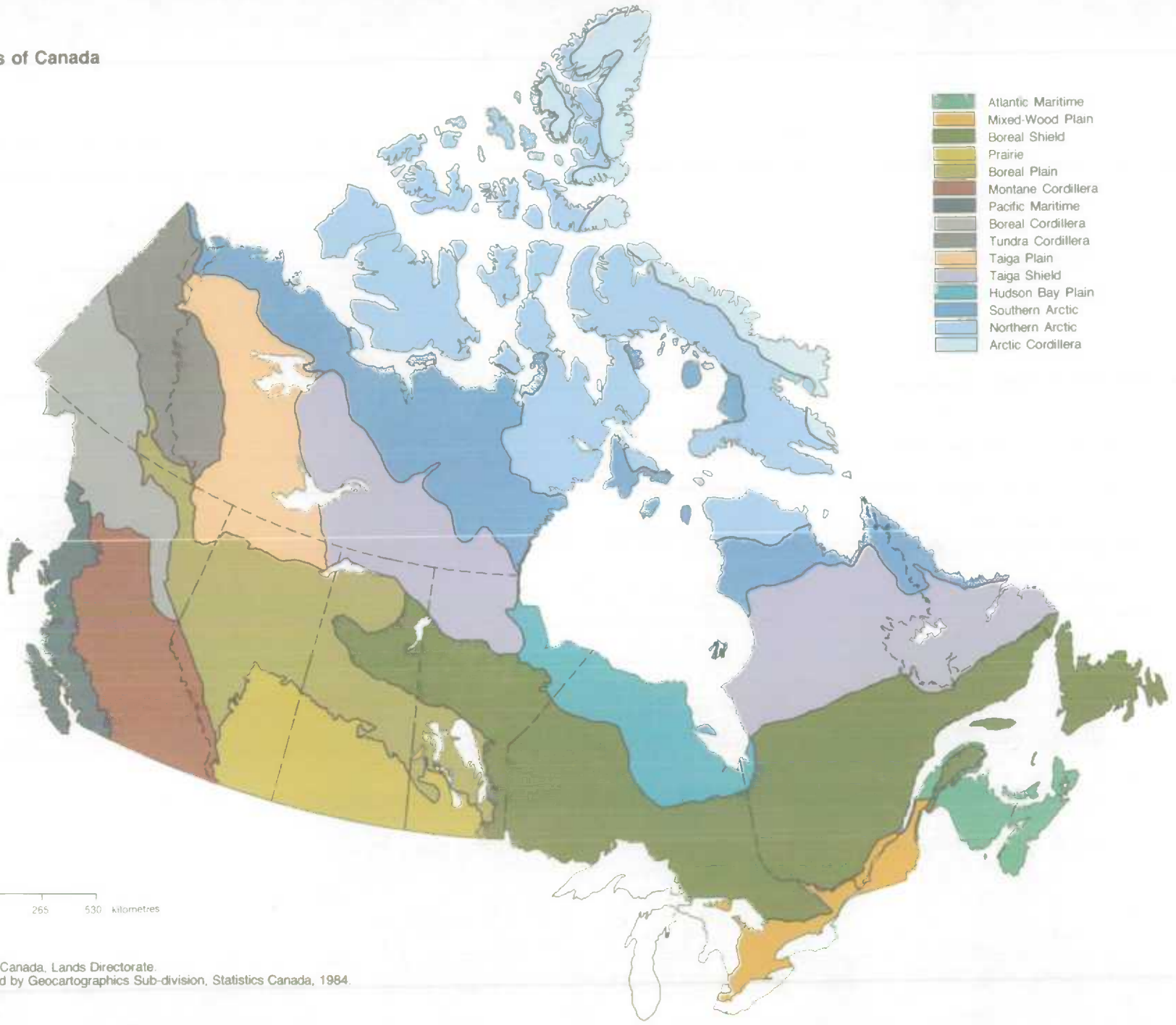
Finally, it should be noted that boundary lines often imply a degree of precision in demarcation of ecozones that does not actually exist. More realistically, the boundaries should perhaps be viewed as transition zones ranging from tens to hundreds of kilometres wide depending on the ecozones involved.

The fifteen ecozones presented here are further disaggregated by provinces and territories.

[1] Environment Canada, Inland Waters Directorate, Water Resources Branch, *Hydrometric Map Supplement*, 1977.

Map 1.1.1

## Ecozones of Canada




**Source:**
Environment Canada, Lands Directorate.
Map produced by Geocartographics Sub-division, Statistics Canada, 1984.

Table 1.1.2
## Ecozone Biophysical Characteristics[1]

| Ecozone | Physiography | Vegetation | Soils[2] and Surface Materials | Climate |
|---|---|---|---|---|
| Atlantic Maritime | Hills and coastal plains | Mixed broadleaf and conifer stands | Acid and well weathered soils (podzols) and soils with clay-rich sublayers (luvisols), moraine, marine bottom soils and rock debris | Cool to cold winters, mild summers, moderate to heavy precipitation |
| Mixed-Wood Plain | Plains, some interior hills | Mixed broadleaf and conifer stands | Temperate region soils with clay-rich sublayers (luvisols), marine bottom soils, moraine, rock | Cool to cold winters, warm to hot summers, moderate precipitation |
| Boreal Shield | Plains, uplands, interior hills, many lakes and streams | Conifer and broadleaf boreal stands | Acid and well weathered soils (podzols), lake bottom soils, moraine, rock | Cold winters, warm to hot summers, moderate precipitation |
| Prairie | Plains, some foothills | Short and mixed grasslands, aspen parkland | Organically rich, relatively fertile grassland soils (chernozems), moraine and lake bottom materials | Cold winters, hot summers, minimal precipitation |
| Boreal Plain | Plains, some foothills | Conifer and broadleaf boreal stands | Temperate region soils with clay-rich sublayers (luvisols), moraine and lake bottom materials | Cold winters, warm summers, moderate precipitation |
| Montane Cordillera | Mountainous highlands, interior plains | Mixed vegetation, conifer stands to sage brush | Temperate region soils with clay-rich sublayers (luvisols), soils with minimal weathering (brunisols), moraine, rock, rock debris | Cool to cold winters, warm to hot summers, arid in lee areas, moist in montane areas |
| Pacific Maritime | Mountainous highlands, some coastal plains | Coastal western and mountain hemlock | Acid and well-weathered soils (podzols), moraine, rock, rock debris | Mild winters, mild summers, heavy precipitation especially in fall and winter |
| Boreal Cordillera | Mountainous highlands, some hills and plains | Boreal, some alpine tundra and open woodland | Soils with minimal weathering (brunisols), moraine, rock | Cold winters, mild summers, minimal precipitation in lee areas, moist in montane areas |
| Tundra Cordillera | Mountainous highlands | Alpine and arctic tundra | Soils with minimal weathering (brunisols), frozen soils (cryosols), moraine, rock | Very cold winters, cool summers, minimal precipitation |
| Taiga Plain | Plains, some foothills | Open woodland, shrublands and wetlands | Soils with minimal weathering (brunisols), some frozen soils (cryosols), organic materials, moraine | Cold winters, mild to warm summers, moderate precipitation |
| Taiga Shield | Plains, uplands, some interior hills, many lakes and streams | Open woodlands, some arctic tundra and lichen heath | Soils with minimal weathering (brunisols), acid and well-weathered soils (podzols) some frozen soils (cryosols), moraine, rock | Cold winters, warm summers, moderate precipitation |
| Hudson Bay Plain | Plains | Wetland, arctic tundra and some conifer stands | Organic soils, sea bottom and beach materials | Cold winters, mild summers, minimal precipitation |
| Southern Arctic | Plains, some interior hills | Shrub/herb/heath arctic tundra | Frozen soils (cryosols), moraine rock, marine bottom sediments | Cold winters, cool summers, minimal precipitation |
| Northern Arctic | Plains and hills | Herb-lichen arctic tundra | Frozen soils (cryosols), moraine, rock, marine bottom sediments | Very cold winters, cool summers, minimal precipitation |
| Arctic Cordillera | Mountainous highlands | Largely non-vegetated, some shrub/herb arctic tundra | Frozen soils (cryosols), rock, rock debris, ice | Very cold winters, cool to cold summers, minimal precipitation |

[1] This list is meant to be illustrative only and is not a comprehensive presentation of the characteristics of these areas.
[2] Cross Reference; refer to Map 1.2.2 (Soils) for a further explanation of soil types.

**Source:**
Environment Canada, Lands Directorate, *Terrestrial Ecozones of Canada*, by E. Wiken, unpublished working paper, August, 1983.

Table 1.1.3
## Area of Ecozones[1]

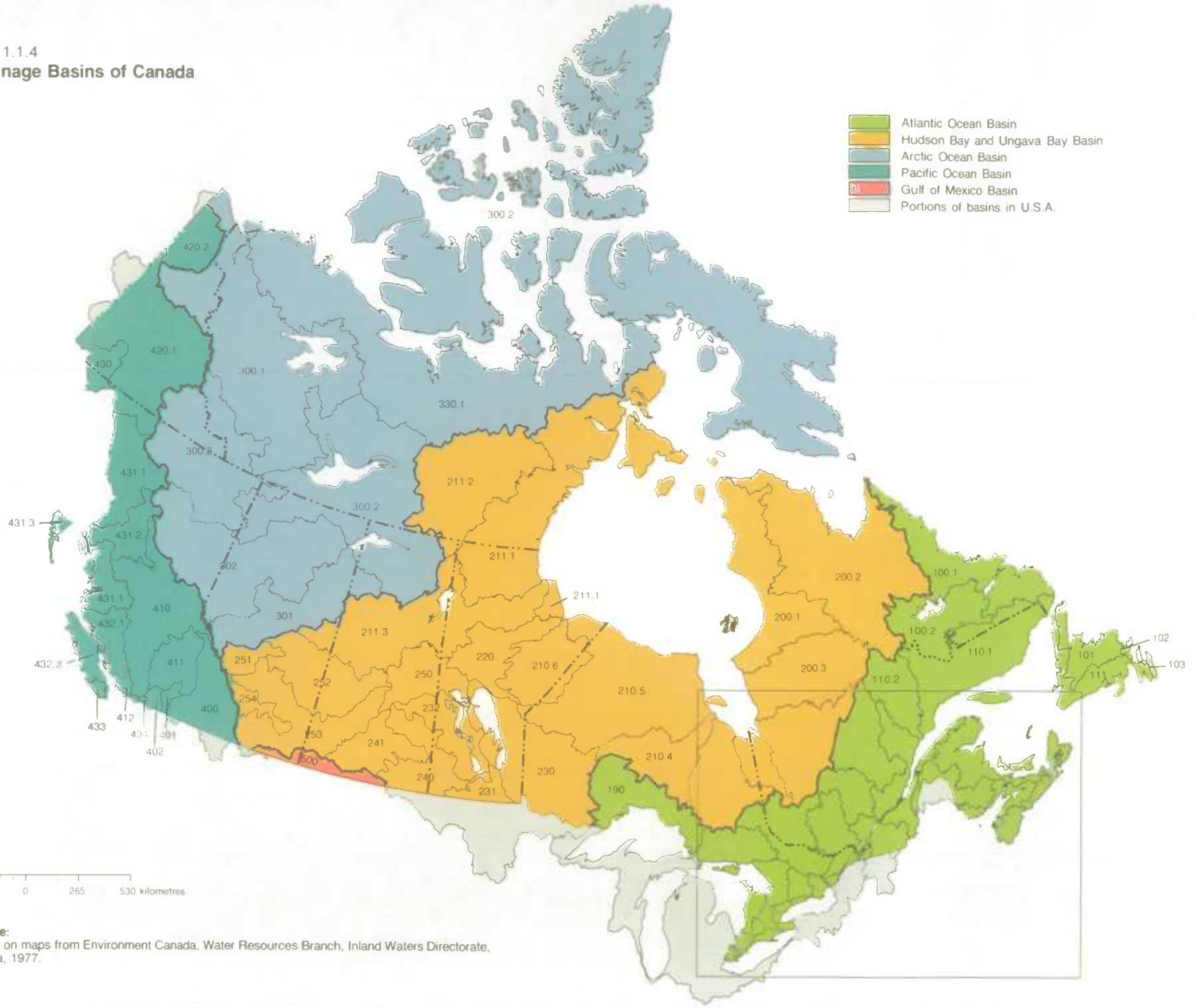
| Ecozone | Square Kilometres |
|---|---|
| **Atlantic Maritime** | **188 810**[2] |
| Prince Edward Island part | 5 660 |
| Nova Scotia part | 55 490 |
| New Brunswick part | 72 950 |
| Québec part | 54 710[2] |
| **Mixed-Wood Plain** | **194 955**[3] |
| Québec part | 56 935 |
| Ontario part | 138 020[3] |
| **Boreal Shield** | **1 817 845**[4] |
| Newfoundland and Labrador part | 122 985 |
| New Brunswick Part | 490 |
| Québec part | 693 705 |
| Ontario part | 652 180[4] |
| Manitoba part | 248 455 |
| Saskatchewan part | 100 030 |
| **Prairie** | **491 135** |
| Manitoba part | 70 715 |
| Saskatchewan part | 253 645 |
| Alberta part | 166 975 |
| **Boreal Plain** | **882 595** |
| Manitoba part | 129 685 |
| Saskatchewan part | 258 765 |
| Alberta part | 375 850 |
| British Columbia part | 93 895 |
| Yukon part | 23 975 |
| Northwest Territories part | 425 |
| **Montane Cordillera** | **463 300** |
| Alberta part | 43 855 |
| British Columbia part | 419 445 |
| **Pacific Maritime** | **197 040** |
| British Columbia | 197 040 |
| **Boreal Cordillera** | **425 770** |
| British Columbia part | 207 535 |
| Yukon part | 218 235 |
| **Tundra Cordillera** | **376 960** |
| Yukon part | 227 745 |
| Northwest Territories part | 149 215 |
| **Taiga Plain** | **557 240** |
| Alberta part | 68 090 |
| British Columbia part | 29 885 |
| Yukon part | 5 485 |
| Northwest Territories part | 453 780 |
| **Taiga Shield** | **1 301 290** |
| Newfoundland and Labrador part | 226 515 |
| Québec part | 490 095 |
| Manitoba part | 122 630 |
| Saskatchewan part | 39 890 |
| Alberta part | 6 420 |
| Northwest Territories part | 415 740 |
| **Hudson Bay Plain** | **370 820** |
| Québec part | 8 625 |
| Ontario part | 278 380 |
| Manitoba part | 78 665 |
| Northwest Territories part | 5 150 |
| **Southern Arctic** | **992 595** |
| Newfoundland and Labrador part | 56 220 |
| Québec part | 157 360 |
| Yukon part | 8 010 |
| Northwest Territories part | 771 005 |
| **Northern Arctic** | **1 408 590** |
| Québec part | 79 250 |
| Northwest Territories part | 1 329 340 |
| **Arctic Cordillera** | **301 665** |
| Northwest Territories | 301 665 |
| **Canada** | **9 970 610** |

[1] These figures include the area of all freshwater in the ecozones.
[2] This figure includes 34 330 square kilometres of the St. Lawrence River Estuary surface area. The St. Lawrence River Estuary is defined by Inland Waters Directorate, Environment Canada as being that portion of the River between Ile d'Orleans and Anticosti Island.
[3] This figure includes 50 515 square kilometres of Great Lakes surface area.
[4] This figure includes 37 750 square kilometres of Great Lakes surface area.

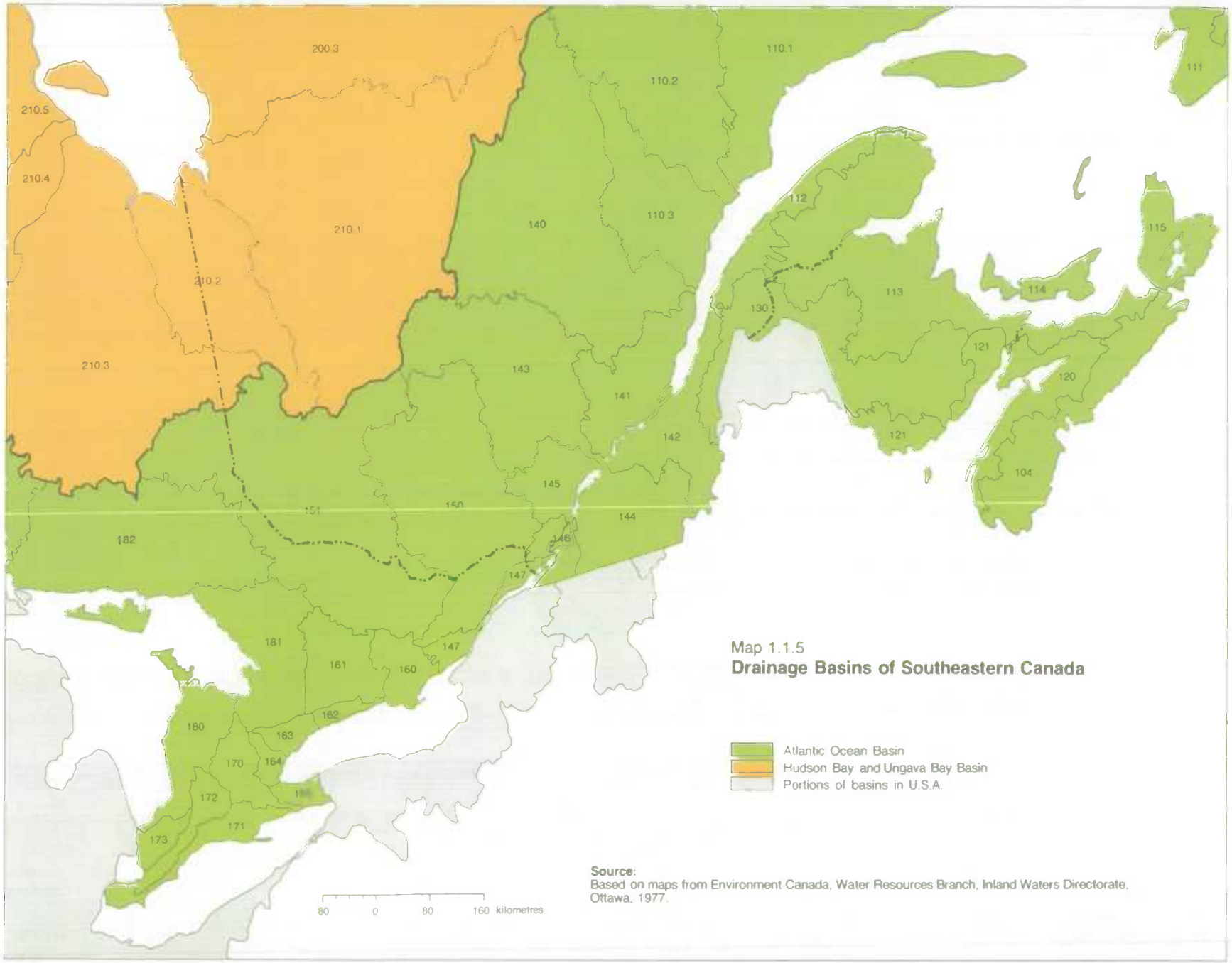
**Source:**
Statistics Canada, special tabulation; advice provided by Geographical Services Directorate, Energy, Mines and Resources Canada.

**Notes:**
These data were derived through the use of a computer planimeter. Due to the scale of the maps which were digitized to derive this information, these data should be regarded as estimates only.

Map 1.1.4
**Drainage Basins of Canada**




**Source:**
Based on maps from Environment Canada, Water Resources Branch, Inland Waters Directorate, Ottawa, 1977.




Map 1.1.5
**Drainage Basins of Southeastern Canada**

Atlantic Ocean Basin
Hudson Bay and Ungava Bay Basin
Portions of basins in U.S.A.

**Source:**
Based on maps from Environment Canada, Water Resources Branch, Inland Waters Directorate, Ottawa, 1977.

Table 1.1.6
## Drainage Basin Reference Codes and Areas[1]

| | | | Area in Square Kilometres |
|---|---|---|---|
| 1. | | **ATLANTIC OCEAN BASIN** | |
| | | **Atlantic Ocean Coastal Drainage** | |
| 100.1 | - 10 | Labrador Coast Rivers | 150 230 |
| 100.2 | - 10 | Churchill and Naskaupi Rivers | 110 715 |
| 101 | - 10 | Newfoundland, North Coast Rivers | 48 510 |
| 102 | - 10 | Trinity Bay Coast Rivers | 4 575 |
| 103 | - 10 | St. John's area Rivers | 2 935 |
| 104 | - 12 | Nova Scotia, Southeast Coast Rivers | 23 295 |
| | | **Gulf of St. Lawrence Coastal Drainage** | |
| 110.1 | | Gulf, Mainland North Coast Rivers: | 184 640 |
| 110.1 | - 10 | Newfoundland (Labrador) part | 32 475 |
| 110.1 | - 24 | Québec part[2] | 152 165 |
| 110.2 | - 24 | Manicouagan and Outardes Rivers[3] | 68 370 |
| 110.3 | - 24 | Betsiamites River[2] | 28 915 |
| 111 | - 10 | Gulf, Newfoundland West and South Coast Rivers | 56 280 |
| 112 | - 24 | North Gaspe Peninsula Rivers[2] | 12 245 |
| 113 | | Gulf, Mainland South and West Coast Rivers: | 62 860 |
| 113 | - 12 | Nova Scotia part | 7 015 |
| 113 | - 13 | New Brunswick part | 33 610 |
| 113 | - 24 | Québec part | 22 235 |
| 114 | - 11 | Prince Edward Island Rivers | 5 660 |
| 115 | - 12 | Cape Breton Island Rivers | 10 660 |
| | | **Bay of Fundy Coastal and Saint John River Drainage** | |
| 120 | | Bay of Fundy Coast Rivers: | 25 140 |
| 120 | - 12 | Nova Scotia part | 14 520 |
| 121 | - 13 | New Brunswick part | 10 620 |
| 130 | | Saint John River: | 37 450 |
| 130 | - 13 | New Brunswick part | 29 210 |
| 130 | - 24 | Québec part | 8 240 |
| | | **St. Lawrence River Drainage** | |
| 140 | - 24 | Saguenay River | 87 970 |
| 141 | - 24 | Québec City area - Middle North Shore Rivers[3] | 20 025 |
| 142 | - 24 | Chaudière River - Middle South Shore Rivers[3] | 17 685 |
| 143 | - 24 | St. Maurice River | 45 405 |
| 144 | - 24 | Eastern Township Rivers - Richelieu River | 20 590 |
| 145 | - 24 | Eastern Laurentian Rivers | 9 445 |
| 146 | - 24 | Montréal area Rivers | 4 670 |
| 147 | | West St. Lawrence River: | 4 800 |
| 147 | - 24 | Québec part | 710 |
| 147 | - 35 | Ontario part | 4 090 |
| | | **Ottawa River Drainage** | |
| 150 | | Lower Ottawa River: | 56 070 |
| 150 | - 24 | Québec part | 46 235 |
| 150 | - 35 | Ontario part | 9 835 |
| 151 | | Upper Ottawa River: | 90 615 |
| 151 | - 24 | Québec part | 47 980 |
| 151 | - 35 | Ontario part | 42 635 |
| | | **Lake Ontario Shore Drainage** | |
| 160 | - 35 | Belleville - Napanee area Rivers[4] | 7 055 |
| 161 | - 35 | Trent River[4] | 12 815 |
| 162 | - 35 | Oshawa - Colborne area Rivers[4] | 1 910 |
| 163 | - 35 | Toronto area Rivers[4] | 3 050 |
| 164 | - 35 | Hamilton area Rivers[4] | 2 300 |
| 165 | - 35 | Niagara Peninsula Rivers[4] | 2 565 |
| | | **Lake Erie and Lake St. Clair Shore Drainage** | |
| 170 | - 35 | Grand River[5] | 7 035 |
| 171 | - 35 | Lake Erie Shore Rivers[5] | 7 315 |
| 172 | - 35 | Thames River[5] | 5 800 |
| 173 | - 35 | Sydenham River[5] | 3 400 |
| | | **Lake Huron Shore Drainage** | |
| 180 | - 35 | South Huron Shore Rivers[6] | 13 930 |
| 181 | - 35 | Georgian Bay Shore - Lake Simcoe Shore Rivers[6] | 22 740 |
| 182 | - 35 | North Huron Shore Rivers[6] | 55 850 |
| | | **Lake Superior Shore Drainage** | |
| 190 | - 35 | Lake Superior Shore Rivers[7] | 101 795 |

| | | | Area in Square Kilometres |
|---|---|---|---|
| 2. | | **HUDSON BAY AND UNGAVA BAY BASIN** | |
| | | **Hudson Bay and Ungava Bay Coastal Drainage** | |
| 200.1 | - 24 | East Hudson Bay Coast Rivers | 198 075 |
| 200.2 | - 24 | Ungava Bay Coast Rivers | 384 035 |
| 200.3 | - 24 | Eastmain and LaGrande Rivers | 163 430 |
| 210.1 | - 24 | Rupert and Nottaway Rivers | 137 955 |
| 210.2 | | Harricanaw River: | 42 615 |
| 210.2 | - 24 | Québec part | 26 320 |
| 210.2 | - 35 | Ontario part | 16 295 |
| 210.3 | | Moose River: | 112 290 |
| 210.3 | - 24 | Québec part | 3 650 |
| 210.3 | - 35 | Ontario part | 108 640 |
| 210.4 | - 35 | Albany River | 100 195 |
| 210.5 | | Southwest Hudson Bay Coast Rivers: | 325 920 |
| 210.5 | - 35 | Ontario part | 304 585 |
| 210.5 | - 46 | Manitoba part | 21 335 |
| 210.6 | | Hayes River: | 107 935 |
| 210.6 | - 35 | Ontario part | 15 880 |
| 210.6 | - 46 | Manitoba part | 92 055 |
| 211.1 | | West Hudson Bay Coast Rivers: | 427 165 |
| 211.1 | - 46 | Manitoba part | 112 455 |
| 211.1 | - 47 | Saskatchewan part | 300 |
| 211.1 | - 61 | Northwest Territories part | 314 410 |
| 211.2 | | Thelon - Kazan Rivers: | 243 935 |
| 211.2 | - 46 | Manitoba part | 795 |
| 211.2 | - 47 | Saskatchewan part | 5 220 |
| 211.2 | - 61 | Northwest Territories part | 237 920 |
| 211.3 | | Churchill River: | 282 520 |
| 211.3 | - 46 | Manitoba part | 93 790 |
| 211.3 | - 47 | Saskatchewan part | 172 780 |
| 211.3 | - 48 | Alberta part | 15 950 |
| | | **Nelson River Drainage** | |
| 220 | - 46 | Nelson River | 90 365 |
| | | **Lake Winnipeg Shore Drainage** | |
| 230 | | Lake Winnipeg Shore Rivers: | 227 845 |
| 230 | - 35 | Ontario part | 130 560 |
| 230 | - 46 | Manitoba part | 97 285 |
| 231 | - 46 | Red River | 25 620 |
| 232 | | Dauphin River: | 83 510 |
| 232 | - 46 | Manitoba part | 65 245 |
| 232 | - 47 | Saskatchewan part | 18 265 |
| | | **Assiniboine River Drainage** | |
| 240 | | Assiniboine and Souris Rivers: | 90 245 |
| 240 | - 46 | Manitoba part | 31 595 |
| 240 | - 47 | Saskatchewan part | 58 650 |
| 241 | | Qu'Appelle River - Old Wives Lake: | 71 600 |
| 241 | - 46 | Manitoba part | 70 |
| 241 | - 47 | Saskatchewan part | 71 530 |
| | | **Saskatchewan River Drainage** | |
| 250 | | Saskatchewan River: | 78 730 |
| 250 | - 46 | Manitoba part | 19 340 |
| 250 | - 47 | Saskatchewan part | 59 390 |
| 251 | - 48 | Upper North Saskatchewan River | 28 065 |
| 252 | | Lower North Saskatchewan River: | 124 750 |
| 252 | - 47 | Saskatchewan part | 57 030 |
| 252 | - 48 | Alberta part | 67 720 |
| 253 | | South Saskatchewan River and Red Deer River: | 152 575 |
| 253 | - 47 | Saskatchewan part | 56 970 |
| 253 | - 48 | Alberta part | 95 605 |
| 254 | - 48 | Bow River | 24 980 |
| 3. | | **ARCTIC OCEAN BASIN** | |
| | | **Mackenzie River Drainage** | |
| 300.1 | | Mackenzie River: | 544 765 |
| 300.1 | - 60 | Yukon part | 68 530 |
| 300.1 | - 61 | Northwest Territories part | 476 235 |
| 300.2 | | Great Slave Lake Shore Rivers: | 496 915 |
| 300.2 | - 47 | Saskatchewan part | 114 900 |
| 300.2 | - 48 | Alberta part | 76 265 |
| 300.2 | - 59 | British Columbia part | 8 065 |
| 300.2 | - 61 | Northwest Territories part | 297 685 |
| 300.3 | | Liard River: | 273 915 |
| 300.3 | - 48 | Alberta part | 9 035 |
| 300.3 | - 59 | British Columbia part | 142 545 |

Table 1.1.6

## Drainage Basin Reference Codes and Areas[1] (concluded)

| | | | Area in Square Kilometres |
|---|---|---|---|
| 300.3 | - 60 | Yukon part | 60 670 |
| 300.3 | - 61 | Northwest Territories part | 61 665 |
| 301 | | Athabasca River: | 160 690 |
| 301 | - 47 | Saskatchewan part | 16 720 |
| 301 | - 48 | Alberta part | 143 970 |
| 302 | | Peace River: | 319 080 |
| 302 | - 48 | Alberta part | 194 040 |
| 302 | - 59 | British Columbia part | 125 040 |
| | | **Arctic Ocean Coastal Drainage** | |
| 330.1 | | Mainland Arctic Coast Rivers: | 707 725 |
| 330.1 | - 60 | Yukon Part | 16 120 |
| 330.1 | - 61 | Northwest Territories part | 691 605 |
| 330.2 | - 61 | Arctic Islands Rivers | 1 346 800 |
| 4. | | **PACIFIC OCEAN BASIN** | |
| | | **Columbia River Drainage** | |
| 400 | - 59 | Columbia River | 88 960 |
| 401 | - 59 | Okanagan River | 7 820 |
| 402 | - 59 | Similkameen River | 7 155 |
| | | **Fraser River Drainage** | |
| 410 | - 59 | Upper Fraser River | 172 820 |
| 411 | - 59 | Thompson River | 56 570 |
| 412 | - 59 | Lower Fraser River | 5 745 |
| | | **Yukon River Drainage** | |
| 420.1 | | Yukon River: | 272 985 |
| 420.1 | - 59 | British Columbia part | 24 075 |
| 420.1 | - 60 | Yukon part | 248 910 |
| 420.2 | - 60 | Porcupine River | 61 820 |
| | | **Pacific Ocean, North Coastal Drainage** | |
| 430 | | Alsek River: | 38 605 |
| 430 | - 59 | British Columbia part | 11 205 |
| 430 | - 60 | Yukon part | 27 400 |
| 431.1 | - 59 | Pacific Ocean, North Coast Rivers | 154 575 |
| 431.2 | - 59 | Skeena River | 55 245 |
| 431.3 | - 59 | Queen Charlotte Islands Rivers | 9 695 |
| | | **Pacific Ocean, South Coastal Drainage** | |
| 432.1 | - 59 | Pacific Ocean, South Coast Rivers | 44 560 |
| 432.2 | - 59 | Northern Vancouver Island Rivers | 27 925 |
| 433 | - 59 | Southern Vancouver Island Rivers | 4 850 |
| 434 | - 59 | Skagit River | 950 |
| 5. | | **GULF OF MEXICO BASIN** | |
| | | **Missouri River Drainage** | |
| 500 | | Milk - Missouri Tributary Rivers: | 26 135 |
| 500 | - 47 | Saskatchewan part | 20 575 |
| 500 | - 48 | Alberta part | 5 560 |

[1] These figures include the area of freshwater in the basins except as noted.

[2] This basin feeds water to the St. Lawrence River Estuary. The St. Lawrence River Estuary is defined by Inland Waters Directorate, Environment Canada, as being that portion of the River between l'Ile d'Orléans and Anticosti Island. The area of the estuary between the height of land separating the Saguenay Basin from the Betsiamites Basin and Anticosti Island is approximately 28,000 square kilometres. This area is not included in the basin totals.

[3] This basin feeds water to the St. Lawrence Estuary. The St. Lawrence River Estuary is defined by Inland Waters Directorate, Environment Canada, as being that portion of the River between Ile d'Orléans and Anticosti Island. The area of the estuary between Ile d'Orléans and the height of land separating the Saguenay Basin from the Betsiamites Basin is approximately 6,330 square kilometres. This area is not included in the basin total.

[4] This basin feeds water to Lake Ontario. The area of the Canadian portion of this Lake is 10,050 square kilometres. This area is not included in the basin total.

[5] This basin feeds water to Lake St. Clair and/or Lake Erie. The area of the Canadian portion of Lake St. Clair is 695 square kilometres and the area of the Canadian portion of Lake Erie is 12,770 square kilometres. These areas are not included in the basin total.

[6] This basin feeds water to Lake Huron. The area of the Canadian portion of Lake Huron is 36,000 square kilometres. This area is not included in the basin total.

[7] This basin feeds water to Lake Superior. The area of the Canadian portion of Lake Superior is 28,750 square kilometres. This area is not included in the basin total.

**Source:**
Statistics Canada, special tabulations; advice provided by Geographical Services Directorate, Energy Mines and Resources Canada.

**Notes:**
These data were derived through the use of a computer planimeter. Due to the scale of the maps digitized to provide this information, these data should be regarded as estimates only.

The basin codes presented here have two components. The first number is the basin code itself while the second number is the Standard Geographical Classification Code for the Province or Territory. The Provincial and Territorial codes are as follows:

10 — Newfoundland
11 — Prince Edward Island
12 — Nova Scotia
13 — New Brunswick
24 — Quebec
35 — Ontario
46 — Manitoba
47 — Saskatchewan
48 — Alberta
59 — British Columbia
60 — Yukon
61 — Northwest Territories

Table 1.1.7
## Major Drainage Areas Reference List

| Major Drainage Area | Drainage Basin Code |
|---|---|
| **1. Atlantic Ocean Basin** | |
| Atlantic Ocean Coastal Drainage | 100.1, 100.2, 101, 102, 103, 104 |
| Gulf of St. Lawrence Coastal Drainage | 110.1, 110.2, 110.3, 111, 112, 113, 114, 115 |
| Bay of Fundy Coastal - Saint John River Drainage | 120, 121, 130 |
| St. Lawrence River Drainage | 140, 141, 142, 143, 144, 145, 146, 147 |
| Ottawa River Drainage | 150, 151 |
| Lake Ontario Shore Drainage | 160, 161, 162, 163, 164, 165 |
| Lake Erie Shore and Lake St. Clair Shore Drainage | 170, 171, 172, 173 |
| Lake Huron Shore Drainage | 180, 181, 182 |
| Lake Superior Shore Drainage | 190 |
| **2. Hudson Bay and Ungava Bay Basin** | |
| Hudson Bay and Ungava Bay Coastal Drainage | 200.1, 200.2, 200.3, 210.1, 210.2, 210.3, 210.4, 210.5, 210.6, 211.1, 211.2, 211.3 |
| Nelson River Drainage | 220 |
| Lake Winnipeg Shore Drainage | 230, 231, 232 |
| Assiniboine River Drainage | 240, 241 |
| Saskatchewan River Drainage | 250, 251, 252, 253, 254 |
| **3. Arctic Ocean Basin** | |
| Mackenzie River Drainage | 300.1, 300.2, 300.3, 301, 302 |
| Arctic Ocean Coastal | 330.1, 330.2 |
| **4. Pacific Ocean Basin** | |
| Columbia River Drainage | 400, 401, 402 |
| Fraser River Drainage | 410, 411, 412 |
| Yukon River Drainage | 420.1, 420.2 |
| Pacific Ocean, North Coastal Drainage | 430, 431.1, 431.2, 431.3 |
| Pacific Ocean, South Coastal Drainage | 432.1, 432.2, 433, 434 |
| **5. Gulf of Mexico Basin** | |
| Missouri River Drainage | 500 |

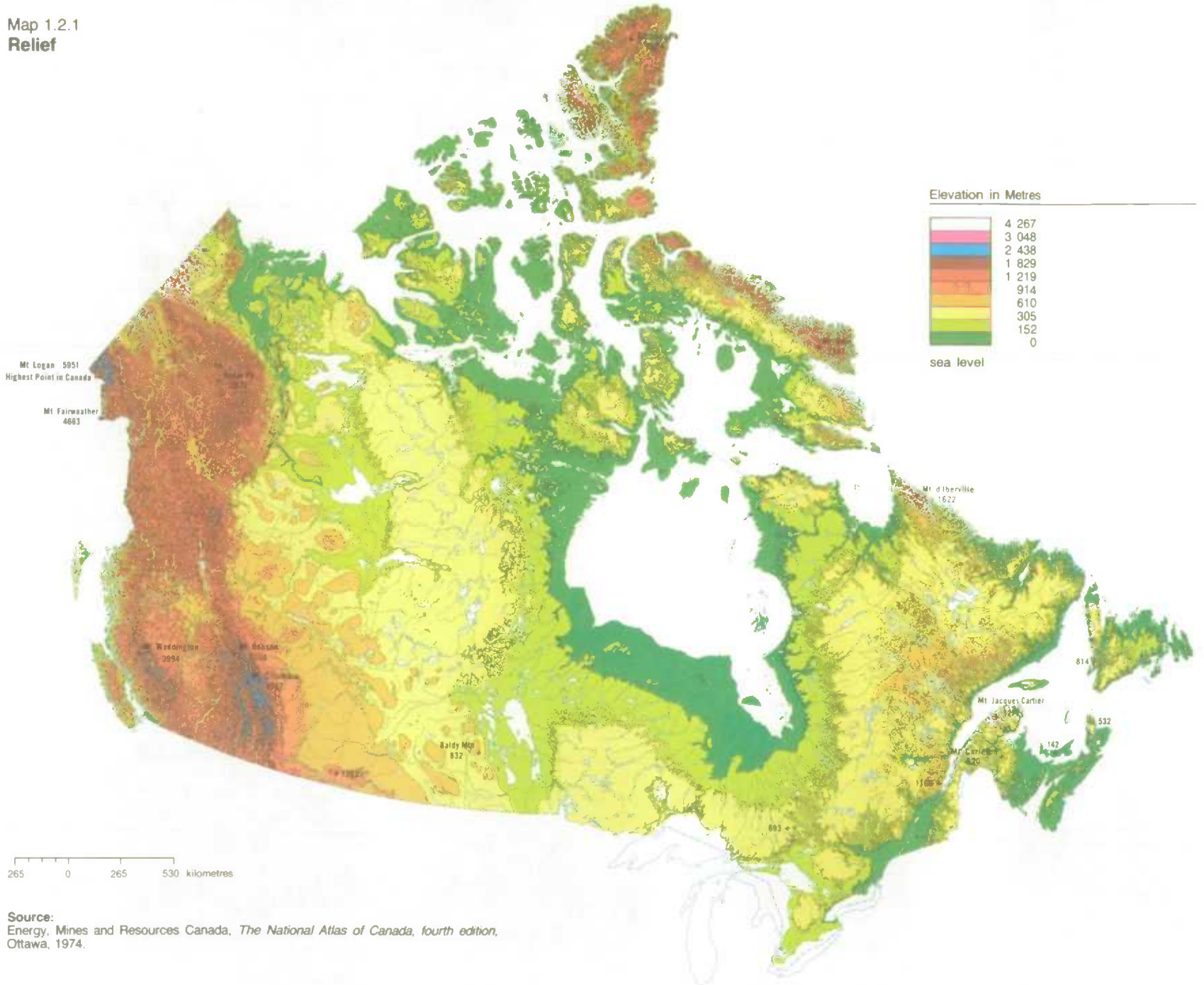
**Notes:**
Statistics for drainage basins are available from Statistics Canada at four levels of detail. The most aggregate level is the Major Drainage Area. These units are groupings of the individual Drainage Basins portrayed in Map 1.1.4 and Map 1.1.5. Major Drainage Areas are used extensively in the main body of this publication to provide a general overview of geographic patterns and for the presentation of time series data. The list presented in this table details the constituent basins of each Major Drainage Area.

The second level of detail is the Drainage Basin itself. Some data for these units appear in the body of this publication and much more is to be found in the Appendices, including disaggregations by province. Due to the large number of basins involved, however, only a selection of the available information could be published here. Therefore, a third level of detail available are data for the Drainage Basins which could not be published here due to space constraints but which are on file and are available.
Typically, these are data from the 1971 and 1976 Censuses.

Finally, data are also available on a special request basis. For example, the Drainage Basins presented in this publication could be further disaggregated. Statistics could also be produced for other special user-defined study areas In some cases, work in this area has already been undertaken and data tabulations may be available in an unpublished form.
Special tabulations are usually prepared on a cost recovery basis.

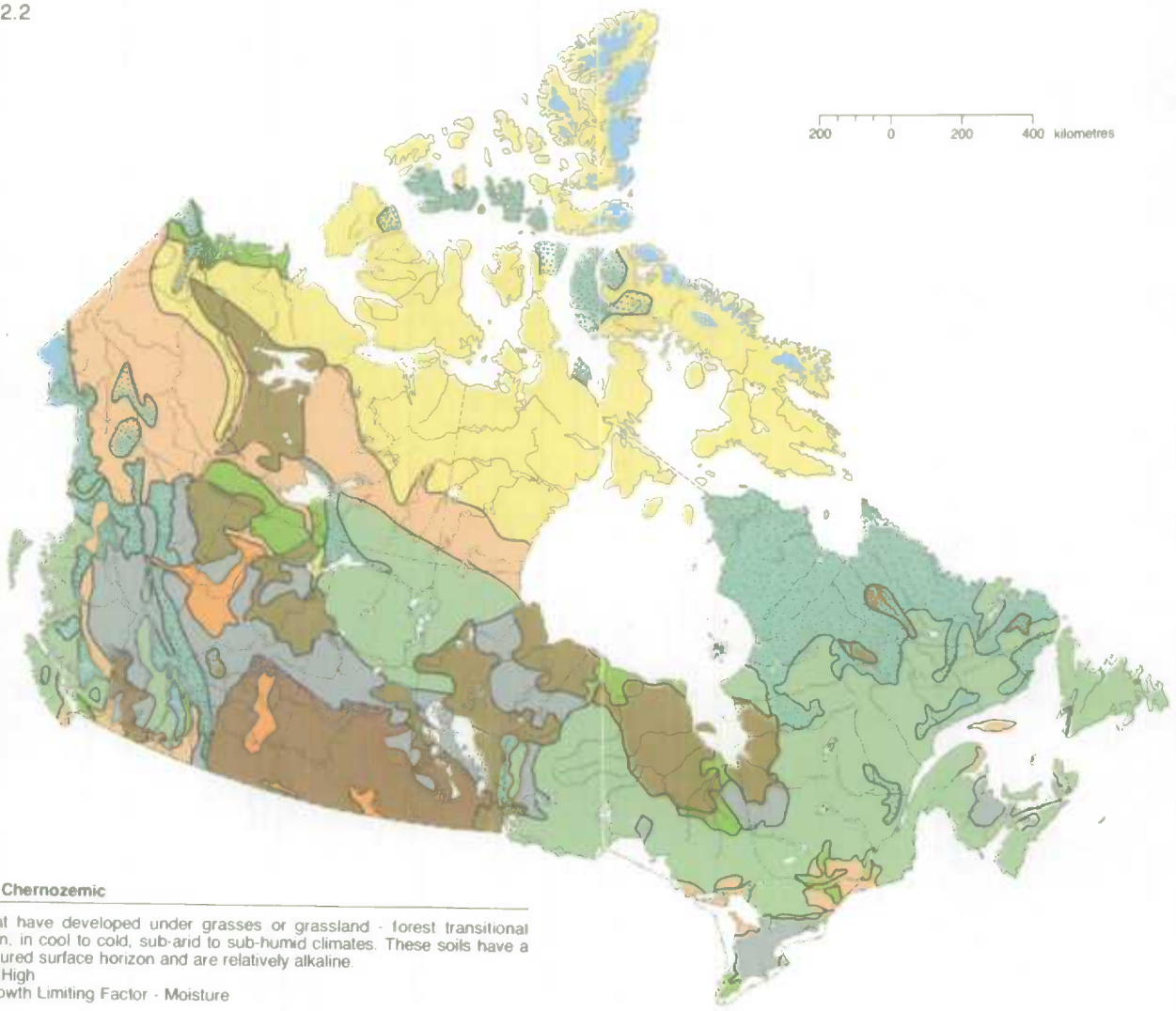
# 1.2
# Physiography and Climate

Map 1.2.1
**Relief**




**Source:**
Energy, Mines and Resources Canada, *The National Atlas of Canada, fourth edition*, Ottawa, 1974.

Map 1.2.2
## Soils




**Chernozemic**

Soils that have developed under grasses or grassland - forest transitional vegetation, in cool to cold, sub-arid to sub-humid climates. These soils have a dark-coloured surface horizon and are relatively alkaline.
Fertility - High
Major Growth Limiting Factor - Moisture

**Solonetzic**

Soils that have developed under grasses in semi-arid to sub-humid climates. They are noted for a B horizon (middle soil layer) which is very hard when dry and which swells to a sticky mass of low permeability when wet. Accumulations of salt often occur in the lower soil horizons.
Fertility - Medium (variable).
Major Growth Limiting Factor - Moisture/Salinity

**Luvisolic**

An order of soils that have eluvial horizons (i.e. layers from which organic and other matter has been removed or leached) and illuvial horizons (i.e. layers in which material, particularly silicate clays, leached from above accumulate). These soils have developed under forest or forest-grassland transition in a moderate to cool climate.
Fertility - High

**Podzolic**

An order of soils having middle horizons (layers) in which organic matter, iron, and aluminium oxides are accumulated due to the leaching of overlying horizons. This soil order is acidic and evolves in a moist cool to cold climate under forests (usually coniferous) or heath land.
Fertility
- Low (Variable)
- Medium when acidity allows

Major Growth Limiting Factor - Acidity

**Brunisolic**

This order of soils is characterized by little horizon development. They occur under a wide variety of climate and vegetative conditions.
Fertility - Medium (variable)

**Regosolic**[1]

These soils are typically young, have no horizon development and do not meet the requirements of any other soil group.
Fertility - Low (variable)

**Gleysolic**

An order of soils developed under wet conditions. These soils undergo long periods of water saturation and commonly occur in areas with a high water table. Humid to sub-humid climates are required for the formation of these soils.
Fertility - High to Medium
Major Growth Limiting Factor - Drainage

**Organic**

Soil composed largely of organic materials such as peat. They commonly occur in poorly drained depressions and regions with a very humid climate.
Fertility - High to Medium (variable) depending on drainage and nutrient availability.

**Glaciers**

**Dominantly Rockland**

[1] Northern regosols are now defined as cryosols under the Canadian System of Soil Classification.

**Source:**
Energy, Mines and Resources Canada, *The National Atlas of Canada: fourth edition*, Ottawa, 1974.

**Note:**
Soil order in the Canadian System of Soil Classification reflects the nature of the soil environment and the effects of dominant soil forming processes.

Table 1.2.3
## Annual Surface Water Flow Rates of Selected Drainage Basins

| Basin | Annual Reliable Flow Rate[1] | Annual Mean Flow Rate | Annual High Flow Rate[2] |
|---|---|---|---|
| | cubic metres per second | | |
| 1. **Atlantic Ocean Basin**[3] | **21 228** | **29 087** | **36 954** |
| 150,151 Upper, Lower Ottawa River | 1 390 | 1 990 | 2 590 |
| 160 to 190 Great Lakes Basins[3] | 2 403 | 3 067 | 3 733 |
| 2. **Hudson Bay and Ungava Bay Basin**[3] | **21 634** | **30 594** | **39 795** |
| 211 Churchill River[4] | 323 | 701 | 1 070 |
| 231,240,241 Red, Assiniboine, Qu'Appelle Rivers[3] | 16 | 50 | 189 |
| 251,252 Upper, Lower North Saskatchewan River | 160 | 234 | 373 |
| 253,254 South Saskatchewan, Red Deer, Bow Rivers[3] | 147 | 239 | 418 |
| 3. **Arctic Ocean Basin** | **13 896** | **20 491** | **27 089** |
| 301,302 Athabasca, Peace Rivers | 1 862 | 2 903 | 3 946 |
| 4. **Pacific Ocean Basin**[3] | **19 095** | **24 951** | **30 795** |
| 400 Columbia River[3] | 1 644 | 2 009 | 2 373 |
| 401,402 Okanagan, Similkameen Rivers[3] | 31 | 74 | 116 |
| 410 to 412 Upper, Lower Fraser, Thompson Rivers | 3 044 | 3 972 | 4 900 |
| 5. **Gulf of Mexico Basin**[3] | **3** | **12** | **41** |

[1] Flow equalled or exceeded in nineteen out of twenty years.
[2] Flow equalled or exceeded in only one out of twenty years.
[3] Excludes inflow from U.S.A. portion of basin.
[4] Excludes flow transferred into neighbouring basin(s) by water diversions.

**Source:**
Environment Canada, Inland Waters Directorate, unpublished information.

Map 1.2.4
## Growing Degree-Days


**Sources:**
Energy, Mines and Resources Canada, *The National Atlas of Canada, fifth edition*, Growing Degree-Days, Ottawa, 1981.
K. Hare and M. Thomas, *Climate Canada*, Wiley, Toronto, 1974.

**Note:**
This map portrays the geographic differences in heat (energy) availability for plant growth. Growing degree-days, the unit of measurement, is calculated in the following manner. It is assumed that plant growth begins as air temperature rises beyond a threshold of 5°C. For each day that the mean of the hourly air temperature readings exceeds 5°C the value by which it exceeds this number is recorded. The successive daily values are added together to provide the total number of growing degree-days. Temperature normals used for these calculations are based on the climatological recording period of 1941 to 1970. Certain types of crops require greater energy inputs and a longer season than others. The map of growing degree-days illustrates the climatic limitations to agriculture present in much of the country. For example, corn requires much greater energy inputs than barley. Therefore, while it is possible to grow commercially viable crops of barley throughout south and central Canada where soils permit, corn is generally limited to the parts of southern Canada with at least 2 000 growing degree-days, with a substantially higher heat input being desirable.

Degree-Days above 5°C (annual normal)

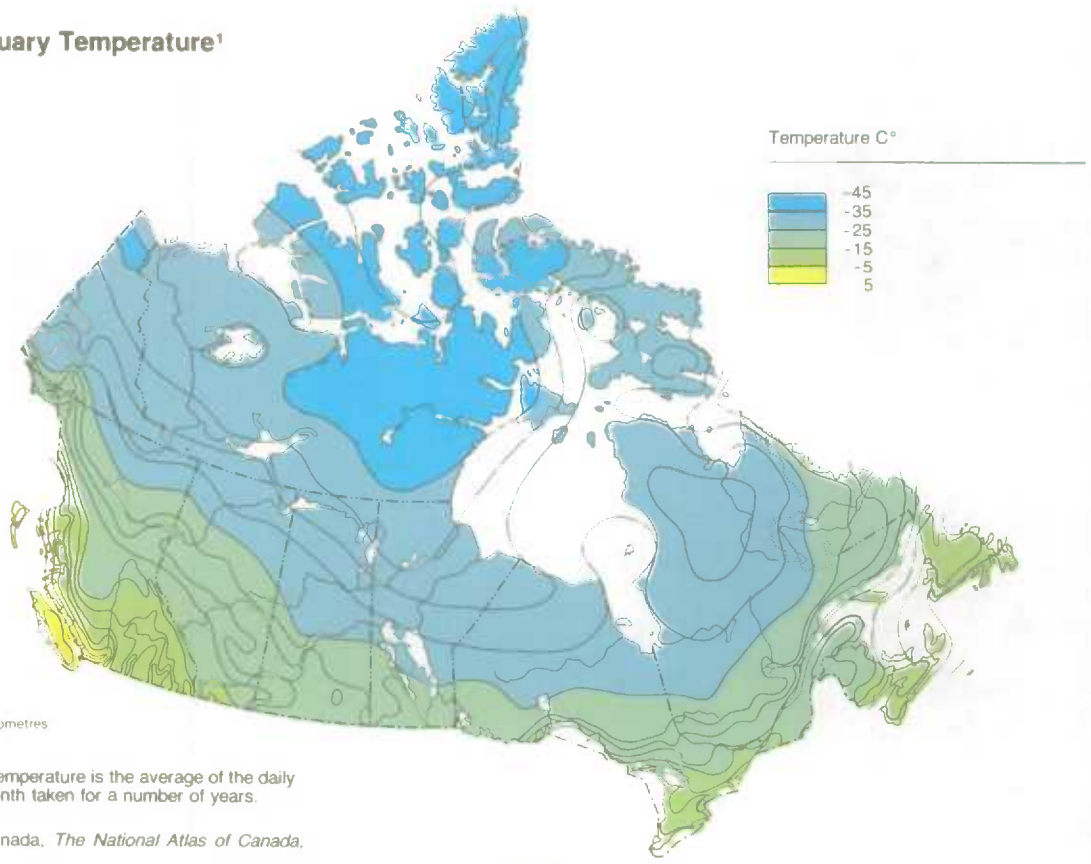
- 0- 999
- 1 000- 1 499
- 1 500- 1 999
- ≥ 2 000

Growing Season: Number of days with an average temperature above 5°C.

Degree-Days: The number of degrees above 5°C accumulated for all days of the growing season.

Map 1.2.5

## Average Minimum January Temperature[1]

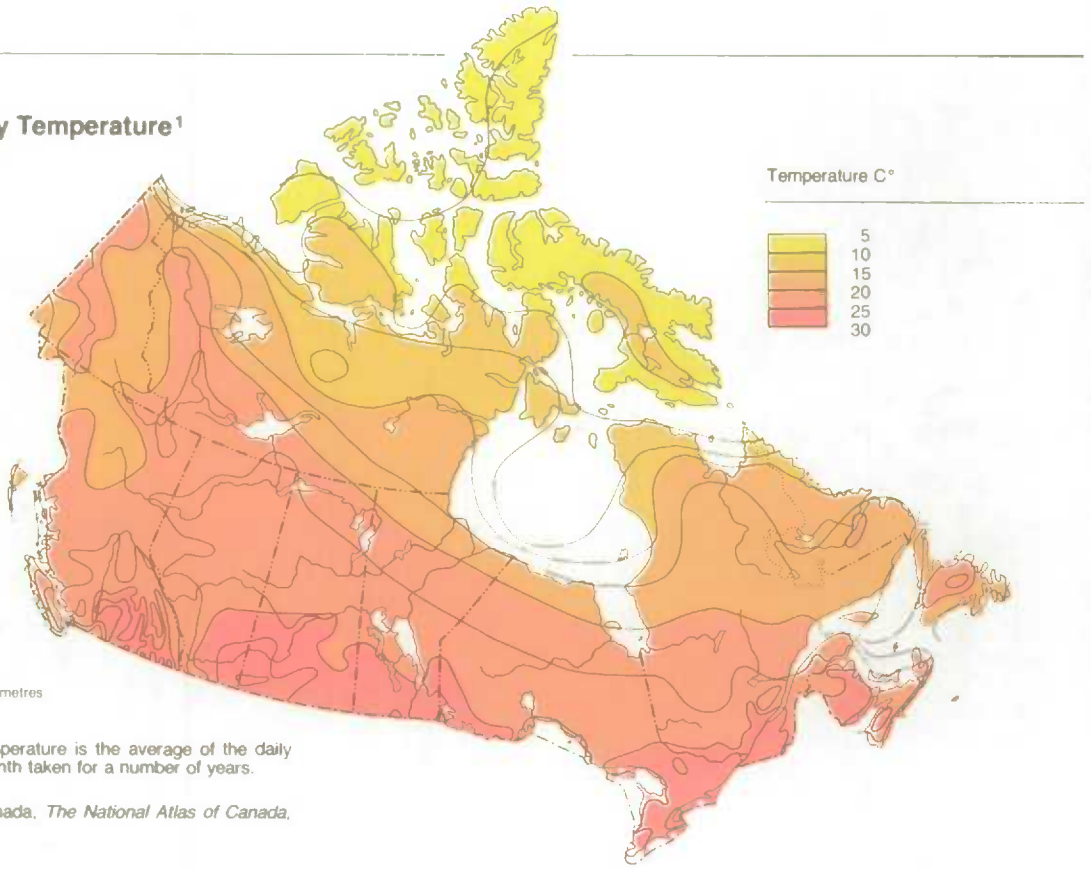



[1] The average minimum January temperature is the average of the daily minimum temperature for the month taken for a number of years.

**Source:**
Energy, Mines and Resources Canada, *The National Atlas of Canada, fourth edition*, Ottawa, 1974.

Map 1.2.6

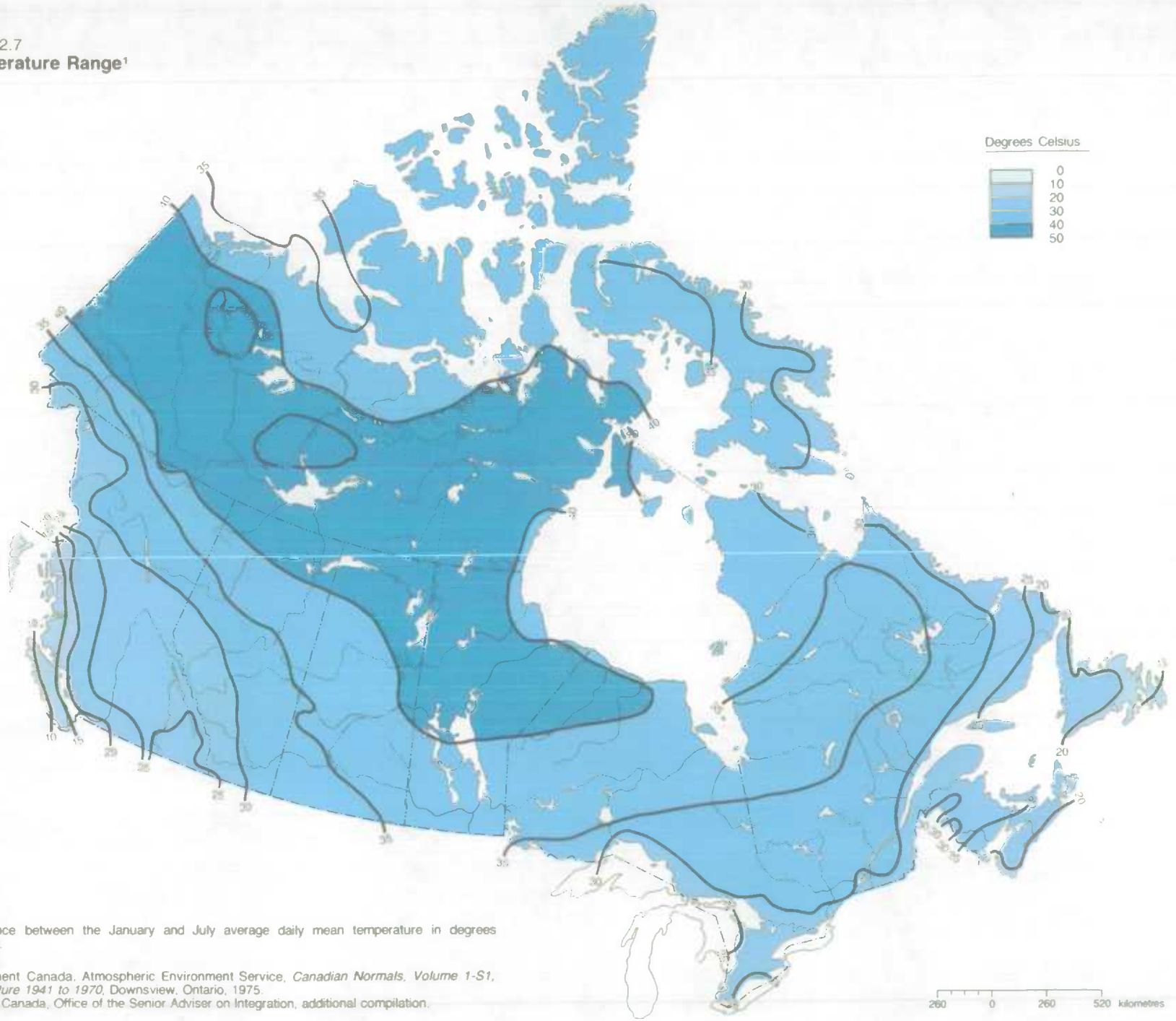
## Average Maximum July Temperature[1]




[1] The average maximum July temperature is the average of the daily minimum temperature for the month taken for a number of years.

**Source:**
Energy, Mines and Resources Canada, *The National Atlas of Canada, fourth edition*, Ottawa, 1974.

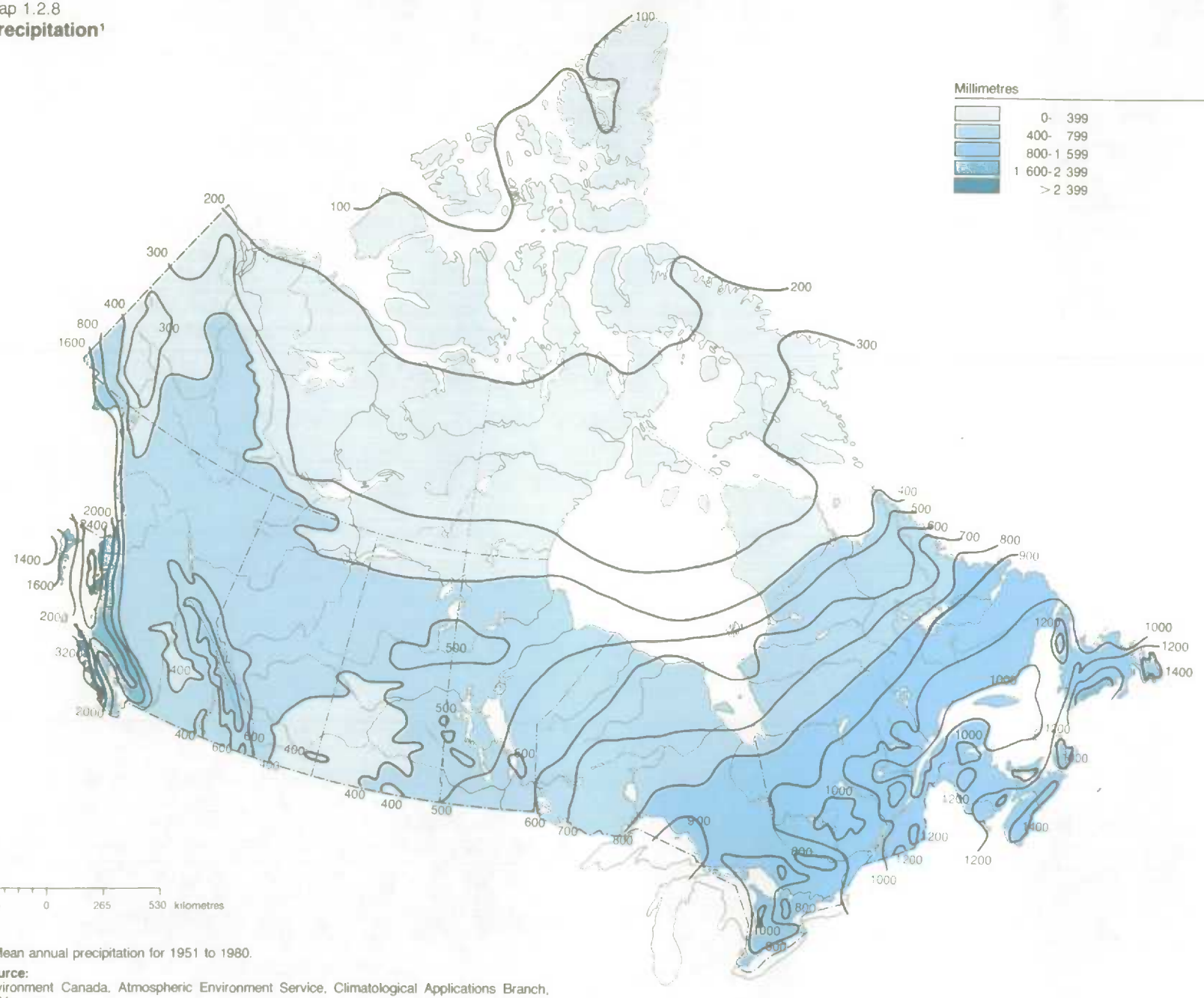
Map 1.2.7
**Temperature Range**[1]




[1] Difference between the January and July average daily mean temperature in degrees Celsius.

**Sources:**
Environment Canada, Atmospheric Environment Service, *Canadian Normals, Volume 1-S1, Temperature 1941 to 1970*, Downsview, Ontario, 1975.
Statistics Canada, Office of the Senior Adviser on Integration, additional compilation.

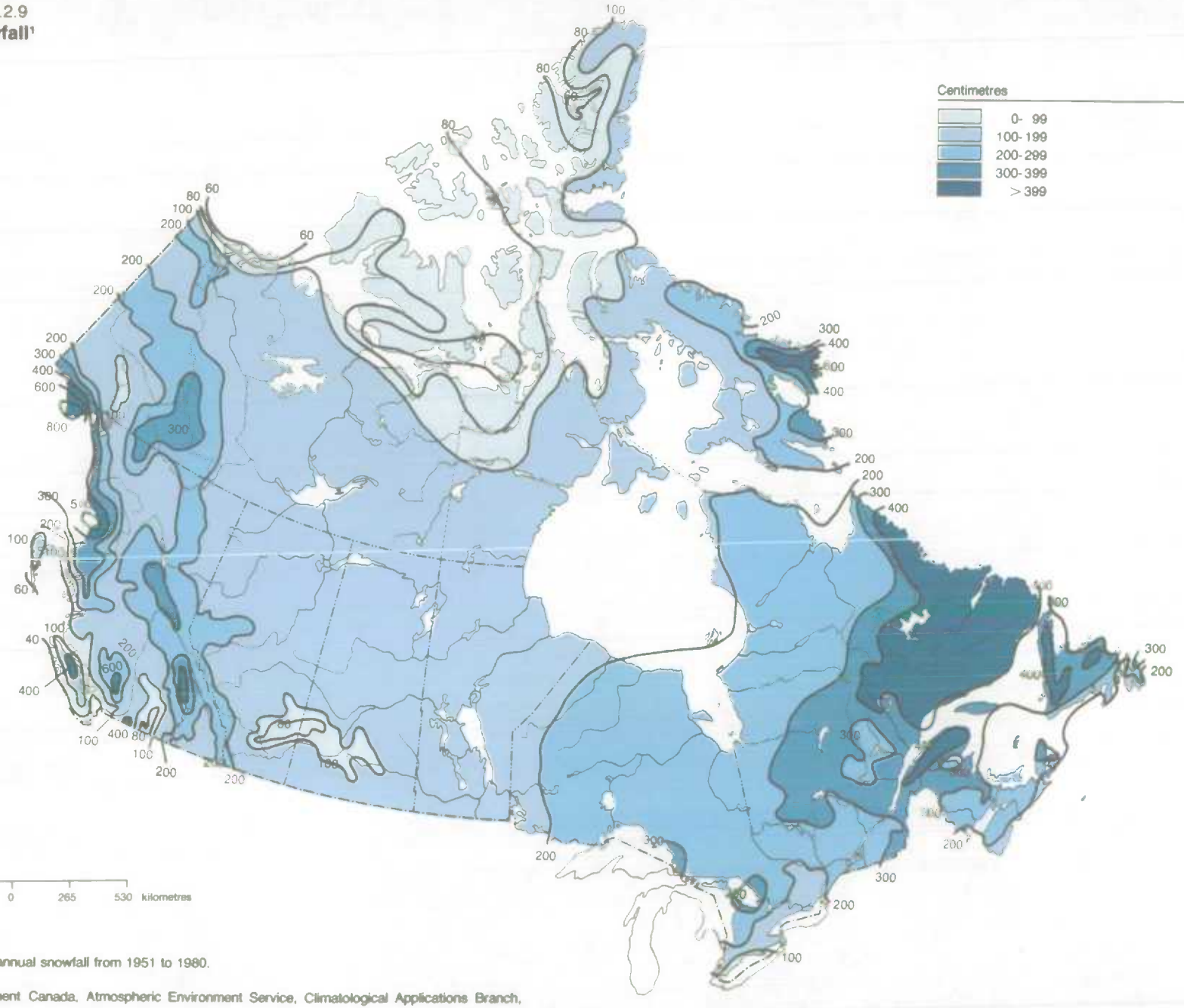
Map 1.2.8
## Precipitation[1]




[1] Mean annual precipitation for 1951 to 1980.

**Source:**
Environment Canada, Atmospheric Environment Service, Climatological Applications Branch, 1984.

Map 1.2.9
**Snowfall**[1]




[1] Mean annual snowfall from 1951 to 1980.

**Source:**
Environment Canada, Atmospheric Environment Service, Climatological Applications Branch, 1984.

Table 1.2.10
**Climate Profile of Canada**

| Ecozone | Last Spring Frost[1] | First Fall Frost[1] | Frost-Free Period(Days)[2] | Growing Degree Days above 5 Degrees (C)[1] | Days with Temperatures Below 0 Degrees (C)[3] | Hours with Temperatures Greater Than +30 Degrees (C)[4] |
|---|---|---|---|---|---|---|
| | average date | | annual average | | | |
| **Atlantic Maritime** | | | | | | |
| Halifax | May 12 | October 15 | 155 | 1 694 | 167 | 5 |
| Saint John | May 18 | October 3 | 139 | 1 499 | 175 | 2 |
| Fredericton | May 19 | September 23 | 126 | 1 770 | 177 | 33 |
| **Mixed-Wood Plain** | | | | | | |
| Québec City | May 13 | September 28 | 137 | 1 690 | 177[4] | 17 |
| Montréal | May 3 | October 8 | 157 | 2 113 | 149[4] | 31 |
| Ottawa | May 7 | October 2 | 147 | 2 043 | 166 | 49 |
| Toronto | May 8 | October 5 | 149 | 2 127 | 154 | 73 |
| Windsor | April 26 | October 21 | 177 | 2 533 | 135 | 81 |
| **Boreal Shield** | | | | | | |
| St. John's | June 1 | October 11 | 131 | 1 196 | 177[4] | 0 |
| Sudbury | May 18 | September 24 | 128 | 1 664 | 168 | 16 |
| Thunder Bay | May 30 | September 2 | 104 | 1 425 | 205[4] | 20 |
| **Prairie** | | | | | | |
| Winnipeg | May 23 | September 22 | 121 | 1 785 | 195 | 56 |
| Regina | May 24 | September 11 | 109 | 1 677 | 207 | 91 |
| Lethbridge | May 17 | September 19 | 124 | 1 776 | 175[5] | 69 |
| Edmonton | May 25 | September 8 | 105 | 1 328 | 192 | 10 |
| Calgary | May 25 | September 15 | 112 | 1 387 | 261 | 17 |
| **Boreal Plain** | | | | | | |
| Peace River | May 31 | September 2 | 93 | 1 239 | 217 | 7 |
| **Montane Cordillera** | | | | | | |
| Kamloops | May 4 | October 1 | 149 | 2 216 | 146[7] | 143 |
| Prince George | June 6 | August 31 | 85 | 1 199 | 203[7] | 7 |
| **Pacific Maritime** | | | | | | |
| Victoria | April 16 | November 4 | 201 | 1 864 | 60 | 8 |
| Prince Rupert | May 11 | October 15 | 156 | 1 148 | 71 | 0 |
| **Boreal Cordillera** | | | | | | |
| Whitehorse | June 8 | August 30 | 82 | 897 | 219[7] | <1 |
| Dawson | June 13 | August 17 | 64 | .. | 234 | 1 |
| **Taiga Plain** | | | | | | |
| Fort Simpson | June 3 | August 21 | 79 | 1 166 | 226[8] | 2 |
| Hay River | June 2 | September 11 | 100 | 1 050 | 227[2] | 4 |
| Norman Wells | May 28 | September 1 | 95 | 1 023 | 239[2] | 2 |
| **Taiga Shield** | | | | | | |
| Goose Bay | June 5 | September 18 | 104[4] | 1 022 | 214[4] | 6 |
| Yellowknife | May 27 | September 16 | 111 | 1 022 | 229[7] | 1 |
| **Hudson Bay Plain** | | | | | | |
| Churchill | June 24 | September 9 | 76 | 555 | 255 | 1 |
| **Southern Arctic** | | | | | | |
| Fort Chimo | June 27 | September 2 | 66 | 509 | 253[7] | <1 |
| Baker Lake | June 23 | August 30 | 67 | 392 | 279[7] | 0 |
| Inuvik | June 23 | August 14 | 51 | 665 | 269[7] | <1 |
| **Northern Arctic** | | | | | | |
| Frobisher Bay | June 28 | August 27 | 59 | 179 | 272[8] | 0 |
| Resolute | July 10 | July 20 | 9 | 33 | 321[8] | 0 |
| **Arctic Cordillera** | | | | | | |
| Alert | July 14 | July 19 | 4 | 33 | 316[7] | 0 |
| Sachs Harbour | July 10 | July 22 | 11 | 118 | 314[7] | 0 |

Table 1.2.10
## Climate Profile of Canada (concluded)

| Ecozone | Hours with Temperatures Less Than -20 Degrees (C)[4] | Hours of Bright Sunshine | Precipitation (mm)[1] | Days with Snowfall[1] | Days with Snow Cover[3] | Wind Speed (kms/h) |
|---|---|---|---|---|---|---|
| | annual average | | | | | |
| **Atlantic Maritime** | | | | | | |
| Halifax | 27 | 1 883 | 1 491 | 64 | 60[4] | 20 |
| Saint John | 92 | 1 819 | 1 444 | 59 | 82 | 19 |
| Fredericton | 123 | 1 860 | 1 109 | 56 | 115 | 14 |
| **Mixed-Wood Plain** | | | | | | |
| Québec City | 233 | 2 018 | 946 | 62 | 115 | 16 |
| Montréal | 130 | 1 995 | 879 | 62 | 116 | 15 |
| Ottawa | 190 | 1 829[4] | 1 174 | 73 | 139 | 16 |
| Toronto | 32 | 2 045 | 762 | 47 | 72 | 15 |
| Windsor | 8 | 1 980[5] | 849 | 45 | 43 | 17 |
| **Boreal Shield** | | | | | | |
| St. John's | 2 | 1 458 | 1 514 | 88 | 120 | 24 |
| Sudbury | 396 | .. | 861 | 79 | 139 | 21 |
| Thunder Bay | 555 | .. | 712 | 61 | .. | 17 |
| **Prairie** | | | | | | |
| Winnipeg | 884 | 2 230 | 526 | 57 | 126 | 19 |
| Regina | 744 | 2 277 | 384 | 58 | 130 | 21 |
| Lethbridge | 330 | 2 387 | 423 | 53 | 81 | 20 |
| Edmonton | 691 | 2 356 | 467 | 61 | 121 | 13 |
| Calgary | 415 | 2 208 | 424 | 62 | 99 | 16 |
| **Boreal Plain** | | | | | | |
| Peace River | 971 | .. | 375 | 59 | .. | 13 |
| **Montane Cordillera** | | | | | | |
| Kamloops | 81 | 2 032 | 257 | 33 | 63 | 12 |
| Prince George | 292 | 1 865 | 628 | 78 | 140 | 11 |
| **Pacific Maritime** | | | | | | |
| Victoria | 0 | 2 183 | 873 | 13 | 8 | 11 |
| Prince Rupert | 9 | 1 036 | 2 523 | 35 | 25 | 15 |
| **Boreal Cordillera** | | | | | | |
| Whitehorse | 872 | 1 825 | 261 | 73 | 165 | 14 |
| Dawson | 1 922 | .. | 306 | .. | 187 | 4 |
| **Taiga Plain** | | | | | | |
| Port Simpson | 1 958 | 1 915 | 355 | 72 | 193 | 9 |
| Hay River | 1 875 | .. | 340 | 75 | 185 | 12 |
| Norman Wells | 2 502 | .. | 328 | 87 | 206 | 12 |
| **Taiga Shield** | | | | | | |
| Goose Bay | 621 | 1 674 | 946 | 97 | 190 | 18 |
| Yellowknife | 2 310 | .. | 267 | 82 | 191 | 16 |
| **Hudson Bay Plain** | | | | | | |
| Churchill | 2 345 | .. | 402 | 100 | 209 | 23 |
| **Southern Arctic** | | | | | | |
| Fort Chimo | 1 600 | 1 863 | 266 | 99 | .. | 10 |
| Baker Lake | 3 387 | .. | 235 | 73 | 249 | 22 |
| Inuvik | 2 848 | .. | 504 | 99 | 210 | 16 |
| **Northern Arctic** | | | | | | |
| Frobisher Bay | 2 193 | 1 435 | 433 | 106 | 239 | 17 |
| Resolute | 3 933 | 1 459 | 131 | 82 | 281 | 22 |
| **Arctic Cordillera** | | | | | | |
| Alert | 4 411 | .. | 155 | 93 | 305 | 10 |
| Sachs Harbour | 3 651 | 1 712 | 114 | 67 | .. | 21 |

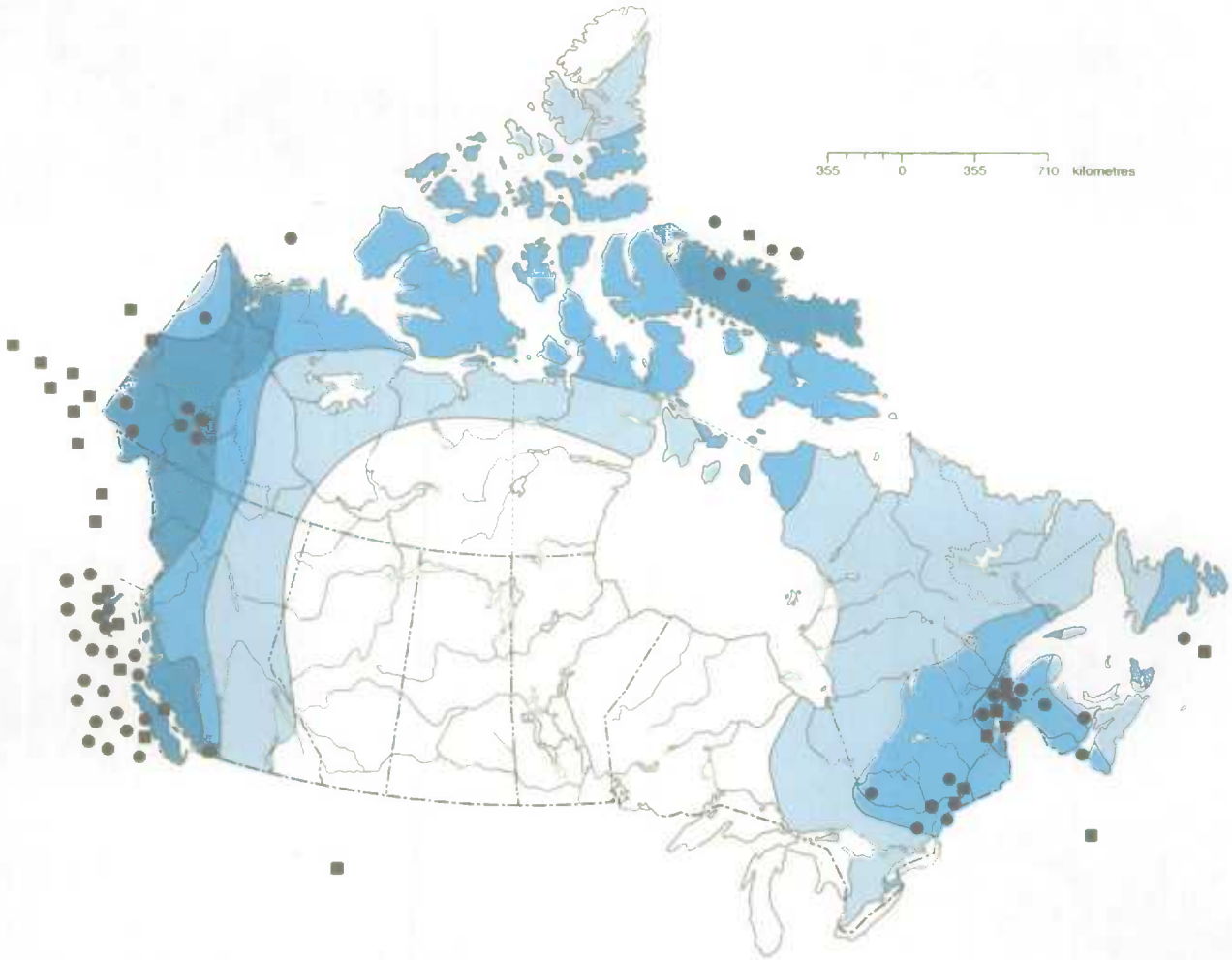
[1] Based on 1951 to 1980 climate normals. A normal is the annual average determined for a specified period, usually twenty-five years.
[2] Based on 1959 to 1980 normals.
[3] Based on 1941 to 1970 normals except as noted.
[4] Based on a normal period of ten to twenty-nine years.
[5] Figure for Harrow, Ontario.
[6] Based on a normal of ten years or less.
[7] Based on a ten year normal.

**Source:**
Environment Canada, Atmospheric Environment Service, *Canadian Climate Normals*, various issues.

**Notes:**
The above climatological profile is composed of observations from major weather stations located at airports. The stations were selected in an attempt to best represent the observed climatological conditions throughout the ecozones.
Complete coverage of all ecozones was not possible because few stations exist in remote northern areas. For this reason no data are shown for the Tundra Cordillera.
Cross Reference: For a discussion of growing degree days, see Map 1.2.4.

# 1.3
# Major Geophysical and Meteorological Events

Map 1.3.1
## Earthquake Severity Potential[1]




**Zone 1** There is a 1 in 100 chance each year of experiencing an earthquake acceleration of up to 1 percent of the acceleration due to gravity (9.8 metres/second/second) (Minor damage or no damage).

**Zone 2** There is a 1 in 100 chance each year of experiencing an earthquake acceleration of between 1 and 3 percent of the acceleration due to gravity. (Minor damage).

**Zone 3** There is a 1 in 100 chance each year of experiencing an earthquake acceleration of between 3 and 6 percent of the acceleration due to gravity. (Moderate damage).

**Zone 4** There is a 1 in 100 chance each year of experiencing an earthquake acceleration of greater than 6 percent of the acceleration due to gravity. (Moderate-Major damage).

**Major Earthquakes[2]**

■ Earthquakes 7 and over on the Richter Scale.

● Earthquakes between 5.5 and 6.99 on the Richter Scale.

[1] This map divides Canada into 4 earthquake severity potential zones. The map was developed in response to the need for earthquake specifications in the National Building Code of Canada. These zones do not indicate the frequency of earthquakes or the risk of an earthquake taking place but rather the degree of severity of a quake should one occur. For more information refer to "The New Seismic Zoning Map for Canada 1970", Department of Energy, Mines and Resources.

[2] Earthquakes greater than Richter Scale 7, felt in Canada but with epicentres outside Canada are also shown.

**Source:**
Energy Mines and Resources Canada, Earth Science Branch, Seismology Division.

Table 1.3.2
## Major Earthquakes

| Year | Richter Scale[1] | Epicentre Location | Impacts |
|---|---|---|---|
| 1663 | 7.5 - 8.0[2] | Lower St. Lawrence River | Many landslides |
| 1732 | 7.0[2] | Montréal | Houses damaged in Montréal, one death |
| 1831 | 5.5 - 6.0[2] | St. Lawrence River Basin (two quakes) | .. |
| 1855 | 5.5 - 6.0[2] | Moncton | .. |
| 1860 | 6.5 - 7.0[2] | Mouth of Saguenay River, Québec | .. |
| 1861 | 5.5 - 6.0[2] | Ottawa | Damage to chimneys |
| 1870 | 7.0[2] | Mouth of the Saguenay River, Québec | Brick structures damaged extensively |
| 1872 | 7.5[2] | East of Vancouver | .. |
| 1897 | 5.6[2] | Near Montréal | .. |
| 1914 | 5.6[2] | Lanark, Ontario | .. |
| 1918 | 7.0 | Vancouver Island | .. |
| 1924 | 6.1 | La Malbaie, Québec | .. |
| 1925 | 7.0 | Mouth of the Saguenay River, Québec | All chimneys destroyed in epicentre area, major structural damage to buildings |
| 1929 | 7.2 | Grand Banks, Newfoundland | Trans Atlantic cables were severed, seismic sea wave killed twenty-seven in Newfoundland |
| 1929 | 7.0 | Queen Charlotte Sound, British Columbia | .. |
| 1933 | 7.3 | Baffin Bay, Northwest Territories | .. |
| 1935 | 6.2 | Timiskaming, Québec | Chimneys were toppled as far away as Mattawa, Ontario |
| 1944 | 6.5 | Cornwall, Ontario | Major structural damage to buildings |
| 1944 | 6.5 | Whitehorse, Yukon | .. |
| 1946 | 7.3 | Strait of Georgia, British Columbia | Structural damage to buildings |
| 1949 | 8.0 | Queen Charlotte Islands, British Columbia | Minor damage |
| 1952 | 6.0 | South of Whitehorse, Yukon | .. |
| 1953 | 6.5 | East Central Yukon | .. |
| 1955 | 6.5 | East Central Yukon | .. |
| 1958 | 6.5 | East Central Yukon | .. |
| 1956 | 6.8 | West of Vancouver Island | .. |
| 1956 | 6.5 | Queen Charlotte Islands | .. |
| 1957 | 6.8 | West of Vancouver Island | .. |
| 1960 | 6.7 | Queen Charlotte Islands | .. |
| 1970 | 7.0 | Queen Charlotte Islands | .. |
| 1972 | 6.2 | Near Nootka Island, British Columbia | .. |
| 1972 | 6.2 | West of Vancouver Island | .. |
| 1979 | 7.1 | Alaska-Yukon Border | Minor property damage |
| 1982 | 5.7 | North Central New Brunswick | Little damage |
| 1985 | 6.6 | Western Northwest Territories | Minor damage |

[1] The Richter scale is a logarithmic scale used to measure the intensity of an earthquake. For example, an earthquake of Scale Five is ten times as intense as a Scale Four earthquake.
[2] Estimated Magnitude.

**Source:**
Energy Mines and Resources Canada, Earth Physics Branch, Seismology Division.

**Notes:**
Earthquakes documented in this table were of Richter scale magnitude 5.5 or greater. Many other earthquakes of lesser magnitude have occurred in Canada. These may have had significant impacts but are not accounted for here.
It should also be noted that earthquakes in this table had epicentres within Canada. Other quakes with epicentres outside Canada have not been included. For example, the earthquake of October 7, 1984, magnitude 5.1, epicentre in New York State, which was felt in much of Southern Québec and Ontario, is not included here. This listing omits some of the smaller quakes which have occurred in isolated northern areas. These are, however, included on Map 1.3.1.

Table 1.3.3
**Major Storms**

| Date | Location | Type of Storm and Characteristics | Major Impacts |
|---|---|---|---|
| August 25, 1873 | Cape Breton | Hurricane | Many deaths, 1,200 boats destroyed |
| April 2 to 6, 1885 | Ottawa Valley | Heavy snow (108 cm) followed by heavy rain (50 mm) | Communications paralyzed |
| January 9, 1889 | Niagara Falls | Snow storms with high winds | Niagara suspension bridge blown down |
| June 30, 1912 | Regina | Tornado | Twenty-eight killed, hundreds injured, extensive property damage |
| November 7 to 13, 1913 | Lower Great Lakes, Ontario | Rain storm with winds of 80 to 130 km/h | Rough seas resulted in the loss of eight ships and drowning of 200 seamen |
| June 22, 1922 | Portage la Prairie, Manitoba | Tornado | Five deaths, many injured, extensive property damage |
| September 17, 1932 | Maritime Provinces | Tropical storm with high winds and heavy rains | Much of the Annapolis apple crop was destroyed, waves and wind damaged fishing boats and gear throughout the Maritimes |
| January 19, 20, 1935 | Southern British Columbia | Heavy snow (44 cm) followed by low temperatures (-20 C) | Roads were impassable for days, roofs collapsed throughout the area |
| December 11, 12, 1944 | Southern Ontario, Québec | Heavy snow (52 cm) and strong winds | Roads blocked for days by drifts |
| June 17, 1944 | Windsor, Ontario | Tornado | Sixteen people killed, 100 injured |
| July 29, 1946 | Okanagan Valley, British Columbia | Hailstorm with stones of 5 cm diameter | Major damage to the pear and apple crops |
| May 21, 1953 | Sarnia, Ontario | Thunderstorm and tornadoes | Five killed, forty injured, extensive property damage |
| October 14, 15, 1954 | Southern Ontario | "Hurricane Hazel" | Widespread wind and flood damage, eighty deaths |
| June 19, 1955 | Vita, Manitoba | Tornado | 300 persons injured |
| January 5, 6, 1956 | New Brunswick and Prince Edward Island | Ice storm with high winds | Ice coating (10 cm) on trees, wires caused considerable damage |
| August 16, 1956 | Elkhorn and Crystal City, Manitoba | Hailstorm and tornadoes | Crops destroyed and buildings demolished |
| February 27, to March 2, 1958 | St. John's, Newfoundland | Freezing rain which lasted 43 hours | Heavy ice caused power disruptions in much of Province |
| February 16, 1959 | St. John's Newfoundland | Heavy snow with strong winds | Six deaths, power disruptions, transport and communications paralyzed |
| February 28, 1959 | Listowel, Ontario | Heavy snow followed by rain | An arena roof collapse resulted in eight deaths |
| June 19, 1959 | Northumberland Strait, Nova Scotia | Squall | Several drownings when fishing boats capsized |
| February 25, 26, 1961 | Montréal area | Ice storm with high winds (120 km/h) | Major damage to public utilities |
| August 31, 1961 | Timmins, Ontario | Thunderstorm with hail | Five deaths due to floods and damage to structures and automobiles |
| December 1, 2, 1964 | Nova Scotia, New Brunswick | Rain/snow storm with high winds gusting up to 160 km/h | Twenty-three deaths, three fishing boats capsized by waves |
| February 18, 1965 | Stewart, British Columbia | Heavy snow | Avalanche killed twenty-six, injured twenty |
| March 4, 1966 | Winnipeg area | Heavy snow (36 cm) and strong winds (120 km/h) | City paralyzed for two days by drifting snow |
| April 17 to 20, 1967 | Southern Alberta | Two snow storms dropped 203 cm of snow within one week | Thousands of cattle starved |
| January 13 to 15, 1968 | Southern Ontario | Snow and ice storm | Transport and communication disruptions, extensive damage to trees |

Table 1.3.3
**Major Storms (concluded)**

| Date | Location | Type of Storm and Characteristics | Major Impacts |
|---|---|---|---|
| August 1, 1969 | Montréal area | Hail storm with stones as large as 6.9 cm diameter | Widespread damage |
| August 4, 1969 | Edmonton area | Hail storm and tornadoes | Widespread damage |
| November 7 to 13, 1969 | Québec | Freezing rain | Extensive damage to utilities |
| July 11, 1970 | Alberta | Hail storm with high winds (120 km/h) | Extensive damage to structures, trees, crops |
| August 20, 1970 | Georgian Bay to Québec border | Tornado | In the Sudbury area, four persons killed, 750 persons left homeless, thousands of trees felled |
| March 4, 1971 | Southern Québec | Heavy snow (43 cm) with high winds (100 km/h) | Montréal paralyzed for two days |
| April 2 to 5, 1975 | Eastern Canada | Heavy snow with high winds | Communities isolated for several days, extensive damage, including to ships |
| June 25, 1975 | Saskatchewan | Thunderstorms with high winds | Extensive crop and property damage |
| February 2, 1976 | Maritime Provinces | Heavy rain and snow with strong winds | Power and transportation disruptions |
| January 28 to 31, 1977 | Niagara Peninsula and Prince Edward County, Ontario | Heavy snow and high winds | Communities paralyzed, transport disrupted |
| January 26, 1978 | Southern Ontario | Heavy snow and high winds (115 km/h) | Twelve deaths, extensive damage |
| February, 1978 | Regina area | Heavy snow and high winds which lasted a week | Snowdrifts paralyzed community for days |
| August 9, 1979 | Woodstock, Ontario | Three tornadoes | Extensive damage |
| February 8 to 17, 1979 | Frobisher Bay, Northwest Territories | Blizzard with 100 km/h wind gusts, temperatures of -40 C | Community cut off for ten days |
| April 14, 1980 | Okanagan Valley, British Columbia | Thunderstorm with wind gusts to 139 km/h at Kelowna | Wind uprooted trees and caused power failures |
| May 31, 1980 | Brampton, Ontario | Tornado with thunderstorms | Extensive damage |
| July 28, 1981 | Calgary area | Hailstorms | Two deaths, extensive damage |
| February 14, 15, 1982 | Newfoundland | Heavy snow with high winds | Ocean Ranger oil-rig sank, eighty-four deaths |
| February 22 to 26, 1982 | Prince Edward Island, Magdalen Islands, Québec | Succession of storms with heavy snow and high winds | Communities isolated for several days, power and communication disruptions |
| March 6, 1983 | Winnipeg | Freezing rain | Extensive damage, transport disruptions |
| December 13, 1983 | Southern Québec | Freezing rain | Major power disruptions throughout region |
| April 13, 1984 | Newfoundland | Freezing rain | Power and communications disruptions |
| July 15, 1984 | Blue Sea Lake and West Québec | Tornado | One dead, thirty-eight injured |
| August 14, 1984 | Toronto | Tornado | Extensive damage |
| September 2, 1984 | London, Ontario | Tornado | Thirty persons injured |
| May 31, 1985 | Barrie, Orangeville, Tottenham, Grand Valley, Alliston, Ontario | Tornado | Twelve dead, 165 injured, 450 homes destroyed |

**Source:**
Environment Canada, Atmospheric Environment Service, Downsview, Ontario

**Notes:**
The criterion for inclusion of storms here is major impact on man. In a number of cases significant storms have not been listed because they caused only minor damage or occurred in isolated locations.
In addition, the listing of storms is weighted somewhat to present more information from recent years. It should be noted that this is partly a function of the change in quality of the reporting system through time.

Table 1.3.4
**Major Floods**

| Year | Location | Cause | Major Impacts |
|---|---|---|---|
| 1826, Spring | Red River, Manitoba | Spring run-off | Widespread damage, river fourteen feet above normal |
| 1878, Summer | Don River, Toronto, Ontario | Heavy rain, thirteen cms in 7.5 hours | Widespread damage to residence and utilities |
| 1894, Summer | Fraser and Columbia River Basins | Spring run-off | Widespread damage |
| 1913, Spring | Amherst and Cumberland County, Nova Scotia | Heavy rain | Widespread damage, two deaths |
| 1915, Summer | North Saskatchewan River, Edmonton, Alberta | Heavy rain | Widespread damage |
| 1917, Summer | Chaudière River, Québec | Rain | Widespread damage |
| 1928, Spring | Estrie River, Québec | Spring run-off | Widespread damage, four deaths |
| 1929, Fall | Burin Pensinsula, Newfoundland | Seismic sea-wave | Twenty-nine deaths |
| 1936, Spring | New Brunswick | Spring run-off | Many bridges, dams washed out |
| 1948, Spring | Lower Fraser River, British Columbia | Spring run-off and heavy rain | 200 square kilometres flooded, 2,000 homes damaged, disaster relief - $38.6 million |
| 1950, Spring | Red River, Manitoba | Spring run-off and heavy rain | 1,760 square kilometres of land flooded, 100,000 people evacuated, extensive damage to homes in Winnipeg, disaster relief - $46.7 million |
| 1954, Fall | Humber River, Toronto, Ontario | Heavy rain from Hurricane Hazel | Eighty drowned, disaster relief - $43.1 million |
| 1955, Spring | Saskatchewan | Spring run-off and heavy rain | Disaster relief - $16.5 million |
| 1955, Spring | Manitoba | Spring run-off and heavy rain | Disaster relief - $4.6 million |
| 1957, Summer | Bécancour, Québec | Heavy rain | Widespread damage, four deaths |
| 1961, Summer | Timmins, Ontario | Heavy rain | Widespread damage, five deaths |
| 1964, Spring | Port Alberni, British Columbia | Seismic sea-wave from Alaska earthquake | Much damage in coastal areas, disaster relief - $2.0 million |
| 1964, Spring | Old Man and Milk River Basins, Alberta | Heavy rain | Twenty-one persons died in the portions of the Basins in Montana |
| 1966, Spring | Red River, Manitoba | Spring run-off and heavy rain | Disaster relief - $14.8 million |
| 1966, Fall | North Shore, Québec | Heavy rain | Widespread damage, four deaths |
| 1970, Spring | New Brunswick | Spring run-off and heavy rain | Widespread damage, two deaths, disaster relief - $4.2 million |
| 1971, Summer | Nova Scotia, around Halifax | Heavy rain from Hurricane Beth | Disaster relief - $2.5 |
| 1972, Spring | Fraser River, British Columbia | Spring run-off and heavy rain | Disaster relief - $4.8 |
| 1972, Summer | Peace River, Smokey River, Alberta | Heavy rain | Extensive damage in Grande Prairie, agricultural losses, disaster relief - $8.7 million |
| 1972, Fall | Western end of Lake Erie | Wind driven waves | Extensive damage |
| 1973, Spring | New Brunswick | Spring run-off and heavy rain | Widespread damage, disaster relief - $7.1 million |
| 1974, Spring | Grand River, Cambridge, Ontario | Heavy rain | Extensive damage |
| 1974, Spring | Southern Québec | Spring run-off | Disaster relief - $16.7 million |
| 1974, Spring | Saskatchewan | Spring run-off | Disaster relief - $5.1 million |
| 1974, Spring | Alberta | Spring run-off | Disaster relief - $6.5 million |
| 1976, Spring | Red River, Manitoba | Spring run-off | Disaster relief - $3.1 million |
| 1976, Spring | Nova Scotia | Heavy rain | Disaster relief - $2.6 million |
| 1976, Spring | Québec | Spring run-off, heavy rain, ice jams | Disaster relief - $12.9 million |
| 1978, Spring | Northwest British Columbia | Spring run-off | Disaster relief - $4.5 million |
| 1979, Spring | Manitoba | Spring run-off | Disaster relief - $8.8 million |
| 1979, Spring | Sturgeon River, Field, Ontario | Heavy rain and spring run-off | Major damage in Field |

Table 1.3.4
**Major Floods (concluded)**

| Year | Location | Cause | Major Impacts |
|---|---|---|---|
| 1979, Spring | Dawson, Yukon | Ice jams and spring run-off | Extensive damage, disaster relief - $1.0 million |
| 1979, Spring | New Brunswick | Spring run-off and heavy rain | Disaster relief - $1.6 million |
| 1980, Spring | Ganaraska River, Port Hope, Ontario | Spring run-off and heavy rain | Major damage to Port Hope |
| 1980, Winter | Southwestern British Columbia | Heavy rain | Widespread damage |
| 1981, Fall | South coast, British Columbia | Heavy rain | Landslides, disaster relief - $2.0 million |
| 1981, Fall | Turkey Creek, Windsor, Ontario | Heavy rain during thunderstorm | Damage to southeastern section of city |
| 1982, Spring | Aklavik, Northwest Territories | Spring run-off and ice jams | Extensive damage |
| 1983, Winter | Newfoundland | Heavy rain | Dam burst on the Exploits River, damage to Grand Falls and Bishops Falls |
| 1983, Spring | Regina, Saskatchewan | Spring run-off | Extensive damage |

**Sources:**
Environment Canada, Inland Waters Directorate, Water Planning and Management Branch.
Environment Canada, Atmospheric Environment Service.
Emergency Planning Canada.

**Notes:**
The criterion for inclusion of floods here is major impact on man. In a number of cases significant floods have not been listed because they caused only minor damage or occurred in isolated locations. In addition, the listing of floods is weighted somewhat to present more information for recent years. It should be noted that this is partly a function of the change in quality of the reporting system through time.
Disaster relief payments are made by the Federal and Provincial Governments under the "Disaster Relief Assistance Programme" of Emergency Planning Canada. Actual damages in dollars always exceed disaster relief as many losses are not included under the agreement. These figures are in constant 1971 dollars. Current values were converted using the Gross National Expenditure Implicit Price Index (1971 = 100).

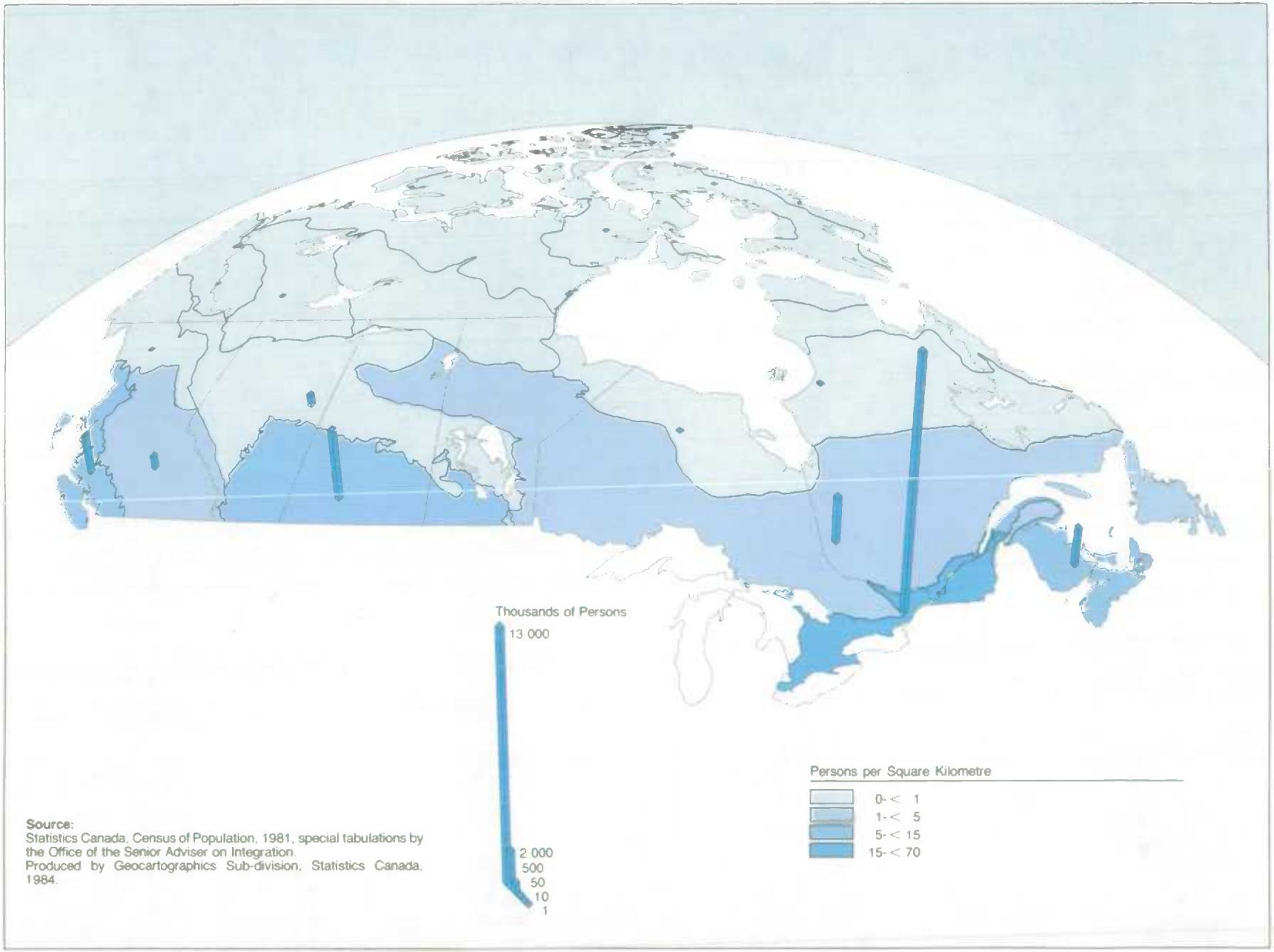
# 2

# Population

# Contents

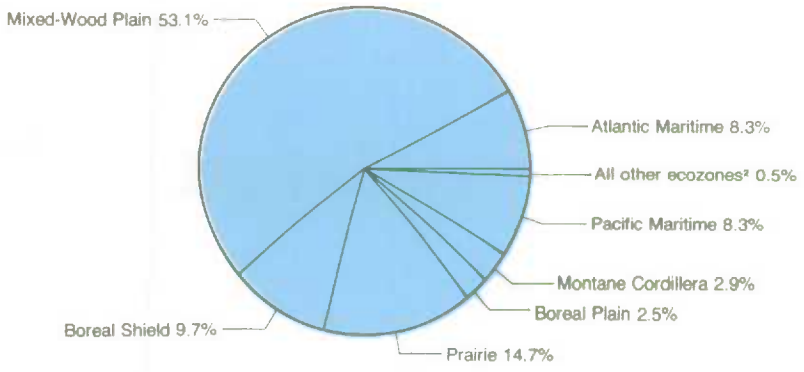
Map 2.1.1

## Population and Population Density by Ecozone, 1981




**Source:**
Statistics Canada, Census of Population, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Chart 2.1.2
**Population[1] by Ecozone, 1981**




[1] Population of Canada was 24 343 181 in 1981.
[2] Includes Boreal Cordillera, Tundra Cordillera, Taiga Plain, Taiga Shield, Hudson Bay Plain, Southern Arctic, Northern Arctic and Arctic Cordillera.

**Source:**
Statistics Canada, Census of Population, 1981.

Table 2.1.3
**Population and Population Density by Ecozone, 1971, 1976 and 1981**

| Ecozone | Area | Total Population | | | Population Density[2] | | | Percentage Change in Population[3] | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1971[1] | 1976 | 1981 | 1971 | 1976 | 1981 | 1971-1976 | 1976-1981 |
| | square kilometres | | | | persons/square kilometre | | | | |
| **Atlantic Maritime** | **188 810** | **1 880 300** | **1 966 983** | **2 018 573** | **10** | **10** | **11** | **4.6** | **2.6** |
| Prince Edward Island | 5 660 | 111 640 | 118 229 | 122 506 | 20 | 21 | 22 | 5.9 | 3.6 |
| Nova Scotia | 55 490 | 788 960 | 828 571 | 847 442 | 14 | 15 | 15 | 5.0 | 2.3 |
| New Brunswick | 72 950 | 634 170 | 676 863 | 696 012 | 9 | 9 | 10 | 6.7 | 2.8 |
| Québec | 54 710 | 345 530 | 343 320 | 352 613 | 6 | 6 | 6 | -0.6 | 2.7 |
| **Mixed-Wood Plain** | **194 955** | **11 723 495** | **12 438 504** | **12 937 746** | **60** | **64** | **66** | **6.1** | **4.0** |
| Québec | 56 935 | 4 903 165 | 5 074 561 | 5 218 574 | 86 | 89 | 92 | 3.5 | 2.8 |
| Ontario | 138 020 | 6 820 330 | 7 363 943 | 7 719 172 | 49 | 53 | 56 | 8.0 | 4.8 |
| **Boreal Shield** | **1 817 845** | **2 206 615** | **2 292 040** | **2 352 274** | **1** | **1** | **1** | **3.9** | **2.6** |
| Newfoundland | 122 985 | 495 915 | 526 987 | 538 822 | 4 | 4 | 4 | 6.3 | 2.2 |
| New Brunswick | 490 | 390 | 387 | 391 | 1 | 1 | 1 | ... | ... |
| Québec | 693 705 | 767 985 | 800 702 | 847 899 | 1 | 1 | 1 | 4.3 | 5.9 |
| Ontario | 652 180 | 877 085 | 895 532 | 900 487 | 1 | 1 | 1 | 2.1 | 0.6 |
| Manitoba | 248 455 | 57 340 | 59 600 | 53 156 | <1 | <1 | <1 | 3.9 | -10.8 |
| Saskatchewan | 100 030 | 7 895 | 8 832 | 11 519 | <1 | <1 | <1 | 11.9 | 30.4 |
| **Prairie** | **491 135** | **2 982 080** | **3 190 644** | **3 578 205** | **6** | **6** | **7** | **7.0** | **12.1** |
| Manitoba | 70 515 | 833 000 | 865 591 | 875 574 | 12 | 12 | 12 | 3.9 | 1.2 |
| Saskatchewan | 253 645 | 782 885 | 774 904 | 817 916 | 3 | 3 | 3 | -1.0 | 5.6 |
| Alberta | 166 975 | 1 366 195 | 1 550 149 | 1 884 715 | 8 | 9 | 11 | 13.5 | 21.6 |
| **Boreal Plain** | **882 595** | **511 315** | **535 803** | **611 518** | **1** | **1** | **1** | **4.8** | **14.1** |
| Manitoba | 129 685 | 94 280 | 93 000 | 94 388 | 1 | 1 | 1 | -1.4 | 1.5 |
| Saskatchewan | 258 765 | 132 910 | 135 294 | 136 128 | 1 | 1 | 1 | 1.8 | 0.6 |
| Alberta | 375 850 | 241 125 | 264 169 | 326 917 | 1 | 1 | 1 | 9.6 | 23.8 |
| British Columbia | 93 895 | 41 875 | 41 946 | 52 862 | <1 | <1 | 1 | 0.2 | 26.0 |
| Yukon | 23 975 | 1 120 | 1 394 | 1 223 | <1 | <1 | <1 | 24.5 | -12.3 |
| Northwest Territories | 425 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| **Montane Cordillera** | **463 300** | **506 310** | **618 067** | **697 675** | **1** | **1** | **2** | **22.1** | **12.9** |
| Alberta | 43 855 | 20 170 | 23 287 | 25 333 | <1 | 1 | 1 | 15.5 | 8.8 |
| British Columbia | 419 445 | 486 135 | 594 780 | 672 342 | 1 | 1 | 2 | 22.3 | 13.0 |

Table 2.1.3
## Population and Population Density by Ecozone, 1971, 1976 and 1981 (concluded)

| Ecozone | Area | Total Population | | | Population Density[2] | | | Percentage Change in Population[3] | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1971[1] | 1976 | 1981 | 1971 | 1976 | 1981 | 1971-1976 | 1976-1981 |
| | square kilometres | | | | persons/square kilometre | | | | |
| **Pacific Maritime** | **197 040** | **1 652 500** | **1 825 014** | **2 014 099** | **8** | **9** | **10** | **10.4** | **10.4** |
| British Columbia | 197 040 | 1 652 500 | 1 825 014 | 2 014 099 | 8 | 9 | 10 | 10.4 | 10.4 |
| **Boreal Cordillera** | **425 770** | **19 370** | **24 032** | **25 838** | **<1** | **<1** | **<1** | **24.1** | **7.5** |
| British Columbia | 207 535 | 3 390 | 4 356 | 4 668 | <1 | <1 | <1 | 28.5 | 7.2 |
| Yukon | 218 235 | 15 985 | 19 676 | 21 170 | <1 | <1 | <1 | 23.1 | 7.6 |
| **Tundra Cordillera** | **376 960** | **1 525** | **1 082** | **1 164** | **<1** | **<1** | **<1** | **-29.0** | **7.6** |
| Yukon | 227 745 | 1 285 | 762 | 759 | <1 | <1 | <1 | -40.7 | -0.4 |
| Northwest Territories | 149 215 | 240 | 320 | 405 | <1 | <1 | <1 | ... | ... |
| **Taiga Plain** | **557 240** | **13 255** | **15 706** | **15 446** | **<1** | **<1** | **<1** | **18.5** | **-1.7** |
| Alberta | 68 090 | 385 | 432 | 759 | <1 | <1 | <1 | ... | ... |
| British Columbia | 29 885 | 715 | 512 | 496 | <1 | <1 | <1 | -28.4 | ... |
| Yukon | 5 485 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| Northwest Territories | 453 780 | 12 155 | 14 762 | 14 191 | <1 | <1 | <1 | 21.4 | -3.9 |
| **Taiga Shield** | **1 301 290** | **41 780** | **52 328** | **55 344** | **<1** | **<1** | **<1** | **25.2** | **5.8** |
| Newfoundland | 226 515 | 24 500 | 28 720 | 26 683 | <1 | <1 | <1 | 17.2 | -7.1 |
| Québec | 490 095 | 7 940 | 12 551 | 14 663 | <1 | <1 | <1 | 58.1 | 16.9 |
| Manitoba | 122 630 | 345 | 47 | 952 | <1 | <1 | <1 | ... | ... |
| Saskatchewan | 39 890 | 2 545 | 2 293 | 2 750 | <1 | <1 | <1 | -9.9 | 19.9 |
| Alberta | 6 420 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| Northwest Territories | 415 740 | 6 450 | 8 717 | 10 288 | <1 | <1 | <1 | 35.1 | 18.0 |
| **Hudson Bay Plain** | **370 620** | **10 645** | **10 177** | **9 976** | **<1** | **<1** | **<1** | **-4.4** | **-2.0** |
| Québec | 8 625 | 1 080 | 1 071 | 1 335 | <1 | <1 | <1 | -0.8 | 24.6 |
| Ontario | 278 380 | 5 690 | 4 990 | 5 448 | <1 | <1 | <1 | -12.3 | 9.2 |
| Manitoba | 78 665 | 3 275 | 3 268 | 2 171 | <1 | <1 | <1 | -0.2 | -33.6 |
| Northwest Territories | 5 150 | 595 | 848 | 1 022 | <1 | <1 | <1 | 42.5 | 20.5 |
| **Southern Arctic** | **992 595** | **10 410** | **12 096** | **14 360** | **<1** | **<1** | **<1** | **16.2** | **18.7** |
| Newfoundland | 56 220 | 1 690 | 2 018 | 2 173 | <1 | <1 | <1 | 19.4 | 7.7 |
| Québec | 157 360 | 530 | 652 | 2008 | <1 | <1 | <1 | 23.0 | 208.0 |
| Yukon | 8 010 | 0 | 4 | 1 | 0 | <1 | <1 | ... | ... |
| Northwest Territories | 771 005 | 8 195 | 9 422 | 10 178 | <1 | <1 | <1 | 15.0 | 8.0 |
| **Northern Arctic** | **1 408 590** | **7 990** | **9 193** | **10 036** | **<1** | **<1** | **<1** | **15.1** | **9.2** |
| Québec | 79 250 | 1 535 | 1 588 | 1 306 | <1 | <1 | <1 | 3.5 | -17.8 |
| Northwest Territories | 1 329 340 | 6 455 | 7 605 | 8 730 | <1 | <1 | <1 | 17.8 | 14.8 |
| **Arctic Cordillera** | **301 665** | **720** | **935** | **927** | **<1** | **<1** | **<1** | **29.9** | **-0.9** |
| **Canada** | **9 970 610** | **21 568 310** | **22 992 604** | **24 343 161** | **2** | **2** | **2** | **6.6** | **5.9** |

[1] The 1971 Census figures have been random rounded. Since they have been rounded independently, individual items may not add exactly to totals.
[2] <1 indicates that the population density is less than 1 when rounded to the nearest whole number.
[3] ... is used in cases of areas where at least one of the population figures involved in the calculation of the percentage change is less than 500 persons.

**Source:**
Statistics Canada, Census of Population 1971, 1976 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

Table 2.1.4
## Population and Population Density by Major Drainage Area, 1971, 1976 and 1981

| Major Drainage Area[1] | Area | Population | | | Population Density[2] | | | Percentage Change in Population | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1971[3] | 1976 | 1981 | 1971 | 1976 | 1981 | 1971-1976 | 1976-1981 |
| | square kilometres | | | | persons/square kilometre | | | | |
| **Atlantic Ocean Basin** | **1 559 950** | **15 488 130** | **16 371 946** | **16 981 283** | **10** | **10** | **11** | **5.7** | **3.7** |
| Atlantic Ocean Coastal | 340 260 | 722 905 | 766 613 | 790 481 | 2 | 2 | 2 | 6.0 | 3.1 |
| Gulf of St. Lawrence Coastal | 463 960 | 1 087 955 | 1 132 881 | 1 151 462 | 2 | 2 | 2 | 4.1 | 1.6 |
| Bay of Fundy Coastal and Saint John River | 62 590 | 653 985 | 696 676 | 712 348 | 10 | 11 | 11 | 6.5 | 2.2 |
| St. Lawrence River | 210 590 | 5 280 705 | 5 447 744 | 5 623 988 | 25 | 26 | 27 | 3.2 | 3.2 |
| Ottawa River | 146 685 | 1 172 210 | 1 255 402 | 1 298 464 | 8 | 9 | 9 | 7.1 | 3.4 |
| Lake Ontario Shore | 39 745 | 3 984 305 | 4 304 304 | 4 551 875 | 100 | 108 | 115 | 8.0 | 5.8 |
| Lake Erie and Lake St. Clair Shore | 37 055 | 1 481 910 | 1 577 582 | 1 621 106 | 40 | 43 | 44 | 6.5 | 2.8 |
| Lake Huron Shore | 128 520 | 933 185 | 1 012 875 | 1 051 119 | 7 | 8 | 8 | 8.5 | 3.8 |
| Lake Superior Shore | 130 545 | 170 970 | 177 869 | 180 440 | 1 | 1 | 1 | 4.0 | 1.4 |
| **Hudson Bay and Ungava Bay Basin** | **3 524 355** | **3 664 450** | **3 891 185** | **4 301 130** | **1** | **1** | **1** | **6.2** | **10.5** |
| Hudson Bay and Ungava Bay Coastal | 2 526 070 | 297 065 | 308 263 | 323 227 | <1 | <1 | <1 | 3.8 | 4.9 |
| Nelson River | 90 365 | 30 255 | 30 897 | 26 276 | <1 | <1 | <1 | 2.1 | 15.0 |
| Lake Winnipeg Shore | 336 975 | 775 540 | 798 679 | 812 547 | 2 | 2 | 2 | 3.0 | 1.7 |
| Assiniboine River | 161 845 | 695 370 | 698 517 | 705 202 | 4 | 4 | 4 | 0.5 | 1.0 |
| Saskatchewan River | 409 100 | 1 866 220 | 2 054 829 | 2 433 878 | 5 | 5 | 6 | 10.1 | 18.4 |
| **Arctic Ocean Basin** | **3 849 890** | **247 775** | **281 815** | **344 983** | **<1** | **<1** | **<1** | **13.7** | **22.4** |
| Mackenzie River | 1 795 365 | 238 305 | 270 820 | 332 747 | <1 | <1 | <1 | 13.6 | 22.9 |
| Arctic Ocean Coastal | 2 054 525 | 9 470 | 10 995 | 12 326 | <1 | <1 | <1 | 16.1 | 12.1 |
| **Pacific Ocean Basin** | **1 010 280** | **2 153 275** | **2 434 814** | **2 702 600** | **2** | **2** | **3** | **13.1** | **11.0** |
| Columbia River | 103 935 | 252 380 | 304 203 | 342 115 | 2 | 3 | 3 | 20.5 | 12.5 |
| Fraser River | 235 135 | 1 154 130 | 1 306 512 | 1 465 271 | 5 | 6 | 6 | 13.2 | 12.2 |
| Yukon River | 334 805 | 17 200 | 20 728 | 21 941 | <1 | <1 | <1 | 20.5 | 5.9 |
| Pacific Ocean, North Coastal | 258 120 | 75 735 | 80 080 | 87 731 | <1 | <1 | <1 | 5.7 | 9.6 |
| Pacific Ocean, South Coastal | 78 285 | 653 830 | 723 291 | 785 542 | 8 | 9 | 10 | 10.6 | 8.6 |
| **Gulf of Mexico Basin** | **26 135** | **14 660** | **12 844** | **13 095** | **1** | **<1** | **1** | **-12.4** | **2.0** |
| Missouri River | 26 135 | 14 660 | 12 844 | 13 095 | 1 | <1 | 1 | -12.4 | 2.0 |
| Canada | 9 970 610 | 21 568 310 | 22 992 604 | 24 343 181 | 2 | 2 | 2 | 6.6 | 5.9 |

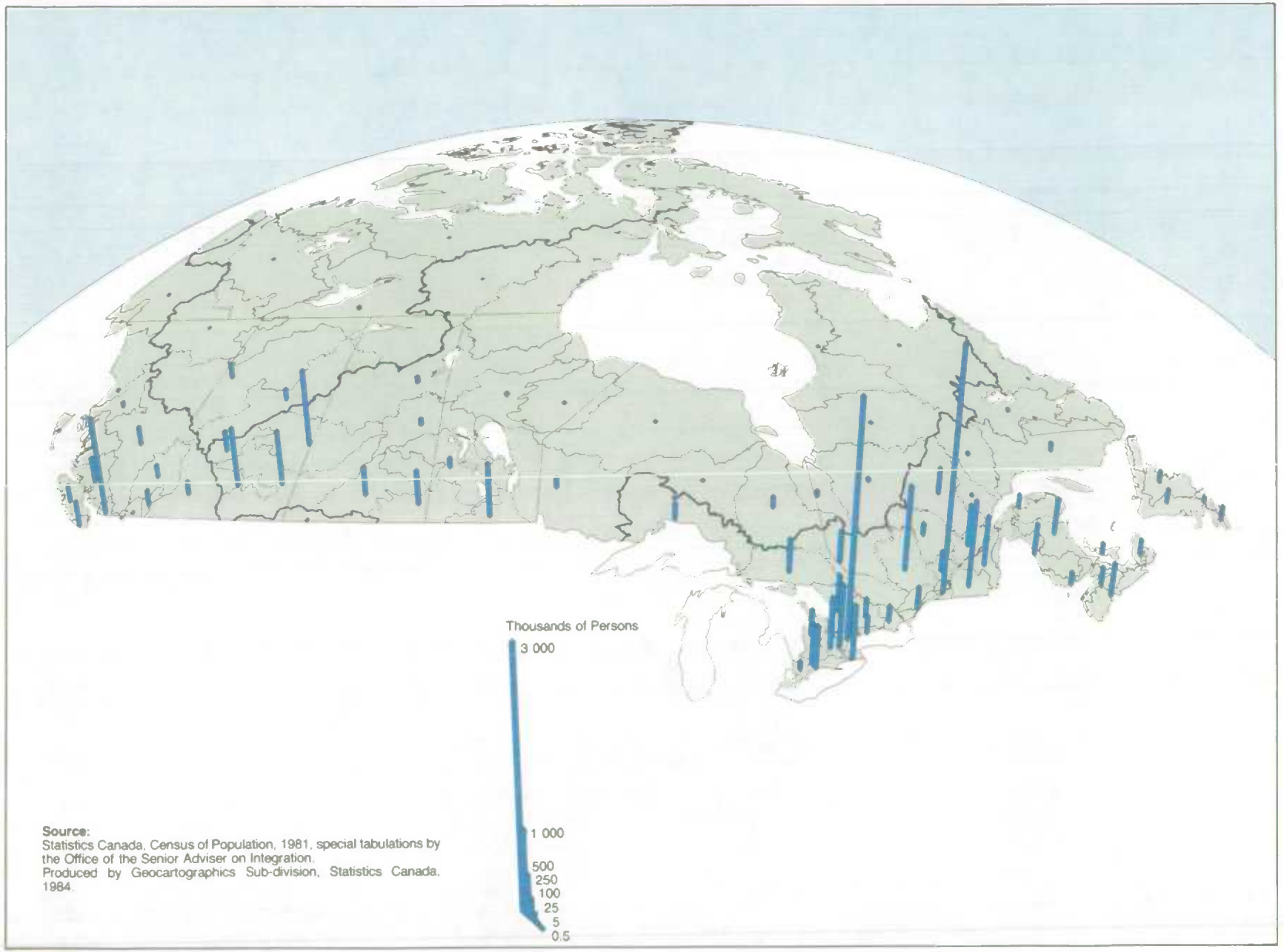
[1] Refer to the Appendix for detailed data by drainage basin and provincial components.

[2] <1 indicates that the population density is less than 1 when rounded to the nearest whole number.

[3] The 1971 Census figures have been random rounded. Since drainage area totals have been rounded independently, they may not add exactly to the Canada total.

**Source:**
Statistics Canada, Census of Population 1971, 1976 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

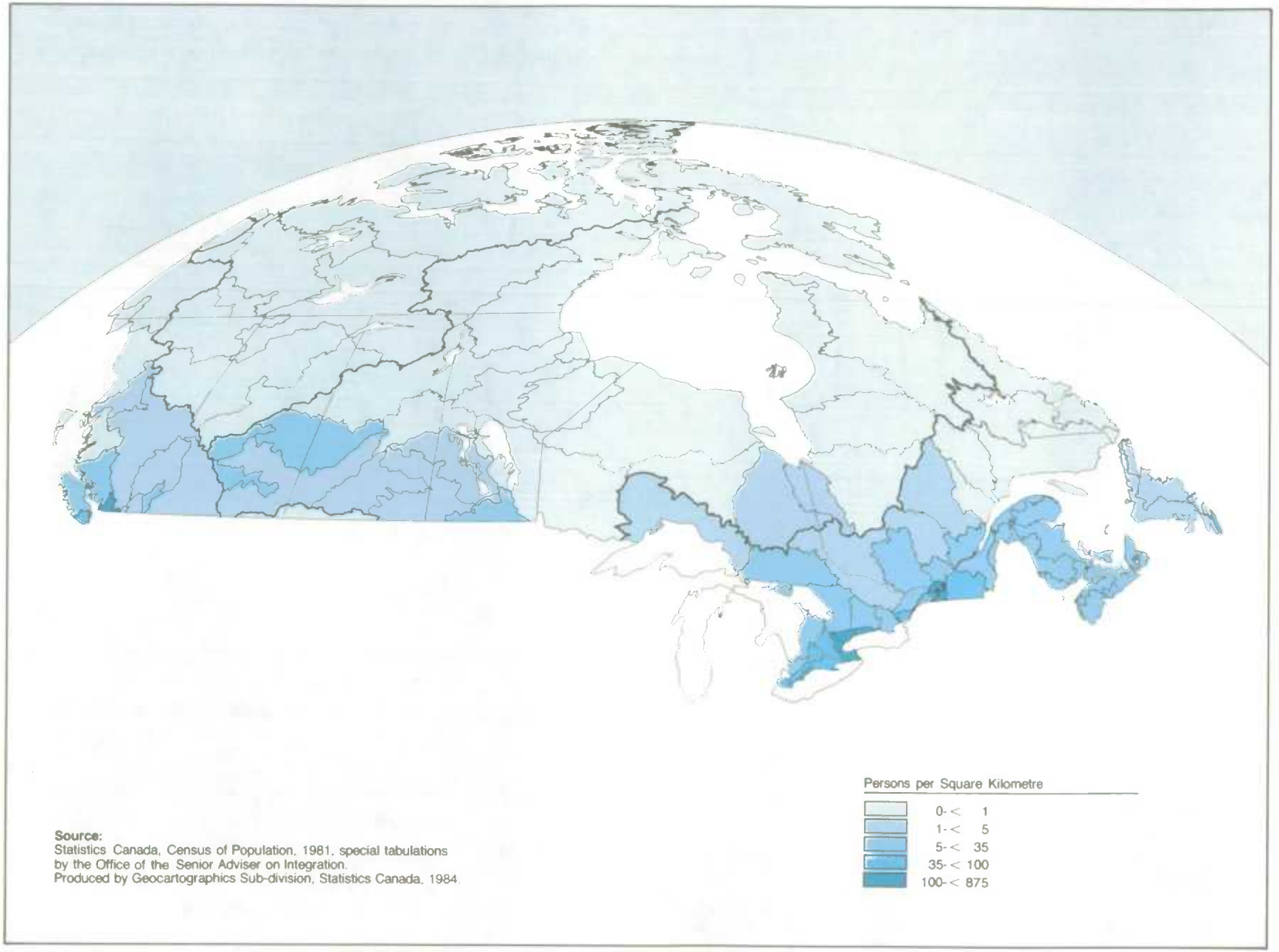
Map 2.1.5
**Population by Drainage Basin, 1981**




**Source:**
Statistics Canada, Census of Population, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Map 2.1.6

## Population Density by Drainage Basin, 1981




**Source:**
Statistics Canada, Census of Population, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Table 2.1.7
## Population of American Drainage Basins with Waters Flowing into Canada, 1980

| Drainage Basin | Population | Area | Corresponding Canadian Drainage Basin Reference Codes |
|---|---|---|---|
| | | square kilometres | |
| **St. Croix River**[1] | **11 410** | **3 805** | **121** |
| Maine | 11 410 | | |
| **Saint John River** | **114 629** | **19 060** | **130** |
| Maine | 114 629 | | |
| **Lake Memphremagog - St. Francis River and Lake Champlain - Richelieu River** | **552 474** | **22 800** | **144** |
| Vermont | 350 415 | | |
| New York | 202 059 | | |
| **Great Lakes - St. Lawrence River** | **25 752 440** | **504 455**[2] | **147, 160-165 170-173, 180-182, 190** |
| New York | 3 698 318 | | |
| Pennsylvania | 256 321 | | |
| Ohio | 4 202 704 | | |
| Michigan | 9 262 078 | | |
| Indiana | 2 114 974 | | |
| Illinois | 3 668 851 | | |
| Wisconsin | 2 298 417 | | |
| Minnesota | 255 777 | | |
| **Souris River - Rainy River - Red River - Lake Winnipeg** | **682 492** | **141 720** | **230, 231, 240** |
| Minnesota | 278 419 | | |
| South Dakota | 5 308 | | |
| North Dakota | 398 765 | | |
| **St. Mary River - Belly River** | **2 100** | **1 505** | **253** |
| Montana | 2 100 | | |
| **Milk River** | **2 650** | **3 110** | **500** |
| Montana | 2 650 | | |
| **Kootenay River** | **25 041** | **51 800** | **400** |
| Montana | 17 752 | | |
| Idaho | 7 289 | | |
| **Kettle River** | **1 214** | **1 478** | **400** |
| Washington | 1 214 | | |
| **Similkameen River** | **102** | **704** | **402** |
| Washington | 102 | | |
| **Vedder River** | .. | **763** | **412** |
| Washington | .. | | |
| **Yukon River** | **37** | **23 300** | **420.1** |
| Alaska | 37 | | |
| **Porcupine River** | **0** | **1 810** | **420.2** |
| Alaska | 0 | | |
| **Firth River** | **0** | **2 870** | **330.1** |
| Alaska | 0 | | |
| **Total, U.S.A. Basin Systems with Flow into Canada** | **27 144 589** | **779 180** | |

[1] St. Croix River does not flow from the U.S.A into Canada, rather it marks the international border.
[2] Includes surface area of Great Lakes in the U.S.A. This area is 156,960 sq. kms.

**Sources:**
U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Washington.
Environment Canada, *Hydrological Atlas of Canada*, 1978.
U.S. Water Resources Council, *The Nation's Water Resources, 1975-2000*, U.S.G.P.O., Washington, 1978.

**Note:**
Population figures are estimates based on 1980 Census of Population county subdivision data.

Table 2.1.8
## Population of Major Urban Areas[1] by Ecozone, 1981

| Ecozone | Major Urban Area | Urban Area Population | Urban Area Population as a Percentage of Ecozone Population | Rural Fringe[2] Population | Rural Fringe Population as a Percentage of Ecozone Rural Population |
|---|---|---|---|---|---|
| **Atlantic Maritime** | **Major Urban Areas (50 000 + )** | **656 178** | **32.5** | **132 508** | **13.2** |
| | Halifax, N.S. (CMA) | 277 727 | 13.8 | 50 935 | 5.1 |
| | Saint John, N.B. (CMA) | 114 048 | 5.6 | 19 897 | 2.0 |
| | Moncton, N.B. (CA) | 98 354 | 4.9 | 19 772 | 2.0 |
| | Sydney, N.S. (CA) | 87 489 | 4.3 | 13 100 | 1.3 |
| | Fredericton, N.B. (CA) | 64 439 | 3.2 | 21 836 | 2.2 |
| | Québec, Qué. (CMA) (part) | 14 121 | 0.7 | 6 968 | 0.7 |
| **Mixed-Wood Plain** | **Major Urban Areas (50 000 + )** | **9 867 019** | **76.3** | **552 566** | **26.1** |
| | Toronto, Ont. (CMA) | 2 998 947 | 23.2 | 99 833 | 4.7 |
| | Montréal, Qué. (CMA) | 2 828 349 | 21.9 | 72 539 | 3.4 |
| | Ottawa-Hull, Ont./Qué. (CMA) (part) | 693 045 | 5.4 | 58 781 | 2.8 |
| | Québec, Qué. (CMA) (part) | 556 499 | 4.3 | 37 865 | 1.8 |
| | Hamilton, Ont. (CMA) | 542 095 | 4.2 | 41 674 | 2.0 |
| | St. Catharines-Niagara, Ont. (CMA) | 304 353 | 2.4 | 23 569 | 1.1 |
| | Kitchener, Ont. (CMA) | 287 801 | 2.2 | 13 035 | 0.6 |
| | London, Ont. (CMA) | 283 668 | 2.2 | 23 225 | 1.1 |
| | Windsor, Ont. (CMA) | 246 110 | 1.9 | 24 699 | 1.2 |
| | Oshawa, Ont. (CMA) | 154 217 | 1.2 | 7 637 | 0.4 |
| | Sherbrooke, Qué. (CA) | 117 324 | 0.9 | 17 257 | 0.8 |
| | Kingston, Ont. (CA) | 114 982 | 0.9 | 30 933 | 1.5 |
| | Trois-Rivières, Qué. (CMA) | 111 453 | 0.9 | 8 220 | 0.4 |
| | Brantford, Ont. (CA) | 88 330 | 0.7 | 6 530 | 0.3 |
| | Peterborough, Ont. (CA) | 85 701 | 0.7 | 20 054 | 0.9 |
| | Sarnia, Ont. (CA) | 83 951 | 0.6 | 8 728 | 0.4 |
| | Guelph, Ont. (CA) | 78 456 | 0.6 | 7 249 | 0.3 |
| | Shawinigan, Qué. (CA) (part) | 61 673 | 0.5 | 9 474 | 0.4 |
| | Barrie, Ont. (CA) | 61 271 | 0.5 | 10 837 | 0.5 |
| | Saint-Jean-sur-Richelieu, Qué. (CA) | 60 710 | 0.5 | 9 969 | 0.5 |
| | Drummondville, Qué. (CA) | 54 679 | 0.4 | 14 424 | 0.7 |
| | Cornwall, Ont. (CA) | 53 405 | 0.4 | 6 034 | 0.3 |
| **Boreal Shield** | **Major Urban Areas (50 000 + )** | **736 807** | **31.3** | **113 872** | **12.0** |
| | St. John's, Nfld. (CMA) | 154 820 | 6.6 | 23 126 | 2.4 |
| | Sudbury, Ont. (CMA) | 149 923 | 6.4 | 14 977 | 1.6 |
| | Chicoutimi-Jonquière, Qué. (CMA) | 135 172 | 5.7 | 23 358 | 2.5 |
| | Thunder Bay, Ont. (CMA) | 121 379 | 5.2 | 12 014 | 1.3 |
| | Sault Ste. Marie, Ont. (CA) | 86 962 | 3.7 | 12 450 | 1.3 |
| | North Bay, Ont. (CA) | 57 137 | 2.4 | 5 897 | 0.6 |
| | Ottawa-Hull, Ont./Qué. (CMA) (part) | 24 933 | 1.1 | 15 569 | 1.6 |
| | Québec, Qué. (CMA) (part) | 5 455 | 0.2 | 5 455 | 0.6 |
| | Shawinigan, Qué. (CA) (part) | 1 026 | -- | 1 026 | 0.1 |
| **Prairie** | **Major Urban Areas (50 000 + )** | **2 151 343** | **60.1** | **61 637** | **7.4** |
| | Edmonton, Alta. (CMA) (part) | 656 843 | 18.4 | 40 371 | 4.9 |
| | Calgary, Alta. (CMA) | 592 743 | 16.6 | 0 | 0 |
| | Winnipeg, Man. (CMA) (part) | 583 234 | 16.3 | 19 566 | 2.4 |
| | Regina, Sask. (CMA) | 164 313 | 4.6 | 1 700 | 0.2 |
| | Saskatoon, Sask. (CMA) | 154 210 | 4.3 | 0 | 0 |
| **Boreal Plain** | **Major Urban Areas (50 000 + )** | **1 822** | **0.3** | **1 822** | **0.5** |
| | Winnipeg, Man. (CMA) (part) | 1 608 | 0.3 | 1 608 | 0.4 |
| | Edmonton, Alta. (CMA) (part) | 214 | -- | 214 | 0.1 |
| **Montane Cordillera** | **Major Urban Areas (50 000 + )** | **210 024** | **30.1** | **39 776** | **13.7** |
| | Kelowna, B.C. (CA) | 77 468 | 11.1 | 21 111 | 7.3 |
| | Prince George, B.C. (CA) | 67 559 | 9.7 | 8 404 | 2.9 |
| | Kamloops, B.C. (CA) | 64 997 | 9.3 | 10 261 | 3.5 |
| **Pacific Maritime** | **Major Urban Areas (50 000 + )** | **1 559 358** | **77.4** | **95 573** | **32.5** |
| | Vancouver, B.C. (CMA) | 1 268 183 | 63.0 | 71 550 | 24.4 |
| | Victoria, B.C. (CMA) | 233 481 | 11.6 | 13 663 | 4.7 |
| | Nanaimo, B.C. (CA) | 57 694 | 2.9 | 10 360 | 3.5 |
| **Canada** | **Major Urban Areas (50 000 + )** | **15 182 551** | **62.4** | **997 754** | **16.9** |

[1] The major urban areas include all Census Metropolitan Areas as well as all Census Agglomerations of 50,000 population or more in 1981. For a detailed explanation of 1981 Census Metropolitan Areas and Census Agglomerations, refer to the 1981 Census Dictionary, Catalogue 99-901, May 1982. Also note: several of these urban areas are split and appear in more than one ecozone.

[2] The rural fringe population is the population living in the rural parts of the CA or CMA. The rural population refers to persons living outside population concentrations of 1,000 or more with a population density of 400 or more per square kilometre.

**Source:**
Statistics Canada, 1981 Census of Population, special tabulations by the Office of the Senior Adviser on Integration.

Table 2.1.9
## Rural-Urban Population by Major Drainage Area, 1971, 1976 and 1981

| Major Drainage Area[1] | Rural Population | | | Urban Population[2] | | | Urban Population as a Percentage of Total Population | |
|---|---|---|---|---|---|---|---|---|
| | 1971[3] | 1976 | 1981 | 1971 | 1976 | 1981 | 1971 | 1981 |
| **Atlantic Ocean Basin** | **3 319 980** | **3 730 092** | **3 925 535** | **11 676 720** | **12 641 854** | **13 055 748** | **75.4** | **76.9** |
| Atlantic Ocean Coastal | 270 125 | 275 717 | 280 609 | 452 780 | 490 896 | 509 872 | 62.6 | 64.5 |
| Gulf of St. Lawrence Coastal | 544 325 | 592 629 | 625 372 | 543 630 | 540 252 | 526 090 | 50.0 | 45.7 |
| Bay of Fundy Coastal and Saint John River | 296 590 | 335 221 | 353 918 | 357 405 | 361 455 | 358 430 | 54.6 | 50.3 |
| St. Lawrence River | 835 995 | 945 095 | 1 055 338 | 4 444 695 | 4 502 649 | 4 568 650 | 84.2 | 81.2 |
| Ottawa River | 320 185 | 354 206 | 388 026 | 852 025 | 901 196 | 910 438 | 72.7 | 70.1 |
| Lake Ontario Shore | 288 755 | 406 033 | 413 172 | 3 204 135 | 3 898 271 | 4 138 703 | 91.7 | 90.9 |
| Lake Erie and Lake St. Clair Shore | 396 730 | 404 244 | 393 170 | 1 085 180 | 1 173 338 | 1 227 936 | 73.2 | 75.7 |
| Lake Huron Shore | 343 320 | 383 154 | 380 568 | 589 865 | 629 721 | 670 551 | 63.2 | 63.8 |
| Lake Superior Shore | 23 955 | 33 793 | 35 362 | 147 005 | 144 076 | 145 078 | 86.0 | 80.4 |
| **Hudson Bay and Ungava Bay Basin** | **1 176 780** | **1 188 955** | **1 227 124** | **2 489 470** | **2 702 203** | **3 074 006** | **67.9** | **71.5** |
| Hudson Bay and Ungava Bay Coastal | 130 755 | 141 663 | 158 093 | 168 105 | 166 600 | 165 134 | 56.2 | 51.1 |
| Nelson River | 10 240 | 12 013 | 10 149 | 20 020 | 18 884 | 16 127 | 66.2 | 61.4 |
| Lake Winnipeg Shore | 253 725 | 257 345 | 253 681 | 521 810 | 541 334 | 558 866 | 67.3 | 68.8 |
| Assiniboine River | 270 340 | 249 564 | 238 798 | 425 035 | 448 953 | 466 404 | 61.1 | 66.1 |
| Saskatchewan River | 511 720 | 528 370 | 566 403 | 1 354 500 | 1 526 459 | 1 867 475 | 72.6 | 76.7 |
| **Arctic Ocean Basin** | **130 230** | **139 278** | **155 788** | **117 540** | **142 537** | **189 285** | **47.4** | **54.9** |
| Mackenzie River | 122 810 | 130 603 | 145 795 | 115 490 | 140 217 | 186 952 | 48.5 | 56.2 |
| Arctic Ocean Coastal | 7 420 | 8 675 | 9 993 | 2 050 | 2 320 | 2 333 | 21.6 | 18.9 |
| **Pacific Ocean Basin** | **515 405** | **554 466** | **585 712** | **1 637 870** | **1 880 348** | **2 116 888** | **76.1** | **78.3** |
| Columbia River | 101 540 | 122 930 | 135 025 | 150 835 | 181 273 | 207 090 | 59.8 | 60.5 |
| Fraser River | 236 770 | 236 662 | 246 628 | 917 355 | 1 069 850 | 1 218 643 | 79.5 | 83.2 |
| Yukon River | 5 985 | 7 417 | 7 127 | 11 215 | 13 311 | 14 814 | 65.2 | 67.5 |
| Pacific Ocean, North Coastal | 29 580 | 34 541 | 40 008 | 46 160 | 45 539 | 47 723 | 60.9 | 54.4 |
| Pacific Ocean, South Coastal | 141 530 | 152 916 | 156 924 | 512 305 | 570 375 | 628 618 | 78.4 | 80.0 |
| **Gulf of Mexico Basin** | **14 660** | **12 844** | **13 095** | **0** | **0** | **0** | **0** | **0** |
| Missouri River | 14 660 | 12 844 | 13 095 | 0 | 0 | 0 | 0 | 0 |
| **Canada** | **5 157 075** | **5 625 635** | **5 907 254** | **16 411 235** | **17 366 969** | **18 435 927** | **76.1** | **75.7** |

[1] Refer to the Appendix for detailed data by Drainage Basin and provincial components.

[2] In 1971, all incorporated cities, towns and villages of 1,000 persons or more were defined as urban. Also, all population concentrations of 1,000 or more with a population density of at least 386 persons per square kilometre were classified as urban. In 1976 and 1981, all population concentrations of 1,000 or more with a population density of at least 386 (400 in the 1981 Census) persons per square kilometre were classified as urban, regardless of the legal status of the municipality.

[3] The 1971 Census figures have been random rounded. Since they have been rounded independently, individual items may not add exactly to totals.

**Source:**
Statistics Canada, Census of Population, 1971, 1976 and 1981, special tabulations by the Office of the Senior Adviser of Integration.

Table 2.1.10
## Population of Major Urban Areas[1] by Major Drainage Area, 1981

| Major Drainage Area | Major Urban Area | Urban Area Population | Urban Area Population as a Percentage of Drainage Area Population | Rural Fringe[2] Population | Rural Fringe Population as a Percentage of Drainage Area Rural Population |
|---|---|---|---|---|---|
| **Atlantic Ocean Basin** | **Major Urban Areas (50 000 + )** | **11 260 004** | **66.3** | **798 946** | **20.4** |
| Atlantic Ocean Coastal | Major Urban Areas (50 000 + ) | 415 758 | 52.6 | 60 717 | 21.6 |
| | Halifax, N.S. (CMA) (part) | 260 938 | 33.0 | 37 591 | 13.4 |
| | St. John's, Nfld. (CMA) | 154 820 | 19.6 | 23 126 | 8.2 |
| Gulf of St. Lawrence Coastal | Major Urban Areas (50 000 + ) | 88 433 | 7.7 | 14 044 | 2.2 |
| | Sydney, N.S. (CA) | 87 489 | 7.6 | 13 100 | 2.1 |
| | Moncton, N.B. (CA) (part) | 841 | 0.1 | 841 | 0.1 |
| | Fredericton, N.B. (CA) (part) | 103 | -- | 103 | -- |
| Bay of Fundy Coastal and Saint John River | Major Urban Areas (50 000 + ) | 292 686 | 41.1 | 73 905 | 20.9 |
| | Saint John, N.B. (CMA) | 114 048 | 16.0 | 19 897 | 5.6 |
| | Moncton, N.B. (CA) (part) | 97 513 | 13.7 | 18 931 | 5.3 |
| | Fredericton, N.B. (CA) (part) | 64 336 | 9.0 | 21 733 | 6.1 |
| | Halifax, N.S. (CMA) (part) | 16 789 | 2.4 | 13 344 | 3.8 |
| St. Lawrence River | Major Urban Areas (50 000 + ) | 4 050 581 | 72.0 | 225 848 | 21.4 |
| | Montréal, Qué. (CMA) | 2 828 349 | 50.3 | 72 539 | 6.9 |
| | Québec, Qué. (CMA) | 576 075 | 10.2 | 50 288 | 4.8 |
| | Chicoutimi-Jonquière, Qué. (CMA) | 135 172 | 2.4 | 23 358 | 2.2 |
| | Sherbrooke, Qué. (CA) | 117 324 | 2.1 | 17 257 | 1.6 |
| | Trois-Rivières, Qué. (CMA) | 111 453 | 2.0 | 8 220 | 0.8 |
| | Shawinigan, Qué. (CA) | 62 699 | 1.1 | 10 500 | 1.0 |
| | Saint-Jean-sur-Richelieu, Qué. (CA) | 60 710 | 1.1 | 9 969 | 0.9 |
| | Drummondville, Qué. (CA) | 54 679 | 1.0 | 14 424 | 1.4 |
| | Cornwall, Ont. (CA) | 53 405 | 0.9 | 6 034 | 0.6 |
| | Kingston, Ont. (CA) (part) | 50 715 | 0.9 | 13 259 | 1.3 |
| Ottawa River | Major Urban Areas (50 000 + ) | 719 886 | 55.4 | 75 358 | 19.4 |
| | Ottawa-Hull, Ont./Qué. (CMA) | 717 978 | 55.3 | 74 350 | 19.2 |
| | North Bay, Ont. (CA) (part) | 1 908 | 0.1 | 1 008 | 0.3 |
| Lake Ontario Shore | Major Urban Areas (50 000 + ) | 4 090 511 | 89.9 | 188 674 | 45.7 |
| | Toronto, Ont. (CMA) (part) | 2 952 537 | 64.9 | 85 947 | 20.8 |
| | Hamilton, Ont. (CMA) (part) | 529 436 | 11.6 | 33 793 | 8.2 |
| | St. Catharines-Niagara, Ont. (CMA) | 304 353 | 6.7 | 23 569 | 5.7 |
| | Oshawa, Ont. (CMA) | 154 217 | 3.4 | 7 637 | 1.8 |
| | Peterborough, Ont. (CA) | 85 701 | 1.9 | 20 054 | 4.9 |
| | Kingston, Ont. (CA) (part) | 64 267 | 1.4 | 17 674 | 4.3 |
| Lake Erie and Lake St. Clair Shore | Major Urban Areas (50 000 + ) | 1 014 340 | 62.6 | 86 894 | 22.1 |
| | Kitchener, Ont. (CMA) | 287 801 | 17.8 | 13 035 | 3.3 |
| | London, Ont. (CMA) | 283 668 | 17.5 | 23 225 | 5.9 |
| | Windsor, Ont. (CMA) | 246 110 | 15.2 | 24 699 | 6.3 |
| | Brantford, Ont. (CA) | 88 330 | 5.4 | 6 530 | 1.7 |
| | Guelph, Ont. (CA) | 78 456 | 4.8 | 7 249 | 1.8 |
| | Sarnia, Ont. (CA) (part) | 17 316 | 1.1 | 4 275 | 1.1 |
| | Hamilton, Ont. (CMA) (part) | 12 659 | 0.8 | 7 881 | 2.0 |
| Lake Huron Shore | Major Urban Areas (50 000 + ) | 448 469 | 42.7 | 56 624 | 14.9 |
| | Sudbury, Ont. (CMA) | 149 923 | 14.3 | 14 977 | 3.9 |
| | Sault Ste. Marie, Ont. (CA) (part) | 69 001 | 6.6 | 7 582 | 2.0 |
| | Sarnia, Ont. (CA) (part) | 66 635 | 6.3 | 4 453 | 1.2 |
| | Barrie, Ont. (CA) | 61 271 | 5.8 | 10 837 | 2.8 |
| | North Bay, Ont. (CA) (part) | 55 229 | 5.3 | 4 889 | 1.3 |
| | Toronto, Ont. (CMA) (part) | 46 410 | 4.4 | 13 886 | 3.6 |
| Lake Superior Shore | Major Urban Areas (50 000 + ) | 139 340 | 77.2 | 16 882 | 47.7 |
| | Thunder Bay, Ont. (CMA) | 121 379 | 67.3 | 12 014 | 34.0 |
| | Sault Ste. Marie, Ont. (CA) (part) | 17 961 | 10.0 | 4 868 | 13.8 |
| **Hudson Bay and Ungava Bay Basin** | **Major Urban Areas (50 000 + )** | **2 153 165** | **50.1** | **63 459** | **5.2** |
| Lake Winnipeg Shore | Major Urban Areas (50 000 + ) | 462 283 | 56.9 | 19 059 | 7.5 |
| | Winnipeg, Man. (CMA) (part) | 462 283 | 56.9 | 19 059 | 7.5 |
| Assiniboine River | Major Urban Areas (50 000 + ) | 286 872 | 40.7 | 3 815 | 1.6 |
| | Regina, Sask. (CMA) | 164 313 | 23.3 | 1 700 | 0.7 |
| | Winnipeg, Man. (CMA) (part) | 122 559 | 17.4 | 2 115 | 0.9 |

Table 2.1.10
**Population of Major Urban Areas[1] by Major Drainage Area, 1981 (concluded)**

| Major Drainage Area | Major Urban Area | Urban Area Population | Urban Area Population as a Percentage of Drainage Area Population | Rural Fringe[2] Population | Rural Fringe Population as a Percentage of Drainage Area Rural Population |
|---|---|---|---|---|---|
| Saskatchewan River | Major Urban Areas (50 000 + ) | 1 404 010 | 57.7 | 40 585 | 7.2 |
| | Edmonton, Alta. (CMA) | 657 057 | 27.0 | 40 585 | 7.2 |
| | Calgary, Alta. (CMA) | 592 743 | 24.4 | 0 | 0 |
| | Saskatoon, Sask. (CMA) | 154 210 | 6.3 | 0 | 0 |
| **Pacific Ocean Basin** | **Major Urban Areas (50 000 + )** | **1 769 382** | **65.5** | **135 349** | **23.1** |
| Columbia River | Major Urban Areas (50 000 + ) | 77 468 | 22.6 | 21 111 | 15.6 |
| | Kelowna, B.C. (CA) | 77 468 | 22.6 | 21 111 | 15.6 |
| Fraser River | Major Urban Areas (50 000 + ) | 1 156 459 | 78.9 | 84 843 | 34.4 |
| | Vancouver, B.C. (CMA) (part) | 1 023 903 | 69.9 | 66 178 | 26.8 |
| | Prince George, B.C. (CA) | 67 559 | 4.6 | 8 404 | 3.4 |
| | Kamloops, B.C. (CA) | 64 997 | 4.4 | 10 261 | 4.2 |
| Pacific Ocean, South Coastal | Major Urban Areas (50 000 + ) | 535 455 | 68.2 | 29 395 | 18.7 |
| | Vancouver, B.C. (CMA) (part) | 244 280 | 31.1 | 5 372 | 3.4 |
| | Victoria, B.C. (CMA) | 233 481 | 29.7 | 13 663 | 8.7 |
| | Nanaimo, B.C. (CA) | 57 694 | 7.3 | 10 360 | 6.6 |
| **Canada** | **Major Urban Areas (50 000 + )** | **15 182 551** | **62.4** | **997 754** | **16.9** |

[1] The major urban areas include all Census Metropolitan Areas as well as all Census Agglomerations of 50,000 population or more in 1981. For a detailed explanation of 1981 Census Metropolitan Areas and Census Agglomerations, refer to the 1981 Census Dictionary, Catalogue 99-901, May 1982. Also note: Several of these urban areas are split and appear in more than one Major Drainage Area.

[2] The rural fringe population is the population living in the rural parts of the CA or CMA. The rural population refers to persons living outside population concentrations 1,000 or more with a population density of 400 or more per square kilometre.

**Source:**
Statistics Canada, Census of Population, 1981, special tabulations by the Office of the Senior Adviser on Integration.

Table 2.1.11
## Experienced[1] Labour Force[2] by Major Drainage Area, 1971 and 1981[3]

| Major Drainage Area | Experienced Labour Force | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All Industries | | Agriculture | | Forestry | | Fishing and Trapping | | Mines, Quarries and Oil Wells | |
| | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 |
| **Atlantic Ocean Basin** | **6 122 900** | **8 278 070** | **221 565** | **239 565** | **37 720** | **49 940** | **20 115** | **28 145** | **67 730** | **76 105** |
| Atlantic Ocean Coastal | 249 360 | 350 310 | 2 075 | 2 725 | 3 120 | 4 450 | 7 210 | 10 110 | 4 760 | 6 625 |
| Gulf of St. Lawrence Coastal | 332 495 | 462 250 | 14 880 | 14 455 | 10 730 | 13 030 | 9 960 | 12 985 | 13 335 | 18 250 |
| Bay of Fundy Coastal and Saint John River | 236 025 | 310 175 | 10 870 | 11 765 | 6 510 | 8 115 | 1 405 | 2 185 | 1 440 | 1 915 |
| St. Lawrence River | 1 954 215 | 2 652 070 | 64 010 | 68 570 | 9 410 | 11 320 | 220 | 425 | 10 930 | 11 895 |
| Ottawa River | 459 020 | 642 430 | 18 820 | 19 445 | 4 100 | 6 200 | 80 | 375 | 6 460 | 6 440 |
| Lake Ontario Shore | 1 809 250 | 2 454 125 | 29 310 | 34 630 | 540 | 1 295 | 395 | 520 | 5 475 | 6 640 |
| Lake Erie and Lake St. Clair Shore | 642 040 | 819 900 | 52 775 | 58 995 | 260 | 320 | 510 | 875 | 1 760 | 2 100 |
| Lake Huron Shore | 371 575 | 495 960 | 28 340 | 28 190 | 1 145 | 2 120 | 235 | 420 | 21 535 | 20 340 |
| Lake Superior Shore | 68 920 | 90 850 | 685 | 790 | 1 905 | 3 090 | 100 | 250 | 2 035 | 1 900 |
| **Hudson Bay and Ungava Bay Basin** | **1 505 640** | **2 182 205** | **218 130** | **192 945** | **7 525** | **11 305** | **1 000** | **1 875** | **49 745** | **92 420** |
| Hudson Bay and Ungava Bay Coastal | 92 810 | 131 355 | 5 075 | 4 205 | 3 785 | 5 310 | 540 | 310 | 11 110 | 13 415 |
| Nelson River | 11 470 | 10 760 | 15 | 30 | 10 | 135 | 45 | 70 | 3 940 | 2 360 |
| Lake Winnipeg Shore | 325 135 | 399 140 | 36 720 | 32 060 | 2 325 | 3 125 | 240 | 950 | 3 765 | 3 400 |
| Assiniboine River | 289 990 | 341 955 | 64 870 | 54 285 | 165 | 235 | 20 | 85 | 3 725 | 5 230 |
| Saskatchewan River | 786 235 | 1 298 995 | 111 450 | 102 365 | 1 240 | 2 500 | 155 | 460 | 27 205 | 68 015 |
| **Arctic Ocean Basin** | **93 700** | **165 670** | **16 295** | **16 330** | **2 015** | **3 235** | **470** | **410** | **6 740** | **19 500** |
| Mackenzie River | 91 370 | 161 690 | 16 295 | 16 320 | 2 015 | 3 235 | 320 | 325 | 6 725 | 19 220 |
| Arctic Ocean Coastal | 2 330 | 3 980 | 0 | 10 | 0 | 0 | 150 | 85 | 15 | 280 |
| **Pacific Ocean Basin** | **898 650** | **1 373 130** | **21 390** | **29 355** | **27 110** | **36 320** | **3 840** | **6 415** | **14 735** | **21 845** |
| Columbia River | 99 875 | 161 085 | 5 630 | 7 185 | 3 015 | 4 725 | 15 | 60 | 5 015 | 8 215 |
| Fraser River | 486 570 | 753 360 | 12 705 | 17 770 | 9 215 | 12 790 | 1 415 | 2 090 | 5 050 | 7 350 |
| Yukon River | 7 715 | 12 495 | 5 | 85 | 70 | 55 | 25 | 30 | 1 165 | 1 335 |
| Pacific Ocean, North Coastal | 29 595 | 43 410 | 395 | 415 | 2 815 | 3 305 | 450 | 735 | 970 | 1 785 |
| Pacific Ocean, South Coastal | 274 895 | 402 780 | 2 655 | 3 900 | 11 995 | 15 445 | 1 935 | 3 500 | 2 535 | 3 160 |
| **Gulf of Mexico Basin** | **6 010** | **6 250** | **3 645** | **3 060** | **5** | **0** | **0** | **0** | **75** | **145** |
| Missouri River | 6 010 | 6 250 | 3 645 | 3 060 | 5 | 0 | 0 | 0 | 75 | 145 |
| **Canada** | **8 626 925** | **12 005 320** | **481 190** | **481 275** | **74 380** | **100 765** | **25 440** | **36 870** | **139 035** | **210 020** |

Table 2.1.11
## Experienced[1] Labour Force[2] by Major Drainage Area, 1971 and 1981[3] (concluded)

| Major Drainage Area | Experienced Labour Force | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Manufacturing Industries | | Construction | | Service Sector[5] | | Industry Unspecified or Undefined | | Ratio of Resource Base Industries[4] to All Industries | | Ratio of Resource Base Industries to All Good Producing Industries[6] | |
| | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 |
| **Atlantic Ocean Basin** | **1 407 015** | **1 799 125** | **375 430** | **454 315** | **3 503 030** | **5 354 225** | **490 095** | **276 650** | **8.6** | **7.2** | **22.8** | **21.9** |
| Atlantic Ocean Coastal | 27 780 | 44 215 | 19 495 | 21 655 | 165 495 | 248 890 | 19 425 | 11 640 | 12.9 | 14.1 | 45.9 | 53.0 |
| Gulf of St Lawrence Coastal | 52 535 | 78 745 | 28 310 | 32 410 | 173 610 | 275 525 | 29 135 | 16 850 | 25.9 | 23.9 | 60.6 | 62.7 |
| Bay of Fundy Coastal and Saint John River | 34 785 | 46 185 | 16 255 | 21 745 | 147 185 | 207 815 | 17 575 | 10 450 | 14.8 | 13.5 | 45.4 | 43.9 |
| St. Lawrence River | 478 825 | 603 985 | 102 540 | 129 810 | 1 104 805 | 1 725 210 | 183 475 | 100 855 | 6.8 | 5.3 | 18.1 | 16.4 |
| Ottawa River | 52 100 | 69 205 | 29 170 | 33 185 | 310 085 | 485 070 | 38 205 | 22 510 | 9.8 | 7.3 | 37.3 | 33.5 |
| Lake Ontario Shore | 491 840 | 614 790 | 110 830 | 132 405 | 1 044 640 | 1 590 235 | 126 220 | 73 610 | 2.9 | 2.4 | 7.7 | 7.1 |
| Lake Erie and Lake St. Clair Shore | 186 820 | 230 510 | 37 095 | 43 795 | 321 865 | 461 045 | 40 955 | 22 260 | 10.2 | 8.6 | 21.9 | 20.5 |
| Lake Huron Shore | 68 515 | 92 855 | 27 425 | 34 255 | 194 150 | 302 165 | 30 230 | 15 615 | 18.3 | 12.9 | 42.5 | 34.8 |
| Lake Superior Shore | 13 815 | 18 635 | 4 310 | 5 055 | 41 195 | 58 270 | 4 875 | 2 860 | 17.8 | 17.6 | 49.9 | 52.1 |
| **Hudson Bay and Ungava Bay Basin** | **149 325** | **214 445** | **93 020** | **179 390** | **875 405** | **1 420 545** | **111 490** | **69 280** | **21.1** | **15.2** | **56.7** | **46.5** |
| Hudson Bay and Ungava Bay Coastal | 10 005 | 15 620 | 4 510 | 8 440 | 47 310 | 76 750 | 10 475 | 7 305 | 34.1 | 28.0 | 80.1 | 73.5 |
| Nelson River | 805 | 810 | 1 100 | 335 | 4 375 | 6 565 | 1 180 | 455 | 45.3 | 32.3 | 78.9 | 89.0 |
| Lake Winnipeg Shore | 49 770 | 60 225 | 18 435 | 21 740 | 190 260 | 264 910 | 23 620 | 12 730 | 16.0 | 11.9 | 43.4 | 38.0 |
| Assiniboine River | 20 100 | 25 140 | 12 925 | 19 705 | 168 945 | 227 735 | 19 240 | 9 540 | 25.6 | 18.2 | 68.1 | 57.7 |
| Saskatchewan River | 68 645 | 112 650 | 56 050 | 129 170 | 464 515 | 844 585 | 56 975 | 39 250 | 19.7 | 14.1 | 54.4 | 42.8 |
| **Arctic Ocean Basin** | **5 460** | **10 750** | **7 270** | **15 210** | **46 200** | **93 830** | **9 250** | **6 405** | **34.1** | **28.8** | **75.2** | **70.1** |
| Mackenzie River | 5 365 | 10 645 | 7 195 | 15 045 | 44 770 | 90 675 | 8 685 | 6 225 | 34.6 | 29.3 | 75.4 | 70.3 |
| Arctic Ocean Coastal | 95 | 105 | 75 | 165 | 1 430 | 3 155 | 565 | 180 | 9.3 | 9.9 | 49.3 | 58.1 |
| **Pacific Ocean Basin** | **145 470** | **194 780** | **62 405** | **103 160** | **552 975** | **929 570** | **70 725** | **51 685** | **15.3** | **12.9** | **46.0** | **43.5** |
| Columbia River | 16 105 | 23 165 | 8 125 | 15 180 | 54 395 | 97 455 | 7 575 | 5 100 | 25.2 | 19.7 | 61.4 | 52.6 |
| Fraser River | 82 235 | 112 115 | 36 175 | 55 810 | 302 595 | 516 915 | 37 180 | 28 520 | 11.8 | 10.3 | 36.3 | 35.7 |
| Yukon River | 130 | 265 | 530 | 865 | 4 795 | 8 940 | 995 | 920 | 19.4 | 13.3 | 67.8 | 58.6 |
| Pacific Ocean, North Coastal | 7 300 | 10 235 | 1 550 | 2 585 | 13 510 | 22 730 | 2 605 | 1 620 | 42.0 | 36.9 | 84.0 | 80.9 |
| Pacific Ocean, South Coastal | 39 700 | 49 000 | 16 025 | 28 720 | 177 680 | 293 530 | 22 370 | 15 525 | 14.8 | 12.5 | 49.8 | 46.6 |
| **Gulf of Mexico Basin** | **40** | **250** | **110** | **290** | **1 755** | **2 210** | **380** | **295** | **66.2** | **53.8** | **96.1** | **85.6** |
| Missouri River | 40 | 250 | 110 | 290 | 1 755 | 2 210 | 380 | 295 | 66.2 | 53.8 | 96.1 | 85.6 |
| **Canada** | **1 707 335** | **2 219 375** | **538 220** | **752 365** | **4 979 385** | **7 800 315** | **681 940** | **404 335** | **11.8** | **9.7** | **31.7** | **29.5** |

[1] The experienced labour force is derived by deleting from the total labour force, unemployed persons 15 years and over who had never worked or who had worked only prior to January 1, 1970 or January 1, 1980, as applicable.

[2] The 1981 data were compiled as far as feasible in accordance with the 1971 Census definition of the labour force; the resulting universe however still reflects certain differences. First, women working less than 20 hours per week without pay on a family farm were included in 1981 but had been excluded in 1971. Second, the "looking for work" reference period was increased from one week in 1971 to four weeks in 1981.

[3] Industry data for both years are based on the 1970 Standard Industrial Classification.

[4] The resource base industries include the following: agriculture (SIC 001-021), forestry (SIC 031-039), fishing and trapping (SIC 041-047), mines, quarries and oil wells (SIC 051-099), fish product industries (SIC 102), fruit and vegetable processing industries (SIC 103), sawmills, planing mills and shingle mills (SIC 251), pulp and paper mills (SIC 271), smelting and refining (SIC 295).

[5] Includes transportation, communication and other utilities (SIC 501-579), trade (SIC 602-699), finance, insurance and real estate (SIC 701-737), community, business and personal service industries (SIC 801-899), public administration and defence (SIC 902-991).

[6] The all good producing industries include the primary and secondary industries. Please note that this ratio excludes the service sector industries.

**Source:**
Statistics Canada, Census of Population, 1971 and 1981, special tabulations.

**Note:**
The 1971 and 1981 figures have been random rounded. Since drainage area totals have been rounded independently, they may not add exactly to the Canada totals.

Table 2.1.12
## Ecozone Socio-Economic Profile, 1971 and 1981

| Characteristics | Ecozone | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Atlantic Maritime | | Mixed-Wood Plain | | Boreal Shield | | Prairie | |
| | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 |
| Sex: | | | | | | | | |
| Male | 946 095 | 1 002 970 | 5 808 905 | 6 343 815 | 1 130 635 | 1 190 395 | 1 499 100 | 1 795 635 |
| Female | 934 200 | 1 015 605 | 5 914 595 | 6 593 930 | 1 075 980 | 1 161 880 | 1 482 980 | 1 782 565 |
| Age Groups: | | | | | | | | |
| 0-14 years | 592 040 | 484 805 | 3 325 065 | 2 761 925 | 758 480 | 608 495 | 883 635 | 827 695 |
| 15-24 years | 369 705 | 396 485 | 2 158 130 | 2 430 760 | 435 390 | 476 105 | 552 150 | 723 955 |
| 25-64 years | 754 330 | 925 715 | 5 312 555 | 6 484 685 | 874 480 | 1 078 700 | 1 280 675 | 1 678 535 |
| 65 years and over | 164 225 | 211 560 | 927 750 | 1 260 375 | 138 265 | 188 980 | 265 625 | 348 020 |
| Age Dependency Ratio[1] (percent) | 67.3 | 52.7 | 56.9 | 45.1 | 68.5 | 51.3 | 62.7 | 48.9 |
| Mobility Status: | | | | | | | | |
| Migrants[2](as a percentage of population age 5 and over) | 18.1 | 17.1 | 23.6 | 21.2 | 20.0 | 17.4 | 23.7 | 23.7 |
| Income[3] per Capita (1980 dollars) | 4 318 | 6 448 | 6 376 | 8 677 | 4 620 | 6 824 | 5 545 | 9 057 |
| Private Households, Total | 469 585 | 629 240 | 3 347 790 | 4 482 330 | 527 910 | 709 570 | 875 265 | 1 249 325 |
| Average Income[3] (1980 dollars) | 16 647 | 20 331 | 21 804 | 24 747 | 18 581 | 22 238 | 18 348 | 25 563 |
| Labour Force[4], Total | 671 835 | 906 435 | 4 961 835 | 6 695 530 | 743 425 | 1 039 285 | 1 288 215 | 1 889 575 |
| Education (as a percentage of labour force): | | | | | | | | |
| Less than Grade 9 | 33.6 | 17.0 | 27.5 | 13.6 | 35.1 | 18.0 | 23.2 | 9.9 |
| University, without Degree | 7.4 | 9.5 | 7.6 | 9.3 | 6.4 | 7.7 | 8.9 | 10.9 |
| University Degree | 5.5 | 9.1 | 7.4 | 11.3 | 4.4 | 7.2 | 6.9 | 11.1 |
| Unemployment Rate (percent) | 9.2 | 16.0 | 7.8 | 9.7 | 9.9 | 15.9 | 6.3 | 6.0 |
| Experienced[5] Labour Force, Total | 655 535 | 874 995 | 4 855 605 | 6 545 155 | 721 690 | 1 000 200 | 1 289 090 | 1 872 715 |
| Percentage Distribution by Industry[6]: | | | | | | | | |
| Agriculture | 4.2 | 3.3 | 3.7 | 3.0 | 2.5 | 1.8 | 14.6 | 8.8 |
| Forestry | 2.2 | 2.1 | 0.2 | 0.2 | 2.9 | 2.9 | 0.1 | 0.1 |
| Fishing and Trapping | 1.8 | 1.7 | -- | -- | 1.0 | 1.1 | -- | -- |
| Mines, Quarries and Oil Wells | 1.7 | 1.5 | 0.4 | 0.3 | 7.4 | 5.5 | 2.1 | 3.6 |
| Manufacturing Industries | 14.7 | 14.8 | 25.1 | 23.3 | 15.1 | 16.3 | 10.0 | 9.8 |
| Construction | 7.3 | 6.7 | 5.7 | 5.2 | 7.7 | 6.5 | 6.2 | 8.5 |
| Transportation | 8.8 | 8.1 | 7.0 | 7.2 | 8.7 | 8.2 | 8.6 | 8.7 |
| Trade | 14.6 | 16.2 | 14.6 | 16.3 | 13.3 | 15.2 | 15.7 | 17.1 |
| Finance | 2.7 | 3.7 | 4.8 | 5.7 | 2.1 | 3.0 | 3.8 | 5.3 |
| Services | 23.2 | 28.4 | 23.7 | 28.5 | 23.0 | 28.1 | 24.2 | 27.8 |
| Public Administration | 10.9 | 10.2 | 7.0 | 7.0 | 7.0 | 7.6 | 7.7 | 7.4 |
| Unspecified or Undefined | 8.0 | 3.3 | 7.8 | 3.3 | 9.4 | 3.9 | 6.9 | 2.9 |
| Ratio of Resource Base Industries[7] to All Industries (percent) | 17.2 | 15.4 | 5.8 | 4.6 | 24.0 | 20.6 | 18.4 | 13.1 |
| Ratio of Resource Base Industries to All Good Producing Industries[8] (percent) | 49.7 | 49.5 | 15.4 | 13.8 | 59.5 | 58.2 | 51.8 | 41.4 |

Table 2.1.12
**Ecozone Socio-Economic Profile, 1971 and 1981 (continued)**

| Characteristics | Ecozone | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Boreal Plain | | Montane Cordillera | | Pacific Maritime | | Boreal Cordillera | |
| | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 |
| Sex: | | | | | | | | |
| Male | 267 490 | 317 610 | 262 055 | 354 390 | 824 710 | 993 815 | 10 430 | 13 580 |
| Female | 243 825 | 293 910 | 244 260 | 343 285 | 827 795 | 1 020 285 | 8 945 | 12 255 |
| Age Groups: | | | | | | | | |
| 0-14 years | 179 955 | 175 780 | 159 135 | 171 460 | 439 510 | 405 720 | 6 855 | 7 005 |
| 15-24 years | 86 985 | 120 590 | 90 750 | 128 390 | 291 045 | 354 965 | 3 485 | 5 120 |
| 25-64 years | 202 875 | 264 170 | 218 610 | 334 560 | 755 140 | 1 019 140 | 8 450 | 12 925 |
| 65 years and over | 41 505 | 50 970 | 37 820 | 63 265 | 166 805 | 234 265 | 585 | 790 |
| Age Dependency Ratio[1] (percent) | 76.4 | 58.9 | 63.7 | 50.7 | 58.0 | 46.6 | 62.3 | 43.2 |
| Mobility Status: | | | | | | | | |
| Migrants[2] (as a percentage of population age 5 and over) | 24.8 | 30.6 | 39.8 | 34.2 | 33.0 | 30.0 | 49.1 | 41.6 |
| Income[3] per Capita (1980 dollars) | 3 987 | 7 264 | 5 678 | 8 611 | 6 790 | 10 035 | 6 902 | 10 118 |
| Private Households, Total | 134 300 | 188 670 | 143 720 | 239 925 | 519 120 | 747 660 | 5 265 | 8 240 |
| Average Income[3] (1980 dollars) | 14 498 | 23 063 | 19 037 | 24 630 | 20 873 | 26 629 | 23 312 | 29 925 |
| Labour Force[4], Total | 189 835 | 280 245 | 204 355 | 341 170 | 716 585 | 1 056 755 | 8 430 | 14 405 |
| Education (as a percentage of labour force): | | | | | | | | |
| Less than Grade 9 | 36.6 | 17.8 | 24.0 | 10.0 | 17.0 | 7.0 | 21.1 | 9.0 |
| University, without Degree | 6.2 | 7.2 | 8.4 | 9.7 | 10.4 | 13.3 | 9.0 | 12.0 |
| University Degree | 3.4 | 6.4 | 4.7 | 6.8 | 7.4 | 11.6 | 5.0 | 9.8 |
| Unemployment Rate (percent) | 5.4 | 8.4 | 8.8 | 11.1 | 9.0 | 8.4 | 6.9 | 10.9 |
| Experienced[5] Labour Force, Total | 187 535 | 277 050 | 200 795 | 335 740 | 700 395 | 1 042 680 | 8 335 | 14 250 |
| Percentage Distribution by Industry[6]: | | | | | | | | |
| Agriculture | 26.7 | 16.1 | 4.9 | 3.9 | 1.7 | 1.6 | 0.9 | 1.2 |
| Forestry | 1.5 | 1.8 | 4.5 | 4.0 | 2.6 | 2.2 | 1.3 | 0.9 |
| Fishing and Trapping | 0.2 | 0.4 | -- | 0.1 | 0.5 | 0.6 | 0.4 | 0.2 |
| Mines, Quarries and Oil Wells | 3.5 | 7.6 | 4.6 | 4.7 | 0.8 | 0.6 | 14.6 | 11.2 |
| Manufacturing Industries | 5.9 | 6.5 | 15.9 | 15.2 | 16.4 | 14.0 | 2.7 | 2.7 |
| Construction | 7.2 | 9.2 | 8.1 | 8.7 | 6.6 | 7.1 | 6.8 | 7.1 |
| Transportation | 7.1 | 7.7 | 9.3 | 8.0 | 9.5 | 9.0 | 14.1 | 11.9 |
| Trade | 11.0 | 13.8 | 14.5 | 16.1 | 16.7 | 17.2 | 10.7 | 12.4 |
| Finance | 1.7 | 3.0 | 2.9 | 3.8 | 5.1 | 6.0 | 2.2 | 3.3 |
| Services | 18.3 | 22.3 | 22.4 | 26.5 | 25.7 | 30.5 | 21.4 | 23.1 |
| Public Administration | 7.7 | 7.7 | 4.6 | 5.5 | 6.8 | 7.4 | 12.3 | 18.0 |
| Unspecified or Undefined | 9.0 | 4.0 | 8.3 | 3.6 | 7.7 | 3.8 | 12.7 | 7.7 |
| Ratio of Resource Base Industries[7] to All Industries (percent) | 38.1 | 29.7 | 26.8 | 22.6 | 12.1 | 10.0 | 21.3 | 16.0 |
| Ratio of Resource Base Industries to All Good Producing Industries[8] (percent) | 76.7 | 68.9 | 64.5 | 59.4 | 39.1 | 36.8 | 69.7 | 62.9 |

Table 2.1.12
## Ecozone Socio-Economic Profile, 1971 and 1981 (continued)

| Characteristics | Ecozone | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Tundra Cordillera | | Taiga Plain | | Taiga Shield | | Hudson Bay Plain | |
| | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 |
| Sex: | | | | | | | | |
| Male | 960 | 685 | 7 055 | 8 080 | 22 565 | 29 010 | 5 530 | 5 070 |
| Female | 565 | 475 | 6 200 | 7 365 | 19 215 | 26 335 | 5 115 | 4 900 |
| Age Groups: | | | | | | | | |
| 0-14 years | 465 | 310 | 5 470 | 5 130 | 16 540 | 18 595 | 4 570 | 4 055 |
| 15-24 years | 295 | 210 | 2 485 | 3 315 | 8 055 | 11 175 | 1 995 | 2 125 |
| 25-64 years | 735 610 | 4 860 | 6 300 | 16 505 | 24 585 | 3 745 | 3 375 | |
| 65 years and over | 30 | 35 | 440 | 695 | 680 | 990 | 340 | 420 |
| Age Dependency Ratio[1] (percent) | 48.1 | 42.1 | 80.5 | 60.6 | 70.1 | 54.8 | 85.5 | 81.4 |
| Mobility Status: | | | | | | | | |
| Migrants[2] (as a percentage of population age 5 and over) | 52.7 | 42.0 | 36.2 | 29.7 | 42.2 | 34.4 | 25.2 | 15.8 |
| Income[3] per Capita (1980 dollars) | 7 481 | 10 115 | 4 423 | 6 603 | 6 270 | 8 642 | 3 990 | 4 090 |
| Private Households, Total | 315 | 305 | 2 855 | 3 905 | 8 800 | 14 895 | 2 095 | 2 110 |
| Average Income[3] (1980 dollars) | 20 743 | 28 126 | 18 634 | 24 525 | 24 824 | 30 755 | 17 421 | 18 849 |
| Labour Force[4], Total | 710 | 585 | 4 060 | 6 385 | 15 395 | 25 000 | 3 245 | 2 985 |
| Education (as a percentage of labour force): | | | | | | | | |
| Less than Grade 9 | 24.6 | 16.2 | 35.1 | 21.5 | 24.6 | 13.0 | 32.5 | 30.2 |
| University, without Degree | 8.5 | 9.4 | 7.3 | 8.2 | 7.5 | 10.1 | 6.0 | 6.5 |
| University Degree | 4.9 | 8.5 | 5.0 | 8.1 | 5.4 | 10.1 | 4.0 | 6.7 |
| Unemployment Rate (percent) | 2.8 | 11.1 | 4.6 | 12.4 | 3.9 | 11.5 | 4.5 | 16.9 |
| Experienced[5] Labour Force, Total | 705 | 575 | 4 040 | 6 255 | 15 220 | 24 445 | 3 210 | 2 850 |
| Percentage Distribution by Industry[6]: | | | | | | | | |
| Agriculture | 0 | 0 | 0.1 | 0.2 | 0.1 | 0.1 | 0 | 0.2 |
| Forestry | 0 | 0 | 3.2 | 1.8 | 1.2 | 0.3 | 0.6 | 2.1 |
| Fishing and Trapping | 0 | 0 | 2.4 | 1.6 | 0.7 | 1.6 | 1.1 | 0.4 |
| Mines, Quarries and Oil Wells | 60.3 | 55.7 | 13.1 | 11.4 | 27.5 | 28.7 | 0.2 | 0.9 |
| Manufacturing Industries | 0.7 | 0 | 2.7 | 3.5 | 1.2 | 1.3 | 0.8 | 0.9 |
| Construction | 5.7 | 2.6 | 5.6 | 7.4 | 3.8 | 4.3 | 4.4 | 5.1 |
| Transportation | 5.0 | 2.6 | 13.4 | 12.6 | 11.9 | 9.3 | 12.1 | 14.0 |
| Trade | 1.4 | 2.6 | 8.2 | 11.6 | 6.9 | 9.5 | 6.4 | 9.1 |
| Finance | 1.4 | 1.7 | 1.1 | 2.5 | 1.2 | 2.4 | 0.9 | 1.8 |
| Services | 11.3 | 13.0 | 20.7 | 22.2 | 15.9 | 22.3 | 27.1 | 32.1 |
| Public Administration | 1.4 | 7.8 | 16.6 | 19.3 | 14.3 | 13.9 | 24.3 | 18.6 |
| Unspecified or Undefined | 12.1 | 13.0 | 12.9 | 5.8 | 15.3 | 6.3 | 21.8 | 14.7 |
| Ratio of Resource Base Industries[7] to All Industries (percent) | 69.4 | 64.0 | 23.9 | 18.7 | 35.0 | 33.1 | 2.6 | 5.3 |
| Ratio of Resource Base Industries to All Good Producing Industries[8] (percent) | 91.5 | 95.5 | 76.7 | 67.5 | 85.7 | 85.6 | 28.9 | 48.1 |

Table 2.1.12
**Ecozone Socio-Economic Profile, 1971 and 1981 (continued)**

| Characteristics | Ecozone | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Southern Arctic | | Northern Arctic | | Arctic Cordillera | | Canada | |
| | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 |
| Sex: | | | | | | | | |
| Male | 5 400 | 7 505 | 4 080 | 5 240 | 365 | 490 | 10 795 370 | 12 068 290 |
| Female | 5 010 | 6 860 | 3 910 | 4 795 | 355 | 435 | 10 772 940 | 12 274 890 |
| Age Groups: | | | | | | | | |
| 0-14 years | 4 965 | 5 530 | 3 865 | 4 180 | 355 | 415 | 6 380 900 | 5 481 100 |
| 15-24 years | 1 760 | 3 150 | 1 380 | 2 150 | 135 | 190 | 4 003 750 | 4 658 695 |
| 25-64 years | 3 450 | 5 310 | 2 640 | 3 490 | 220 | 300 | 9 439 255 | 11 842 410 |
| 65 years and over | 230 | 370 | 105 | 220 | 5 | 20 | 1 744 405 | 2 360 975 |
| Age Dependency Ratio[1] (percent) | 99.7 | 69.7 | 98.8 | 78.0 | 101.4 | 88.8 | 60.4 | 47.5 |
| Mobility Status: | | | | | | | | |
| Migrants[2] (as a percentage of population age five and over) | 28.6 | 26.8 | 21.3 | 23.2 | 12.3 | 14.3 | 23.9 | 22.7 |
| Income[3] per Capita (1980 dollars) | 3 395 | 4 945 | 3 458 | 5 032 | 2 423 | 3 230 | 5 856 | 8 438 |
| Private Households, Total | 2 085 | 3 105 | 1 580 | 2 065 | 135 | 175 | 6 040 815 | 8 281 530 |
| Average Income[3] (1980 dollars) | 15 843 | 21 494 | 16 150 | 22 426 | 12 820 | 16 292 | 20 311 | 24 460 |
| Labour Force[4], Total | 2 540 | 5 070 | 2 150 | 3 400 | 145 | 240 | 8 813 345 | 12 267 075 |
| Education (as a percentage of labour force): | | | | | | | | |
| Less than Grade 9 | 48.2 | 34.8 | 60.9 | 41.8 | 69.0 | 58.3 | 27.2 | 13.1 |
| University, without Degree | 5.9 | 7.4 | 6.0 | 6.6 | 6.9 | 4.2 | 7.9 | 9.7 |
| University Degree | 4.9 | 7.5 | 4.4 | 8.4 | 6.9 | 4.2 | 6.8 | 10.5 |
| Unemployment Rate (percent) | 6.7 | 18.4 | 2.8 | 12.4 | 0 | 22.9 | 7.9 | 10.0 |
| Experienced[5] Labour Force, Total | 2 505 | 4 910 | 2 140 | 3 300 | 145 | 225 | 8 626 925 | 12 005 320 |
| Percentage Distribution by Industry[6]: | | | | | | | | |
| Agriculture | 0 | 0 | 0 | 0 | 0 | 0 | 5.6 | 4.0 |
| Forestry | 0.2 | 0 | 0 | 0 | 0 | 0 | 0.9 | 0.8 |
| Fishing and Trapping | 3.8 | 3.7 | 7.5 | 2.0 | 24.1 | 2.2 | 0.3 | 0.3 |
| Mines, Quarries and Oil Wells | 1.8 | 4.4 | 0.7 | 5.6 | 0 | 0 | 1.6 | 1.7 |
| Manufacturing Industries | 4.8 | 4.6 | 4.9 | 2.4 | 0 | 0 | 19.8 | 18.5 |
| Construction | 3.0 | 3.6 | 3.7 | 3.9 | 0 | 2.2 | 6.2 | 6.3 |
| Transportation | 8.2 | 10.1 | 6.8 | 10.5 | 3.4 | 8.9 | 7.8 | 7.8 |
| Trade | 11.0 | 9.9 | 7.7 | 12.1 | 10.3 | 11.1 | 14.7 | 16.3 |
| Finance | 0.6 | 3.5 | 0.2 | 3.2 | 0 | 4.4 | 4.2 | 5.2 |
| Services | 21.8 | 26.3 | 17.5 | 27.9 | 13.8 | 35.6 | 23.7 | 28.3 |
| Public Administration | 27.7 | 22.2 | 29.2 | 24.5 | 31.0 | 31.1 | 7.4 | 7.4 |
| Unspecified or Undefined | 17.4 | 11.7 | 21.3 | 8.2 | 10.3 | 2.2 | 7.9 | 3.4 |
| Ratio of Resource Base Industries[7] to All Industries (percent) | 7.5 | 11.8 | 10.4 | 8.3 | 26.9 | 2.3 | 11.8 | 9.7 |
| Ratio of Resource Base Industries to All Good Producing Industries[8] (percent) | 45.6 | 64.2 | 48.6 | 54.3 | 100.0 | 50.0 | 31.7 | 29.5 |

Table 2.1.12
## Ecozone Socio-Economic Profile, 1971 and 1981 (concluded)

[1] Age Dependency Ratio = $\frac{\text{(Persons age 0-14 and 65 and over)}}{\text{(Persons age 15-64)}} \times 100$

This variable indicates the relation between the size of the mostly non-working age population and that of the mostly working age population.

[2] Migrants are persons who, on Census day, were found to be residing in a Census Subdivision different from the one they were residing in five years earlier or were living outside Canada five years earlier. The mobility universe is the population 5 years of age and over residing in Canada on Census day. However, in this table inmates of institutions are excluded from the 1981 universe.

[3] Income refers to the total money income received during calendar year 1970 or 1980, as applicable. In this table, the 1971 Census income sample covers all individuals 15 years and over, while the 1981 sample covers, the population 15 years and over, excluding the inmates of institutions. Also, income data for 1970 were inflated in terms of the 1980 purchasing power of the dollar. Thus, income data are presented in 1980 dollars.

[4] The 1981 data were compiled as far as feasible in accordance with the 1971 Census definition of the labour force; the resulting universe however, still reflects certain differences. First, women working less than 20 hours per week without pay on a family farm were included in 1981 but had been excluded in 1971. Second, the "looking for work" reference period was increased from one week in 1971 to four weeks in 1981.

[5] The experienced labour force is derived by deleting from the total labour force, unemployed persons 15 years and over who had never worked or who had worked only prior to January 1, 1970 or January 1, 1980, as applicable.

[6] Industry data for both years are based on the 1970 Standard Industrial Classification.

[7] The resource base industries include the following: agriculture (SIC 001-021), forestry (SIC-031-039), fishing and trapping (SIC 041-047), mines, quarries and oil wells (SIC 051-099), fish product industries (SIC 102), fruit and vegetable processing industries (SIC 103), sawmills, planing mills and shingle mills (SIC 251), pulp and paper mills (SIC 271), smelting and refining (SIC 295).

[8] The all good producing industries include the primary and secondary industries. Note that this ratio excludes the service sector industries (ie. transportation, communication and other utilities (SIC 501-579), trade (SIC 602-699), finance, insurance and real estate (SIC 701-737), community, business and personal service industries (SIC 801-899), public administration and defence (SIC 902-991)).

**Source:**
Statistics Canada, Census of Population,1971 and 1981, special tabulations.

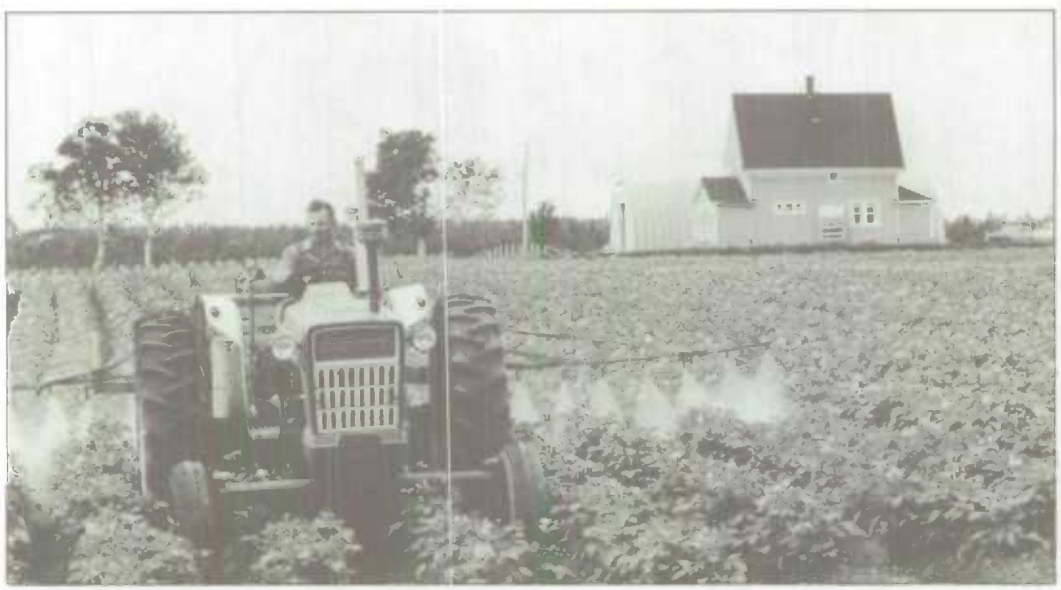
**Note:**
The 1971 and 1981 figures have been random rounded. Since totals have been rounded independently, they do not necessarily equal the sum of individually rounded figures.

# 3

# Harvesting

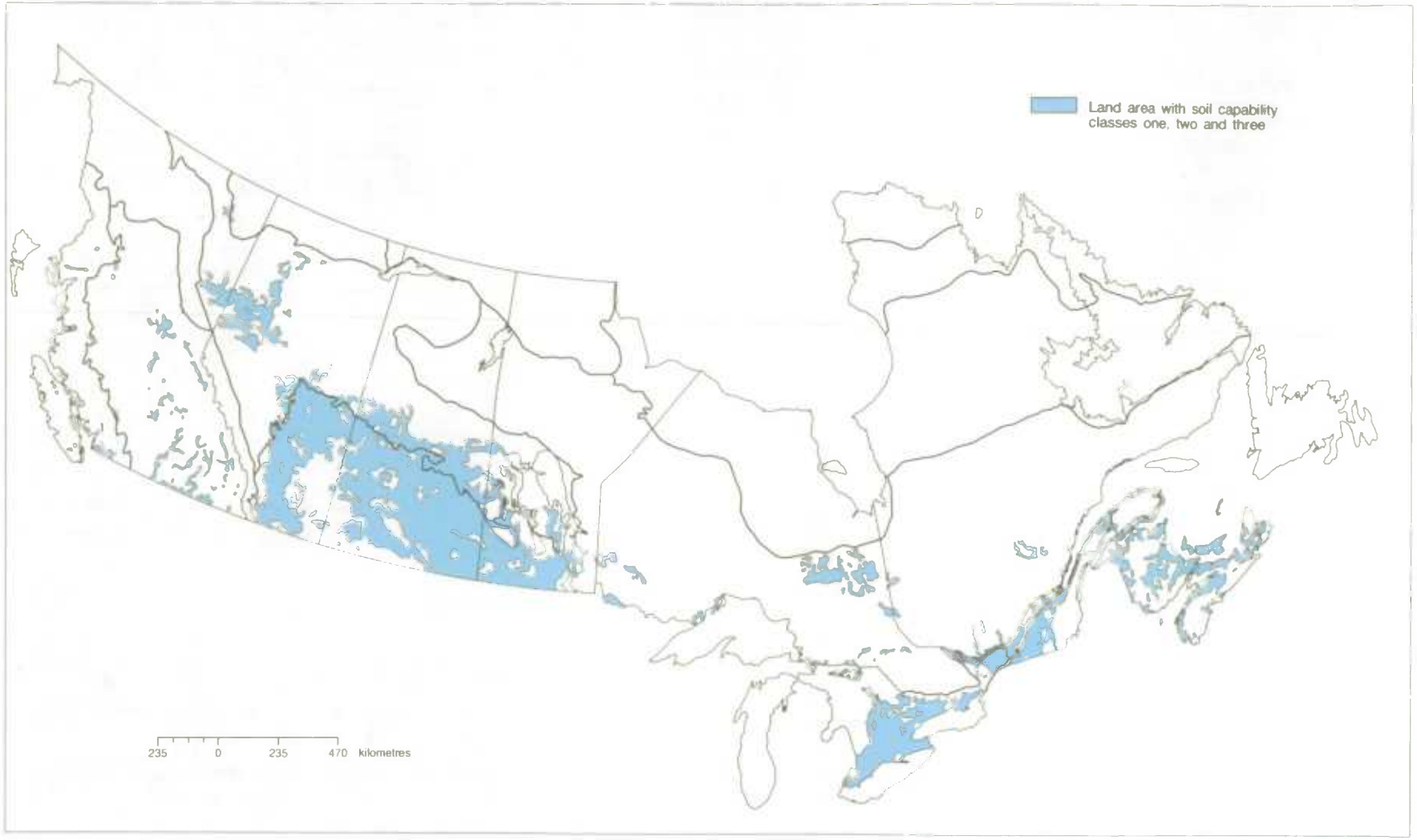
# Contents

# 3.1
# Agriculture



Map 3.1.1

## Canada Land Inventory Agricultural Soil Capability, Classes One, Two and Three[1]




[1] Moderate to high capability for agriculture; see Technical Box 3.1.2 for additional information.

**Sources:**
Environment Canada, Lands Directorate, *Canada's Special Resource Lands*, by Wendy Simpson-Lewis *et al.*, 1979.
British Columbia Environment and Land Use Committee Secretariat, *Agriculture Land Capability in British Columbia*, 1976.

Technical Box 3.1.2

## The Canada Land Inventory Soil Capability Classes

The Canada Land Inventory Program involved the mapping and assessment of 2.5 million square kilometres in the settled areas of Canada, for agriculture, forestry, recreation, and wildlife capability as well as present land use. The information for the C.L.I. mapping was gathered between 1960 and 1968, and compiled usually at a scale of 1:50,000. The interpretation of land use was completed by field survey and air photo review.

Land capability refers to the ability of the land to accommodate a particular use or activity without permanent damage. Determination of capability involves interpreting climate, vegetation, soil, and other data. Seven classes of capability were established for each use. The following are the seven classes for agriculture. The first three are considered capable of sustained production of commonly cultivated crops, the fourth is marginal for arable cultivation, the fifth is capable of use only for permanent pasture and hay, the sixth is capable of use only for wild pasture, while the seventh class is for soils and land types considered incapable of use for arable cultivation or permanent pasture.

**Class 1** Soils in this class have no significant limitations for crops;
These deep soils are level or have very gentle slopes, are 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;
These deep soils 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 from any one of a number of factors including mildly adverse regional climate, moderate effects of erosion, poor soil structure or slow permeability, low fertility 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 practises are more difficult to apply and maintain.
Limitations arise from a combination of two of the factors described under Class 2, or from one of the following: moderate climatic limitations; moderately severe effects of erosion; an 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 a soil which is slow to release water; stoniness sufficiently severe to seriously handicap cultivation and necessitating some clearing; a restricted rooting zone; 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 include the adverse effects of a combination of two or more of those described in Classes 2 and 3, or one of the following: moderately severe climate; very low water-holding capacity; low fertility that is difficult or not feasible to correct; strong slopes; severe past erosion; a very intractable soil mass 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; a very restricted rooting zone, but more than 30 centimetres of soil over bedrock; an impermeable layer;

**Class 5** Soils in this class have very severe limitations that restrict their capability to produce perennial forage crops; 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;

Technical Box 3.1.2

## The Canada Land Inventory Soil Capability Classes (concluded)

Limitations include the adverse effects of one or more of the following: 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; stoniness or shallowness of soil that makes annual cultivation impractical;
Some soils can be used for cultivated field crops provided unusually intensive management is carried out;

**Class 6** Soils in this class are only capable 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 on Class 5 soils;
Limitations include the adverse effects of one or more of the following: 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 salt-tolerant, native plants; very frequent overflow allowing less than 10 weeks effective grazing; water on the surface of the soil for most of the year; stoniness or shallowness of soil that makes any cultivation impractical.

**Class 7** Soils in this class have no capability for cultivation or permanent pasture;
All classified areas (except organic soils) not included in Classes 1 to 6 are placed in this class.

**Source:**
Environment Canada, Lands Directorate, *Canada's Special Resource Lands*, by Wendy Simpson-Lewis *et al.*, 1981.

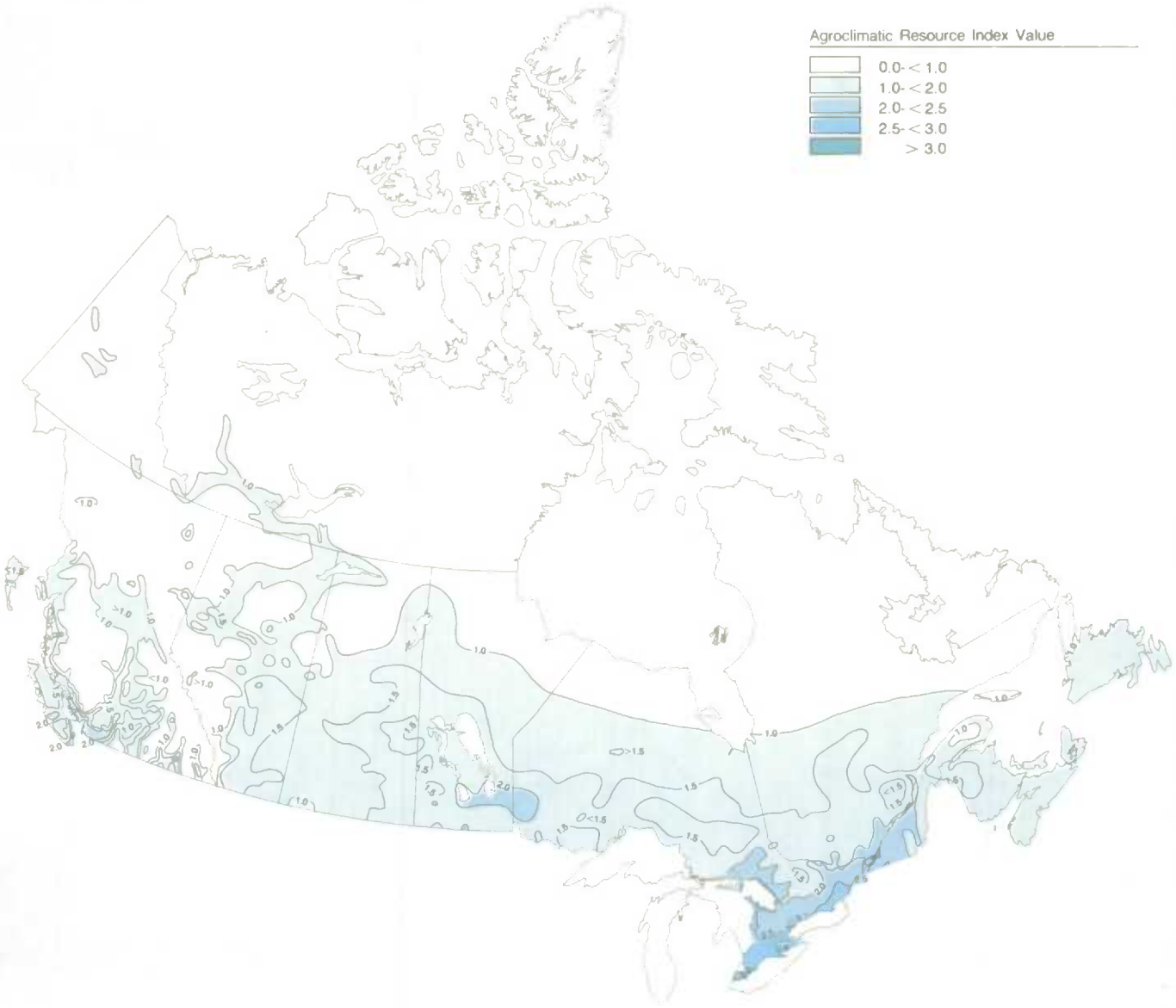
Table 3.1.3
## Canada Land Inventory: Soil Capability for Agriculture

| | Soil Capability Classes | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Organic[1] | Unclassed[2] | Not Classified by CLI | Total Land Area |
| | hectares | | | | | | | | | | |
| Newfoundland | 0 | 0 | 1 851 | 16 613 | 91 517 | 207 439 | 644 075 | 217 918 | 1 446 929 | 37 945 658 | 40 572 000 |
| Prince Edward Island | 0 | 261 561 | 141 519 | 49 776 | 76 064 | 0 | 27 716 | 6 686 | 181 | 2 497 | 566 000 |
| Nova Scotia | 0 | 166 317 | 982 877 | 424 410 | 82 215 | 14 325 | 3 516 041 | 116 301 | 860 | 245 654 | 5 549 000 |
| New Brunswick | 0 | 160 528 | 1 151 144 | 2 032 089 | 1 700 253 | 11 543 | 1 838 630 | 132 768 | 115 306 | 201 739 | 7 344 000 |
| Quebec | 19 556 | 907 106 | 1 277 202 | 2 580 503 | 1 658 600 | 10 671 | 20 599 589 | 1 516 902 | 132 117 | 125 465 754 | 154 068 000 |
| Ontario | 2 156 752 | 2 217 667 | 2 908 818 | 2 624 648 | 1 915 301 | 1 140 285 | 11 221 332 | 2 563 271 | 782 742 | 79 327 184 | 106 858 000 |
| Manitoba | 162 501 | 2 530 607 | 2 440 659 | 2 394 118 | 2 323 786 | 2 092 169 | 1 088 592 | 4 741 738 | 3 858 208 | 43 365 622 | 64 995 000 |
| Saskatchewan | 999 691 | 5 874 448 | 9 424 700 | 3 893 109 | 8 736 287 | 3 950 141 | 225 526 | 2 788 605 | 1 126 956 | 28 213 537 | 65 233 000 |
| Alberta | 786 527 | 3 837 093 | 6 105 329 | 9 279 576 | 11 093 057 | 3 930 670 | 4 191 398 | 5 991 972 | 2 658 857 | 18 244 521 | 66 119 000 |
| British Columbia[3] | 21 057 | 235 474 | 692 026 | 1 701 678 | 6 671 675 | 5 419 073 | 15 254 812 | ... | ... | 64 784 205 | 94 780 000 |
| Northwest Territories and Yukon[4] | .. | .. | .. | .. | .. | .. | .. | .. | .. | 390 977 000 | 390 977 000 |
| **Total** | **4 146 084** | **16 190 801** | **25 126 125** | **24 996 520** | **34 348 755** | **16 776 316** | **58 607 711** | **18 076 161** | **10 122 156** | **722 872 032** | **997 061 000** |

[1] Organic soils are peatlands, bogs and marshes capable of supporting agricultural production and can be distinguished from mineral soils by their high organic content.
[2] Unclassed lands are unmapped areas, water, forest reserves, national parks, urban areas, provincial parks.
[3] In British Columbia, organic soils are not separately identified and have been classified to equivalently rated mineral soils.
[4] Not covered by Canada Land Inventory.

**Source:**
Environment Canada, Lands Directorate, *Agricultural Land Use Change in Canada*, by J.D. McCuaig and E.W. Manning, Catalogue 73-1/21E, 1982.

Map 3.1.4
## Canadian Agroclimatic Resource Index




**Source:**
G.D.V. Williams, Agriculture Canada, as published in Environment Canada, *Canada's Special Resource Lands*, by Wendy Simpson-Lewis *et al.*, 1979.

**Note:**
The agroclimatic resource index was developed to offer a geographical evaluation of critical climatic parameters affecting agriculture. Williams reasoned that length of frost-free period was of prime importance and therefore this forms the basic element of the index. The index is based on the number of frost-free days divided by 60 (ie. minimum growing period). Adjustments were then made to the index to account for two other important types of climatic restrictions on agriculture. In regions with a significant shortage of moisture such as in the drier part of the Prairies and some interior valleys of British Columbia, the index was modified downward, by applying Sly's data on moisture index (Agriculture Canada, 1976), to reflect the degree of moisture limitation. On the other hand, some coastal locations have a different climatic shortcoming. In spite of a long frost-free season, summer heat may be inadequate for crops requiring a long growing season to fully mature. Therefore, utilizing growing degree-day information, the agroclimatic index was again altered downward to reflect the lack of sufficient summer heat in coastal areas. The resulting agroclimatic index, ACRI, has values which vary from 1.0 in the north (agricultural frontier areas) to 3.0 in the south near Windsor, Ontario.

Table 3.1.5
## Farms and Farmland, 1901 to 1981[1]

| | Improved Farmland | | | | | | Unimproved Farmland | | | Total Farmland | Number of Farms | Average Farm Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cultivated Land[2] | | | | Other | Total Improved Farmland | Woodland | Other | Total Unimproved Farmland | | | |
| | Cropland | Improved Pasture | Summer Fallow | Total Cultivated Land | | | | | | | | |
| | millions of hectares | | | | | | | | | | number | hectares |
| 1901 | 8.1 | 0 | .. | 8.1 | .. | 12.2 | 6.8 | 6.7 | 13.5 | 25.7 | 511.1 | 50.3 |
| 1911 | 14.4 | 0 | 1.0 | 15.4 | .. | 19.7 | 7.1 | 17.3 | 24.4 | 44.1 | 682.8 | 64.5 |
| 1921 | 20.2 | 3.1 | 4.8 | 28.1 | 0.4 | 28.6 | 9.6 | 18.7 | 28.4 | 57.0 | 711.1 | 80.2 |
| 1931 | 23.6 | 3.2 | 6.8 | 33.6 | 1.0 | 34.7 | 10.8 | 20.5 | 31.3 | 66.0 | 728.6 | 90.6 |
| 1941 | 22.8 | 3.4 | 9.5 | 35.7 | 1.3 | 37.1 | 9.0 | 24.1 | 33.1 | 70.2 | 732.9 | 95.8 |
| 1951 | 25.2 | 4.0 | 8.9 | 38.1 | 1.1 | 39.2 | 9.2 | 22.0 | 31.2 | 70.4 | 623.1 | 113.1 |
| 1961 | 25.3 | 4.1 | 11.4 | 40.8 | 1.0 | 41.8 | 6.8 | 21.0 | 28.0 | 69.8 | 480.9 | 145.2 |
| 1971 | 27.8 | 4.1 | 10.6 | 42.7 | 1.0 | 43.8 | 4.6 | 20.2 | 25.0 | 68.7 | 366.1 | 187.5 |
| 1976 | 28.3 | 4.1 | 10.9 | 43.3 | 0.9 | 44.2 | 4.4 | 19.8 | 24.2 | 68.4 | 338.6 | 202.6 |
| 1981 | 30.9 | 4.4 | 9.7 | 45.0 | 1.0 | 46.1 | 3.5 | 16.2 | 19.8 | 65.9 | 318.4 | 207.0 |

[1] For Census years before 1961, the definition of a Census Farm was "an agricultural holding of more than three acres, or a farm of one to three acres with $250.00 or more in sales." From the 1961 Census to the 1976 Census, the definition of a Census Farm was changed to "an agricultural holding of one acre or more with sales of $50.00 or more." In 1981 the definition was changed to "an agricultural holding with sales of products of $250.00 or more."

[2] Cultivated Land is land under crops, improved pasture (i.e. maintained grasslands) or in fallow.

**Sources:**
Statistics Canada, *Handbook of Agricultural Statistics* Catalogue 21-503, August 1955, for Census data before 1961.
Statistics Canada, Census of Agriculture, for years 1961, 1971 and 1981.

**Notes:**

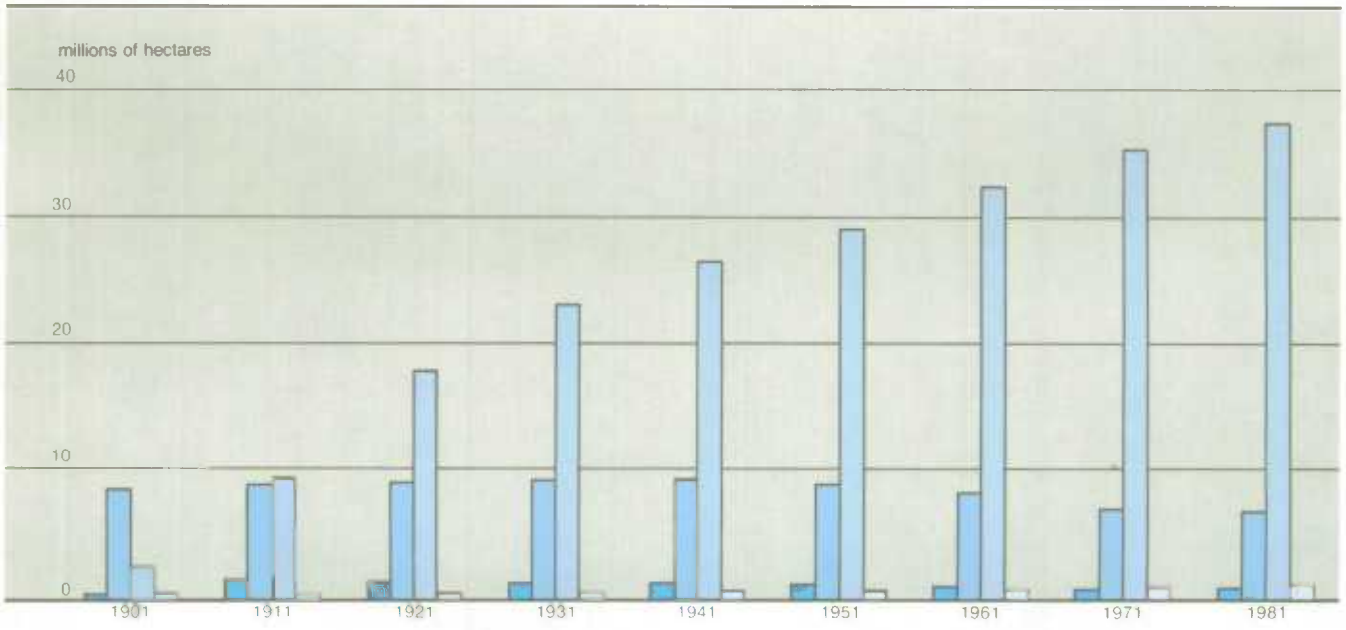
**Improved Land**

The area of improved land consists of the total of the areas reported for the following four land categories: cropland, improved pasture, summerfallow and other improved land.
(i) Cropland - Included in this item is the total area of land sown for harvest in the Census year. Cropland includes the total area of all field crops, plus the areas of fruits, vegetables, greenhouses, mushroom houses and nursery products. The sum of the individual crops is not necessarily equal to cropland since occasionally two crops may be harvested from the same land in one year; also, crops reported in fractions of acres are rounded.
(ii) Improved pasture - All land which was being used for pasture or grazing and which has had some improvements made to it in recent years is included. Improvements include cultivation, drainage, irrigation, fertilization, seeding or spraying.
(iii) Summerfallow - Land normally in crops but from which no crop was harvested during the Census year. The land may have been cultivated or sprayed during the year to control weeds.
(iv) Other improved land - This item includes the area of barnyards, home gardens, lanes and roads on farms. It also includes areas of cultivated land that were lying idle, being neither summerfallowed nor cropped, and newly broken land that had not been seeded to a crop.

**Unimproved Land**

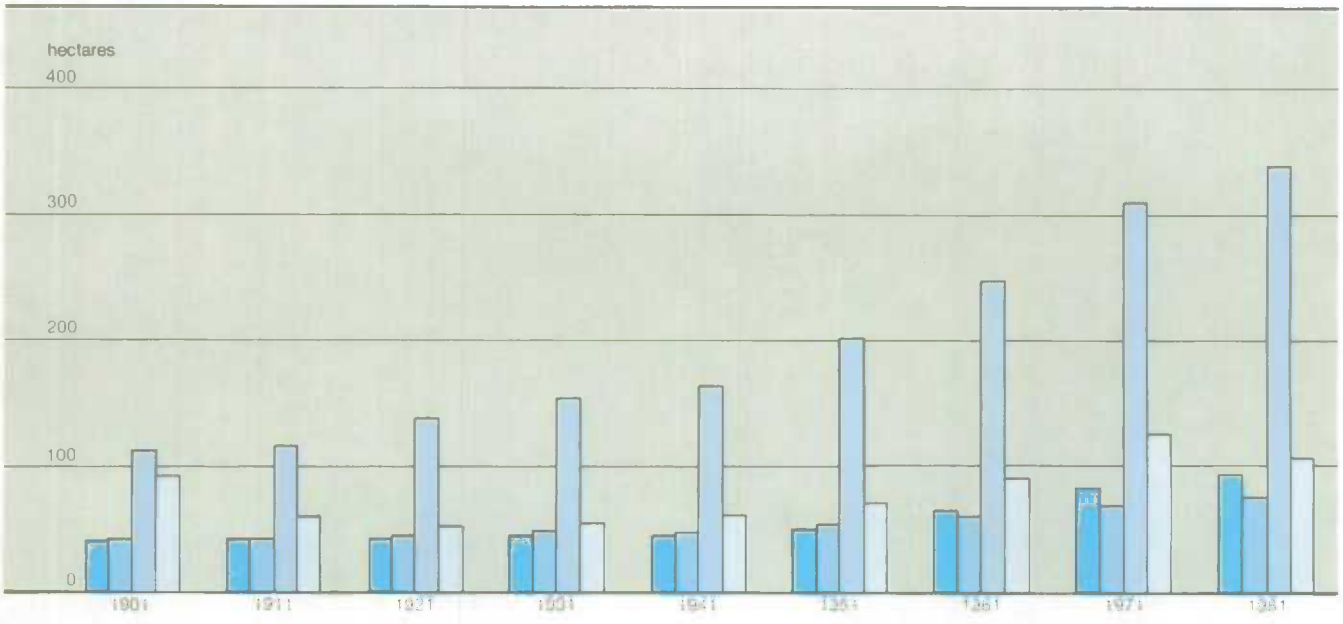
The area of unimproved land consists of the total areas reported as woodland and other unimproved land.
(v) Woodland - This includes farm woodlots, land leased for cutting, sugar bush and cut-over land with young growth which has or will have value as timber, fuelwood or Christmas trees. The area of trees planted for wind-breaks is also included. It excludes large tracts of timber which are run as a separate business from the farm.
(vi) Other unimproved land - Areas of native pasture or hay land that had not been cultivated, brush pasture, grazing or waste land, sloughs, marsh and rocky land are all included in this item.
It should also be noted that individual items may not add to totals due to rounding.

Chart 3.1.6
**Improved Farmland by Region, 1901 to 1981**




**Sources:**
Statistics Canada, *Handbook of Agricultural Statistics*, Catalogue 21-503, August 1955 for Census data before 1961.
Statistics Canada, Census of Agriculture, for years 1961, 1971 and 1981.

Chart 3.1.7
**Average Size of Farm by Region, 1901 to 1981**




**Sources:**
Statistics Canada, *Handbook of Agricultural Statistics*, Catalogue 21-503, August 1955 for Census data before 1961.
Statistics Canada, Census of Agriculture, for years 1961, 1971 and 1981.

Table 3.1.8
## Indicators of Changing Agricultural Technology, 1901 to 1981

| | Total Farmland | Cropland | Labour Force[1] | Fertilizers[2] | Tractors[3] and Combines | Number of Workers | Tonnes of Fertilizers | Number of Tractors and Combines |
|---|---|---|---|---|---|---|---|---|
| | millions of hectares | | thousands of workers | thousands of tonnes | number | per thousand hectares of farmland | per thousand hectares of cropland | |
| 1901 | 25.7 | 8.1 | 718 | .. | .. | 27.9 | .. | .. |
| 1911 | 44.1 | 14.4 | 928 | .. | .. | 21.0 | .. | .. |
| 1921 | 57.0 | 20.2 | 1 025 | .. | 47 455 | 18.0 | .. | 2 |
| 1931 | 66.0 | 23.6 | 1 118 | 254 | 114 227 | 16.9 | 11 | 5 |
| 1941 | 70.2 | 22.8 | 1 074 | 289 | 178 765 | 15.3 | 13 | 8 |
| 1951 | 70.4 | 25.2 | 826 | 688 | 490 186 | 11.7 | 27 | 19 |
| 1961 | 69.8 | 25.3 | 649 | 961 | 705 400 | 9.3 | 38 | 28 |
| 1971 | 68.7 | 27.8 | 510 | 1 885 | 759 449 | 7.4 | 68 | 27 |
| 1976 | 68.4 | 28.3 | 489 | 2 737 | 798 615 | 7.1 | 97 | 28 |
| 1981 | 65.9 | 30.9 | 508 | 3 501 | 818 716 | 7.7 | 113 | 26 |

[1] Includes workers 10 years old and over in 1901 and 15 years old and over in all other years.

[2] Fertilizers refers to applications of commercial fertilizer only and not applications of manure produced on the farm. Up to 1978 these data were obtained from the "Annual Fertilizer Dealer Survey" which includes all fertilizer for sale by dealers. A small amount of this fertilizer was for non-agricultural uses (i.e. household, institution and governments). The 1981 quantity of fertilizers is obtained from the Census of Agriculture, therefore, the 1981 figure is not necessarily comparable to those of the previous years.

[3] Includes only tractors in 1921.

**Sources:**
Statistics Canada, *1921 Census of Canada*, Volume IV.
Statistics Canada, *1961 Census of Canada*, Volume III.
Statistics Canada, *Fertilizer Trade*, Catalogue 46-207, various issues.
Statistics Canada, *1971 Census of Agriculture*, Volume IV.
Statistics Canada, *The Labour Force*, January 1971, Catalogue 71-001.
Statistics Canada, *Labour Force Annual Averages, 1975-78*, Catalogue 71-529.

Chart 3.1.9
**Production of Cattle,[1] 1901 to 1981**

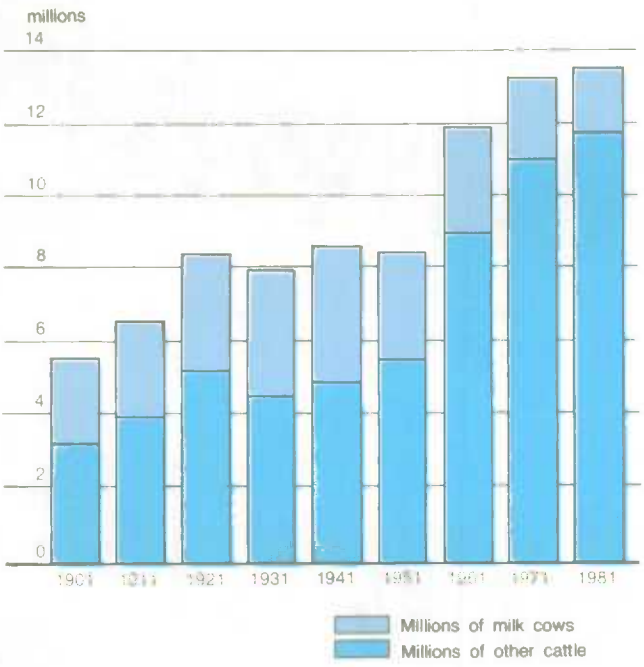



Chart 3.1.10
**Production of Sheep, Horses and Pigs,[1] 1901 to 1981**

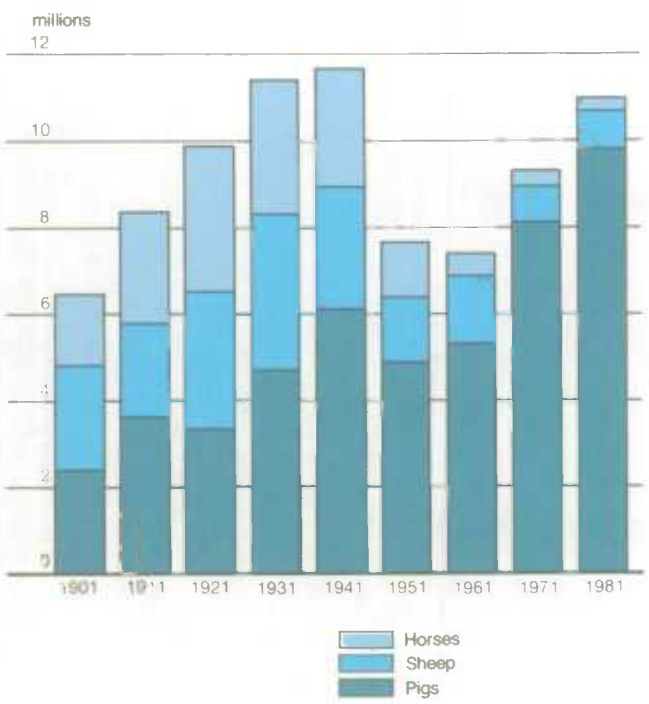
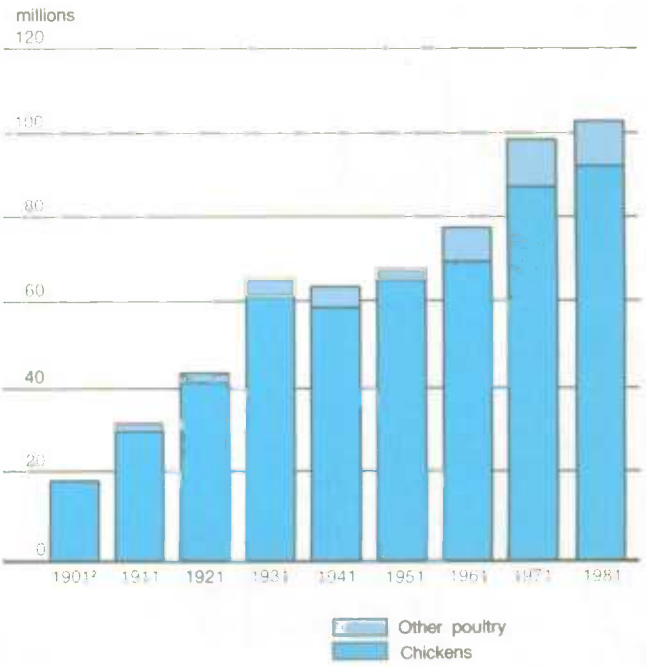


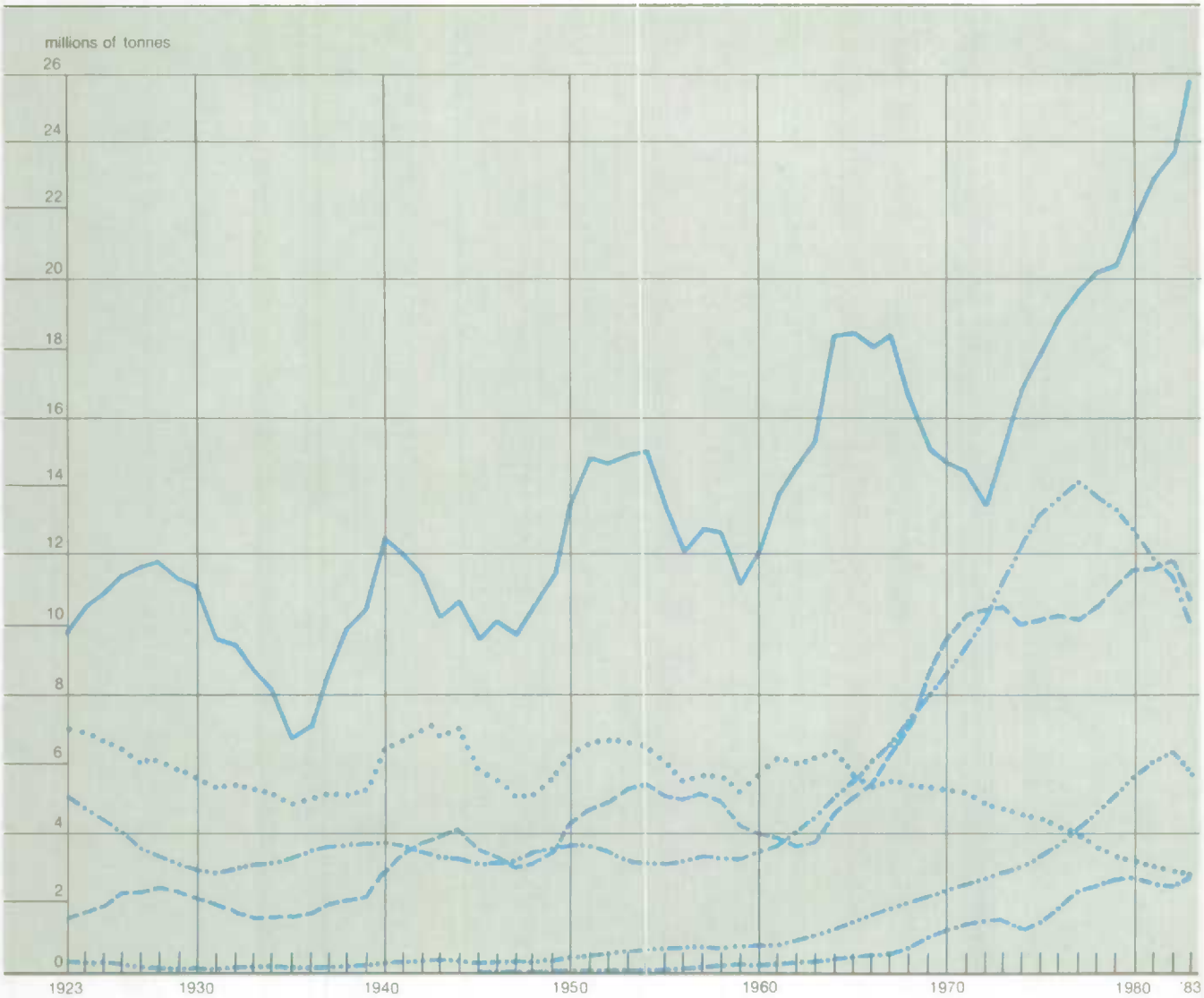

Chart 3.1.11
**Production of Poultry[1], 1901 to 1981**




[1] Includes only animals on Census farms.
[2] Other poultry and chickens were not separated in 1901.

**Sources:**
Statistics Canada, 1941 Census of Canada, Volume I.
Statistics Canada, 1951 Census of Canada, Volume VI.
Statistics Canada, 1971 Census of Agriculture, *Agriculture: Canada*, Catalogue 96-701.
Statistics Canada, 1981 Census of Agriculture, *Agriculture: Canada* Catalogue 96-901.

Chart 3.1.12
**Production of Selected Major Field Crops, 1923 to 1983**
(five year averages)




**Sources:**
Statistics Canada, *Handbook of Agricultural Statistics, part 1, Field Crops 1921-1974*, Catalogue 21-516, 1977.
Statistics Canada, *Handbook of Field Crop Area, Yield Production, Average Farm Price and Value, 1953-1983*, working document, August 1984.

Table 3.1.13

## Production of Selected Major Field Crops by Ecozone, 1971, 1976, and 1981

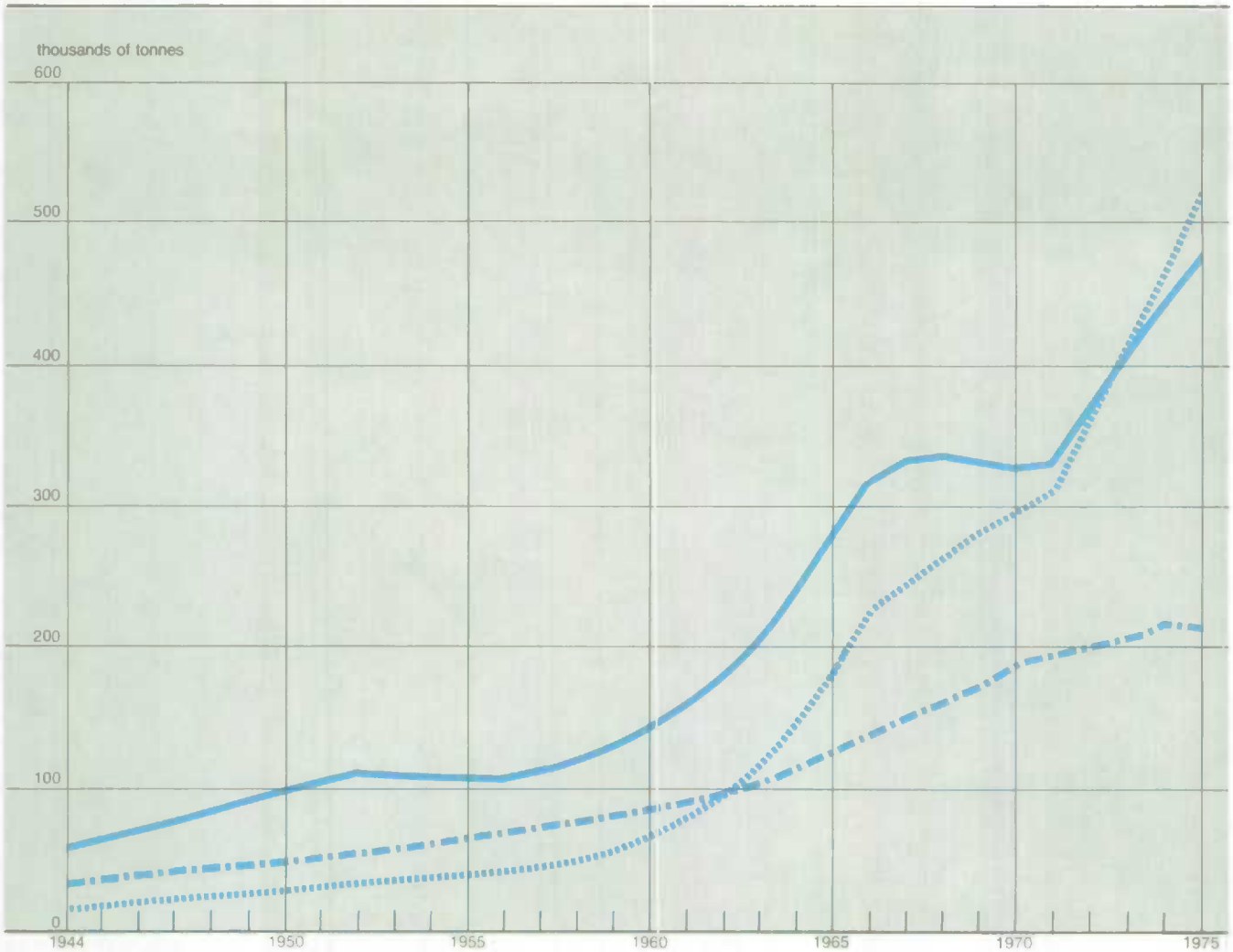
| Ecozone | Close-Row Crops | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Wheat | | | Oats for Grain | | | Barley | | |
| | 1971 | 1976 | 1981 | 1971 | 1976 | 1981 | 1971 | 1976 | 1981 |
| | tonnes | | | tonnes | | | tonnes | | |
| **Atlantic Maritime** | **17 745** | **33 373** | **31 169** | **84 868** | **147 025** | **120 419** | **40 562** | **49 897** | **106 976** |
| Nova Scotia | 5 089 | 4 409 | 8 491 | 11 397 | 15 453 | 14 080 | 7 120 | 4 790 | 9 362 |
| New Brunswick | 5 879 | 5 688 | 10 043 | 35 610 | 31 970 | 30 813 | 6 532 | 5 879 | 9 819 |
| Prince Edward Island | 6 777 | 20 276 | 9 036 | 37 861 | 48 302 | 29 009 | 26 911 | 33 530 | 60 005 |
| Québec | .. | 3 000 | 3 600 | .. | 51 299 | 46 517 | .. | 5 698 | 27 789 |
| **Mixed-Wood Plain** | **392 914** | **738 300** | **846 545** | **514 039** | **530 424** | **408 490** | **439 933** | **355 236** | **742 293** |
| Québec | .. | 54 301 | 113 603 | .. | 244 097 | 187 166 | .. | 25 993 | 213 019 |
| Ontario | 392 914 | 683 999 | 732 942 | 514 039 | 286 327 | 221 323 | 439 933 | 329 243 | 529 274 |
| **Boreal Shield** | **20 310** | **27 096** | **37 488** | **110 977** | **116 475** | **91 648** | **24 916** | **32 202** | **87 883** |
| Québec | .. | 2 600 | 2 300 | .. | 41 100 | 32 812 | .. | 6 998 | 16 194 |
| Ontario | 1 766 | 391 | .. | 63 135 | 59 545 | 48 302 | 13 478 | 13 869 | 54 271 |
| Manitoba | 18 544 | 24 106 | 35 188 | 47 843 | 15 831 | 10 534 | 11 438 | 11 335 | 17 419 |
| **Prairie** | **12 794 433** | **20 532 304** | **21 106 821** | **3 610 257** | **3 097 690** | **1 901 726** | **10 246 337** | **719 752** | **9 677 419** |
| Manitoba | 1 887 325 | 2 649 592 | 3 038 399 | 1 020 118 | 825 305 | 388 727 | 1 862 937 | 1 369 734 | 2 094 610 |
| Saskatchewan | 8 748 392 | 13 413 588 | 12 598 161 | 1 315 026 | 1 045 711 | 612 593 | 4 467 270 | 1 953 153 | 2 236 687 |
| Alberta | 2 158 715 | 4 469 124 | 5 470 260 | 1 275 114 | 1 226 674 | 900 405 | 3 916 130 | 3 876 865 | 5 346 122 |
| **Boreal Plain** | **1 157 143** | **2 255 650** | **2 780 452** | **863 351** | **939 425** | **666 322** | **2 313 388** | **2 876 082** | **3 109 531** |
| Manitoba | 108 082 | 129 503 | 252 152 | 104 125 | 99 622 | 63 403 | 172 233 | 77 684 | 217 622 |
| Saskatchewan | 640 970 | 1 582 168 | 1 689 998 | 396 832 | 342 281 | 204 780 | 1 019 383 | 1 007 898 | 1 094 495 |
| Alberta | 317 899 | 484 105 | 751 213 | 282 523 | 408 073 | 348 788 | 960 895 | 1 609 788 | 1 621 057 |
| British Columbia | 90 192 | 59 874 | 87 090 | 79 871 | 89 448 | 49 351 | 160 877 | 180 711 | 176 357 |
| **Canada** | **14 411 900** | **23 586 674** | **24 802 200** | **5 640 093** | **4 831 542** | **3 188 300** | **13 099 300** | **10 513 700** | **13 724 200** |

| Ecozone | Wide-Row Crops | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Corn for Grain | | | Fodder Corn | | | Soybeans | | |
| | 1971 | 1976 | 1981 | 1971 | 1976 | 1981 | 1971 | 1976 | 1981 |
| | tonnes | | | tonnes | | | tonnes | | |
| **Atlantic Maritime** | .. | .. | .. | .. | **401 000** | **235 000** | **0** | **0** | **0** |
| Nova Scotia | .. | .. | .. | .. | 168 000 | 98 000 | 0 | 0 | 0 |
| New Brunswick | .. | .. | .. | .. | 75 000 | 54 000 | 0 | 0 | 0 |
| Prince Edward Island | .. | .. | .. | .. | 158 000 | 83 000 | 0 | 0 | 0 |
| Québec | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| **Mixed-Wood Plain** | **2 591 331** | **3 758 300** | **5 539 000** | **9 443 000** | **13 434 410** | **10 648 900** | **279 800** | **250 400** | **606 800** |
| Québec | .. | 331 300 | 303 000 | 1 607 000 | 3 309 410 | 2 876 900 | 0 | 0 | 0 |
| Ontario | 2 599 000 | 3 427 000 | 5 236 000 | 7 836 000 | 10 125 000 | 7 772 000 | 279 800 | 250 400 | 606 800 |
| **Boreal Shield** | **7 285** | **7 328** | **6 096** | **155 560** | **233 000** | **200 000** | **0** | **0** | **0** |
| Québec | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| Ontario | 7 285 | 7 328 | 6 096 | 155 560 | 233 000 | 200 000 | 0 | 0 | 0 |
| Manitoba | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| **Prairie** | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| Manitoba | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| Saskatchewan | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| Alberta | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| **Boreal Plain** | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| Manitoba | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| Saskatchewan | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| Alberta | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| British Columbia | .. | .. | .. | .. | .. | .. | 0 | 0 | 0 |
| **Canada** | **2 941 500** | **3 759 200** | **6 673 700** | **9 724 000** | **14 423 410** | **12 098 900** | **279 800** | **250 400** | **606 800** |

**Source:**
Statistics Canada, Agriculture Division, Handbook of Field Crop Area, Yield, Production, Average Farm Price and Value, 1953-1983, (working documents) August 1984.
Statistics Canada, Agriculture Crop Production Statistics, special tabulations by Cansim Division.

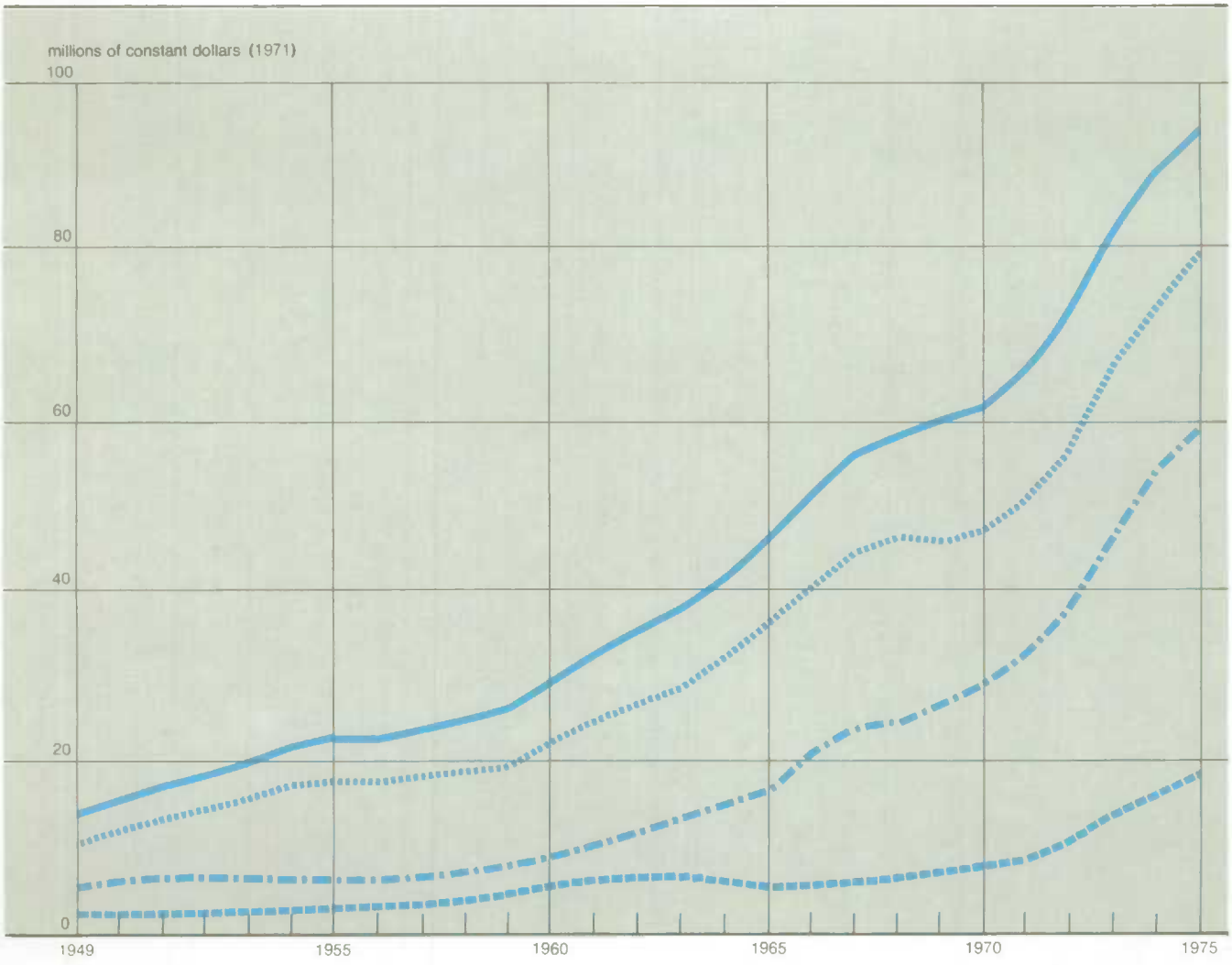
**Note:**
This table was compiled from crop district and county level information . Where data are unavailable by crop district or county they are still included in the national totals. Generally these amounts are negligible for individual geographic units.
Close-row and wide-row crops have been differentiated according to environmental implications associated with the cultivation practices of each; for more detail see Technical Box 3.1.17.

Chart 3.1.14
**Nutrient Content of Fertilizers Sold, 1944 to 1975**
(five year averages)




**Source:**
Statistics Canada, *Fertilizer Trade*, Catalogue 46-207, various issues.

Chart 3.1.15
**Sales of Pest Control Products, 1949 to 1975[1]**
(five year averages)




[1] Data on sales of pest control products have not been collected by Statistics Canada since 1977.

**Sources:**
Statistics Canada, *Sales of Pest Control Products by Canadian Registrants*, Catalogue 46-212, various issues.
Statistics Canada, *Industry Price Indexes*, Catalogue 62-011.

Table 3.1.16
## Agricultural Land Use[1] by Ecozone, 1981

| Ecozone | Area of Ecozone | Farmland Area | Farmland as a Percentage Total Ecozone Area | Number of Farms | Average Farm Size | Cropland Area | Improved Pasture | Woodland Area | Other Land[2] |
|---|---|---|---|---|---|---|---|---|---|
| | thousands of hectares | hectares | percent | number | | hectares | | | |
| **Atlantic Maritime** | **18 881** | **1 609 427** | **8.5** | **16 771** | **96** | **583 127** | **175 007** | **651 895** | **199 398** |
| Prince Edward Island | 566 | 283 024 | 50.0 | 3 154 | 90 | 158 280 | 36 228 | 65 436 | 23 079 |
| Nova Scotia | 5 549 | 466 023 | 8.4 | 5 045 | 92 | 112 782 | 46 106 | 240 842 | 66 293 |
| New Brunswick | 7 295 | 436 502 | 6.0 | 4 060 | 108 | 130 022 | 41 479 | 199 688 | 65 313 |
| Québec | 5 471 | 423 879 | 7.7 | 4 512 | 94 | 182 044 | 51 194 | 145 930 | 44 711 |
| **Mixed-Wood Plain** | **19 496** | **7 888 125** | **40.5** | **113 373** | **70** | **4 721 579** | **861 116** | **1 194 725** | **1 110 705** |
| Québec | 5 694 | 2 560 053 | 45.0 | 36 713 | 70 | 1 293 910 | 289 532 | 658 168 | 318 443 |
| Ontario | 13 802 | 5 328 072 | 38.6 | 76 660 | 70 | 3 427 670 | 571 584 | 536 557 | 792 261 |
| **Boreal Shield** | **171 733** | **1 597 440** | **0.9** | **13 700** | **117** | **515 230** | **196 681** | **483 737** | **401 792** |
| Newfoundland | 12 299 | 33 454 | 0.3 | 679 | 49 | 4 744 | 4 148 | 5 770 | 18 792 |
| New Brunswick | 49 | 1 386 | 2.8 | 3 | 462 | 505 | 0 | 845 | 361 |
| Québec | 69 371 | 795 238 | 1.1 | 6 919 | 115 | 280 084 | 102 833 | 265 402 | 146 918 |
| Ontario | 65 218 | 711 165 | 1.1 | 5 788 | 123 | 205 057 | 85 425 | 205 719 | 214 963 |
| Manitoba | 24 846 | 56 197 | 0.2 | 311 | 182 | 24 841 | 4 275 | 6 001 | 21 080 |
| **Prairie** | **49 114** | **42 626 476** | **86.8** | **116 009** | **367** | **19 934 083** | **2 123 627** | **399 866** | **20 168 900** |
| Manitoba | 7 052 | 5 995 255 | 85.0 | 22 436 | 267 | 3 731 779 | 258 043 | 129 412 | 1 876 021 |
| Saskatchewan | 25 365 | 22 699 936 | 89.5 | 56 605 | 401 | 10 105 171 | 820 220 | 133 658 | 11 640 887 |
| Alberta | 16 698 | 13 931 285 | 83.4 | 36 968 | 377 | 6 097 132 | 1 045 364 | 136 796 | 6 651 992 |
| **Boreal Plain** | **85 820** | **10 585 123** | **12.3** | **40 141** | **264** | **4 885 748** | **824 002** | **657 928** | **4 217 445** |
| Manitoba | 12 969 | 1 564 476 | 12.1 | 6 697 | 234 | 663 750 | 90 189 | 112 772 | 697 765 |
| Saskatchewan | 25 877 | 3 247 148 | 12.5 | 10 711 | 303 | 1 635 692 | 155 144 | 147 995 | 1 308 317 |
| Alberta | 37 585 | 5 079 552 | 13.5 | 20 927 | 607 | 2 330 671 | 530 788 | 352 216 | 1 865 877 |
| British Columbia | 9 390 | 693 947 | 7.4 | 1 806 | 384 | 255 635 | 47 880 | 44 946 | 345 486 |
| **Montane Cordillera** | **46 330** | **1 384 998** | **3.0** | **9 866** | **140** | **245 962** | **191 829** | **139 905** | **807 302** |
| Alberta | 4 386 | 97 677 | 2.2 | 161 | 607 | 13 438 | 5 290 | 3 660 | 75 289 |
| British Columbia | 41 945 | 1 287 321 | 3.1 | 9 705 | 133 | 232 524 | 186 539 | 136 246 | 732 013 |
| **Pacific Maritime** | **19 704** | **170 244** | **0.9** | **8 436** | **20** | **75 176** | **29 668** | **18 789** | **46 611** |
| British Columbia | 19 704 | 170 244 | 0.9 | 8 436 | 20 | 75 176 | 29 668 | 18 789 | 46 611 |
| **Boreal Cordillera** | **42 577** | **27 083** | **0.1** | **65** | **417** | **4 906** | **2 796** | **4 049** | **15 332** |
| British Columbia | 20 754 | 27 083 | 0.1 | 65 | 417 | 4 906 | 2 796 | 4 049 | 15 332 |
| Yukon | 21 824 | .. | .. | .. | .. | .. | .. | .. | .. |
| **Canada** | **997 061** | **65 888 916** | **6.6** | **318 361** | **207** | **30 965 812** | **4 404 726** | **3 550 894** | **26 967 482** |

[1] For definitions of agricultural land uses, see the note in Table 3.1.5
[2] Other land refers to summerfallow, native pasture, rangeland, cutover, and sloughs.

**Source:**
Statistics Canada, 1981 Census of Agriculture, special tabulation by the Office of the Senior Advisor on Integration.

**Notes:**
The Yukon and Northwest Territories have been excluded from the 1981 Census of Agriculture because of the small number of farms (less than twenty).
The data for the Hudson Bay Plain have been allocated to the Boreal Shield and data for both the Taiga Plain and the Taiga Shield has been allocated to the Boreal Plain. These minor adjustments were made to conform to confidentiality restrictions. It should also be noted that individual items may not add to totals due to rounding.

Technical Box 3.1.17

## Cropping Practices: An Indicator of Environmental Stress

Agricultural statistics which describe cropping intensity and changes in cropping patterns over time, can be used as indicators of environmental stress. In this chapter, crop data have been organized into the following cropping practices: (i) wide-row cropping, (ii) close-row cropping, (iii) summer fallowing, and (iv) forage cropping[1]. To focus more sharply on intensity of cropping practices, a further distinction is made by identifying the farms on which over eighty percent of cropland is under a particular wide-row or close-row cropping practice. These are referred to as monoculture farms in this publication[2]. From an ecological perspective, monoculture crop systems are inherently unstable being susceptible to widespread outbreaks of insects, weeds, disease, and micro-nutrient imbalances. Increased crop yields have been achieved and maintained largely by monoculture practices and the increasing application of fertilizers. (Table 3.1.14) Monoculture is therefore highly productive, however, pesticides are needed to stabilize pests which propagate readily in monoculture systems (Table 3.1.15).

(i) Wide-row cropping practices are associated with high applications of fertilizers and pesticides per hectare (see table below), and the relatively high risk of soil erosion. There is evidence that some wide-row cropping practices hasten natural organic matter decomposition which in turn affects soil stability and fertility. Soil compaction is also a concern in wide-row cropping as a result of the use of heavy machinery. The land devoted to wide-row crop cultivation was 1.5 million hectares in 1971 and 2.4 million hectares in 1981, a growth of forty-five percent over the decade. Eighty percent of the land in this particular use is found in the Mixed-Wood Plain Ecozone and is further concentrated in southern Ontario (See Map 3.1.19). The significance of farms classified as wide-row monoculture is evident as they account for four times the expenditure on fertilizers and chemicals per hectare when compared to the Canadian farm average (see table below).

(ii) Close-row cropping practices provide a vegetation cover similar to natural grasslands during the growing season and thus, provides better protection from soil erosion than open plowed land and land in wide-row crops. On the other hand, the scale of operations in this practice, particularly in the Prairie Ecozone, the introduction of high yielding crops and the increase in the use of fertilizers are some of the factors that suggest an intensification of environmental stress generally associated with single crop systems. The prevalence of close-row monoculture is evident as over sixty percent of the cropland in Canada was under this practice in 1981, while the figure approached eighty percent in the Prairie Ecozone (See Table 3.1.18).

(iii) Summer fallowing practice is linked to close-row cropping mainly in the Prairie region. The purpose of summer fallowing is to conserve soil moisture and release soil nutrients. Environmental concerns associated with summer fallow are wind and water erosion and salinization (i.e. the tendency for excess soil water to cause the migration of sub-strata salts to downslope evaporation areas).

(iv) Forage cropping practice is associated with livestock production and pasturage. Soil erosion is kept to a minimum by grass cover. Furthermore, a forage-based rotational cropping system (which includes legumes) is a natural means of restoring nitrogen to soils.

Many of the tables which follow in this chapter present cropping practice statistics by Ecozone and Major Drainage Area. More detailed information for all Drainage Basins have been compiled for the variables appearing here. Some of this information appears in the Appendix or is available upon request.

[1] Crops reported in the Agricultural Census were grouped into the following categories:
Wide-row crops — corn for grain, corn for silage, soybeans, sunflowers, dry field peas, dry field beans, potatoes, sugar beets, tobacco, vegetables.
Close-row crops — oats for grain, barley, mixed grain, buckwheat, flaxseed, rapeseed, mustard, fodder oats, wheat, rye.
Fodder crops — alfalfa, improved pasture, other fodder crops.

[2] Methodology based on D. Trant, "Cropping Practice Pilot Study: A Methodology to Enhance Agricultural Statistics for Environmental Assessment," Unpublished Working Paper, September 1983.

Technical Box 3.1.17

## Profile of Monoculture[1] Farms, 1971 and 1981

| | Average Farm Size | | Distribution of Farms | | Distribution of Cropland | | Distribution of Fertilizer Expenses | | Distribution of Chemical Expenses | | Fertilizer Expenses per Hectare of Cropland | | Chemical Expenses per Hectare of Cropland | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 | 1971 | 1981 |
| | hectares | | percent | | | | | | | | dollars[2] per hectare | | | |
| Wide-Row Monoculture | 56 | 69 | 4 | 5 | 2 | 3 | 12 | 12 | 19 | 12 | 39 | 40 | 15 | 15 |
| Close-Row Monoculture | 288 | 339 | 36 | 34 | 61 | 62 | 43 | 49 | 27 | 49 | 2 | 7 | 1 | 3 |
| Forage Monoculture | 128 | 130 | 21 | 23 | 7 | 7 | 5 | 2 | 4 | 2 | 6 | 8 | 1 | 1 |
| Other[3] | 140 | 153 | 39 | 38 | 30 | 28 | 40 | 37 | 50 | 37 | 8 | 15 | 3 | 5 |
| Canada Average or Total | 188 | 207 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 5 | 10 | 2 | 3 |

[1] Monoculture is defined as the planting of one crop type on a continuous year-to-year basis. Monoculture farms in the above table are farms where 80% or more of cropland is under one crop type.

[2] Expenses are in constant dollars (1971) and were converted using farm input price indices for fertilizer and farm chemicals.

[3] Includes all other farms not defined as monocultures.

**Source:**
Statistics Canada, Census of Agriculture 1981, Special Tabulation by the Office of Senior Adviser on Integration.
Statistics Canada, *Farm Input Price Index*, Catalogue 62-004, Various issues.

Table 3.1.18
## Cropping Practices by Ecozone, 1981

| Ecozone | Cultivated[1] Area | Wide-Row[2] | | Close-Row[3] | | Forage[4] | | Summerfallow[5] | | Other Crops[6] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Crop Area | Percentage of Cultivated Area | Crop Area | Percentage of Cultivated Area | Crop Area | Percentage of Cultivated Area | Area | Percentage of Cultivated Area | Area | Percentage of Cultivated Area |
| | hectares | hectares | percent | hectares | percent | hectares | percent | hectares | percent | hectares | percent |
| **Atlantic Maritime** | **777 838** | **76 199** | **9.8** | **171 284** | **22.0** | **439 968** | **56.6** | **19 703** | **2.5** | **70 684** | **9.1** |
| Prince Edward Island | 199 683 | 32 100 | 16.1 | 73 994 | 37.1 | 80 935 | 40.5 | 5 175 | 2.6 | 7 479 | 3.7 |
| Nova Scotia | 161 915 | 10 097 | 6.2 | 19 276 | 11.9 | 111 641 | 69.0 | 3 027 | 1.9 | 17 874 | 11.0 |
| New Brunswick | 176 655 | 27 633 | 15.6 | 27 352 | 15.5 | 106 506 | 60.3 | 5 154 | 2.9 | 10 010 | 5.7 |
| Québec | 239 585 | 6 369 | 2.7 | 50 662 | 21.1 | 140 886 | 58.8 | 6 347 | 2.6 | 35 321 | 14.7 |
| **Mixed-Wood Plain** | **5 674 074** | **1 897 760** | **33.4** | **1 150 047** | **20.3** | **1 791 028** | **31.6** | **91 378** | **1.6** | **743 861** | **13.1** |
| Québec | 1 618 258 | 292 383 | 18.1 | 304 413 | 18.8 | 851 703 | 52.6 | 34 816 | 2.2 | 134 943 | 8.3 |
| Ontario | 4 055 816 | 1 605 377 | 39.6 | 845 634 | 20.8 | 939 325 | 23.2 | 56 562 | 1.4 | 608 918 | 15.0 |
| **Boreal Shield** | **734 402** | **19 356** | **2.6** | **127 816** | **17.4** | **491 630** | **66.9** | **22 490** | **3.1** | **73 111** | **10.0** |
| Newfoundland | 9 249 | 962 | 10.4 | 296 | 3.2 | 7 179 | 77.6 | 358 | 3.9 | 454 | 4.9 |
| New Brunswick | 513 | 132 | 25.6 | 327 | 63.7 | 8 | 1.6 | 8 | 1.6 | 38 | 7.5 |
| Québec | 394 831 | 10 345 | 2.6 | 61 434 | 15.6 | 287 136 | 72.7 | 11 914 | 3.0 | 24 002 | 6.1 |
| Ontario | 297 229 | 7 411 | 2.5 | 52 494 | 17.7 | 190 371 | 64.0 | 6 747 | 2.3 | 40 206 | 13.5 |
| Manitoba | 32 580 | 506 | 1.6 | 13 265 | 40.7 | 6 936 | 21.3 | 3 464 | 10.6 | 8 409 | 25.8 |
| **Prairie** | **30 515 217** | **354 084** | **1.2** | **17 790 486** | **58.3** | **2 660 062** | **8.7** | **8 457 508** | **27.7** | **1 253 077** | **4.1** |
| Manitoba | 4 456 532 | 286 781 | 6.4 | 3 055 062 | 68.6 | 352 287 | 7.9 | 466 710 | 10.5 | 295 692 | 6.6 |
| Saskatchewan | 17 131 742 | 22 080 | 0.1 | 9 479 067 | 55.3 | 985 633 | 5.8 | 6 206 351 | 36.2 | 438 611 | 2.6 |
| Alberta | 8 926 943 | 45 224 | 0.5 | 5 256 357 | 58.9 | 1 322 142 | 14.8 | 1 784 447 | 20.0 | 518 773 | 5.8 |
| **Boreal Plain** | **6 805 287** | **22 808** | **0.3** | **3 668 734** | **53.9** | **1 478 304** | **21.7** | **1 095 537** | **16.1** | **539 904** | **7.9** |
| Manitoba | 882 103 | 13 405 | 1.5 | 462 791 | 52.5 | 155 039 | 17.6 | 128 164 | 14.5 | 122 704 | 13.9 |
| Saskatchewan | 2 288 949 | 7 809 | 0.3 | 1 419 110 | 62.0 | 226 168 | 9.9 | 498 113 | 21.8 | 137 749 | 6.0 |
| Alberta | 3 281 281 | 1 488 | -- | 1 612 422 | 49.1 | 998 692 | 30.4 | 419 822 | 12.8 | 248 857 | 7.6 |
| British Columbia | 352 953 | 106 | -- | 174 411 | 49.4 | 98 405 | 27.9 | 49 438 | 14.0 | 30 593 | 8.7 |
| **Montane Cordillera** | **448 870** | **5 595** | **1.2** | **40 145** | **8.9** | **287 362** | **64.0** | **11 079** | **2.5** | **104 689** | **23.3** |
| Alberta | 19 927 | 0 | 0.0 | 5 846 | 29.3 | 7 549 | 37.9 | 1 199 | 6.0 | 5 333 | 26.8 |
| British Columbia | 428 943 | 5 595 | 1.3 | 34 299 | 8.0 | 279 813 | 65.2 | 9 880 | 2.3 | 99 356 | 23.2 |
| **Pacific Maritime** | **108 140** | **17 715** | **16.4** | **7 226** | **6.7** | **71 702** | **66.3** | **3 296** | **3.0** | **8 201** | **7.6** |
| British Columbia | 108 140 | 17 715 | 16.4 | 7 226 | 6.7 | 71 702 | 66.3 | 3 296 | 3.0 | 8 201 | 7.6 |
| **Boreal Cordillera** | **8 615** | **3** | -- | **1 566** | **18.2** | **5 734** | **66.6** | **913** | **10.6** | **399** | **4.6** |
| British Columbia | 8 615 | 3 | -- | 1 566 | 18.2 | 5 734 | 66.6 | 913 | 10.6 | 399 | 4.6 |
| **Canada** | **45 072 443** | **2 393 520** | **5.3** | **22 957 305** | **50.9** | **7 225 790** | **16.0** | **9 701 904** | **21.5** | **2 793 925** | **6.2** |

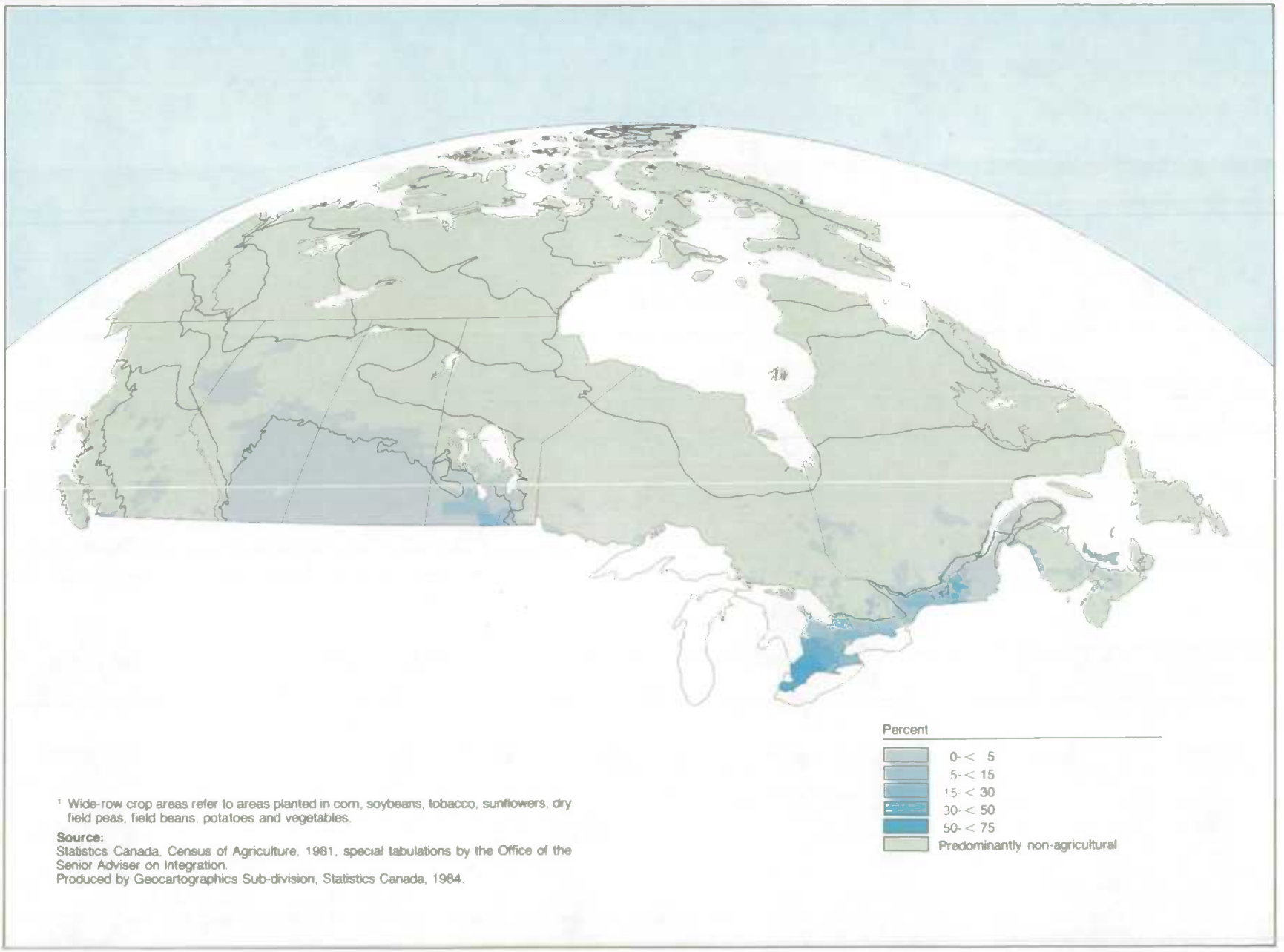
**Footnotes:**
[1] Cultivated area refers to land that is under crops, is improved pasture, or is fallow land.
[2] Wide-row crop areas refer to areas planted in corn, soybeans, tobacco, sunflowers, dry field peas, field beans, potatoes, and all vegetables.
[3] Close-row crop areas refer to areas planted in oats, barley, mixed-grain, all wheat, flaxseed, rapeseed, mustardseed, and rye.
[4] Forage crop areas refer to areas planted in alfalfa, tame hay other fodder crops and improved pasture. For more detail see Technical Box 3.1.17.
[5] Summerfallow refers to land upon which a crop is temporarily not being grown in order to build up soil moisture.
[6] Other crop areas refers to tree fruit areas, berry and grape areas, greenhouses, nurseries, mushroom farms, and other minor crop areas.

**Source:**
Statistics Canada, Census of Agriculture 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Notes:**
The Yukon and Northwest Territories have been excluded from the 1981 Census of Agriculture because of the small number of farms (less than twenty).
The data for the Hudson Bay Plain have been allocated to the Boreal Shield and data for both the Taiga Shield and the Taiga Plain have been allocated to the Boreal Plain. These adjustments were made to conform to confidentiality restrictions. It should also be noted that individual items may not add to totals due to rounding.

Map 3.1.19

## Wide-Row[1] Cropland as a Percentage of Total Farmland, by Census Division, 1981

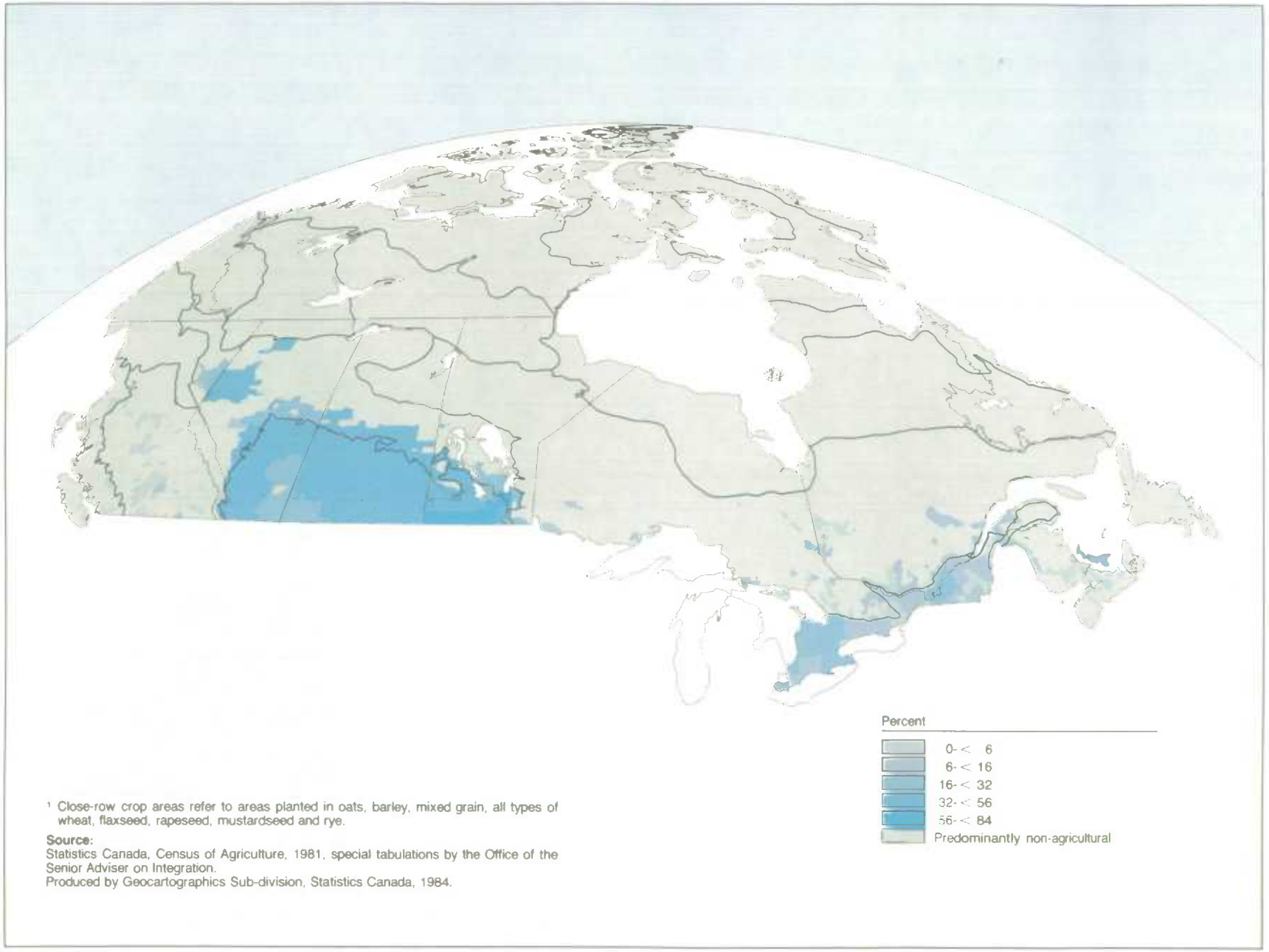



[1] Wide-row crop areas refer to areas planted in corn, soybeans, tobacco, sunflowers, dry field peas, field beans, potatoes and vegetables.

**Source:**
Statistics Canada, Census of Agriculture, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Map 3.1.20

## Close-Row[1] Cropland as a Percentage of Total Farmland, by Census Division, 1981




[1] Close-row crop areas refer to areas planted in oats, barley, mixed grain, all types of wheat, flaxseed, rapeseed, mustardseed and rye.

**Source:**
Statistics Canada, Census of Agriculture, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Table 3.1.21
## Agricultural Land Use[1] by Major Drainage Area, 1981

| Major Drainage Area | Area of Major Drainage Area | Farmland Area | Farmland Area as a Percentage of Major Drainage Area | Number of Farms | Average Farm Size | Cropland Area | Improved Pasture Area | Woodland Area | Other Land[2] Area |
|---|---|---|---|---|---|---|---|---|---|
| | thousands of hectares | hectares | percent | number | hectares | | | | |
| **Atlantic Ocean Basin** | **155 994** | **10 764 928** | **6.9** | **141 811** | **76** | **5 709 582** | **1 193 291** | **2 257 356** | **1 604 698** |
| Atlantic Ocean Coastal | 34 026 | 93 475 | 0.3 | 1 454 | 64 | 13 626 | 8 564 | 53 334 | 17 952 |
| Gulf of St. Lawrence Coastal | 42 963 | 878 392 | 2.0 | 8 907 | 99 | 360 269 | 105 355 | 308 425 | 104 343 |
| Bay of Fundy Coastal and Saint John River | 6 259 | 704 841 | 11.3 | 6 676 | 106 | 197 960 | 63 824 | 344 318 | 98 740 |
| St. Lawrence River | 21 059 | 2 977 492 | 14.1 | 41 880 | 71 | 1 493 521 | 354 468 | 725 413 | 404 091 |
| Ottawa River | 14 669 | 1 377 391 | 9.4 | 14 043 | 98 | 580 723 | 194 888 | 328 426 | 273 354 |
| Lake Ontario | 2 970 | 1 162 531 | 39.1 | 18 430 | 63 | 621 685 | 134 873 | 139 648 | 266 324 |
| Lake Erie and Lake St. Clair Shore | 2 355 | 1 887 022 | 80.1 | 29 777 | 63 | 1 507 481 | 106 580 | 124 002 | 148 958 |
| Lake Huron Shore | 9 252 | 1 647 291 | 17.8 | 20 229 | 81 | 919 501 | 221 036 | 224 503 | 282 251 |
| Lake Superior Shore | 10 180 | 36 493 | 0.4 | 415 | 88 | 14 817 | 3 703 | 9 287 | 8 686 |
| **Hudson Bay and Ungava Bay Basin** | **352 436** | **47 368 476** | **13.4** | **141 087** | **336** | **22 470 605** | **2 562 264** | **852 740** | **21 482 868** |
| Hudson Bay and Ungava Bay Coastal | 252 607 | 1 057 724 | 0.4 | 3 972 | 266 | 403 993 | 93 334 | 96 901 | 463 496 |
| Lake Winnipeg Shore | 33 698 | 5 860 345 | 17.4 | 24 090 | 243 | 3 302 521 | 274 122 | 263 620 | 2 020 082 |
| Assiniboine River | 16 185 | 14 543 592 | 89.9 | 41 592 | 350 | 7 100 976 | 542 001 | 134 151 | 6 766 464 |
| Saskatchewan River | 40 910 | 25 906 816 | 63.3 | 71 433 | 363 | 11 663 115 | 1 652 808 | 358 067 | 12 232 826 |
| **Arctic Ocean Basin** | **384 989** | **4 260 714** | **1.1** | **15 110** | **282** | **1 976 814** | **344 158** | **284 439** | **1 655 303** |
| Mackenzie River | 179 537 | 4 260 714 | 2.4 | 15 110 | 282 | 1 976 814 | 344 158 | 284 439 | 1 655 303 |
| **Pacific Ocean Basin** | **101 028** | **1 454 105** | **1.4** | **18 129** | **80** | **307 236** | **215 967** | **154 878** | **776 023** |
| Columbia River | 10 394 | 273 921 | 2.6 | 5 297 | 52 | 67 716 | 38 952 | 30 392 | 136 861 |
| Fraser River | 23 514 | 1 034 927 | 4.4 | 10 093 | 103 | 203 493 | 155 804 | 103 164 | 572 467 |
| Pacific Ocean, North Coastal | 25 812 | 87 091 | 0.4 | 469 | 186 | 18 000 | 12 474 | 10 313 | 46 305 |
| Pacific Ocean, South Coastal | 7 829 | 58 166 | 0.7 | 2 270 | 26 | 18 027 | 8 738 | 11 009 | 20 391 |
| **Gulf of Mexico Basin** | **2 614** | **2 040 692** | **78.1** | **2 224** | **918** | **501 575** | **89 045** | **1 481** | **1 448 591** |
| Missouri River | 2 614 | 2 040 692 | 78.1 | 2 224 | 918 | 501 575 | 89 045 | 1 481 | 1 448 591 |
| **Canada** | **997 061** | **65 888 916** | **6.6** | **318 361** | **207** | **30 965 812** | **4 404 726** | **3 550 894** | **26 967 482** |

[1] For definitions of agricultural land uses, see the note in Table 3.1.5.
[2] Other land refers to summerfallow, native pasture, rangeland, cutover and sloughs.

**Source:**
Statistics Canada, Census of Agriculture 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Table 3.1.22
## Cropping Practices by Major Drainage Area, 1981

| Major Drainage Area | Cultivated[1] Area | Wide-Row[2] | | Close-Row[3] | | Forage[4] | | Summerfallow[5] | | Other Crops[6] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Crop Area | Percentage of Cultivated Area | Crop Area | Percentage of Cultivated Area | Crop Area | Percentage of Cultivated Area | Crop Area | Percentage of Cultivated Area | Crop Area | Percentage of Cultivated Area |
| | hectares | hectares | percent | hectares | percent | hectares | percent | hectares | percent | hectares | percent |
| **Atlantic Ocean Basin** | **7 028 432** | **1 991 876** | **28.3** | **1 421 275** | **20.2** | **2 624 542** | **37.3** | **125 558** | **1.8** | **865 181** | **12.3** |
| Atlantic Ocean Coastal | 22 694 | 1 062 | 4.7 | 1 122 | 4.9 | 18 316 | 80.7 | 504 | 2.2 | 1 690 | 7.4 |
| Gulf of St. Lawrence Coastal | 477 047 | 38 712 | 8.1 | 126 177 | 26.4 | 260 791 | 54.7 | 11 423 | 2.4 | 39 944 | 8.4 |
| Bay of Fundy Coastal and Saint John River | 269 460 | 34 845 | 12.9 | 39 279 | 14.6 | 166 103 | 61.6 | 7 676 | 2.8 | 21 557 | 8.0 |
| St. Lawrence River | 1 888 109 | 316 346 | 16.8 | 351 728 | 18.6 | 1 014 684 | 53.7 | 40 120 | 2.1 | 165 231 | 8.8 |
| Ottawa River | 790 768 | 108 783 | 13.8 | 131 159 | 16.6 | 425 325 | 53.8 | 15 157 | 1.9 | 110 344 | 14.0 |
| Lake Ontario Shore | 777 005 | 205 009 | 26.4 | 155 073 | 20.0 | 219 371 | 28.2 | 20 447 | 2.6 | 177 105 | 22.8 |
| Lake Erie and Lake St. Clair Shore | 1 628 875 | 942 043 | 57.8 | 351 969 | 21.6 | 164 075 | 10.1 | 14 814 | 0.9 | 155 974 | 9.6 |
| Lake Huron Shore | 1 155 601 | 344 745 | 29.8 | 261 607 | 22.6 | 343 954 | 29.8 | 15 064 | 1.3 | 190 231 | 16.5 |
| Lake Superior Shore | 18 873 | 331 | 1.8 | 3 161 | 16.7 | 11 923 | 63.2 | 353 | 1.9 | 3 105 | 16.5 |
| **Hudson Bay and Ungava Bay Basin** | **33 832 403** | **376 924** | **1.1** | **19 585 667** | **57.9** | **3 461 114** | **10.2** | **8 799 533** | **26.0** | **1 609 165** | **4.8** |
| Hudson Bay and Ungava Bay Coastal | 571 308 | 1 008 | 0.2 | 253 400 | 44.4 | 182 524 | 31.9 | 73 981 | 12.9 | 60 395 | 10.6 |
| Lake Winnipeg Shore | 4 039 984 | 241 173 | 6.0 | 2 568 587 | 63.6 | 420 556 | 10.4 | 463 341 | 11.5 | 346 327 | 8.6 |
| Assiniboine River | 11 365 946 | 71 534 | 0.6 | 6 572 141 | 57.8 | 668 182 | 5.9 | 3 722 969 | 32.8 | 331 120 | 2.9 |
| Saskatchewan River | 17 855 165 | 63 209 | 0.4 | 10 191 539 | 57.1 | 2 189 852 | 12.3 | 4 539 242 | 25.4 | 871 323 | 4.9 |
| **Arctic Ocean Basin** | **2 723 658** | **1 270** | **--** | **1 449 928** | **53.2** | **700 200** | **25.7** | **402 686** | **14.8** | **169 574** | **6.2** |
| Mackenzie River | 27 236 658 | 1 270 | -- | 1 449 928 | 53.2 | 700 200 | 25.7 | 402 686 | 14.8 | 169 574 | 6.2 |
| **Pacific Ocean Basin** | **536 092** | **23 311** | **4.3** | **41 392** | **7.7** | **338 292** | **63.1** | **12 889** | **2.4** | **120 208** | **22.4** |
| Columbia River | 108 570 | 2 519 | 2.3 | 11 307 | 10.4 | 50 069 | 46.1 | 1 902 | 1.8 | 42 773 | 39.4 |
| Fraser River | 368 869 | 19 070 | 5.2 | 26 174 | 7.1 | 253 133 | 68.6 | 9 572 | 2.6 | 60 920 | 16.5 |
| Pacific Ocean, North Coastal | 31 173 | 155 | 0.5 | 2 298 | 7.4 | 25 796 | 82.8 | 699 | 2.2 | 2 224 | 7.1 |
| Pacific Ocean, South Coastal | 27 481 | 1 567 | 5.7 | 1 613 | 5.9 | 9 294 | 33.8 | 716 | 2.6 | 14 291 | 52.0 |
| **Gulf of Mexico Basin** | **951 858** | **139** | **--** | **459 044** | **48.2** | **101 640** | **10.7** | **361 238** | **38.0** | **29 797** | **3.1** |
| Missouri River | 951 858 | 139 | -- | 459 044 | 48.2 | 101 640 | 10.7 | 361 238 | 38.0 | 29 797 | 3.1 |
| **Canada** | **45 072 443** | **2 393 520** | **5.3** | **22 957 305** | **50.9** | **7 225 790** | **16.0** | **9 701 904** | **21.5** | **2 793 925** | **6.2** |

[1] Cultivated land refers to land that is under crops, in improved pasture or in fallow.
[2] Wide-row crop areas refer to areas planted in corn, soybeans, tobacco sunflowers, dry field peas, field beans, potatoes, and all vegetables.
[3] Close-row crop areas refer to areas planted in oats, barley, mixed-grain, all wheat, flaxseed, rapeseed, mustardseed, and rye.
[4] Forage crop areas refer to areas planted in alfalfa, tame hay other fodder crops and improved pasture. For more details see Technical Box 3.1.17.
[5] Summerfallow area refers to land upon which a crop is temporarily not being grown in order to build up soil moisture.
[6] Other crop areas refers to tree fruit areas, berry and grape areas, greenhouses, nurseries, mushroom farms, and other minor crop areas.

**Source:**
Statistics Canada, Census of Agriculture 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Table 3.1.23
## Cropping Practices by Ecozone, 1971, 1976 and 1981

| Ecozone | Wide-Row[1] Crop Area | | | | Close-Row[2] Crop Area | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Atlantic Maritime** | **65 913** | **78 381** | **76 198** | **15.6** | **176 053** | **174 597** | **171 284** | **-2.7** |
| Prince Edward Island | 23 272 | 30 362 | 32 100 | 37.9 | 65 847 | 70 910 | 73 994 | 12.4 |
| Nova Scotia | 9 073 | 11 054 | 10 096 | 11.3 | 18 535 | 16 770 | 19 276 | 4.0 |
| New Brunswick | 27 838 | 28 633 | 27 633 | -0.7 | 32 778 | 31 526 | 27 352 | -16.6 |
| Québec | 5 730 | 8 332 | 6 369 | 11.1 | 58 893 | 55 391 | 50 662 | -14.0 |
| **Mixed-Wood Plain** | **1 207 570** | **1 522 527** | **1 897 759** | **57.2** | **1 231 154** | **1 196 063** | **1 150 048** | **-6.6** |
| Québec | 156 066 | 206 062 | 292 383 | 87.4 | 310 310 | 290 125 | 304 413 | -1.9 |
| Ontario | 1 051 504 | 1 316 465 | 1 605 376 | 52.7 | 920 844 | 905 938 | 845 634 | -8.2 |

Table 3.1.23
## Cropping Practices by Ecozone, 1971, 1976 and 1981 (continued)

| Ecozone | Wide-Row[1] Crop Area | | | | Close-Row[2] Crop Area | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Boreal Shield** | **12 657** | **19 300** | **19 361** | **53.0** | **126 396** | **139 791** | **127 815** | **1.1** |
| Newfoundland | 900 | 1 053 | 967 | 7.4 | 104 | 268 | 296 | 184.8 |
| New Brunswick | 7 | 11 | 132 | 1 785.7 | 125 | 94 | 327 | 161.6 |
| Québec | 6 460 | 11 062 | 10 345 | 60.1 | 76 566 | 81 390 | 61 434 | -19.8 |
| Ontario | 5 281 | 6 980 | 7 411 | 40.3 | 42 053 | 48 723 | 52 493 | 24.8 |
| Manitoba | 9 | 194 | 506 | 5 520.6 | 7 548 | 9 316 | 13 265 | 75.7 |
| **Prairie** | **197 122** | **137 872** | **354 079** | **79.6** | **16 343 884** | **15 911 500** | **17 790 487** | **8.9** |
| Manitoba | 118 923 | 85 152 | 286 776 | 141.1 | 2 701 536 | 2 781 234 | 3 055 062 | 13.0 |
| Saskatchewan | 33 181 | 8 205 | 22 079 | -33.5 | 9 161 990 | 8 560 057 | 9 479 067 | 3.5 |
| Alberta | 45 018 | 44 515 | 45 224 | 0.5 | 4 480 358 | 4 570 209 | 5 256 357 | 17.3 |
| **Boreal Plain** | **5 334** | **10 002** | **22 809** | **327.6** | **3 094 434** | **3 034 916** | **3 668 734** | **18.6** |
| Manitoba | 1 863 | 2 786 | 13 405 | 619.5 | 402 323 | 374 758 | 462 791 | 15.0 |
| Saskatchewan | 1 763 | 4 340 | 7 809 | 342.9 | 1 136 642 | 1 119 946 | 1 419 110 | 24.9 |
| Alberta | 1 552 | 2 766 | 1 489 | -4.1 | 1 405 321 | 1 396 012 | 1 612 422 | 14.7 |
| British Columbia | 156 | 110 | 106 | -32.1 | 150 148 | 144 200 | 174 411 | 16.1 |
| **Montane Cordillera** | **5 033** | **5 117** | **5 595** | **11.2** | **32 632** | **35 162** | **40 145** | **23.0** |
| Alberta | 0 | 0 | 0 | 0.0 | 4 690 | 5 303 | 5 846 | 24.6 |
| British Columbia | 5 033 | 5 117 | 5 595 | 11.2 | 27 942 | 29 859 | 34 299 | 22.8 |
| **Pacific Maritime** | **12 113** | **15 898** | **17 715** | **46.3** | **6 456** | **6 482** | **7 226** | **11.9** |
| British Columbia | 12 113 | 15 898 | 17 715 | 46.3 | 6 456 | 6 482 | 7 226 | 11.9 |
| **Boreal Cordillera** | **18** | **0** | **3** | **-83.3** | **3 173** | **1 459** | **1 566** | **-50.6** |
| British Columbia | 18 | 0 | 3 | -83.3 | 3 173 | 1 459 | 1 566 | -50.6 |
| **Canada** | **1 505 760** | **1 789 097** | **2 393 510** | **59.0** | **21 014 180** | **20 499 972** | **22 957 304** | **9.2** |

| Ecozone | Forage[3] Crop Area | | | | Summerfallow[4] Area | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Atlantic Maritime** | **486 480** | **471 889** | **439 968** | **-9.6** | **13 305** | **6 652** | **19 703** | **48.1** |
| Prince Edward Island | 90 066 | 87 978 | 80 935 | -10.1 | 3 476 | 2 344 | 5 175 | 48.9 |
| Nova Scotia | 102 073 | 110 466 | 111 641 | 9.4 | 3 717 | 2 909 | 3 027 | -18.6 |
| New Brunswick | 107 998 | 108 254 | 106 506 | -1.4 | 2 538 | 1 867 | 5 154 | 103.1 |
| Québec | 186 343 | 165 191 | 140 886 | -24.4 | 3 574 | 1 532 | 6 347 | 77.6 |
| **Mixed-Wood Plain** | **2 413 862** | **2 135 957** | **1 791 028** | **-25.8** | **113 308** | **86 648** | **91 378** | **-19.4** |
| Québec | 1 159 336 | 1 005 740 | 851 703 | -26.5 | 22 307 | 15 118 | 34 816 | 56.1 |
| Ontario | 1 254 526 | 1 130 217 | 939 325 | -25.1 | 91 001 | 71 530 | 56 562 | -37.8 |
| **Boreal Shield** | **535 425** | **527 877** | **491 630** | **-8.2** | **14 931** | **10 391** | **22 490** | **50.6** |
| Newfoundland | 5 275 | 8 493 | 7 179 | 36.1 | 202 | 175 | 358 | 77.1 |
| New Brunswick | 400 | 151 | 8 | -98.0 | 2 | 0 | 8 | 400.0 |
| Québec | 335 567 | 311 791 | 287 138 | -14.4 | 7 170 | 3 791 | 11 914 | 66.2 |
| Ontario | 184 336 | 199 572 | 190 371 | 3.3 | 5 280 | 4 005 | 6 747 | 27.8 |
| Manitoba | 9 847 | 7 870 | 6 936 | -29.6 | 2 277 | 2 420 | 3 464 | 52.1 |
| **Prairie** | **2 246 968** | **2 473 703** | **2 660 062** | **18.4** | **9 258 057** | **9 415 817** | **8 457 508** | **-8.6** |
| Manitoba | 325 448 | 346 389 | 352 287 | 8.2 | 904 762 | 765 190 | 466 710 | -48.4 |
| Saskatchewan | 865 047 | 943 900 | 985 633 | 13.9 | 6 045 344 | 6 532 727 | 6 206 351 | 2.7 |
| Alberta | 1 056 473 | 1 183 414 | 1 322 142 | 25.1 | 2 307 951 | 2 117 900 | 1 784 447 | -22.7 |
| **Boreal Plain** | **1 184 063** | **1 433 477** | **1 478 304** | **24.9** | **1 413 053** | **1 389 645** | **1 095 537** | **-22.5** |
| Manitoba | 141 514 | 148 533 | 155 039 | 9.6 | 167 481 | 166 488 | 128 164 | -23.5 |
| Saskatchewan | 223 255 | 274 219 | 226 168 | 1.3 | 656 179 | 653 926 | 498 113 | -24.1 |
| Alberta | 758 414 | 935 299 | 998 692 | 31.7 | 527 260 | 509 677 | 419 822 | -20.4 |
| British Columbia | 60 880 | 75 426 | 98 405 | 61.6 | 62 133 | 59 554 | 49 438 | -20.4 |
| **Montane Cordillera** | **184 580** | **200 397** | **287 362** | **55.7** | **6 839** | **7 247** | **11 079** | **62.0** |
| Alberta | 21 178 | 10 099 | 7 550 | -64.3 | 1 114 | 638 | 1 199 | 7.6 |
| British Columbia | 163 402 | 190 298 | 279 812 | 71.2 | 5 725 | 6 609 | 9 880 | 72.6 |
| **Pacific Maritime** | **68 380** | **67 660** | **71 702** | **4.9** | **1 502** | **1 181** | **3 296** | **119.5** |
| Britisn Columbia | 68 380 | 67 660 | 71 702 | 4.9 | 1 502 | 1 181 | 3 296 | 119.5 |

Table 3.1.23
## Cropping Practices by Ecozone, 1971, 1976 and 1981 (concluded)

| Ecozone | Forage[3] Crop Area | | | | Summerfallow[4] Area | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Boreal Cordillera** | **5 199** | **3 484** | **5 734** | **10.3** | **577** | **297** | **913** | **58.3** |
| British Columbia | 5 199 | 3 484 | 5 734 | 10.3 | 577 | 297 | 913 | 58.3 |
| **Canada** | **7 124 957** | **7 314 444** | **7 225 790** | **1.4** | **10 821 572** | **10 919 878** | **9 701 906** | **-10.3** |

[1] Wide-row crop areas refers to areas planted in corn, soybeans, sunflowers Dry field peas, field beans, potatoes, and all vegetables.
[2] Close-row crop areas refers to areas planted in oats, barley, mixed grain, all wheat, flaxseed, rapeseed, mustard seed, and rye.
[3] Forage crop areas refers to alfalfa, tame hay, other fodder crops, and improved pasture. For more detail see Technical Box 3.1.17.
[4] Summerfallow area refers to land upon which a crop is temporarily not being grown in order to build up soil moisture.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Notes:**
The Yukon and Northwest Territories have been excluded from the 1981 Census of Agriculture because of the small numbers of farms (less than twenty). The data for the Hudson Bay Plain have been allocated to the Boreal Shield and data for both the Taiga Plain and the Taiga Shield have been allocated to the Boreal Plain. These adjustments were made to conform to confidentiality restrictions. It should also be noted that individual items may not add to totals due to rounding.

Table 3.1.24
## Monoculture[1] Farms by Ecozone, 1971, 1976 and 1981

| Ecozone | Wide-Row Farms | | | | Close-Row Farms | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | number | | | percent | number | | | percent |
| **Atlantic Maritime** | **716** | **591** | **542** | **-24.3** | **1 652** | **953** | **886** | **-46.4** |
| Prince Edward Island | 125 | 81 | 93 | -25.6 | 402 | 261 | 300 | -25.4 |
| Nova Scotia | 122 | 109 | 116 | -4.9 | 266 | 206 | 136 | -48.9 |
| New Brunswick | 413 | 311 | 229 | -44.6 | 419 | 249 | 151 | -64.0 |
| Quebec | 56 | 90 | 104 | 85.7 | 565 | 237 | 299 | -47.1 |
| **Mixed-Wood Plain** | **11 846** | **11 252** | **14 650** | **23.7** | **6 867** | **5 480** | **5 245** | **-23.6** |
| Québec | 1 700 | 1 628 | 2 470 | 45.3 | 2 689 | 1 826 | 2 093 | -22.1 |
| Ontario | 10 146 | 9 624 | 12 180 | 20.1 | 4 178 | 3 654 | 3 152 | -24.6 |
| **Boreal Shield** | **317** | **350** | **349** | **10.1** | **1 332** | **917** | **806** | **-39.5** |
| Newfoundland | 119 | 130 | 118 | -0.8 | 5 | 8 | 5 | 0.0 |
| New Brunswick | 1 | 0 | 0 | 0.0 | 0 | 1 | 0 | 0.0 |
| Québec | 101 | 104 | 129 | 27.7 | 919 | 526 | 470 | -49.0 |
| Ontario | 97 | 116 | 101 | 4.1 | 353 | 335 | 276 | -21.8 |
| Manitoba | 0 | 0 | 1 | 0.0 | 55 | 48 | 55 | 0.00 |
| **Prairie** | **326** | **278** | **378** | **16.0** | **99 490** | **87 108** | **83 154** | **-16.4** |
| Manitoba | 171 | 129 | 223 | 30.4 | 17 741 | 15 545 | 13 026 | -26.6 |
| Saskatchewan | 44 | 42 | 66 | 50.0 | 56 732 | 50 238 | 48 573 | -14.9 |
| Alberta | 111 | 107 | 89 | -19.8 | 25 017 | 21 325 | 21 555 | -13.8 |
| **Boreal Plain** | **43** | **45** | **73** | **69.8** | **21 238** | **17 405** | **18 191** | **-14.4** |
| Manitoba | 10 | 14 | 24 | 140.0 | 3 791 | 2 645 | 2 771 | -26.9 |
| Saskatchewan | 13 | 5 | 9 | -30.8 | 8 843 | 7 188 | 7 409 | -16.2 |
| Alberta | 13 | 21 | 31 | 138.5 | 7 885 | 7 003 | 7 418 | -5.9 |
| British Columbia | 7 | 5 | 9 | 28.6 | 719 | 569 | 593 | -17.5 |
| **Montane Cordillera** | **130** | **149** | **154** | **18.5** | **221** | **254** | **250** | **13.1** |
| Alberta | 0 | 0 | 0 | 0.0 | 15 | 12 | 17 | 13.3 |
| British Columbia | 130 | 149 | 154 | 18.5 | 206 | 242 | 233 | 13.1 |
| **Pacific Maritime** | **306** | **321** | **344** | **12.4** | **182** | **146** | **91** | **-50.0** |
| British Columbia | 306 | 321 | 344 | 12.4 | 182 | 146 | 91 | -50.0 |

Table 3.1.24
## Monoculture[1] Farms by Ecozone, 1971, 1976 and 1981 (concluded)

| Ecozone | Wide-Row Farms | | | | Close-Row Farms | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | number | | | percent | number | | | percent |
| **Boreal Cordillera** | **1** | **0** | **0** | **0.0** | **14** | **7** | **4** | **-71.4** |
| British Columbia | 1 | 0 | 0 | 0.0 | 14 | 7 | 4 | -71.4 |
| **Canada** | **13 686** | **12 986** | **16 490** | **20.5** | **130 996** | **112 271** | **108 627** | **-17.1** |

[1] Monoculture is defined as the planting of one crop type on a continuous year-to-year basis. Monoculture farms in the above table are farms where eighty percent of cropland is under one crop type. For more detail see the Technical Box 3.1.17.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
The data for the Hudson Bay Plain has been allocated to the Boreal Shield and data for both the Taiga Plain and the Taiga Shield has been allocated to the Boreal Plain. These minor adjustments were made to conform to confidentiality restrictions.

Table 3.1.25
## Monoculture[1] Cropland Area by Ecozone, 1971, 1976 and 1981

| Ecozone | Wide-Row | | | | Close-Row | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Atlantic Maritime** | **20 546** | **16 315** | **16 393** | **-20.2** | **25 074** | **20 948** | **24 508** | **-2.3** |
| Prince Edward Island | 4 039 | 3 452 | 4 241 | 5.0 | 8 859 | 9 895 | 12 680 | 43.1 |
| Nova Scotia | 1 132 | 1 465 | 749 | -33.8 | 2 418 | 2 250 | 2 199 | -9.0 |
| New Brunswick | 14 444 | 10 097 | 10 227 | -29.2 | 5 985 | 3 904 | 2 773 | -53.7 |
| Québec | 931 | 1 301 | 1 175 | 26.3 | 7 812 | 4 898 | 6 856 | -12.2 |
| **Mixed-Wood Plain** | **460 731** | **509 788** | **794 769** | **72.5** | **121 419** | **113 036** | **120 099** | **-1.0** |
| Québec | 53 397 | 50 415 | 106 159 | 98.8 | 41 398 | 39 535 | 51 202 | 23.7 |
| Ontario | 407 333 | 459 374 | 688 610 | 69.0 | 80 021 | 73 501 | 68 896 | -13.9 |
| **Boreal Shield** | **2 681** | **3 178** | **3 573** | **33.2** | **22 830** | **25 506** | **25 188** | **10.3** |
| Newfoundland | 362 | 437 | 453 | 25.2 | 4 | 42 | 34 | 663.8 |
| New Brunswick | 6 | 0 | 0 | -100.0 | 4 | 8 | 0 | -100.0 |
| Québec | 1 586 | 2 100 | 2 365 | 49.1 | 14 908 | 16 005 | 12 362 | -17.1 |
| Ontario | 733 | 641 | 754 | 2.8 | 4 924 | 5 422 | 8 464 | 71.9 |
| Manitoba | 0 | 0 | 0 | 0.0 | 2 993 | 4 038 | 4 328 | 44.6 |
| **Prairie** | **6 895** | **6 918** | **22 503** | **226.4** | **14 366 802** | **13 74 4479** | **15 593 959** | **8.5** |
| Manitoba | 3 588 | 4 590 | 19 781 | 451.3 | 2 149 148 | 2 239 606 | 2 279 254 | 6.1 |
| Saskatchewan | 469 | 424 | 707 | 50.6 | 8 559 421 | 7 857 781 | 8 851 399 | 3.4 |
| Alberta | 2 838 | 1 904 | 2 015 | -29.0 | 3 658 233 | 3 647 091 | 4 463 607 | 22.0 |
| **Boreal Plain** | **361** | **418** | **596** | **65.2** | **2 000 607** | **1 887 912** | **2 596 880** | **29.8** |
| Manitoba | 105 | 88 | 295 | 182.4 | 278 976 | 229 354 | 301 944 | 8.2 |
| Saskatchewan | 149 | 26 | 38 | -74.5 | 906 018 | 825 699 | 1 173 007 | 29.5 |
| Alberta | 92 | 290 | 244 | 166.1 | 721 597 | 757 040 | 1 009 706 | 39.9 |
| British Columbia | 15 | 15 | 18 | 18.4 | 94 016 | 75 819 | 112 223 | 19.4 |
| **Montane Cordillera** | **842** | **1 467** | **1 274** | **51.4** | **6 636** | **5 859** | **8 519** | **28.4** |
| Alberta | 0 | 0 | 0 | 0.0 | 1 264 | 494 | 2 037 | 61.1 |
| British Columbia | 842 | 1 467 | 1 274 | 51.4 | 5 372 | 5 365 | 6 482 | 20.7 |
| **Pacific Maritime** | **5 974** | **7 830** | **7 154** | **19.7** | **1 333** | **1 594** | **3 209** | **140.7** |
| British Columbia | 5 974 | 7 830 | 7 154 | 19.7 | 1 333 | 1 594 | 3 209 | 140.7 |
| **Boreal Cordillera** | **14** | **0** | **0** | **-100.0** | **2 225** | **503** | **353** | **-84.1** |
| British Columbia | 14 | 0 | 0 | -100.0 | 2 225 | 503 | 353 | -84.1 |
| **Canada** | **498 048** | **545 915** | **846 261** | **69.9** | **16 546 928** | **15 799 840** | **18 372 716** | **11.0** |

Table 3.1.25
## Monoculture[1] Cropland Area by Ecozone, 1971, 1976 and 1981 (concluded)

[1] Monoculture is defined as the planting of one crop type on a continuous year-to-year basis. Monoculture cropland in the above table is cropland on monoculture farms (eighty percent or more of cropland on these farms is continuously under one crop type). For more detail see Technical Box 3.1.17.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Notes:**
The data for the Hudson Bay Plain have been allocated to the Boreal Shield and data for both the Taiga Plain and the Taiga Shield have been allocated to the Boreal Plain. These minor adjustments were made to conform to confidentiality restrictions. It should also be noted that individual items may not add to totals due to rounding.

Table 3.1.26
## Cropping Practices by Major Drainage Area, 1971, 1976 and 1981

| Major Drainage Area | Wide-Row[1] Crop Area | | | | Close-Row[2] Crop Area | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Atlantic Ocean Basin** | **1 285 843** | **1 619 678** | **1 991 876** | **54.9** | **1 511 495** | **1 481 954** | **1 421 275** | **-6.0** |
| Atlantic Ocean Coastal | 971 | 1 179 | 1 062 | 9.4 | 1 048 | 1 063 | 1 122 | 7.1 |
| Gulf of St. Lawrence Coastal | 28 950 | 38 076 | 38 712 | 33.7 | 127 078 | 129 442 | 126 177 | -0.7 |
| Bay of Fundy Coastal and Saint John River | 34 342 | 36 989 | 34 845 | 1.5 | 45 239 | 42 552 | 39 279 | -13.2 |
| St. Lawrence River | 169 719 | 227 106 | 316 345 | 86.4 | 362 878 | 343 505 | 351 728 | -3.1 |
| Ottawa River | 75 142 | 95 042 | 108 783 | 44.8 | 131 495 | 125 121 | 131 159 | -0.3 |
| Lake Ontario Shore | 102 286 | 146 245 | 205 009 | 100.4 | 180 082 | 170 236 | 155 073 | -13.9 |
| Lake Erie and Lake St. Clair Shore | 694 535 | 797 581 | 942 044 | 35.6 | 386 408 | 399 155 | 351 969 | -8.9 |
| Lake Huron Shore | 179 469 | 277 041 | 344 745 | 92.1 | 274 510 | 267 800 | 261 607 | -4.7 |
| Lake Superior Shore | 429 | 419 | 331 | -22.8 | 2 757 | 3 080 | 3 161 | 14.7 |
| **Hudson Bay and Ungava Bay Basin** | **199 158** | **145 572** | **376 925** | **89.3** | **17 792 330** | **17 315 258** | **19 585 667** | **10.1** |
| Hudson Bay and Ungava Bay Coastal | 519 | 1 108 | 1 008 | 94.2 | 229 458 | 203 153 | 253 400 | 10.4 |
| Lake Winnipeg Shore | 103 622 | 77 581 | 241 173 | 132.7 | 2 261 595 | 2 333 152 | 2 568 588 | 13.6 |
| Assiniboine River | 36 535 | 13 866 | 71 534 | 95.8 | 6 293 645 | 5 882 226 | 6 572 141 | 4.4 |
| Saskatchewan River | 58 482 | 53 017 | 63 210 | 8.1 | 9 007 632 | 8 896 727 | 10 191 539 | 13.1 |
| **Arctic Ocean Basin** | **1 558** | **2 117** | **1 269** | **-18.5** | **1 224 184** | **1 239 597** | **1 449 928** | **18.4** |
| Mackenzie River | 1 558 | 2 117 | 1 269 | -18.5 | 1 224 184 | 1 239 597 | 1 449 928 | 18.4 |
| **Pacific Ocean Basin** | **17 146** | **21 015** | **23 312** | **36.0** | **34 356** | **36 245** | **41 390** | **20.5** |
| Columbia River | 2 999 | 2 650 | 2 519 | -16.0 | 13 043 | 11 476 | 11 307 | -13.3 |
| Fraser River | 12 731 | 16 779 | 19 070 | 49.8 | 18 251 | 20 959 | 26 174 | 43.4 |
| Pacific Ocean, North Coastal | 87 | 103 | 155 | 77.8 | 1 460 | 2 296 | 2 297 | 57.4 |
| Pacific Ocean, South Coastal | 1 329 | 1 483 | 1 567 | 18.0 | 1 602 | 1 514 | 1 612 | 0.6 |
| **Gulf of Mexico Basin** | **2 055** | **715** | **139** | **-93.2** | **451 814** | **426 919** | **459 044** | **1.6** |
| Missouri River | 2 055 | 715 | 139 | -93.2 | 451 814 | 426 919 | 459 044 | 1.6 |
| **Canada** | **1 505 760** | **1 789 097** | **2 393 520** | **59.0** | **21 014 180** | **20 499 972** | **22 957 304** | **9.2** |

| Major Drainage Area | Forage[3] Crop Area | | | | Summerfallow[4] | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Atlantic Ocean Basin** | **3 337 374** | **3 027 120** | **2 624 545** | **-21.4** | **137 088** | **101 408** | **125 559** | **-8.4** |
| Atlantic Ocean Coastal | 15 425 | 15 765 | 18 316 | 18.7 | 318 | 297 | 507 | 58.4 |
| Gulf of St. Lawrence Coastal | 306 257 | 287 099 | 260 791 | -14.8 | 8 681 | 5 241 | 11 423 | 31.6 |
| Bay of Fundy Coastal and Saint John River | 173 951 | 174 931 | 166 104 | -4.5 | 4 340 | 2 976 | 7 676 | 76.9 |
| St. Lawrence River | 1 347 328 | 1 188 370 | 1 014 684 | -24.7 | 26 280 | 17 887 | 40 120 | 52.7 |
| Ottawa River | 484 008 | 465 215 | 425 325 | -12.1 | 10 942 | 9 957 | 15 157 | 38.5 |
| Lake Ontario Shore | 256 005 | 256 172 | 219 371 | -14.3 | 24 902 | 23 641 | 20 447 | -17.9 |
| Lake Erie and Lake St. Clair Shore | 290 153 | 229 393 | 164 076 | -43.5 | 40 166 | 26 969 | 14 814 | -63.1 |
| Lake Huron Shore | 449 944 | 396 338 | 343 954 | -23.6 | 20 907 | 14 149 | 15 064 | -27.9 |
| Lake Superior Shore | 14 303 | 13 837 | 11 924 | -16.6 | 552 | 291 | 353 | -36.0 |

Table 3.1.26
## Cropping Practices by Major Drainage Area, 1971, 1976 and 1981 (concluded)

| Major Drainage Area | Forage[3] Crop Area | | | | Summerfallow[4] | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Hudson Bay and Ungava Bay Basin** | **2 948 448** | **3 319 570** | **3 449 095** | **17.0** | **9 864 826** | **9 975 305** | **8 799 532** | **-10.8** |
| Hudson Bay and Ungava Bay Coastal | 144 548 | 191 214 | 182 525 | 26.3 | 95 019 | 88 771 | 73 981 | -22.1 |
| Lake Winnipeg Shore | 417 934 | 446 192 | 420 556 | 0.6 | 749 366 | 666 066 | 463 341 | -38.2 |
| Assiniboine River | 577 775 | 625 689 | 668 992 | 15.8 | 3 788 60 | 4 044 131 | 3 722 969 | -1.7 |
| Saskatchewan River | 1 808 191 | 2 056 475 | 2 177 022 | 20.4 | 5 231 681 | 5 176 377 | 4 539 242 | -13.2 |
| **Arctic Ocean Basin** | **520 888** | **629 287** | **700 199** | **34.4** | **471 286** | **480 387** | **402 686** | **-14.6** |
| Mackenzie River | 520 888 | 629 287 | 700 199 | 34.4 | 471 286 | 480 387 | 402 686 | -14.6 |
| **Pacific Ocean Basin** | **231 538** | **257 306** | **350 311** | **51.3** | **7 226** | **7 670** | **12 890** | **78.4** |
| Columbia River | 40 154 | 35 982 | 50 068 | 24.7 | 2 229 | 2 058 | 1 902 | -14.7 |
| Fraser River | 159 338 | 185 681 | 253 133 | 58.9 | 4 301 | 4 755 | 9 572 | 122.6 |
| Pacific Ocean, North Coastal | 15 187 | 16 211 | 25 019 | 64.7 | 320 | 559 | 699 | 118.4 |
| Pacific Ocean, South Coastal | 16 859 | 19 432 | 22 091 | 31.0 | 376 | 298 | 716 | 90.5 |
| **Gulf of Mexico Basin** | **86 709** | **81 162** | **101 640** | **17.2** | **341 146** | **355 108** | **361 238** | **5.9** |
| Missouri River | 86 709 | 81 162 | 101 640 | 17.2 | 341 146 | 355 108 | 361 238 | 5.9 |
| **Canada** | **7 124 957** | **7 314 444** | **7 225 790** | **1.4** | **10 821 572** | **10 919 878** | **9 701 906** | **-10.3** |

[1] Wide-row crop areas refers to areas planted in corn, soybeans, tobacco, sunflowers, dry field peas, field beans, potatoes, vegetables.
[2] Close-row crop areas refers to areas planted in oats, barley, mixed-grain, all wheat, flaxseed, rapeseed, mustardseed, and rye.
[3] Forage crop areas refers to areas planted in alfalfa, tame hay and other fodder crops. For more details see Technical Box 3.1.17.
[4] Summerfallow area refers to land upon which a crop is temporarily not being grown in order to build up soil moisture.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976, and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Table 3.1.27
## Monoculture[1] Farms by Major Drainage Area, 1971, 1976 and 1981

| Major Drainage Area | Wide-Row Farms | | | | Close-Row Farms | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | number | | | percent | number | | | percent |
| **Atlantic Ocean Basin** | **12 862** | **12 169** | **15 512** | **20.6** | **9 614** | **7 169** | **6 787** | **-29.4** |
| Atlantic Ocean Coastal | 109 | 128 | 116 | 6.4 | 39 | 29 | 18 | -53.8 |
| Gulf of St. Lawrence Coastal | 296 | 253 | 248 | -16.1 | 1 067 | 643 | 606 | -43.2 |
| Bay of Fundy Coastal and Saint John River | 418 | 321 | 265 | -36.5 | 535 | 315 | 248 | -53.6 |
| St. Lawrence River | 1 769 | 1 734 | 2 650 | 49.8 | 3 283 | 2 114 | 2 403 | -26.8 |
| Ottawa River | 401 | 370 | 463 | 15.5 | 798 | 577 | 606 | -24.1 |
| Lake Ontario Shore | 914 | 1 015 | 1 297 | 41.9 | 1 122 | 988 | 831 | -25.9 |
| Lake Erie and St. Clair Shore | 7 730 | 6 925 | 8 622 | 11.5 | 1 507 | 1 452 | 1 134 | -24.8 |
| Lake Huron Shore | 1 207 | 1 402 | 1 832 | 51.8 | 1 244 | 1 018 | 925 | -25.6 |
| Lake Superior Shore | 18 | 21 | 19 | 5.6 | 19 | 33 | 16 | -15.8 |
| **Hudson Bay and Ungava Bay Basin** | **369** | **326** | **452** | **22.5** | **112 381** | **96 865** | **93 390** | **-16.9** |
| Hudson Bay and Ungava Bay Coastal | 20 | 23 | 27 | 35.0 | 1 558 | 1 017 | 1 246 | -20.0 |
| Lake Winnipeg | 154 | 127 | 213 | 38.3 | 16 500 | 13 841 | 12 122 | -26.5 |
| Assiniboine River | 56 | 47 | 71 | 26.8 | 41 495 | 36 222 | 34 590 | -16.6 |
| Saskatchewan River | 139 | 129 | 141 | 1.4 | 52 828 | 45 805 | 45 432 | -14.0 |
| **Arctic Ocean Basin** | **19** | **21** | **27** | **42.1** | **6 551** | **6 074** | **6 354** | **-3.0** |
| Mackenzie River | 19 | 21 | 27 | 42.1 | 6 551 | 6 074 | 6 354 | -3.0 |

Table 3.1.27
## Monoculture[1] Farms by Major Drainage Area, 1971, 1976 and 1981 (concluded)

| Major Drainage Area | Wide-Row Farms | | | | Close-Row Farms | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | number | | | percent | number | | | percent |
| **Pacific Ocean Basin** | **436** | **470** | **498** | **14.2** | **388** | **388** | **321** | **-17.3** |
| Columbia River | 90 | 108 | 95 | 5.6 | 104 | 105 | 111 | 6.7 |
| Fraser River | 287 | 283 | 327 | 13.9 | 226 | 206 | 157 | -30.5 |
| Pacific Ocean, North Coastal | 12 | 15 | 12 | 0.0 | 11 | 21 | 12 | 9.1 |
| Pacific Ocean, South Coastal | 47 | 64 | 64 | 36.2 | 47 | 56 | 41 | -12.8 |
| **Gulf of Mexico Basin** | **0** | **0** | **0** | **0.0** | **2 062** | **1 755** | **1 775** | **-13.9** |
| Missouri River | 0 | 0 | 0 | 0.0 | 2 062 | 1 755 | 1 775 | -13.9 |
| **Canada** | **13 686** | **12 986** | **16 490** | **20.5** | **130 996** | **112 271** | **108 627** | **-17.1** |

[1] Monoculture is defined as the planting of one crop type on a continuous year-to-year basis. Monoculture farms in the above table are farms where eighty percent cropland is under one crop type. For more details see Technical Box 3.1.17.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

Table 3.1.28
## Monoculture[1] Cropland Area by Major Drainage Area, 1971, 1976 and 1981

| Major Drainage Area | Wide-Row | | | | Close-Row | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | hectares | | | percent | hectares | | | percent |
| **Atlantic Ocean Basin** | **483 859** | **529 215** | **814 292** | **68.3** | **163 673** | **151 974** | **162 053** | **-1.0** |
| Atlantic Ocean Coastal | 352 | 443 | 380 | 8.0 | 163 | 118 | 93 | -42.9 |
| Gulf of St. Lawrence Coastal | 4 735 | 4 664 | 5 661 | 19.6 | 17 883 | 17 368 | 19 711 | 10.2 |
| Bay of Fundy Coastal and Saint John River | 15 094 | 10 935 | 10 346 | -31.5 | 7 042 | 4 166 | 4 403 | -37.5 |
| St. Lawrence River | 55 890 | 53 756 | 111 585 | 99.7 | 50 856 | 48 909 | 58 813 | 15.6 |
| Ottawa River | 13 406 | 12 962 | 22 322 | 66.5 | 11 850 | 10 667 | 15 296 | 29.1 |
| Lake Ontario Shore | 23 761 | 34 788 | 64 156 | 170.0 | 20 761 | 19 310 | 15 573 | -25.0 |
| Lake Erie and Lake St. Clair Shore | 328 517 | 348 126 | 492 500 | 49.9 | 29 665 | 30 948 | 27 334 | -7.9 |
| Lake Huron Shore | 42 050 | 63 466 | 107 269 | 155.1 | 25 244 | 20 257 | 20 505 | -18.8 |
| Lake Superior Shore | 54 | 76 | 72 | 33.4 | 207 | 231 | 325 | 56.6 |
| **Hudson Bay and Ungava Bay Basin** | **7 254** | **7 134** | **23 371** | **222.2** | **15 280 745** | **14 526 040** | **16 802 237** | **10.0** |
| Hudson Bay and Ungava Bay Coastal | 97 | 66 | 435 | 347.9 | 133 255 | 90 826 | 155 367 | 16.6 |
| Lake Winnipeg | 2 525 | 4 012 | 16 386 | 549.0 | 1 698 353 | 1 755 638 | 1 816 948 | 7.0 |
| Assiniboine River | 1 535 | 836 | 4 146 | 170.0 | 5 811 690 | 5 302 723 | 6 013 113 | 3.5 |
| Saskatchewan River | 3 097 | 2 220 | 2 404 | -22.4 | 7 637 447 | 7 376 853 | 8 816 809 | 15.4 |
| **Arctic Ocean Basin** | **119** | **261** | **171** | **44.0** | **684 001** | **732 840** | **973 601** | **42.3** |
| Mackenzie River | 119 | 261 | 171 | 44.0 | 684 001 | 732 840 | 973 601 | 42.3 |
| **Pacific Ocean Basin** | **6 816** | **8 804** | **8 428** | **23.6** | **6 704** | **6 959** | **9 614** | **43.4** |
| Columbia River | 590 | 1 025 | 524 | -11.3 | 3 625 | 3 018 | 3 423 | -5.6 |
| Fraser River | 5 714 | 7 418 | 7 170 | 25.5 | 2 690 | 3 441 | 5 091 | 89.2 |
| Pacific Ocean, North Coastal | 53 | 60 | 36 | -31.5 | 176 | 253 | 297 | 68.6 |
| Pacific Ocean, South Coastal | 459 | 302 | 698 | 52.0 | 213 | 246 | 803 | 278.1 |
| **Gulf of Mexico Basin** | **0** | **0** | **0** | **0.0** | **411 805** | **382 027** | **425 211** | **3.3** |
| Missouri River | 0 | 0 | 0 | 0.0 | 411 805 | 382 027 | 425 211 | 3.3 |
| **Canada** | **498 048** | **545 415** | **846 261** | **69.9** | **16 546 928** | **15 799 840** | **18 372 716** | **11.0** |

[1] Monoculture is defined as the planting of one crop type on a continuous year-to-year basis. Monoculture cropland in the above table is cropland on monoculture farms (eighty percent or more of cropland on these farms is continuously under one crop type). For more detail see the Technical Box 3.1.17.

**Source:**
Statistics Canada, Census of Agriculture, 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Table 3.1.29
## Number of Cattle and Pigs by Ecozone, 1971, 1976 and 1981

| Ecozone | Cattle | | | | Pigs | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | | | | percent | | | | percent |
| **Atlantic Maritime** | **535 026** | **556 065** | **522 218** | **-2.4** | **326 573** | **247 880** | **425 447** | **30.3** |
| Prince Edward Island | 106 062 | 110 396 | 102 454 | -3.4 | 100 936 | 78 691 | 116 843 | 15.8 |
| Nova Scotia | 130 920 | 137 164 | 140 209 | 7.1 | 79 765 | 73 433 | 139 344 | 74.7 |
| New Brunswick | 112 427 | 120 932 | 110 904 | -1.4 | 56 308 | 39 961 | 89 618 | 59.2 |
| Québec | 185 587 | 187 573 | 168 651 | -9.1 | 89 564 | 55 795 | 79 642 | -11.0 |
| **Mixed-Wood Plain** | **4 189 942** | **4 226 714** | **3 941 356** | **-5.9** | **3 525 963** | **3 387 912** | **6 347 426** | **80.0** |
| Québec | 1 304 007 | 1 274 095 | 1 230 963 | -5.6 | 1 191 770 | 1 488 987 | 3 205 765 | 169.0 |
| Ontario | 2 885 935 | 2 952 619 | 2 710 393 | -6.1 | 2 334 193 | 1 898 925 | 3 141 661 | 34.6 |
| **Boreal Shield** | **502 914** | **523 480** | **468 216** | **-6.9** | **147 857** | **104 614** | **201 152** | **36.0** |
| Newfoundland | 7 138 | 7 061 | 6 963 | -2.5 | 14 639 | 15 795 | 19 076 | 30.3 |
| New Brunswick | 229 | 156 | 38 | -83.4 | 22 | 11 | 15 | -47.0 |
| Québec | 291 179 | 297 725 | 266 077 | -8.6 | 102 247 | 72 377 | 155 302 | 51.9 |
| Ontario | 196 080 | 206 889 | 188 101 | -4.1 | 27 474 | 14 736 | 24 176 | -11.9 |
| Manitoba | 8 288 | 11 649 | 7 037 | -15.1 | 3 475 | 1 695 | 2 583 | -25.6 |
| **Prairie** | **6 079 604** | **7 156 302** | **6 093 071** | **0.2** | **3 128 454** | **1 617 586** | **2 151 895** | **-31.1** |
| Manitoba | 864 680 | 1 047 788 | 877 786 | 1.5 | 917 674 | 522 916 | 729 947 | -20.4 |
| Saskatchewan | 2 289 083 | 2 648 040 | 2 053 899 | -10.3 | 925 592 | 418 263 | 491 012 | -46.9 |
| Alberta | 2 925 841 | 3 460 474 | 3 161 386 | 8.1 | 1 285 188 | 676 407 | 930 936 | -27.5 |
| **Boreal Plain** | **1 390 477** | **2 010 988** | **1 737 334** | **24.9** | **910 986** | **380 998** | **508 827** | **-44.0** |
| Manitoba | 265 107 | 340 440 | 291 143 | 9.8 | 149 422 | 101 323 | 142 465 | -4.6 |
| Saskatchewan | 355 948 | 484 380 | 364 558 | 2.4 | 219 682 | 73 006 | 83 322 | -62.0 |
| Alberta | 744 120 | 1 123 927 | 1 003 939 | 34.9 | 529 978 | 201 584 | 268 311 | -49.2 |
| British Columbia | 25 302 | 62 241 | 77 694 | 207.1 | 12 209 | 5 085 | 14 729 | 20.6 |
| **Montane Cordillera** | **411 956** | **480 078** | **535 623** | **30.0** | **22 068** | **13 214** | **69 039** | **212.8** |
| Alberta | 32 416 | 29 971 | 27 562 | -15.0 | 376 | 222 | 150 | -60.0 |
| British Columbia | 379 540 | 450 107 | 508 061 | 33.9 | 21 692 | 12 992 | 68 889 | 217.6 |
| **Pacific Maritime** | **164 557** | **173 966** | **200 131** | **21.6** | **44 170** | **37 434** | **170 881** | **286.9** |
| British Columbia | 164 557 | 173 966 | 200 131 | 21.6 | 44 170 | 37 434 | 170 881 | 286.9 |
| **Boreal Cordillera** | **3 772** | **4 129** | **3 955** | **4.9** | **550** | **38** | **396** | **-27.9** |
| British Columbia | 3 772 | 4 129 | 3 955 | 4.9 | 550 | 38 | 396 | -27.9 |
| **Canada** | **13 278 233** | **15 131 723** | **13 501 904** | **1.7** | **8 106 926** | **5 789 676** | **9 875 065** | **21.8** |

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
The data for the Hudson Bay Plain have been allocated to the Boreal Shield and data for both the Taiga Plain and the Taiga Shield have been allocated to the Boreal Plain. These adjustments were made to confirm to confidentiality restrictions. It should also be noted that individual items may not add to totals due to rounding.

Table 3.1.30
## Number of Poultry by Ecozone, 1971, 1976 and 1981

| Ecozone | Chickens[1] | | | | Other Poultry[2] | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | | | | percent | | | | percent |
| **Atlantic Maritime** | **6 035 323** | **5 904 791** | **6 373 592** | **5.6** | **131 470** | **243 661** | **209 387** | **59.2** |
| Prince Edward Island | 268 642 | 268 252 | 222 729 | -17.1 | 8 074 | 7 943 | 10 680 | 32.3 |
| Nova Scotia | 3 055 813 | 2 992 860 | 3 435 103 | 12.4 | 74 606 | 134 323 | 103 765 | 39.1 |
| New Brunswick | 1 761 933 | 2 046 451 | 2 241 146 | 27.2 | 35 575 | 96 099 | 88 256 | 148.1 |
| Québec | 948 935 | 597 228 | 474 614 | -50.0 | 13 215 | 5 296 | 6 686 | -49.4 |
| **Mixed-Wood Plain** | **49 472 229** | **49 199 220** | **52 094 047** | **5.3** | **6 144 173** | **5 958 662** | **5 991 798** | **-2.5** |
| Québec | 18 774 762 | 19 603 170 | 18 606 522 | -0.9 | 2 175 397 | 1 674 527 | 1 679 278 | -22.8 |
| Ontario | 30 697 467 | 29 596 050 | 33 487 525 | 9.1 | 3 968 776 | 4 284 135 | 4 312 520 | 8.7 |
| **Boreal Shield** | **4 654 916** | **4 238 912** | **4 636 761** | **-0.4** | **323 857** | **375 576** | **329 670** | **1.8** |
| Newfoundland | 808 919 | 943 459 | 932 117 | 15.2 | 2 398 | 3 782 | 3 438 | 43.3 |
| New Brunswick | 49 | 37 | 15 | -69.4 | 0 | 0 | 0 | 0.0 |
| Québec | 2 862 446 | 2 819 678 | 3 158 090 | 10.3 | 296 206 | 326 446 | 313 130 | 5.7 |
| Ontario | 812 496 | 376 146 | 427 680 | -47.4 | 24 541 | 41 563 | 11 371 | -53.7 |
| Manitoba | 171 006 | 99 592 | 118 859 | -30.5 | 712 | 3 785 | 1 731 | 143.1 |
| **Prairie** | **16 622 519** | **15 585 931** | **17 212 652** | **3.6** | **2 645 647** | **2 024 623** | **2 191 279** | **-17.1** |
| Manitoba | 5 571 870 | 5 034 805 | 5 310 346 | -4.7 | 1 079 335 | 775 835 | 782 696 | -27.5 |
| Saskatchewan | 4 528 259 | 3 718 180 | 3 988 696 | -11.9 | 628 461 | 398 442 | 419 613 | -33.2 |
| Alberta | 6 522 390 | 6 832 946 | 7 913 610 | 21.3 | 937 851 | 850 346 | 988 970 | 5.5 |
| **Boreal Plain** | **2 975 411** | **2 418 097** | **2 454 737** | **-17.5** | **435 525** | **412 100** | **423 698** | **-2.8** |
| Manitoba | 934 939 | 723 516 | 725 837 | -22.3 | 256 872 | 246 246 | 290 851 | 13.2 |
| Saskatchewan | 553 675 | 499 246 | 421 889 | -23.8 | 27 830 | 19 045 | 16 352 | -41.2 |
| Alberta | 1 396 518 | 1 137 495 | 1 253 020 | -10.3 | 148 892 | 143 280 | 111 798 | -24.9 |
| British Columbia | 90 279 | 57 840 | 53 991 | -40.2 | 1 931 | 3 529 | 4 697 | 143.2 |
| **Montane Cordillera** | **569 877** | **585 368** | **890 847** | **56.3** | **102 150** | **119 709** | **101 263** | **-0.9** |
| Alberta | 4 235 | 3 941 | 23 895 | 464.2 | 146 | 132 | 194 | 32.9 |
| British Columbia | 565 642 | 581 427 | 866 952 | 53.3 | 102 004 | 119 577 | 101 069 | -0.9 |
| **Pacific Maritime** | **7 204 829** | **9 138 685** | **9 045 003** | **25.5** | **729 447** | **624 978** | **667 602** | **-8.5** |
| British Columbia | 7 204 829 | 9 138 685 | 9 045 003 | 25.5 | 729 447 | 624 978 | 667 602 | -8.5 |
| **Boreal Cordillera** | **2 075** | **1 996** | **10 290** | **395.9** | **93** | **168** | **220** | **136.6** |
| British Columbia | 2 075 | 1 996 | 10 290 | 395.9 | 93 | 168 | 220 | 136.6 |
| **Canada** | **87 537 179** | **87 073 000** | **92 717 929** | **5.9** | **10 512 362** | **9 759 477** | **9 914 917** | **-5.7** |

[1] Chickens refers to hens, pullets, broiler chickens, and cockerels.
[2] Other poultry refers to turkeys, geese and ducks.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Notes:**
The data for the Hudson Bay Plain have been allocated to the Boreal Shield and data for both the Taiga Plain and the Taiga Shield have been allocated to the Boreal Plain. These adjustments were made to conform to confidentiality restrictions. It should also be noted that individual items may not add to totals due to rounding.

Table 3.1.31
## Number of Cattle and Pigs by Major Drainage Area, 1971, 1976 and 1981

| Major Drainage Area | Cattle | | | | Pigs | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | | | | percent | | | | percent |
| **Atlantic Ocean Basin** | **5 150 076** | **5 207 092** | **4 851 279** | **-5.8** | **3 989 759** | **3 736 097** | **6 964 196** | **74.6** |
| Atlantic Ocean Coastal | 22 541 | 21 816 | 22 380 | -0.7 | 23 258 | 23 495 | 29 278 | 25.9 |
| Gulf of St. Lawrence Coastal | 313 982 | 322 929 | 294 258 | -6.3 | 184 805 | 122 975 | 184 431 | -0.2 |
| Bay of Fundy Coastal and Saint John River | 193 954 | 203 827 | 192 656 | -0.7 | 107 566 | 86 466 | 181 360 | 68.6 |
| St. Lawrence River | 1 526 040 | 1 485 322 | 1 426 774 | -6.5 | 1 304 666 | 1 583 675 | 3 402 642 | 160.8 |
| Ottawa River | 621 477 | 610 792 | 595 700 | -4.1 | 119 856 | 76 434 | 166 298 | 38.7 |
| Lake Ontario Shore | 563 201 | 533 050 | 491 072 | -12.8 | 317 169 | 216 073 | 320 719 | 1.1 |
| Lake Erie and Lake St. Clair Shore | 898 655 | 950 655 | 832 951 | -7.3 | 1 251 517 | 1 104 556 | 1 776 606 | 42.0 |
| Lake Huron Shore | 997 557 | 1 064 347 | 983 109 | -1.4 | 677 942 | 520 974 | 901 446 | 33.0 |
| Lake Superior Shore | 12 669 | 14 354 | 12 379 | -2.3 | 2 980 | 1 449 | 1 416 | -52.5 |
| **Hudson Bay and Ungava Bay Basin** | **6 980 393** | **8 433 447** | **7 148 674** | **2.4** | **3 695 137** | **1 865 567** | **2 483 881** | **-32.8** |
| Hudson Bay and Ungava Bay Coastal | 206 767 | 279 577 | 241 893 | 17.0 | 77 048 | 26 542 | 40 728 | -47.1 |
| Lake Winnipeg Shore | 825 167 | 1 058 360 | 870 494 | 5.5 | 838 365 | 506 768 | 710 631 | -15.2 |
| Assiniboine River | 1 609 840 | 1 879 648 | 1 470 898 | -8.6 | 730 356 | 331 130 | 414 830 | -43.2 |
| Saskatchewan River | 4 338 619 | 5 215 862 | 4 565 389 | 5.2 | 2 049 368 | 1 001 107 | 1 317 692 | -35.7 |
| **Arctic Ocean Basin** | **366 842** | **611 905** | **574 915** | **56.7** | **328 854** | **121 681** | **172 569** | **-47.5** |
| Mackenzie River | 366 842 | 611 905 | 574 915 | 56.7 | 328 854 | 121 681 | 172 569 | -47.5 |
| **Pacific Ocean Basin** | **543 766** | **623 576** | **707 762** | **30.2** | **65 862** | **50 382** | **239 760** | **264.0** |
| Columbia River | 104 513 | 109 619 | 120 455 | 15.3 | 10 805 | 6 145 | 24 365 | 125.5 |
| Fraser River | 389 574 | 458 414 | 522 616 | 34.2 | 49 620 | 38 714 | 203 093 | 309.3 |
| Pacific Ocean, North Coastal | 20 171 | 23 928 | 26 217 | 30.0 | 348 | 514 | 541 | 55.5 |
| Pacific Ocean, South Coastal | 29 508 | 31 615 | 38 474 | 30.4 | 5 089 | 5 009 | 11 761 | 131.1 |
| **Gulf of Mexico Basin** | **237 156** | **255 703** | **219 274** | **-7.5** | **27 314** | **15 949** | **14 659** | **-46.3** |
| Missouri River | 237 156 | 255 703 | 219 274 | -7.5 | 27 314 | 15 949 | 14 659 | -46.3 |
| **Canada** | **13 276 233** | **15 131 723** | **13 501 904** | **1.7** | **8 106 926** | **5 789 676** | **9 875 065** | **21.8** |

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Table 3.1.32
## Number of Poultry by Major Drainage Area, 1971, 1976 and 1981

| | Chickens[1] | | | | Other Poultry[2] | | | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | | | | percent | | | | percent |
| **Atlantic Ocean Basin** | **59 871 321** | **59 097 065** | **62 863 360** | **5.0** | **6 597 453** | **6 571 524** | **6 526 377** | **-1.1** |
| Atlantic Ocean Coastal | 1 143 625 | 1 161 506 | 991 557 | -13.3 | 25 476 | 26 727 | 20 479 | -19.6 |
| Gulf of St. Lawrence Coastal | 1 655 267 | 1 694 477 | 1 494 272 | -9.7 | 13 510 | 25 244 | 37 216 | 175.5 |
| Bay of Fundy Coastal and Saint John River | 3 610 528 | 3 677 351 | 4 601 797 | 27.5 | 86 074 | 194 784 | 152 828 | 77.6 |
| St. Lawrence River | 22 548 941 | 23 311 639 | 22 764 594 | 1.0 | 2 473 516 | 1 997 689 | 1 979 528 | -20.0 |
| Ottawa River | 1 878 655 | 1 547 431 | 1 687 855 | -10.2 | 25 220 | 19 863 | 36 516 | 44.8 |
| Lake Ontario Shore | 8 858 814 | 9 223 264 | 10 985 810 | 24.0 | 885 527 | 1 130 733 | 1 246 697 | 40.8 |
| Lake Erie and Lake St. Clair Shore | 12 157 979 | 11 991 783 | 12 468 777 | 2.6 | 2 332 894 | 2 560 536 | 2 475 233 | 6.1 |
| Lake Huron Shore | 7 876 346 | 6 379 757 | 7 768 970 | -1.4 | 754 907 | 615 142 | 577 017 | -23.6 |
| Lake Superior Shore | 141 166 | 109 857 | 99 728 | -29.4 | 329 | 806 | 863 | 162.3 |
| **Hudson Bay and Ungava Bay Basin** | **18 831 391** | **17 454 220** | **18 993 314** | **0.9** | **2 892 808** | **2 348 349** | **2 556 158** | **-11.6** |
| Hudson Bay and Ungava Bay Coastal | 304 689 | 289 481 | 243 991 | -19.9 | 8 127 | 7 988 | 7 760 | -4.5 |
| Lake Winnipeg Shore | 5 856 408 | 5 408 394 | 5 694 623 | -2.8 | 980 708 | 801 261 | 819 704 | -16.4 |
| Assiniboine River | 3 705 062 | 2 808 022 | 2 851 045 | -23.1 | 691 591 | 389 865 | 426 672 | -38.3 |
| Saskatchewan River | 8 965 232 | 8 948 323 | 10 203 655 | 13.8 | 1 212 382 | 1 149 235 | 1 302 022 | 7.4 |
| **Arctic Ocean Basin** | **940 643** | **736 450** | **884 655** | **-6.0** | **103 910** | **88 928** | **55 462** | **-46.6** |
| Mackenzie River | 940 643 | 736 450 | 884 655 | -6.0 | 103 910 | 88 928 | 55 462 | -46.6 |
| **Pacific Ocean Basin** | **7 768 857** | **9 712 227** | **9 911 106** | **27.6** | **831 438** | **744 522** | **768 646** | **-7.6** |
| Columbia River | 230 015 | 167 141 | 403 747 | 75.5 | 56 590 | 77 608 | 58 263 | 3.0 |
| Fraser River | 6 792 242 | 8 658 035 | 8 406 449 | 23.8 | 746 900 | 631 611 | 679 400 | -9.0 |
| Pacific Ocean, North Coastal | 60 535 | 55 470 | 56 365 | -6.9 | 477 | 1 922 | 1 309 | 174.4 |
| Pacific Ocean, South Coastal | 686 065 | 831 581 | 1 044 545 | 52.3 | 27 471 | 33 381 | 29 674 | 8.0 |
| **Gulf of Mexico Basin** | **124 967** | **73 038** | **65 494** | **-47.6** | **11 847** | **6 154** | **8 274** | **-30.2** |
| Missouri River | 124 967 | 73 038 | 65 494 | -47.6 | 11 847 | 6 154 | 8 274 | -30.2 |
| **Canada** | **87 537 179** | **87 073 000** | **92 717 929** | **5.9** | **10 437 456** | **9 759 477** | **9 914 917** | **-5.0** |

[1] Chickens refers to hens, pullets, broiler chickens, and cockerels.
[2] Other Poultry refers to turkeys, geese and ducks.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Table 3.1.33
## Fertilizer[1] Application on Farmland by Ecozone, 1970 and 1980

| Ecozone | Area | | | Quantity | |
|---|---|---|---|---|---|
| | 1970 | 1980 | Change 1970 to 1980 | 1980 | 1980 |
| | hectares | | percent | tonnes | kilograms/hectare |
| **Atlantic Maritime** | **164 661** | **335 693** | **103.9** | **160 210** | **477.3** |
| Prince Edward Island | 53 099 | 100 525 | 89.3 | 53 460 | 531.8 |
| Nova Scotia | 29 713 | 69 975 | 135.5 | 27 860 | 398.1 |
| New Brunswick | 33 255 | 66 512 | 100.0 | 48 975 | 736.3 |
| Québec | 48 594 | 98 681 | 103.1 | 29 915 | 303.2 |
| **Mixed-Wood Plain** | **1 468 416** | **3 096 017** | **110.8** | **1 285 657** | **415.3** |
| Québec | 313 944 | 750 912 | 139.2 | 350 245 | 466.4 |
| Ontario | 1 154 472 | 2 345 105 | 103.1 | 935 412 | 398.9 |
| **Boreal Shield** | **75 667** | **184 364** | **143.7** | **55 938** | **303.4** |
| Newfoundland | 1 463 | 2 777 | 89.8 | 2 406 | 866.4 |
| New Brunswick | 5 | 46 | 820.0 | 13 | 282.6 |
| Québec | 35 239 | 84 818 | 140.7 | 32 182 | 379.4 |
| Ontario | 35 828 | 88 450 | 146.9 | 19 835 | 224.3 |
| Manitoba | 3 137 | 8 273 | 163.7 | 1 502 | 181.8 |
| **Prairie** | **3 745 427** | **11 313 319** | **202.1** | **1 417 137** | **125.3** |
| Manitoba | 1 041 770 | 2 795 197 | 168.3 | 479 081 | 171.4 |
| Saskatchewan | 1 077 212 | 4 458 000 | 313.8 | 403 984 | 90.6 |
| Alberta | 1 626 445 | 4 060 122 | 149.6 | 534 072 | 131.5 |
| **Boreal Plain** | **1 181 855** | **2 810 673** | **137.8** | **385 537** | **137.2** |
| Manitoba | 136 175 | 367 576 | 169.9 | 58 780 | 159.9 |
| Saskatchewan | 417 137 | 1 039 000 | 149.1 | 133 385 | 128.4 |
| Alberta | 578 929 | 1 257 834 | 117.3 | 170 905 | 135.9 |
| British Columbia | 49 614 | 146 263 | 194.8 | 22 467 | 153.6 |
| **Montane Cordillera** | **45 890** | **133 272** | **190.4** | **31 057** | **233.0** |
| Alberta | 2 282 | 5 339 | 133.9 | 789 | 147.8 |
| British Columbia | 43 608 | 127 933 | 193.4 | 30 268 | 236.6 |
| **Pacific Maritime** | **23 282** | **54 980** | **136.1** | **34 480** | **627.1** |
| British Columbia | 23 282 | 54 980 | 136.1 | 34 480 | 627.1 |
| **Boreal Cordillera** | **1 060** | **1 131** | **6.7** | **182** | **160.9** |
| British Columbia | 1 060 | 1 131 | 6.7 | 182 | 160.9 |
| **Canada** | **6 706 262** | **17 929 448** | **167.4** | **3 370 198** | **188.0** |

[1] These data refer to commercial fertilizer applied in the crop years 1970 and 1980. The area fertilized is counted only once no matter how many applications were made.

**Source:**
Statistics Canada, Census of Agriculture 1971 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

**Note:**
The data for the Hudson Bay Plain have been allocated to the Boreal Shield and data for both the Taiga Plain and the Taiga Shield have been allocated to the Boreal Plain. These minor adjustments were made to conform to confidentiality restrictions.

Table 3.1.34
## Agricultural Pesticide[1] Application on Farmland by Ecozone, 1970 and 1980

| Ecozone | Area Sprayed/Dusted | | | | | |
|---|---|---|---|---|---|---|
| | with Herbicides | | | with Insecticides | | |
| | 1970 | 1980 | Change 1970 to 1980 | 1970 | 1980 | Change 1970 to 1980 |
| | hectares | | percent | hectares | | percent |
| **Atlantic Maritime** | **92 532** | **158 528** | **71.3** | **64 113** | **74 271** | **15.8** |
| Prince Edward Island | 43 143 | 81 789 | 89.6 | 25 916 | 31 984 | 23.4 |
| Nova Scotia | 15 567 | 20 863 | 34.0 | 9 971 | 11 109 | 11.4 |
| New Brunswick | 29 403 | 40 179 | 36.6 | 24 738 | 26 832 | 8.5 |
| Québec | 4 419 | 15 698 | 255.2 | 3 488 | 4 345 | 24.6 |
| **Mixed-Wood Plain** | **1 265 523** | **2 271 589** | **79.5** | **281 234** | **459 170** | **63.3** |
| Québec | 157 634 | 370 860 | 135.3 | 49 120 | 77 465 | 57.7 |
| Ontario | 1 107 889 | 1 900 729 | 71.6 | 232 114 | 381 706 | 64.4 |
| **Boreal Shield** | **15 474** | **44 271** | **186.1** | **5 301** | **11 123** | **109.8** |
| Newfoundland | 369 | 499 | 35.3 | 497 | 671 | 35.0 |
| New Brunswick | 0 | 0 | 0.0 | 0 | 0 | 0.0 |
| Québec | 3 996 | 14 272 | 257.2 | 2 988 | 6 539 | 118.8 |
| Ontario | 8 282 | 22 894 | 176.4 | 1 483 | 2 343 | 58.0 |
| Manitoba | 2 827 | 6 605 | 133.6 | 333 | 1 570 | 371.5 |
| **Prairie** | **6 365 179** | **10 752 283** | **68.9** | **457 723** | **891 193** | **94.7** |
| Manitoba | 1 509 116 | 2 226 610 | 47.5 | 114 154 | 236 525 | 107.2 |
| Saskatchewan | 2 907 696 | 4 491 540 | 54.5 | 205 389 | 484 446 | 135.9 |
| Alberta | 1 948 367 | 4 034 133 | 107.1 | 138 180 | 170 222 | 23.2 |
| **Boreal Plain** | **804 038** | **1 948 303** | **142.3** | **75 779** | **191 104** | **152.2** |
| Manitoba | 185 250 | 294 704 | 59.1 | 12 088 | 21 678 | 79.3 |
| Saskatchewan | 332 966 | 852 185 | 155.9 | 38 887 | 123 750 | 218.2 |
| Alberta | 257 228 | 721 764 | 180.6 | 23 432 | 39 932 | 70.4 |
| British Columbia | 28 594 | 79 650 | 178.6 | 1 372 | 5 745 | 318.7 |
| **Montane Cordillera** | **16 057** | **25 702** | **60.1** | **18 007** | **13 639** | **-24.3** |
| Alberta | 1 732 | 3 908 | 125.6 | 69 | 0 | -100.0 |
| British Columbia | 14 325 | 21 794 | 52.1 | 17 938 | 13 639 | -24.0 |
| **Pacific Maritime** | **11 222** | **19 548** | **74.2** | **11 349** | **11 434** | **0.8** |
| British Columbia | 11 222 | 19 548 | 74.2 | 11 349 | 11 434 | 0.8 |
| **Boreal Cordillera** | **1 070** | **400** | **-62.6** | **0** | **207** | **...** |
| British Columbia | 1 070 | 400 | -62.6 | 0 | 207 | ... |
| **Canada** | **8 571 099** | **15 220 407** | **77.6** | **913 508** | **1 652 142** | **80.9** |

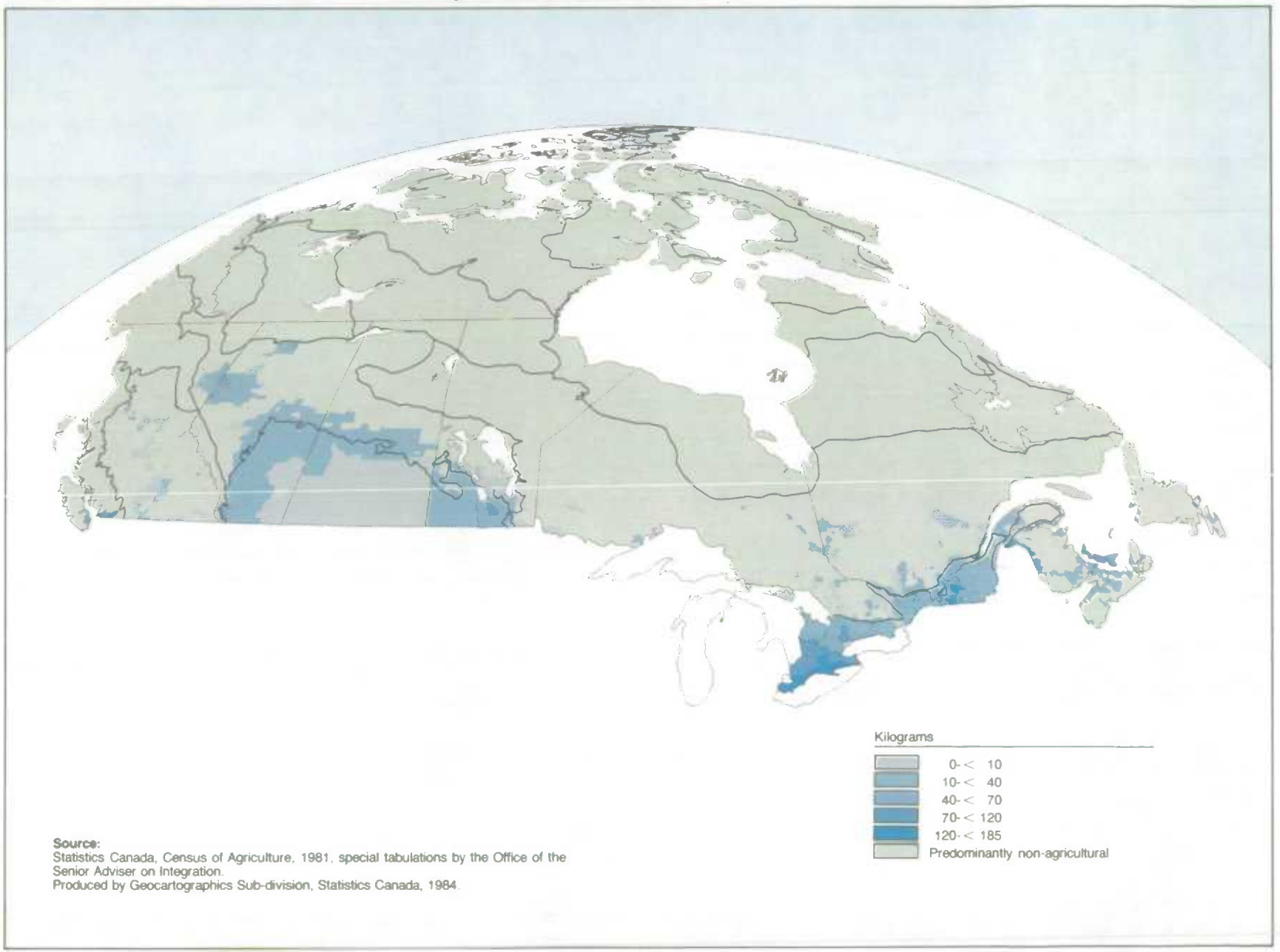
[1] These data refer to the crop years 1970 and 1980 although they are derived from 1971 and 1981 Census responses. The area sprayed/dusted is counted only once for herbicide and once for insecticide no matter how many applications were made.

**Source:**
Statistics Canada, Census of Agriculture 1971 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Notes:**
The data for the Hudson Bay Plain have been allocated to the Boreal Shield and the data for both the Taiga Shield and the Taiga Plain have been allocated to the Boreal Plain. These minor adjustments were made to conform to confidentiality restrictions. It should also be noted that individual items may not add to totals due to rounding.

Map 3.1.35

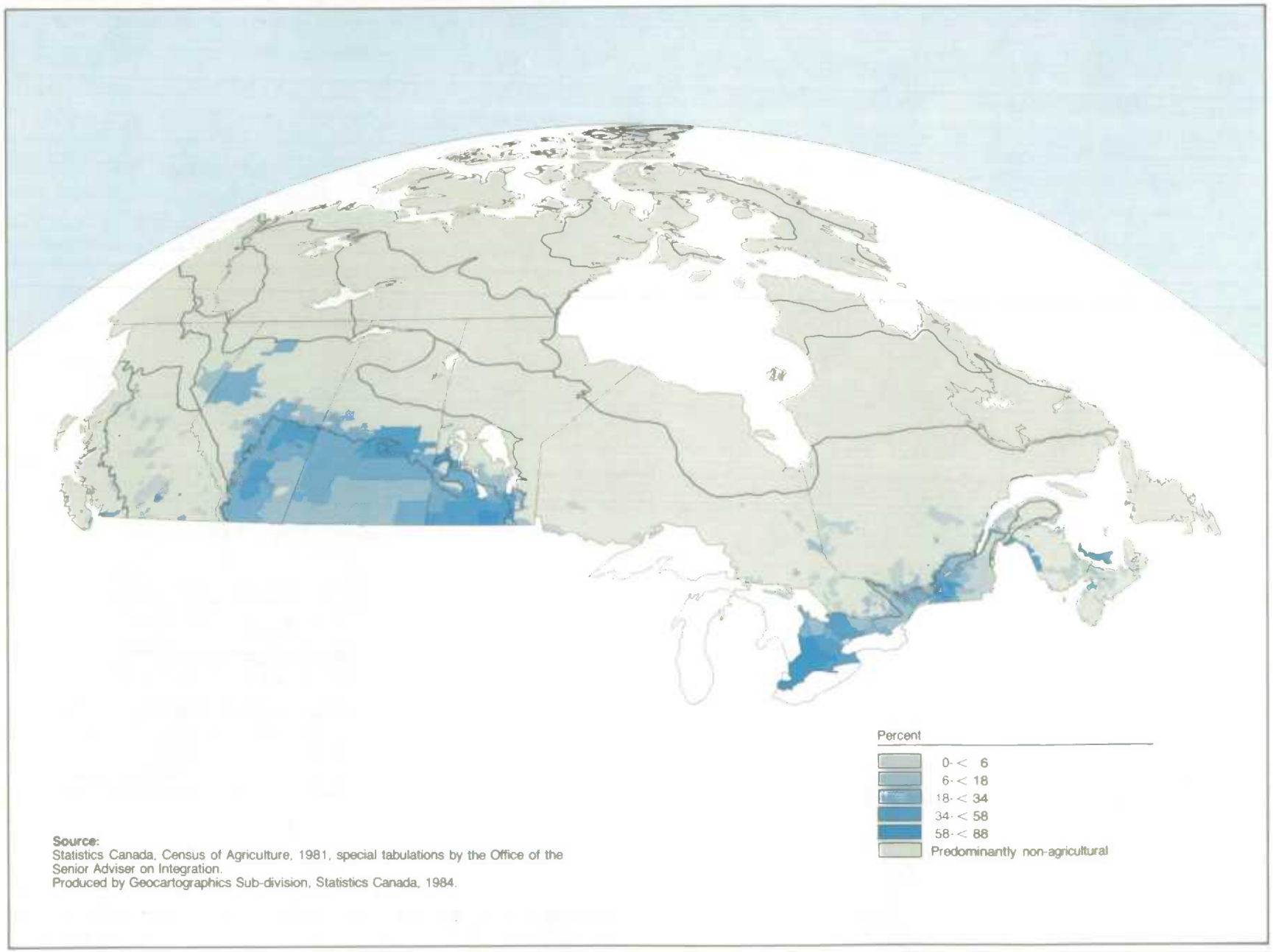
**Kilograms of Fertilizer per Hectare of Farmland, by Census Division, 1980**




**Source:**
Statistics Canada, Census of Agriculture, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Map 3.1.36

## Percentage of Farmland Sprayed or Dusted with Pesticides, by Census Division, 1980




**Source:**
Statistics Canada, Census of Agriculture, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Table 3.1.37
## Fertilizer Application on Farmland by Major Drainage Area, 1970 and 1980

| Major Drainage Area | Area | | | Quantity | |
|---|---|---|---|---|---|
| | 1970 | 1980 | Change 1970-80 | 1980 | 1980 |
| | hectares | | percent | tonnes | kilograms/hectare |
| **Atlantic Ocean Basin** | **1 693 889** | **3 578 781** | **111.3** | **1 494 196** | **417.5** |
| Atlantic Ocean Coastal | 3 400 | 8 064 | 137.2 | 3 761 | 466.4 |
| Gulf of St. Lawrence Coastal | 104 735 | 208 779 | 99.3 | 89 174 | 427.1 |
| Bay of Fundy Coastal and Saint John River | 53 672 | 111 112 | 107.0 | 65 107 | 586.0 |
| St. Lawrence River | 348 161 | 835 811 | 140.1 | 378 865 | 453.3 |
| Ottawa River | 105 219 | 252 844 | 140.3 | 87 095 | 344.5 |
| Lake Ontario Shore | 150 444 | 352 211 | 134.1 | 128 121 | 363.8 |
| Lake Erie and Lake St. Clair Shore | 622 799 | 1 179 933 | 89.5 | 521 719 | 442.2 |
| Lake Huron Shore | 301 187 | 619 680 | 105.7 | 217 838 | 351.5 |
| Lake Superior Shore | 4 272 | 10 347 | 142.2 | 2 516 | 243.2 |
| **Hudson Bay and Ungava Bay Basin** | **4 437 070** | **12 968 313** | **192.3** | **1 653 785** | **127.5** |
| Hudson Bay and Ungava Bay Coastal | 65 196 | 185 644 | 184.7 | 28 735 | 154.8 |
| Lake Winnipeg Shore | 963 719 | 2 384 290 | 147.4 | 408 993 | 171.5 |
| Assiniboine River | 788 937 | 3 141 741 | 298.2 | 346 662 | 110.3 |
| Saskatchewan River | 2 619 218 | 7 256 639 | 177.1 | 869 395 | 119.8 |
| **Arctic Ocean Basin** | **492 771** | **1 108 341** | **124.9** | **150 101** | **135.4** |
| Mackenzie River | 492 771 | 1 108 341 | 124.9 | 150 101 | 135.4 |
| **Pacific Ocean Basin** | **66 856** | **182 759** | **173.4** | **64 711** | **354.1** |
| Columbia River | 18 189 | 39 841 | 119.0 | 13 446 | 337.5 |
| Fraser River | 39 970 | 119 513 | 199.0 | 43 115 | 360.8 |
| Pacific Ocean, North Coastal | 3 597 | 10 686 | 197.1 | 1 406 | 131.6 |
| Pacific Ocean, South Coastal | 5 100 | 12 718 | 149.4 | 6 744 | 530.3 |
| **Gulf of Mexico Basin** | **15 676** | **91 255** | **482.1** | **7 391** | **81.0** |
| Missouri River | 15 676 | 91 255 | 482.1 | 7 391 | 81.0 |
| **Canada** | **6 706 262** | **17 929 448** | **167.4** | **3 370 198** | **188.0** |

[1] These data refer to commercial fertilizer applied during the crop year 1970 and 1980. The area fertilized is counted only once no matter how many applications were made.

**Source:**
Statistics Canada, Census of Agriculture, 1971 and 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due rounding.

Table 3.1.38
## Agricultural Pesticide[1] Application on Farmland by Major Drainage Area, 1970 and 1980

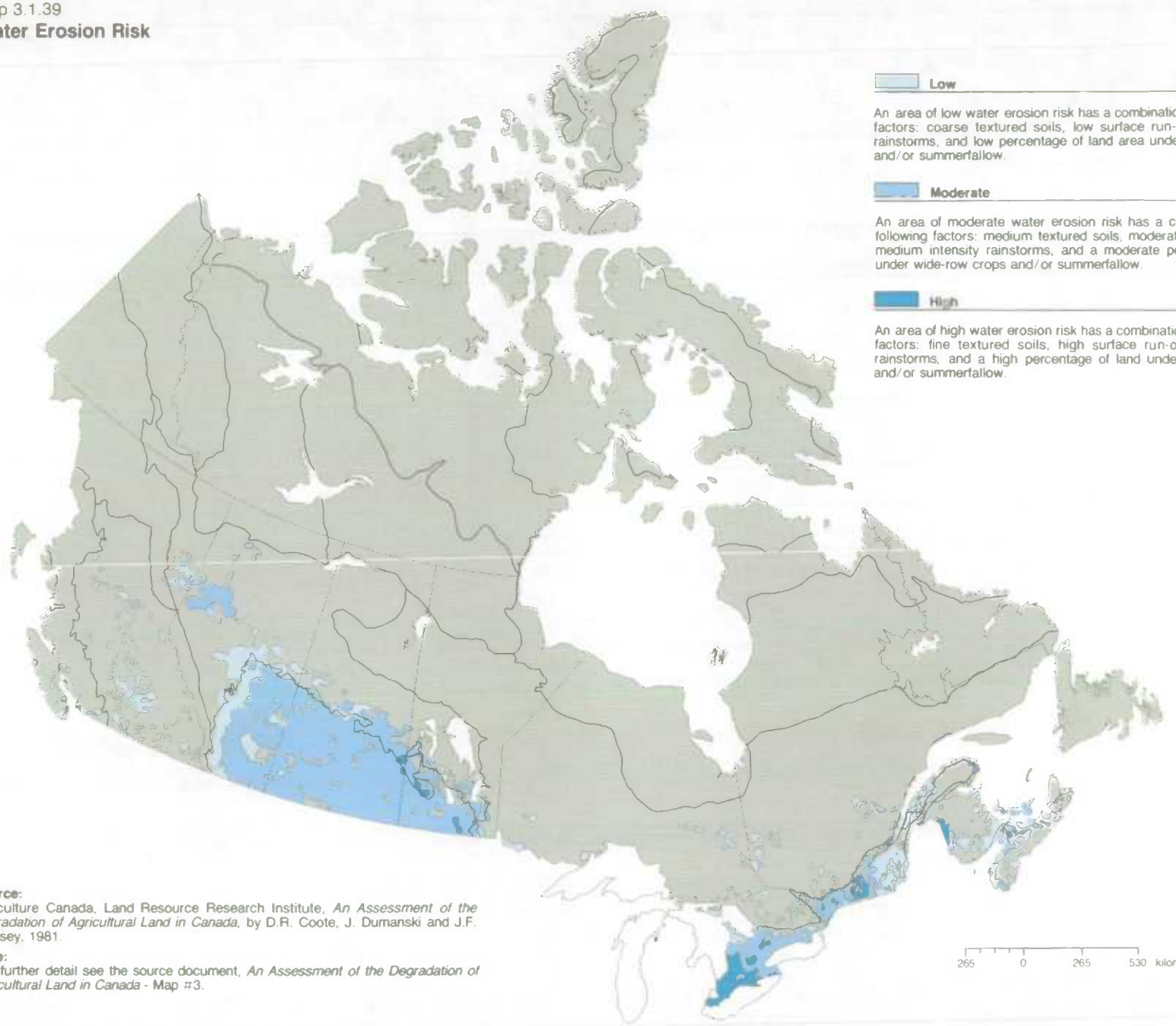
| Major Drainage Area | Area Sprayed/Dusted | | | | | |
|---|---|---|---|---|---|---|
| | with Herbicides | | | with Insecticides | | |
| | 1970 | 1980 | Change 1970 to 1980 | 1970 | 1980 | Change 1970 to 1980 |
| | hectares | | percent | hectares | | percent |
| **Atlantic Ocean Basin** | **1 369 815** | **2 465 402** | **80.0** | **350 136** | **542 788** | **55.0** |
| Atlantic Ocean Coastal | 1 021 | 1 169 | 14.5 | 785 | 645 | -17.8 |
| Gulf of St. Lawrence Coastal | 52 775 | 101 590 | 92.5 | 29 481 | 37 356 | 26.7 |
| Bay of Fundy Coastal and Saint John River | 38 059 | 52 741 | 38.6 | 32 523 | 35 394 | 8.8 |
| St. Lawrence River | 173 930 | 402 765 | 131.6 | 53 765 | 82 279 | 53.0 |
| Ottawa River | 76 481 | 141 872 | 85.5 | 11 323 | 12 709 | 12.2 |
| Lake Ontario Shore | 151 029 | 262 628 | 73.9 | 40 992 | 49 748 | 21.4 |
| Lake Erie and Lake St. Clair Shore | 623 739 | 1 024 688 | 64.3 | 138 400 | 241 070 | 74.2 |
| Lake Huron Shore | 252 305 | 476 668 | 88.9 | 42 630 | 83 331 | 95.5 |
| Lake Superior Shore | 476 | 1 282 | 169.3 | 237 | 257 | 8.4 |
| **Hudson Bay and Ungava Bay Basin** | **6 822 547** | **11 835 803** | **73.5** | **504 125** | **1 036 823** | **105.7** |
| Hudson Bay and Ungava Bay Coastal | 39 765 | 114 285 | 187.4 | 3 573 | 7 071 | 97.9 |
| Lake Winnipeg Shore | 1 187 226 | 1 875 606 | 58.0 | 98 815 | 214 649 | 117.2 |
| Assiniboine River | 2 152 675 | 2 702 494 | 25.5 | 126 303 | 260 355 | 106.1 |
| Saskatchewan River | 3 442 881 | 7 143 418 | 107.5 | 275 434 | 554 748 | 101.4 |
| **Arctic Ocean Basin** | **201 392** | **644 923** | **220.2** | **19 612** | **40 691** | **107.5** |
| Mackenzie River | 201 392 | 644 923 | 220.2 | 19 612 | 40 691 | 107.5 |
| **Pacific Ocean Basin** | **25 548** | **41 342** | **61.8** | **29 286** | **25 106** | **-14.3** |
| Columbia River | 11 852 | 16 105 | 35.9 | 14 783 | 13 097 | -11.4 |
| Fraser River | 12 460 | 22 958 | 84.3 | 13 414 | 11 125 | -17.1 |
| Pacific Ocean, North Coastal | 161 | 627 | 289.4 | 36 | 20 | -43.8 |
| Pacific Ocean, South Coastal | 1 075 | 1 653 | 53.7 | 1 053 | 863 | -18.0 |
| **Gulf of Mexico Basin** | **151 798** | **232 971** | **53.5** | **10 349** | **6 735** | **-34.9** |
| Missouri River | 151 798 | 232 971 | 53.5 | 10 349 | 6 735 | -34.9 |
| **Canada** | **8 571 099** | **15 220 407** | **77.6** | **913 508** | **1 652 142** | **80.9** |

[1] These data refer to the crop years 1970 and 1980 although they are derived from 1971 and 1981 Census responses. The area sprayed/dusted is counted only once for herbicide and once for insecticide no matter how many applications were made.

**Source:**
Statistics Canada, 1971 and 1981 Census of Agriculture, special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
Individual items may not add to totals due to rounding.

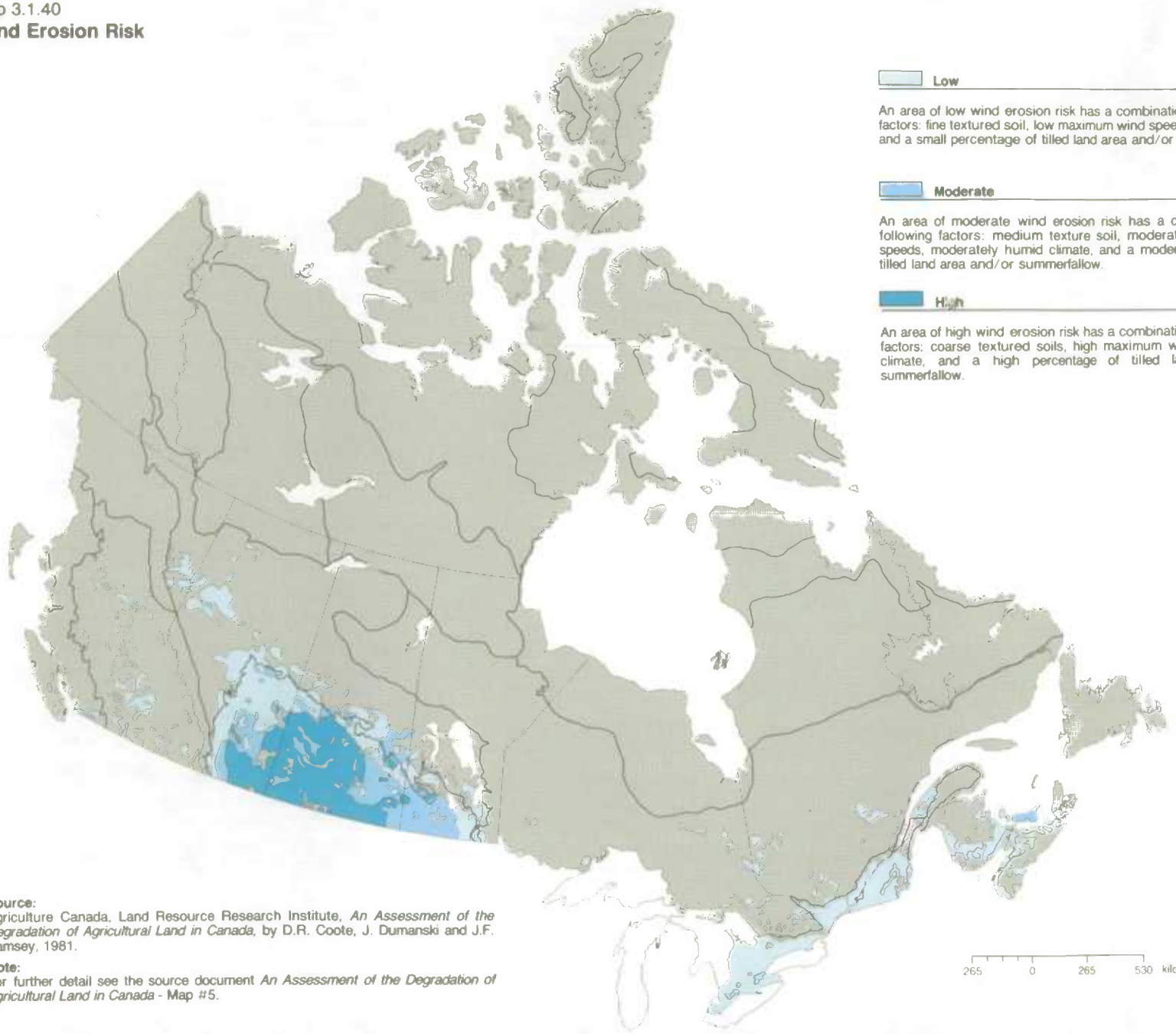
Map 3.1.39
## Water Erosion Risk




**Source:**
Agriculture Canada, Land Resource Research Institute, *An Assessment of the Degradation of Agricultural Land in Canada*, by D.R. Coote, J. Dumanski and J.F. Ramsey, 1981.

**Note:**
For further detail see the source document, *An Assessment of the Degradation of Agricultural Land in Canada* - Map #3.

## Map 3.1.40
## Wind Erosion Risk



**Low**

An area of low wind erosion risk has a combination of the following factors: fine textured soil, low maximum wind speeds, humid climate, and a small percentage of tilled land area and/or summerfallow.

**Moderate**

An area of moderate wind erosion risk has a combination of the following factors: medium texture soil, moderate maximum wind speeds, moderately humid climate, and a moderate percentage of tilled land area and/or summerfallow.

**High**

An area of high wind erosion risk has a combination of the following factors: coarse textured soils, high maximum wind speeds, a dry climate, and a high percentage of tilled land area and/or summerfallow.

265 0 265 530 kilometres

**Source:**
Agriculture Canada, Land Resource Research Institute, *An Assessment of the Degradation of Agricultural Land in Canada*, by D.R. Coote, J. Dumanski and J.F. Ramsey, 1981.

**Note:**
For further detail see the source document *An Assessment of the Degradation of Agricultural Land in Canada* - Map #5.

Table 3.1.41
## Socio-Economic Profile of Persons Employed in Agriculture by Ecozone, 1981[1]

| Ecozone | Total Employed[2] | | Full Time Employed[3] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Persons | Average Income[4] | Persons | As a Percentage of Total Employed | Average Income[4] | Percentage of Full Time Employed | | | |
| | | | | | | Self-Employed[5] | 45 years and Over | Education level | |
| | | | | | | | | Less than Grade Nine | Secondary |
| | | dollars | | percent | dollars | percent | | | |
| **Atlantic Maritime** | **28 085** | **6 900** | **17 415** | **62** | **9 600** | **56** | **42** | **30** | **26** |
| Prince Edward Island | 5 710 | 7 100 | 3 825 | 67 | 9 500 | 61 | 42 | 31 | 23 |
| Nova Scotia | 8 810 | 6 700 | 5 430 | 62 | 9 600 | 48 | 41 | 21 | 32 |
| New Brunswick | 7 560 | 5 800 | 4 145 | 55 | 8 500 | 53 | 45 | 32 | 28 |
| Québec | 6 010 | 8 400 | 4 015 | 67 | 10 900 | 64 | 42 | 37 | 18 |
| **Mixed-Wood Plain** | **186 825** | **8 500** | **133 655** | **72** | **10 800** | **58** | **42** | **32** | **23** |
| Québec | 53 915 | 9 700 | 40 980 | 76 | 11 800 | 58 | 38 | 40 | 21 |
| Ontario | 132 910 | 8 100 | 92 675 | 70 | 10 400 | 57 | 44 | 29 | 24 |
| **Boreal Shield** | **17 320** | **7 300** | **11 390** | **66** | **9 600** | **60** | **43** | **36** | **21** |
| Newfoundland | 1 335 | 6 600 | 690 | 52 | 10 300 | 48 | 49 | 37 | 23 |
| Québec | 9 425 | 7 900 | 5 990 | 64 | 10 500 | 60 | 39 | 38 | 18 |
| Ontario | 6 260 | 6 600 | 4 475 | 72 | 8 300 | 62 | 46 | 32 | 25 |
| Manitoba | 315 | 8 100 | 225 | 78 | 9 100 | 75 | 54 | 43 | 13 |
| **Prairie** | **147 775** | **12 500** | **122 040** | **83** | **13 800** | **70** | **46** | **27** | **26** |
| Manitoba | 29 205 | 9 200 | 23 650 | 81 | 10 500 | 68 | 46 | 34 | 21 |
| Saskatchewan | 66 330 | 13 700 | 54 625 | 82 | 15 100 | 77 | 49 | 29 | 25 |
| Alberta | 52 240 | 12 700 | 43 765 | 84 | 14 100 | 63 | 43 | 21 | 30 |
| **Boreal Plain** | **36 350** | **9 900** | **31 875** | **83** | **10 800** | **75** | **50** | **36** | **21** |
| Manitoba | 3 295 | 8 200 | 5 430 | 86 | 9 000 | 72 | 52 | 48 | 14 |
| Saskatchewan | 11 600 | 10 200 | 9 195 | 79 | 11 400 | 78 | 51 | 39 | 18 |
| Alberta | 18 450 | 10 400 | 15 660 | 85 | 11 100 | 75 | 49 | 31 | 23 |
| British Columbia | 2 000 | 9 400 | 1 595 | 80 | 11 100 | 75 | 40 | 24 | 37 |
| **Montane Cordillera** | **13 420** | **7 800** | **8 990** | **67** | **9 900** | **59** | **47** | **22** | **35** |
| Alberta | 300 | 7 700 | 235 | 78 | 6 700 | 53 | 46 | 18 | 41 |
| British Columbia | 13 120 | 7 800 | 8 760 | 67 | 10 000 | 59 | 47 | 22 | 35 |
| **Pacific Maritime** | **16 955** | **9 100** | **11 290** | **67** | **12 000** | **43** | **39** | **17** | **35** |
| British Columbia | 16 955 | 9 100 | 11 290 | 67 | 12 000 | 43 | 39 | 17 | 35 |
| **Boreal Cordillera** | **160** | **11 200** | **125** | **78** | **13 200** | **57** | **29** | **14** | **43** |
| British Columbia | 80 | 9 700 | 65 | 81 | 10 200 | 69 | 38 | 18 | 29 |
| Yukon | .. | .. | .. | .. | .. | .. | .. | .. | .. |

[1] Standard industrial classification codes 011 to 019 and 021: all farms including experimental and institutional farms, plus services incidental to agriculture such as threshing and contract crop dusting.
[2] Employed in 1980.
[3] Employed 27 or more weeks in 1980.
[4] Incomes appear to be low because of the reporting of negative income (expenses exceeding sales) by some farmers.
[5] Self employed persons are full-time workers, less wage-earners, less unpaid family workers.

**Source:**
Statistics Canada, 1981 Census of Population, special tabulation.

Table 3.1.42
## Economic Profile of Farms by Ecozone, 1980

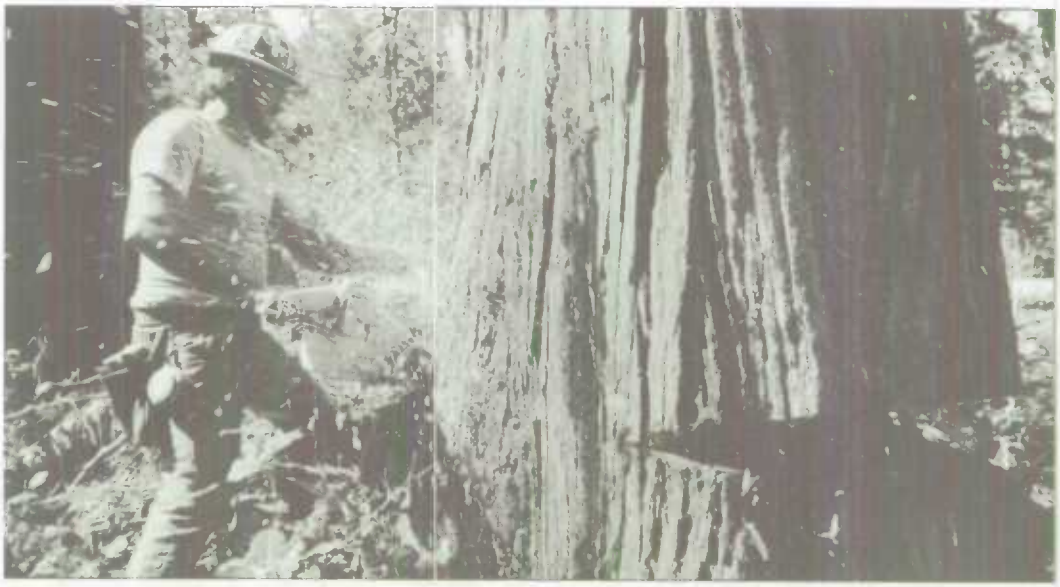
| Ecozone | Number of Farms | Farm Workers[1] | Labour Force per Thousand Hectares of Farmland | Total Sales of Agricultural Products | Total Sales of Agricultural Products per Thousand Hectares of Farmland | Total Capital Value[2] | Total Capital Value per Thousand Hectares of Farmland | Total Value of Farm Machinery | Total Value of Farm Machinery per Thousand Hectares of Farmland |
|---|---|---|---|---|---|---|---|---|---|
| | | | | thousands of current dollars | thousands of current dollars | millions of current dollars | thousands of current dollars | millions of current dollars | thousands of current dollars |
| **Atlantic Maritime** | **16 771** | **28 085** | **17.5** | **618 740** | **384** | **2 913.5** | **1 810** | **594.2** | **369** |
| Prince Edward Island | 3 154 | 5 710 | 20.2 | 140 370 | 496 | 699.5 | 2 472 | 148.9 | 526 |
| Nova Scotia | 5 045 | 8 810 | 18.9 | 198 608 | 426 | 897.5 | 1 926 | 150.3 | 323 |
| New Brunswick | 4 060 | 7 560 | 17.3 | 153 586 | 352 | 666.5 | 1 527 | 141.2 | 323 |
| Quebec | 4 512 | 6 010 | 14.2 | 126 177 | 298 | 650.0 | 1 533 | 153.7 | 362 |
| **Mixed-Wood Plain** | **113 373** | **186 825** | **23.7** | **6 289 604** | **797** | **38 016.1** | **4 819** | **4 677.1** | **593** |
| Quebec | 36 713 | 53 915 | 21.1 | 1 706 063 | 666 | 7 755.0 | 3 029 | 1 373.0 | 536 |
| Ontario | 76 660 | 132 910 | 25.0 | 4 583 542 | 860 | 30 261.0 | 5 680 | 3 304.2 | 620 |
| **Boreal Shield** | **13 700** | **17 335** | **10.8** | **359 493** | **225** | **2 254.7** | **1 411** | **386.7** | **242** |
| Newfoundland | 679 | 1 335 | 39.9 | 28 343 | 847 | 115.6 | 3 455 | 12.4 | 371 |
| New Brunswick | 3 | -- | 0.0 | 425 | 307 | .. | 0 | 0.4 | 289 |
| Quebec | 6 919 | 9 425 | 11.9 | 199 662 | 251 | 1 063.9 | 1 337 | 206.3 | 259 |
| Ontario | 5 788 | 6 260 | 0.0 | 108 124 | 152 | 1 022.0 | 1 437 | 157.9 | 222 |
| Manitoba | 311 | 315 | 5.6 | 22 939 | 408 | 52.9 | 941 | 9.9 | 176 |
| **Prairie** | **116 009** | **147 775** | **3.5** | **6 607 214** | **155** | **65 485.2** | **1 536** | **8 998.3** | **211** |
| Manitoba | 22 436 | 29 205 | 4.9 | 1 236 955 | 206 | 8 889.8 | 1 483 | 1 526.9 | 255 |
| Saskatchewan | 56 605 | 66 330 | 2.9 | 2 688 320 | 118 | 27 688.8 | 1 220 | 4 278.9 | 188 |
| Alberta | 36 968 | 52 240 | 3.8 | 2 681 938 | 193 | 28 906.6 | 2 075 | 3 192.5 | 229 |
| **Boreal Plain** | **40 141** | **38 350** | **3.1** | **1 222 491** | **115** | **13 732.2** | **1 297** | **2 202.6** | **208** |
| Manitoba | 6 697 | 6 295 | 3.1 | 201 200 | 129 | 1 508 2 | 964 | 286 8 | 183 |
| Saskatchewan | 10 711 | 11 600 | 3.6 | 389 794 | 120 | 3 679.7 | 1 133 | 638.0 | 196 |
| Alberta | 20 927 | 18 450 | 3.6 | 573 031 | 113 | 7 786.7 | 1 533 | 1 162.3 | 229 |
| British Columbia | 1 806 | 2 005 | 2.9 | 58 477 | 84 | 757.7 | 1 092 | 115.5 | 166 |
| **Montane Cordillera** | **9 866** | **13 420** | **9.7** | **259 727** | **188** | **3 738.3** | **2 699** | **318.6** | **230** |
| Alberta | 161 | 300 | 3.1 | 9 850 | 101 | 133.9 | 1 371 | 7.4 | 76 |
| British Columbia | 9 705 | 13 120 | 10.2 | 249 877 | 194 | 3 604.4 | 2 800 | 311.1 | 242 |
| **Pacific Maritime** | **8 436** | **16 955** | **99.6** | **490 145** | **2 879** | **4 143.3** | **24 337** | **263.5** | **1 548** |
| British Columbia | 8 436 | 16 955 | 99.6 | 490 145 | 2 879 | 4 143.3 | 24 337 | 263.5 | 1 548 |
| **Boreal Cordillera** | **65** | **160** | **5.9** | **1 154** | **43** | **21.0** | **775** | **3.2** | **118** |
| British Columbia | 65 | 80 | 3.0 | 1 154 | 43 | 21.0 | 775 | 3.2 | 118 |
| Yukon | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| **Canada** | **318 361** | **448 830** | **6.8** | **15 832 069** | **240** | **130 304** | **1 978** | **17 444** | **265** |

[1] Farm workers refers to persons aged 15 or over who worked one week or more in 1980.
[2] Capital value refers to value of buildings, land and livestock.

**Source:**
Statistics Canada, Census of Agriculture 1981, Census of Population 1981, special tabulation by the Office of the Senior Advisor on Integration.

**Notes:**
Individual items may not add to totals due to rounding.

# 3.2
# Forestry



Technical Box 3.2.1

## Canada's Forest Inventory

The purpose of the Forest Inventory is to provide readily accessible, consistent, and up-to-date information on the quantity, quality, and spatial distribution of the "productive forestlands" in Canada. The inventory data are stored on a data base maintained by the Canadian Forestry Service.

The data are obtained from provincial forest management agencies and are based largely on forest stand characteristics. In areas where provincial data are not available (e.g. Yukon, Northwest Territories, other non-managed provincial forestlands) the Canadian Forestry Service has compiled the inventory directly from various sources, including satellite imagery and aerial photographs.

Although the inventoried forests cover approximately 80 percent of the area referred to as "productive forestland", there is nevertheless a significant area of tree cover which is excluded. These areas are, for the most part, found in the northern margin of "productive forestland" which is characterized by low productivity and inaccessibility for harvest. Bordering the southern edge of the forestland are the areas referred to as "predominantly agricultural". These lands, are interspersed with woodlots and contain hardwood stands of species not found elsewhere in Canada.

A major purpose of Canada's Forest Inventory is to allow monitoring of forest productivity. This is reflected in the nature of the definitions, concepts and class structure employed in the Inventory.

### Definitions and Concepts

**Forest Type:**

*Softwood Forest:* Stands where more than 75 percent of the canopy (i.e. tree cover) is coniferous.
*Mixed-wood Forest:* Stands where between 26 percent and 75 percent of the canopy is coniferous.
*Hardwood Forest:* Stands where less than 26 percent of the canopy is coniferous.

**Productivity:**

*Productive Forest:* Land capable of producing a merchantable stand within a reasonable length of time.
*Unproductive Forest:* Land incapable of producing a merchantable stand within a reasonable length of time, characterized by muskeg, barrens, marshes, meadows.
*Stocked Forest:* Land supporting tree growth including seedlings and saplings.
*Non-stocked Forest:* Land capable of producing trees but generally lacking in tree growth due to recent cutover, burn, or disease.

**Age of Forests:**

*Regeneration:* Stands of new tree growth of less than one metre high, either generated naturally or planted by man.
*Immature:* Stands which are past the regeneration stage but insufficiently developed for harvesting.
*Mature:* Stands ready for harvesting (i.e. at or near rotation age).
*Overmature:* Stands of old trees where mortality rate may exceed new wood growth (i.e. past rotation age); characterized by openings in the canopy due to tree mortality.
*Even-aged:* Stands with small age differences in tree stock, usually less than 10 to 20 years, although for old forests (100 to 200 year trees) larger differences of up to 25 percent of rotation age may be classified as even-aged.
*Uneven-aged:* Stands where intermingling trees differ markedly in age, usually greater than 10 to 20 years.

**Status:**

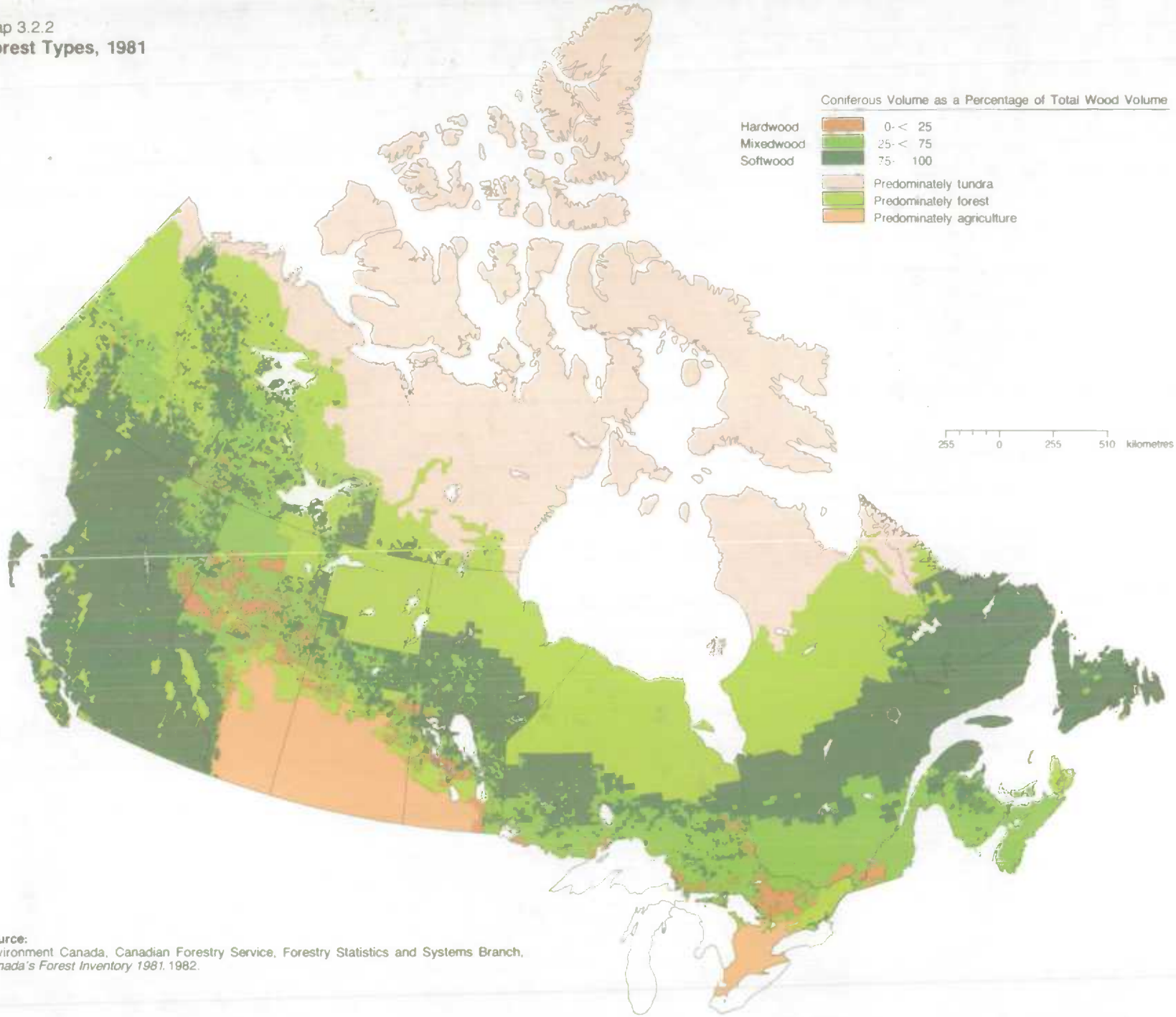
*Reserved Land:* Forestland that by law or policy is not available for harvesting.
*Nonreserved Land:* Forestland that by law or policy is available for harvesting.

### Inventory Coverage of Forestland[1]

| Province/Territory | Area of Forestland | | | Area of Productive Forestland | | |
|---|---|---|---|---|---|---|
| | Inventoried | Noninventoried | Coverage of Inventory | Inventoried | Noninventoried | Coverage of Inventory |
| | thousands of square kilometres | | percent | thousands of square kilometres | | percent |
| Newfoundland | 142 | 0 | 100.0 | 85 | 0 | 100.0 |
| Prince Edward Island | 3 | 0 | 100.0 | 3 | 0 | 100.0 |
| Nova Scotia | 41 | 0 | 100.0 | 29 | 0 | 100.0 |
| New Brunswick | 65 | 0 | 100.0 | 62 | 0 | 100.0 |
| Québec | 624 | 316 | 66.4 | 533 | 316[2] | 62.8 |
| Ontario | 432 | 375 | 53.5 | 377 | 49 | 88.5 |
| Manitoba | 240 | 109 | 68.8 | 139 | ..[3] | .. |
| Saskatchewan | 123 | 55 | 69.2 | 89 | ..[3] | .. |
| Alberta | 331 | 18 | 94.8 | 216 | 18 | 92.3 |
| British Columbia | 566 | 67 | 89.4 | 458 | 57 | 88.9 |
| Yukon | 242 | 0 | 100.0 | 67 | 0 | 100.0 |
| Northwest Territories | 615 | 0 | 100.0 | 143 | 0 | 100.0 |
| **Total** | **3 424** | **940** | **78.5** | **2 201** | **440** | **83.3** |

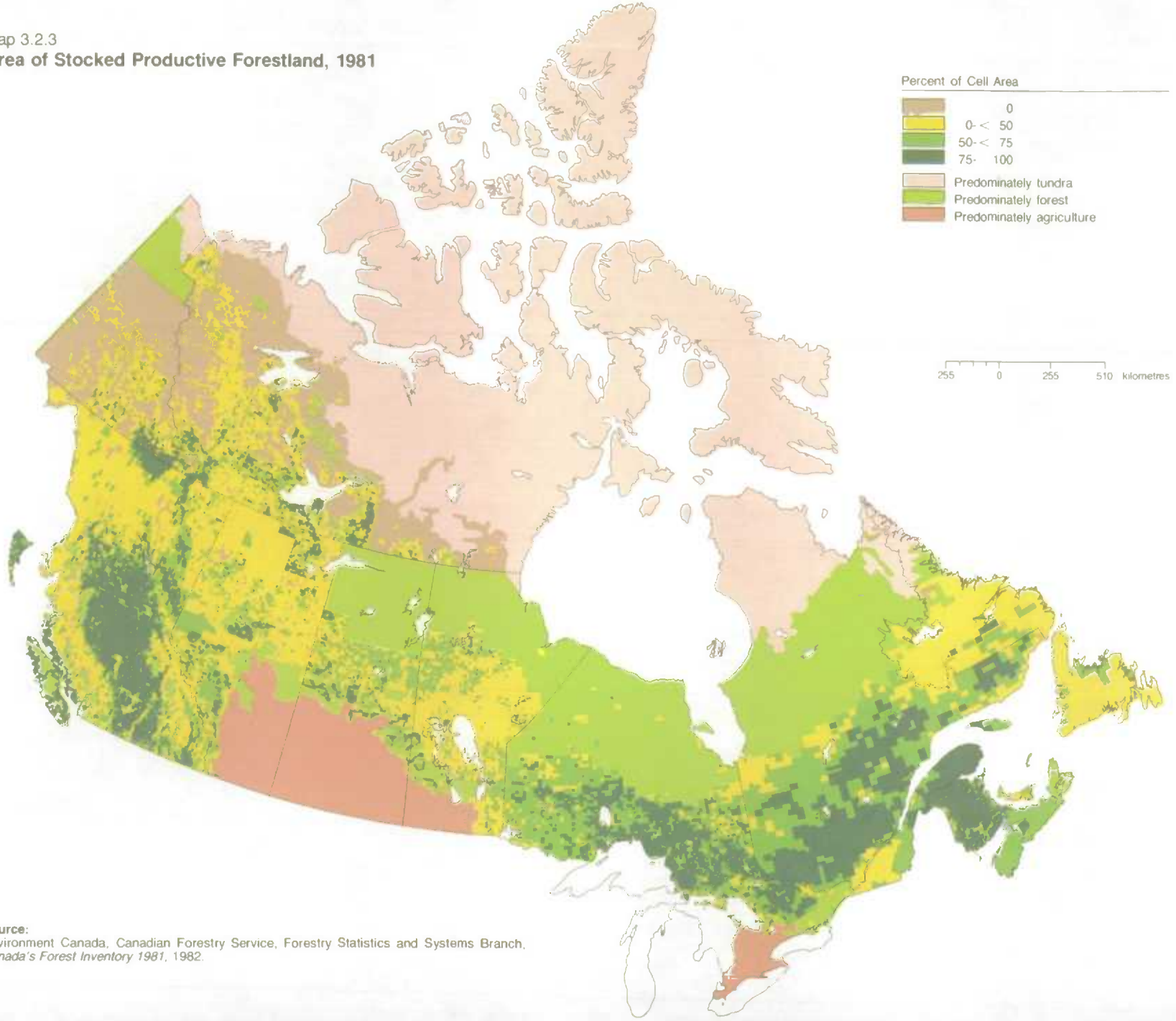
[1] Forestland is basically the area covered by trees. However, problems arise in providing estimates because the transition between treeless tundra and forestland is not sharp or is it clear where to draw the line between scattered farm woodlots and extensive tree cover. Methods of delineation between forestland and non-forestland tend to vary from province to province.
[2] Non-inventoried data available for Québec do not distinguish between unproductive and productive forestland.
[3] Data are not available on non-inventoried productive forestland for Manitoba and Saskatchewan.

Map 3.2.2
**Forest Types, 1981**



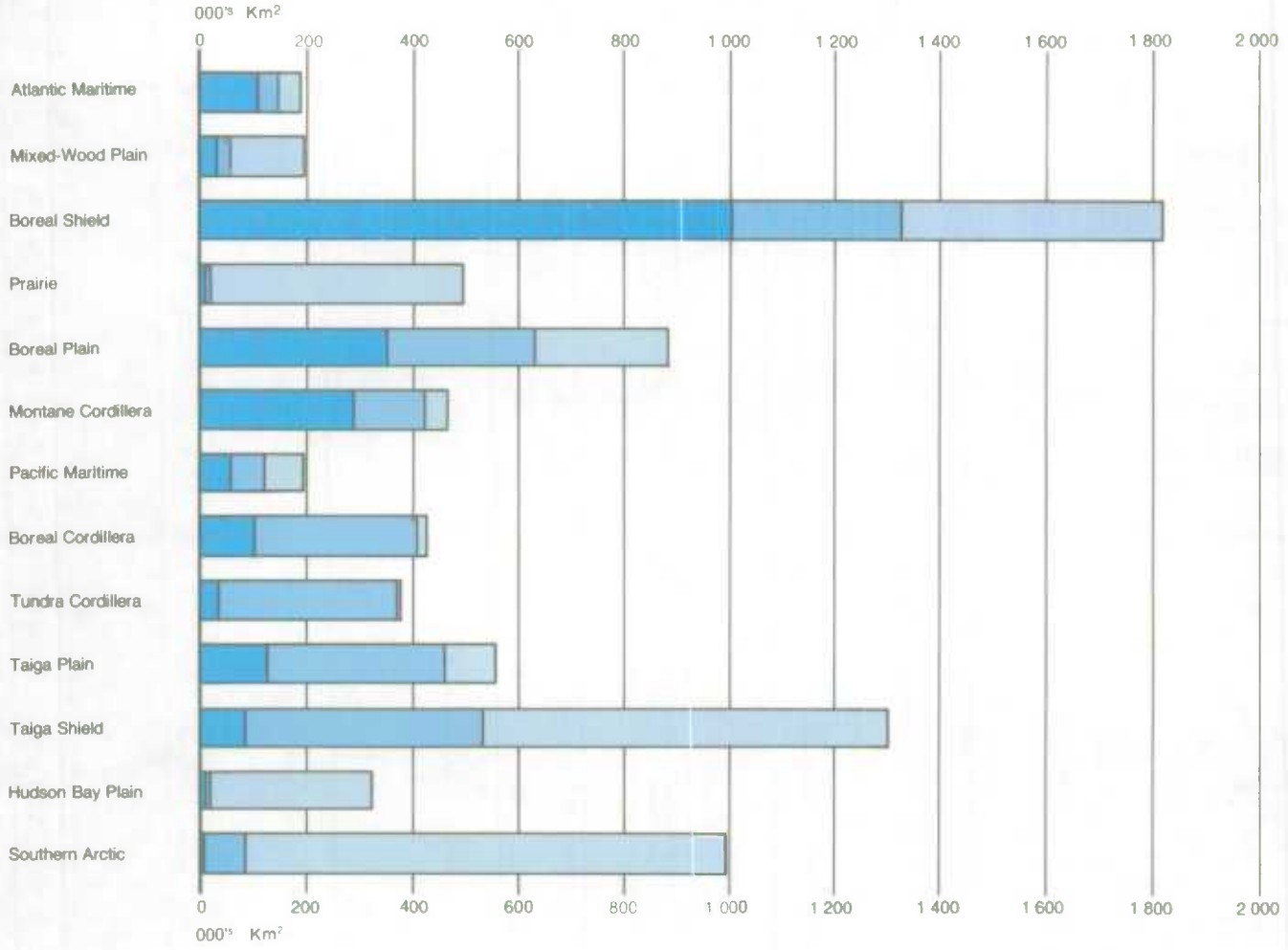

**Source:**
Environment Canada, Canadian Forestry Service, Forestry Statistics and Systems Branch, *Canada's Forest Inventory 1981*. 1982.

Map 3.2.3
**Area of Stocked Productive Forestland, 1981**




**Source:**
Environment Canada, Canadian Forestry Service, Forestry Statistics and Systems Branch, *Canada's Forest Inventory 1981*, 1982.

Chart 3.2.4
**Inventoried Forestland[1] in Relation to Ecozone Area, 1981**




[1] For definitions see Technical Box 3.2.1

**Source:**
Environment Canada, Canadian Forestry Service, Forestry Statistics and Systems Branch.

Table 3.2.5
## Productivity and Status of Inventoried Forestland[1] by Ecozone, 1981

| Ecozone | Productive, Inventoried, Non-Reserved Forestland[2] | | | Inventoried[3] Reserved Forestland | Unproductive[4] Inventoried Forestland | Total[5] Inventoried Forestland | Proportion of Ecozone Area in Inventoried Forestland |
|---|---|---|---|---|---|---|---|
| | Stocked | Non-Stocked | Total | | | | |
| | thousands of square kilometres | | | | | | percent |
| **Atlantic Maritime** | **104.1** | **4.3** | **109.3** | **0.8** | **6.5** | **124.5** | **65.9** |
| Nova Scotia | 28.5 | 0.4 | 29.2 | 0.4 | 3.5 | 41.5 | 74.8 |
| Prince Edward Island[6] | 2.5 | 0.4 | 2.9 | .. | 0.1 | 2.9 | 51.2 |
| New Brunswick | 58.7 | 2.9 | 61.8 | 0.4 | 2.5 | 64.4 | 88.3 |
| Québec | 14.4 | 1.0 | 15.4 | 0.0 | 0.4 | 15.8 | 28.9 |
| **Mixed-Wood Plain** | **27.6** | **1.9** | **29.5** | **0.0** | **1.6** | **31.1** | **16.0** |
| Québec | 24.6 | 1.6 | 26.2 | 0.0 | 1.3 | 27.5 | 48.3 |
| Ontario | 3.0 | 0.3 | 3.2 | 0.0 | 0.3 | 3.5 | 2.5 |
| **Boreal Shield** | **900.5** | **94.0** | **1 006.2** | **8.9** | **241.2** | **1 247.5** | **68.6** |
| Newfoundland | 32.6 | 4.0 | 37.8 | 2.0 | 26.4 | 64.3 | 52.3 |
| New Brunswick | 0.2 | 0.0 | 0.2 | 0.0 | 0.0 | 0.2 | 40.8 |
| Québec | 440.7 | 39.9 | 481.1 | 0.5 | 80.0 | 561.2 | 80.9 |
| Ontario | 319.0 | 36.2 | 363.7 | 4.0 | 50.0 | 413.8 | 63.4 |
| Manitoba | 87.9 | 12.7 | 101.3 | 1.2 | 77.2 | 178.4 | 71.8 |
| Saskatchewan | 20.1 | 1.2 | 22.1 | 1.2 | 7.6 | 30.0 | 30.0 |
| **Prairie** | **4.2** | **0.5** | **6.1** | **1.9** | **0.8** | **7.0** | **1.4** |
| Manitoba | 3.1 | 0.4 | 4.3 | 0.9 | 0.7 | 5.0 | 7.1 |
| Saskatchewan | 0.9 | 0.0 | 0.4 | 0.6 | 0.0 | 1.5 | 0.6 |
| Alberta | 0.2 | 0.1 | 0.4 | 0.4 | 0.1 | 0.6 | 0.4 |
| **Boreal Plain** | **259.8** | **72.5** | **349.9** | **27.3** | **155.0** | **506.1** | **57.3** |
| Manitoba | 26.1 | 4.8 | 32.6 | 2.3 | 20.5 | 53.3 | 41.1 |
| Saskatchewan | 52.6 | 4.6 | 65.6 | 12.4 | 26.5 | 92.1 | 35.6 |
| Alberta | 113.2 | 53.7 | 171.7 | 12.2 | 80.8 | 253.5 | 67.4 |
| British Columbia | 51.4 | 7.8 | 61.8 | 0.2 | 21.4 | 83.5 | 88.9 |
| Yukon | 15.8 | 1.6 | 17.5 | 0.0 | 5.7 | 23.1 | 86.4 |
| Northwest Territories | 0.7 | 0.0 | 0.7 | 0.0 | 0.1 | 0.1 | 23.5 |
| **Montane Cordillera** | **257.5** | **14.3** | **284.4** | **18.1** | **32.3** | **316.8** | **68.4** |
| Alberta | 11.9 | 3.1 | 20.9 | 10.1 | 5.1 | 26.0 | 59.3 |
| British Columbia | 245.6 | 11.2 | 263.5 | 7.3 | 27.2 | 290.9 | 69.3 |
| **Pacific Maritime** | **48.7** | **1.6** | **51.5** | **1.5** | **17.0** | **68.5** | **34.8** |
| British Columbia | 48.7 | 1.6 | 51.5 | 1.5 | 17.0 | 68.5 | 34.8 |
| **Boreal Cordillera** | **78.8** | **18.3** | **101.0** | **5.1** | **119.9** | **220.8** | **51.9** |
| British Columbia | 55.5 | 4.1 | 63.5 | 2.6 | 33.1 | 96.6 | 46.5 |
| Yukon | 23.3 | 14.2 | 37.5 | 2.5 | 86.8 | 124.3 | 57.0 |
| **Tundra Cordillera** | **27.5** | **2.2** | **32.9** | **4.6** | **123.9** | **157.6** | **41.8** |
| Yukon | 10.1 | 2.2 | 12.3 | 0.0 | 82.1 | 94.5 | 41.5 |
| Northwest Territories | 17.4 | 0.0 | 20.6 | 4.6 | 41.8 | 63.1 | 42.3 |
| **Taiga Plain** | **106.1** | **11.4** | **126.8** | **10.9** | **265.2** | **407.5** | **73.1** |
| Alberta | 7.0 | 6.3 | 20.0 | 7.9 | 25.6 | 47.6 | 69.9 |
| British Columbia | 10.1 | 4.9 | 15.1 | 0.1 | 7.6 | 22.7 | 76.0 |
| Northwest Territories | 89.0 | 0.2 | 91.7 | 2.9 | 232.0 | 337.3 | 74.3 |
| **Taiga Shield** | **78.7** | **4.1** | **82.8** | **0.0** | **172.5** | **268.3** | **20.6** |
| Newfoundland | 45.2 | 0.7 | 45.9 | 0.0 | 31.2 | 77.1 | 34.0 |
| Québec | 5.9 | 1.2 | 7.1 | 0.0 | 4.0 | 11.1 | 0.2 |
| Manitoba | 0.7 | 0.1 | 0.8 | 0.0 | 1.6 | 2.4 | 2.0 |
| Alberta | 0.9 | 2.1 | 3.0 | 0.0 | 0.1 | 3.1 | 48.3 |
| Northwest Territories | 26.0 | 0.0 | 26.0 | 0.0 | 135.6 | 174.6 | 42.0 |
| **Hudson Bay Plain** | **6.2** | **0.6** | **6.9** | **0.1** | **8.6** | **15.7** | **4.2** |
| Québec | 2.1 | 0.3 | 2.4 | 0.0 | 4.9 | 7.4 | 85.8 |
| Ontario | 4.1 | 0.3 | 4.5 | 0.1 | 3.9 | 8.3 | 3.0 |
| **Southern Arctic** | **3.2** | **0.0** | **3.2** | **0.0** | **33.4** | **37.0** | **3.7** |
| Newfoundland | 0.4 | 0.0 | 0.4 | 0.0 | 0.0 | 0.4 | 0.7 |
| Yukon | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Northwest Territories | 2.8 | 0.0 | 2.8 | 0.0 | 33.4 | 36.5 | 4.7 |
| **Canada** | **1 903.0** | **225.7** | **2 190.5** | **79.0** | **1 178.2** | **3 408.4** | **33.4** |

[1] See Technical Box 3.2.1 for definitions.
[2] A proportion of the inventoried forestland is undetermined; therefore status or stocking condition could not be allocated. This undetermined portion however, is included in the total.
[3] Reserved forestlands are predominantly found in national parks and provincial parks in which logging is not allowed.
[4] Unproductive forestland is land incapable of producing a merchantable stand of timber.
[5] Includes a portion of the inventory whose productive status is undetermined.

**Source:**
Environment Canada, Canadian Forestry Serice, Forestry Statistics and Systems Branch, *Canada's Forest Inventory, 1981.*

**Notes:**
The minor differences between the Canada and Provincial totals here and those in *Canada's Forest Inventory, 1981* are due to the re-aggregation of the data to ecozones. Also, individual items may not add to totals due to rounding.

Table 3.2.6
## Age Class[1] of Stocked, Productive, Inventoried Forestland[2] by Ecozone, 1981

| Ecozone | Regeneration | | Immature | | Mature | | Overmature | | Uneven Aged | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Area | % of Ecozone Forestland | Area | % of Ecozone Forestland | Area | % of Ecozone Forestland | Area | % of Ecozone Forestland | Area | % of Ecozone Forestland | Area | % of Ecozone Forestland |
| | 000s of km² | % | 000s of km² | % | 000s of km² | % | 000s of km² | % | 000s of km² | % | 000s of km² | % |
| **Atlantic Maritime** | **3.0** | **2.9** | **37.7** | **36.1** | **53.5** | **51.2** | **4.4** | **4.2** | **2.9** | **2.8** | **104.1** | **100.0** |
| Nova Scotia | 0.7 | 2.5 | 3.6 | 12.6 | 19.1 | 67.0 | 2.3 | 8.1 | 2.8 | 9.8 | 28.5 | 100.0 |
| Prince Edward Island | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2.5 | 100.0 |
| New Brunswick | 0.2 | 0.3 | 25.5 | 43.4 | 30.8 | 52.5 | 2.1 | 3.6 | 0.1 | 0.2 | 58.7 | 100.0 |
| Québec | 2.1 | 14.6 | 8.7 | 60.4 | 3.5 | 24.3 | 0.0 | 0.0 | 0.0 | 0.0 | 14.4 | 100.0 |
| **Mixed-Wood Plain** | **5.4** | **19.6** | **16.4** | **59.6** | **5.6** | **20.4** | **0.20** | **0.7** | **0.0** | **0.0** | **27.6** | **100.0** |
| Québec | 5.2 | 21.1 | 14.0 | 56.9 | 5.3 | 21.5 | 0.0 | 0.0 | 0.0 | 0.0 | 24.6 | 100.0 |
| Ontario | 0.2 | 6.7 | 2.4 | 80.0 | 0.2 | 6.7 | 0.2 | 6.7 | 0.0 | 0.0 | 3.0 | 100.0 |
| **Boreal Shield** | **85.7** | **9.5** | **410.6** | **45.6** | **318.6** | **35.4** | **46.6** | **5.2** | **0.0** | **0.0** | **900.5** | **100.0** |
| Newfoundland | 0.0 | 0.0 | 3.2 | 9.8 | 6.9 | 21.2 | 3.6 | 11.0 | 0.0 | 0.0 | 32.6 | 100.0 |
| New Brunswick | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 100.0 |
| Québec | 60.0 | 13.6 | 116.7 | 26.5 | 263.7 | 59.8 | 0.0 | 0.0 | 0.0 | 0.0 | 440.8 | 100.0 |
| Ontario | 15.9 | 5.0 | 225.2 | 70.6 | 35.4 | 11.1 | 42.5 | 13.3 | 0.0 | 0.0 | 319.0 | 100.0 |
| Manitoba | 9.5 | 10.8 | 65.5 | 74.5 | 12.4 | 14.1 | 0.5 | 0.6 | 0.0 | 0.0 | 87.9 | 100.0 |
| Saskatchewan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 20.1 | 100.0 |
| **Prairie** | **0.2** | **4.6** | **2.4** | **57.1** | **1.3** | **31.0** | **0.1** | **2.4** | **0.0** | **0.0** | **4.2** | **100.0** |
| Manitoba | 0.2 | 6.5 | 1.9 | 61.3 | 1.0 | 32.3 | 0.1 | 3.2 | 0.0 | 0.0 | 3.1 | 100.0 |
| Saskatchewan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.9 | 100.0 |
| Alberta | 0.0 | 0.0 | 0.1 | 50.0 | 0.1 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 100.0 |
| **Boreal Plain** | **28.5** | **11.0** | **131.0** | **50.4** | **39.9** | **15.4** | **8.6** | **2.5** | **0.1** | **0.0** | **259.8** | **100.0** |
| Manitoba | 1.8 | 6.9 | 16.6 | 63.6 | 6.7 | 25.7 | 1.1 | 4.2 | 0.0 | 0.0 | 26.1 | 100.0 |
| Saskatchewan | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 52.6 | 100.0 |
| Alberta | 13.9 | 12.3 | 76.7 | 67.8 | 15.3 | 13.5 | 5.6 | 4.9 | 0.0 | 0.0 | 113.2 | 100.0 |
| British Columbia | 6.9 | 13.4 | 28.1 | 54.7 | 16.3 | 31.7 | 0.0 | 0.0 | 0.1 | 0.2 | 51.4 | 100.0 |
| Yukon | 5.9 | 37.1 | 8.8 | 55.3 | 1.0 | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 15.9 | 100.0 |
| Northwest Territories | 0.0 | 0.0 | 0.3 | 42.9 | 0.4 | 57.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 100.0 |
| **Montane Cordillera** | **6.6** | **2.6** | **105.6** | **41.0** | **142.0** | **55.1** | **1.4** | **0.5** | **1.6** | **0.6** | **257.5** | **100.0** |
| Alberta | 0.2 | 1.7 | 7.4 | 62.2 | 2.9 | 24.4 | 1.4 | 11.8 | 0.0 | 0.0 | 11.9 | 100.0 |
| British Columbia | 6.7 | 2.7 | 98.3 | 40.0 | 139.1 | 56.6 | 0.0 | 0.0 | 1.6 | 0.7 | 245.6 | 100.0 |
| **Pacific Maritime** | **2.0** | **4.1** | **9.4** | **19.3** | **37.2** | **76.4** | **0.0** | **0.0** | **0.1** | **0.2** | **48.7** | **100.0** |
| British Columbia | 2.0 | 4.1 | 9.4 | 19.3 | 37.2 | 76.4 | 0.0 | 0.0 | 0.1 | 0.2 | 48.7 | 100.0 |
| **Boreal Cordillera** | **12.0** | **15.2** | **30.2** | **38.4** | **36.3** | **46.1** | **0.0** | **0.0** | **0.0** | **0.0** | **78.6** | **100.0** |
| British Columbia | 2.2 | 4.0 | 18.6 | 33.5 | 34.7 | 62.5 | 0.0 | 0.0 | 0.0 | 0.0 | 55.5 | 100.0 |
| Yukon | 9.9 | 42.5 | 11.6 | 49.8 | 1.5 | 6.4 | 0.0 | 0.0 | 0.0 | 0.0 | 23.3 | 100.0 |
| **Tundra Cordillera** | **5.1** | **18.5** | **17.3** | **62.9** | **5.1** | **16.5** | **0.0** | **0.0** | **0.0** | **0.0** | **27.5** | **100.0** |
| Yukon | 3.9 | 38.6 | 5.8 | 57.4 | 0.5 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.1 | 100.0 |
| Northwest Territories | 1.2 | 6.9 | 11.5 | 66.5 | 4.6 | 26.6 | 0.0 | 0.0 | 0.0 | 0.0 | 17.3 | 100.0 |
| **Taiga Plain** | **5.9** | **5.6** | **64.5** | **60.6** | **35.5** | **33.5** | **0.2** | **0.2** | **0.0** | **0.0** | **106.1** | **100.0** |
| Alberta | 1.6 | 22.9 | 5.1 | 72.9 | 0.1 | 1.4 | 0.1 | 1.4 | 0.0 | 0.0 | 7.0 | 100.0 |
| British Columbia | 1.0 | 9.9 | 8.3 | 82.2 | 0.8 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 10.1 | 100.0 |
| Northwest Territories | 3.3 | 3.7 | 51.1 | 57.4 | 34.5 | 38.8 | 0.1 | 0.1 | 0.0 | 0.0 | 89.0 | 100.0 |
| **Taiga Shield** | **3.8** | **4.6** | **23.8** | **30.2** | **6.7** | **8.5** | **1.0** | **1.3** | **0.0** | **0.0** | **78.7** | **100.0** |
| Newfoundland | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 45.2 | 100.0 |
| Québec | 1.1 | 19.0 | 0.2 | 3.4 | 4.6 | 79.3 | 0.0 | 0.0 | 0.0 | 0.0 | 5.8 | 100.0 |
| Manitoba | 0.1 | 14.3 | 0.5 | 71.4 | 0.1 | 14.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 100.0 |
| Alberta | 0.0 | 0.0 | 0.9 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 100.0 |
| Northwest Territories | 2.6 | 10.0 | 22.1 | 85.0 | 1.2 | 4.6 | 0.0 | 0.0 | 0.0 | 0.0 | 26.0 | 100.0 |
| **Hudson Bay Plain** | **0.7** | **11.3** | **1.8** | **29.0** | **1.5** | **24.2** | **2.3** | **37.1** | **0.0** | **0.0** | **6.2** | **100.0** |
| Québec | 0.6 | 28.6 | 0.3 | 14.3 | 1.2 | 57.1 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 100.0 |
| Ontario | 0.1 | 2.4 | 1.5 | 36.6 | 0.3 | 7.3 | 2.3 | 56.1 | 0.0 | 0.0 | 4.1 | 100.0 |
| **Southern Arctic** | **0.1** | **3.1** | **0.2** | **6.3** | **2.6** | **81.3** | **0.0** | **0.0** | **0.0** | **0.0** | **3.2** | **100.0** |
| Newfoundland | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 0.4 | 100.0 |
| Northwest Territories | 0.1 | 3.6 | 0.2 | 7.1 | 2.6 | 92.9 | 0.0 | 0.0 | 0.0 | 0.0 | 2.8 | 100.0 |
| **Canada** | **159.2** | **8.4** | **850.5** | **44.7** | **684.9** | **36.0** | **62.4** | **3.3** | **4.7** | **0.2** | **1 903.0** | **100.0** |

[1] See Technical Box 3.2.1 for definition of age classes.
[2] Age class has only been determined for stocked, productive, non-reserved forestland.

**Source:**
Environment Canada, Canadian Forestry Service, Forestry Statistics and Systems Branch, *Canada's Forest Inventory, 1981*.

**Note:**
Individual items may not add to totals due to rounding.

Table 3.2.7
## Volume of Softwood Species on Stocked, Productive Forestland,[1] by Ecozone, 1981

| Ecozone | Spruce | Pine | Fir | Hemlock | Cedar | Douglas Fir | Other[2] | Softwood Total |
|---|---|---|---|---|---|---|---|---|
| | thousands of cubic metres | | | | | | | |
| **Atlantic Maritime** | **254 921** | **32 406** | **220 725** | **13 929** | **45 232** | **0** | **5 637** | **572 851** |
| Nova Scotia | 76 050 | 12 282 | 38 082 | 7 876 | 0 | 0 | 2 573 | 136 862 |
| Prince Edward Island | .. | .. | .. | .. | .. | .. | .. | .. |
| New Brunswick | 153 260 | 19 851 | 117 073 | 6 053 | 37 139 | 0 | 2 750 | 336 126 |
| Québec | 25 612 | 273 | 65 570 | 0 | 8 093 | 0 | 314 | 99 863 |
| **Mixed-Wood Plain** | **20 249** | **4 246** | **42 015** | **6 338** | **9 755** | **0** | **967** | **83 570** |
| Québec | 18 507 | 2 436 | 41 018 | 6 156 | 7 207 | 0 | 879 | 76 202 |
| Ontario | 1 742 | 1 810 | 997 | 182 | 2 548 | 0 | 88 | 7 368 |
| **Boreal Shield** | **3 248 056** | **920 187** | **1 065 813** | **29 964** | **100 414** | **0** | **71 736** | **5 436 170** |
| Newfoundland | 39 246 | 261 | 43 368 | 0 | 0 | 0 | 46 230 | 129 106 |
| New Brunswick | 405 | 96 | 778 | 1 | 178 | 0 | 0 | 1 457 |
| Québec | 1 701 151 | 221 823 | 882 697 | 18 910 | 54 682 | 0 | 8 402 | 2 867 665 |
| Ontario | 1 257 601 | 545 236 | 152 872 | 11 054 | 44 969 | 0 | 11 328 | 2 023 060 |
| Manitoba | 196 116 | 124 906 | 5 440 | 0 | 585 | 0 | 5 404 | 332 451 |
| Saskatchewan | 53 536 | 27 866 | 657 | 0 | 0 | 0 | 372 | 82 431 |
| **Prairie** | **4 879** | **3 176** | **168** | **0** | **0** | **160** | **284** | **8 667** |
| Manitoba | 4 643 | 2 456 | 117 | 0 | 0 | 0 | 281 | 7 497 |
| Saskatchewan | 98 | 127 | 7 | 0 | 0 | 0 | 3 | 235 |
| Alberta | 138 | 593 | 44 | 0 | 0 | 160 | 0 | 935 |
| **Boreal Plain** | **746 244** | **495 822** | **38 772** | **0** | **129** | **6 261** | **105 309** | **1 392 538** |
| Manitoba | 55 851 | 33 556 | 4 030 | 0 | 129 | 0 | 3 200 | 96 765 |
| Saskatchewan | 120 539 | 82 156 | 4 312 | 0 | 0 | 0 | 3 664 | 210 671 |
| Alberta | 337 404 | 282 639 | 26 413 | 0 | 0 | 6 152 | 106 | 652 714 |
| British Columbia | 232 450 | 97 472 | 4 017 | 0 | 0 | 110 | 736 | 334 784 |
| Yukon | 0 | 0 | 0 | 0 | 0 | 0 | 93 097 | 93 097 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 4 506 | 4 506 |
| **Montane Cordillera** | **1 223 841** | **1 386 581** | **810 396** | **224 871** | **146 498** | **447 665** | **51 510** | **4 291 362** |
| Alberta | 35 263 | 54 586 | 4 742 | 0 | 0 | 2 594 | 19 | 97 204 |
| British Columbia | 1 188 579 | 1 331 995 | 805 654 | 224 871 | 146 498 | 445 070 | 51 491 | 4 194 158 |
| **Pacific Maritime** | **152 568** | **34 762** | **369 888** | **909 170** | **454 656** | **154 284** | **113 302** | **2 188 631** |
| British Columbia | 152 568 | 34 762 | 369 888 | 909 170 | 454 656 | 154 284 | 113 302 | 2 188 631 |
| **Boreal Cordillera** | **314 449** | **146 430** | **123 855** | **6 226** | **0** | **19** | **81 173** | **672 152** |
| British Columbia | 314 449 | 146 430 | 123 855 | 6 226 | 0 | 19 | 140 | 591 119 |
| Yukon | 0 | 0 | 0 | 0 | 0 | 0 | 81 033 | 81 033 |
| **Tundra Cordillera** | **0** | **0** | **0** | **0** | **0** | **0** | **72 062** | **72 062** |
| Yukon | 0 | 0 | 0 | 0 | 0 | 0 | 40 097 | 40 097 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 31 966 | 31 966 |
| **Taiga Plain** | **52 366** | **4 449** | **10 477** | **0** | **0** | **3** | **241 402** | **308 698** |
| Alberta | 21 215 | 2 721 | 1 927 | 0 | 0 | 0 | 0 | 25 863 |
| British Columbia | 31 151 | 1 728 | 8 550 | 0 | 0 | 3 | 761 | 42 194 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 240 641 | 240 841 |
| **Taiga Shield** | **30 704** | **4 147** | **9 160** | **0** | **0** | **0** | **274 437** | **318 449** |
| Newfoundland | 6 578 | 0 | 3 543 | 0 | 0 | 0 | 249 474 | 259 595 |
| Québec | 22 943 | 249 | 5 611 | 0 | 0 | 0 | 160 | 28 963 |
| Manitoba | 756 | 26 | 0 | 0 | 0 | 0 | 1 | 782 |
| Alberta | 428 | 3 873 | 8 | 0 | 0 | 0 | 0 | 4 306 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 24 803 | 24 803 |
| **Hudson Bay Plain** | **35 465** | **2 961** | **818** | **0** | **87** | **0** | **503** | **39 834** |
| Québec | 11 129 | 1 239 | 349 | 0 | 2 | 0 | 32 | 12 751 |
| Ontario | 24 336 | 1 722 | 488 | 0 | 85 | 0 | 471 | 27 083 |
| **Southern Arctic** | **0** | **0** | **0** | **0** | **0** | **0** | **11 669** | **11 669** |
| Newfoundland | 0 | 0 | 0 | 0 | 0 | 0 | 1 606 | 1 606 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 10 062 | 10 062 |
| **Canada** | **6 083 742** | **3 035 167** | **2 692 083** | **1 190 498** | **756 771** | **608 392** | **1 029 942** | **15 396 653** |

[1] Volume of wood on stocked, productive, non-reserved forestland only. See Technical Box 3.2.1 for definitions.
[2] Tamarack, western larch, European larch.

**Source:**
Environment Canada, Canadian Forestry Service, Forestry Statistics and Systems Branch, *Canada's Forest Inventory, 1981.*

**Notes:**
The minor differences between the Canada and Provincial totals here and those in *Canada's Forest Inventory*, 1981 are due to the reaggregation of the data to ecozones. Also, individual items may not add to totals due to rounding.

Table 3.2.8
## Volume of Hardwood Species on Stocked, Productive Forestland,[1] by Ecozone, 1981

| Ecozone | Aspen/Poplar | Birch | Maple | Other[2] | Hardwood Total | All Hardwood and Softwood Species Total |
|---|---|---|---|---|---|---|
| | thousands of cubic metres | | | | | |
| **Atlantic Maritime** | **48 762** | **56 112** | **118 825** | **46 321** | **270 021** | **842 873** |
| Nova Scotia | 6 453 | 0 | 36 913 | 22 236 | 65 601 | 202 463 |
| Prince Edward Island | .. | .. | .. | .. | .. | .. |
| New Brunswick | 32 373 | 46 031 | 76 035 | 23 530 | 177 969 | 514 095 |
| Québec | 9 937 | 10 081 | 5 877 | 556 | 26 451 | 126 314 |
| **Mixed-Wood Plain** | **16 270** | **28 000** | **87 570** | **16 870** | **128 711** | **212 281** |
| Québec | 12 898 | 26 351 | 63 954 | 13 784 | 116 986 | 193 188 |
| Ontario | 3 373 | 1 650 | 3 617 | 3 086 | 11 725 | 19 093 |
| **Boreal Shield** | **936 588** | **804 065** | **296 832** | **93 934** | **2 131 419** | **7 567 587** |
| Newfoundland | 1 719 | 13 048 | 259 | 4 534 | 19 560 | 148 666 |
| New Brunswick | 56 | 127 | 166 | 21 | 370 | 1 827 |
| Québec | 231 065 | 444 579 | 164 492 | 55 345 | 895 481 | 3 763 146 |
| Ontario | 596 422 | 329 539 | 131 916 | 33 489 | 1 091 367 | 3 114 427 |
| Manitoba | 86 595 | 12 318 | 0 | 544 | 99 458 | 431 909 |
| Saskatchewan | 20 729 | 4 454 | 0 | 0 | 25 183 | 107 613 |
| **Prairie** | **15 636** | **804** | **0** | **1 930** | **18 371** | **27 038** |
| Manitoba | 14 762 | 778 | 0 | 1 930 | 17 470 | 24 967 |
| Saskatchewan | 457 | 26 | 0 | 0 | 484 | 719 |
| Alberta | 417 | 0 | 0 | 0 | 417 | 1 352 |
| **Boreal Plain** | **986 283** | **26 460** | **817** | **17 707** | **1 031 268** | **2 423 806** |
| Manitoba | 69 526 | 5 857 | 0 | 2 752 | 78 136 | 174 901 |
| Saskatchewan | 154 210 | 9 148 | 817 | 652 | 164 828 | 375 500 |
| Alberta | 606 118 | 0 | 0 | 0 | 606 118 | 1 258 832 |
| British Columbia | 156 428 | 11 454 | 0 | 0 | 167 882 | 502 666 |
| Yukon | 0 | 0 | 0 | 9 876 | 9 876 | 102 973 |
| Northwest Territories | 0 | 0 | 0 | 4 427 | 4 427 | 8 933 |
| **Montane Cordillera** | **124 077** | **21 891** | **298** | **455** | **146 720** | **4 438 083** |
| Alberta | 14 003 | 0 | 0 | 0 | 14 003 | 111 207 |
| British Columbia | 110 073 | 21 891 | 298 | 455 | 132 717 | 4 326 875 |
| **Pacific Maritime** | **16 385** | **3 299** | **4 426** | **19 699** | **43 809** | **2 232 440** |
| British Columbia | 16 385 | 3 299 | 4 426 | 19 699 | 43 809 | 2 232 440 |
| **Boreal Cordillera** | **38 346** | **2 299** | **0** | **18 140** | **58 785** | **730 937** |
| British Columbia | 38 346 | 2 299 | 0 | 0 | 40 645 | 631 764 |
| Yukon | 0 | 0 | 0 | 18 140 | 18 140 | 99 173 |
| **Tundra Cordillera** | **0** | **0** | **0** | **17 279** | **17 279** | **89 341** |
| Yukon | 0 | 0 | 0 | 11 852 | 11 852 | 51 748 |
| Northwest Territories | 0 | 0 | 0 | 5 428 | 5 428 | 37 393 |
| **Taiga Plain** | **50 977** | **1 960** | **0** | **113 787** | **166 725** | **475 423** |
| Alberta | 35 414 | 0 | 0 | 0 | 35 414 | 61 277 |
| British Columbia | 15 563 | 1 960 | 0 | 0 | 17 524 | 59 717 |
| Northwest Territories | 0 | 0 | 0 | 113 787 | 113 787 | 354 428 |
| **Taiga Shield** | **1 201** | **1 460** | **0** | **16 285** | **18 946** | **337 396** |
| Newfoundland | 72 | 714 | 0 | 9 234 | 10 020 | 269 615 |
| Québec | 101 | 733 | 0 | 0 | 834 | 29 797 |
| Manitoba | 10 | 12 | 0 | 0 | 22 | 805 |
| Alberta | 1 018 | 0 | 0 | 0 | 1 018 | 5 324 |
| Northwest Territories | 0 | 0 | 0 | 7 052 | 7 052 | 31 854 |
| **Hudson Bay Plain** | **3 053** | **618** | **0** | **0** | **3 671** | **43 505** |
| Québec | 682 | 126 | 0 | 0 | 808 | 13 559 |
| Ontario | 2 371 | 492 | 0 | 0 | 2 864 | 29 946 |
| **Southern Arctic** | **0** | **0** | **0** | **50** | **50** | **11 719** |
| Newfoundland | 0 | 0 | 0 | 34 | 34 | 1 641 |
| Northwest Territories | 0 | 0 | 0 | 16 | 16 | 10 078 |
| **Canada** | **2 237 578** | **946 968** | **488 589** | **362 457** | **4 035 775** | **19 432 327** |

[1] Volume of wood on stocked, productive, non-reserved forestland only. See Technical Box 3.2.1 for definitions.
[2] Black willow, butternut, black walnut, hickory, alder, beech, oak, elm, ash, red mulberry, tulip tree, sassafras, black cherry, cascara, basswood, black gum, arbutus.

**Source:**
Environment Canada, Canadian Forestry Service, Forestry Statistics and Systems Branch, *Canada's Forest Inventory, 1981.*

**Notes:**
The minor differences between the Canada and Provincial totals here and those in *Canada's Forest Inventory, 1981* are due to the re-aggregation of the data to ecozones. Also, individual items may not add to totals due to rounding.

Table 3.2.9
## Forest Harvest[1] by Province, 1954 to 1982 (5 year averages)

| Province | 1954 to 1958 | | 1959 to 1963 | | 1964 to 1968 | | 1969 to 1973 | | 1974 to 1978 | | 1979 to 1982[2] | | Percentage Change Between Periods 1954-1958 and 1979-1982 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Volume | Volume as a Percentage of Canada Total | Volume | Volume as a Percentage of Canada Total | Volume | Volume as a Percentage of Canada Total | Volume | Volume as a Percentage of Canada Total | Volume | Volume as a Percentage of Canada Total | Volume | Volume as a Percentage of Canada Total | |
| | 000s of cubic metres | percent | 000s of cubic metres | percent | 000s of cubic metres | percent | 000s of cubic metres | percent | 000s of cubic metres | percent | 000s of cubic metres | percent | percent |
| Newfoundland | 2 825 | 3.1 | 2 747 | 2.9 | 2 638 | 2.5 | 2 567 | 2.0 | 2 498 | 1.8 | 2 556 | 1.7 | -11 |
| Prince Edward Island | 285 | 0.3 | 244 | 0.3 | 176 | 0.2 | 201 | 0.2 | 164 | 0.1 | 278 | 0.2 | -3 |
| Nova Scotia | 2 941 | 3.3 | 2 565 | 2.8 | 3 142 | 2.9 | 3 349 | 2.7 | 3 765 | 2.7 | 3 980 | 2.7 | 26 |
| New Brunswick | 5 726 | 6.4 | 5 052 | 5.4 | 5 920 | 5.5 | 7 301 | 5.8 | 7 875 | 5.7 | 7 813 | 5.3 | 27 |
| Québec | 27 097 | 30.1 | 25 263 | 27.1 | 27 456 | 25.6 | 28 535 | 22.6 | 31 064 | 22.4 | 32 698 | 22.2 | 17 |
| Ontario | 14 924 | 16.6 | 14 846 | 15.9 | 16 627 | 15.5 | 17 210 | 13.6 | 17 857 | 12.9 | 21 301 | 14.5 | 30 |
| Manitoba | 1 679 | 1.9 | 1 299 | 1.4 | 1 135 | 1.1 | 1 595 | 1.3 | 1 890 | 1.4 | 1 885 | 1.3 | 11 |
| Saskatchewan | 1 560 | 1.7 | 1 294 | 1.4 | 1 474 | 1.4 | 2 470 | 2.0 | 2 756 | 2.0 | 3 248 | 2.2 | 52 |
| Alberta | 3 222 | 3.6 | 3 778 | 4.1 | 3 530 | 3.3 | 4 580 | 3.6 | 5 708 | 4.1 | 6 110 | 4.2 | 47 |
| British Columbia | 29 609 | 32.9 | 36 003 | 38.6 | 44 883 | 41.9 | 58 277 | 46.2 | 64 964 | 46.8 | 66 965 | 45.6 | 56 |
| Yukon and Northwest Territories | 136 | 0.2 | 104 | 0.1 | 102 | 8.1 | 99 | 0.1 | 155 | 0.1 | 153 | 0.1 | 11 |
| **Canada** | **90 005** | **100.0** | **93 196** | **100.0** | **107 081** | **100.0** | **126 186** | **100.0** | **138 695** | **100.0** | **146 985** | **100.0** | **39** |

[1] Data on forest harvest are obtained from a survey of the logging industry by "establishment" (an accounting unit for the purpose of collecting principal statistics). The geographical location of the data is by address of establishment rather than location of harvesting activity.
[2] The 1979 to 1982 average is based on a four year period.

**Source:**
Statistics Canada, Manufacturing and Primary Industries Division, *Canadian Forestry Statistics* , various issues, Catalogue No. 25-202.

**Note:**
Individual items may not add to totals due to rounding.

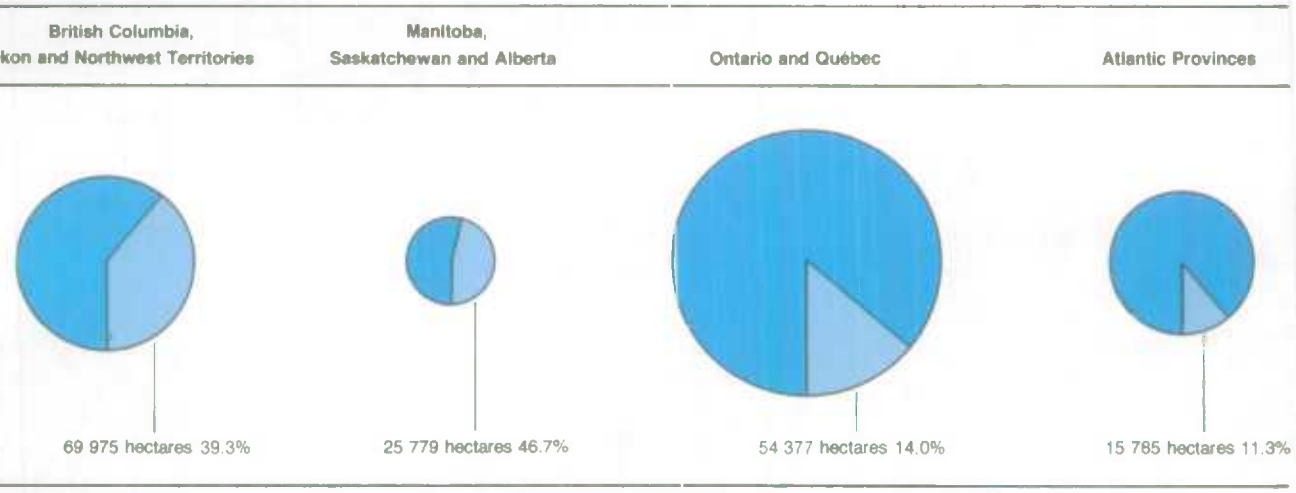
Table 3.2.10
## Annual Forest Harvest, Site Preparation[1] and Planting (based on a 5 year average, 1976 to 1980)

| Province | Area Harvested[2] | Site Preparation | | Planting | | Direct Seeding | |
|---|---|---|---|---|---|---|---|
| | | Area | Area as a Percentage of Area Harvested | Area | Area as a Percentage of Area Harvested | Area | Area as a Percentage of Area Harvested |
| | square kilometres | square kilometres | percent | square kilometres | percent | square kilometres | percent |
| Newfoundland | (160)[3] | 4 | 2.5 | -- | -- | 0 | 0.0 |
| Prince Edward Island | 16 | 1 | 6.2 | 1 | 6.2 | 0 | 0.0 |
| Nova Scotia | 295 | 14 | 4.7 | 22 | 7.4 | -- | -- |
| New Brunswick | (926) | 139 | 15.0 | 101 | 10.9 | 2 | 0.1 |
| Québec | 1 956 | 75 | 3.8 | 152 | 7.8 | 47 | 2.4 |
| Ontario | 1 910 | 469 | 24.5 | 282 | 14.8 | 254 | 13.3 |
| Manitoba | (191) | 42 | 21.9 | 10 | 5.2 | 7 | 3.6 |
| Saskatchewan | 146 | 50 | 34.2 | 53 | 36.3 | 0 | 0.0 |
| Alberta | 215 | 166 | 77.2 | 63 | 29.3 | 64 | 29.7 |
| British Columbia | 1 766 | 699 | 39.6 | 602 | 34.1 | 0 | 0.0 |
| Yukon | 6 | -- | -- | 0 | 0.0 | 0 | 0.0 |
| Northwest Territories | 6 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| **Canada** | **7 594** | **1 659** | **21.8** | **1 287** | **16.9** | **374** | **4.9** |

[1] Site preparation is mainly the breaking of ground and burning of wood debris.
[2] Numbers in brackets are estimates by the Canadian Forestry Service.

**Source:**
Environment Canada, Northern Forest Research Centre, Canadian Forestry Service, *Silviculture Statistics for Canada, 1975-1980*, 1982.

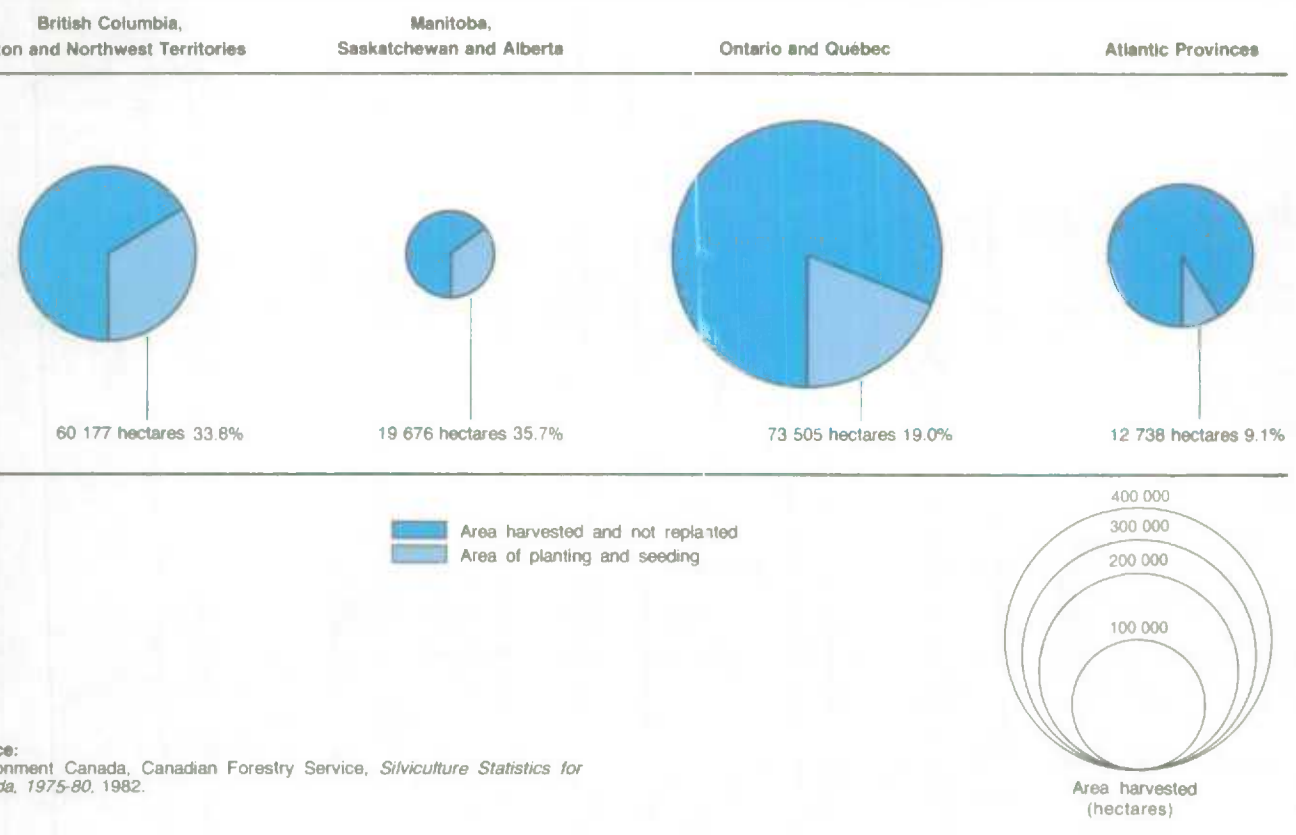
Chart 3.2.11
**Area of Site Preparation[1] as a Proportion of Area Harvested**
(five year annual average, 1976 to 1980)




[1] Site preparation refers to working of top soil and burning of debris.

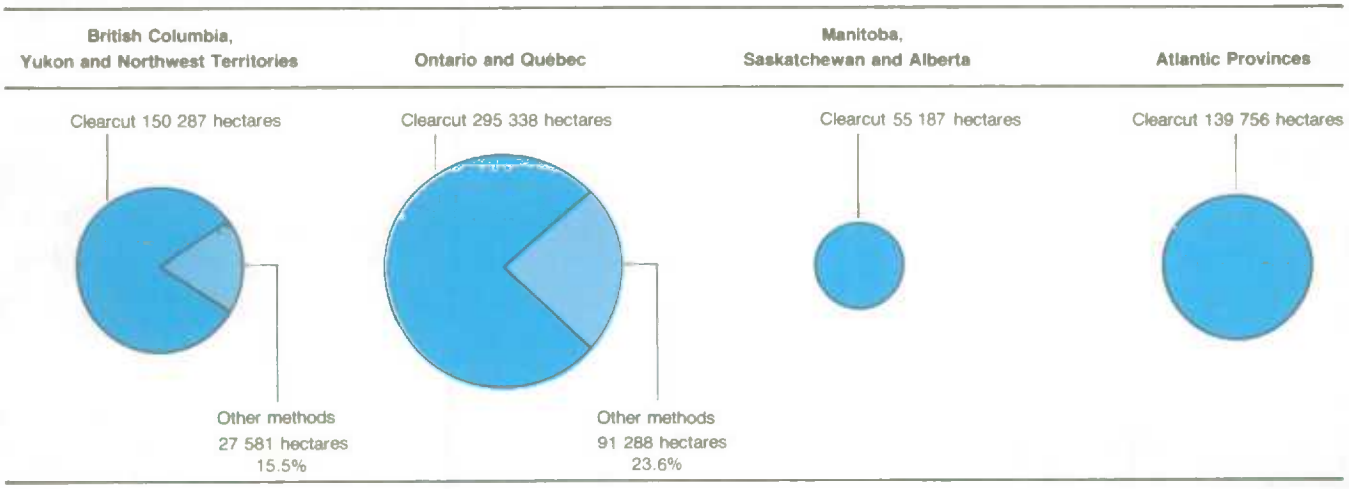
**Source:**
Environment Canada, Canadian Forestry Service, *Silviculture Statistics for Canada 1975-80*, 1982.

Chart 3.2.12
**Area of Planting and Seeding as a Proportion of Area Harvested**
(five year annual average, 1976 to 1980)




**Source:**
Environment Canada, Canadian Forestry Service, *Silviculture Statistics for Canada, 1975-80*, 1982.

Chart 3.2.13
## Method of Forest Harvest by Region
(based on a five year average, 1976 to 1980)




¹ Clearcutting is a method of harvesting in which all merchantable timber is cut within a particular area.
² Other methods of harvesting include strip cutting (cutting of forest in bands), selective cutting (selection and cutting of specific species), and seed tree cutting (cutting of trees left for seeding in an area that was previously harvested).

**Source:**
Environment Canada, Canadian Forestry Service, *Silviculture Statistics for Canada 1975-80*, 1982.

Table 3.2.14
## Area of Pest Control on Forestland[1] (based on a 5 year average, 1976 to 1980)

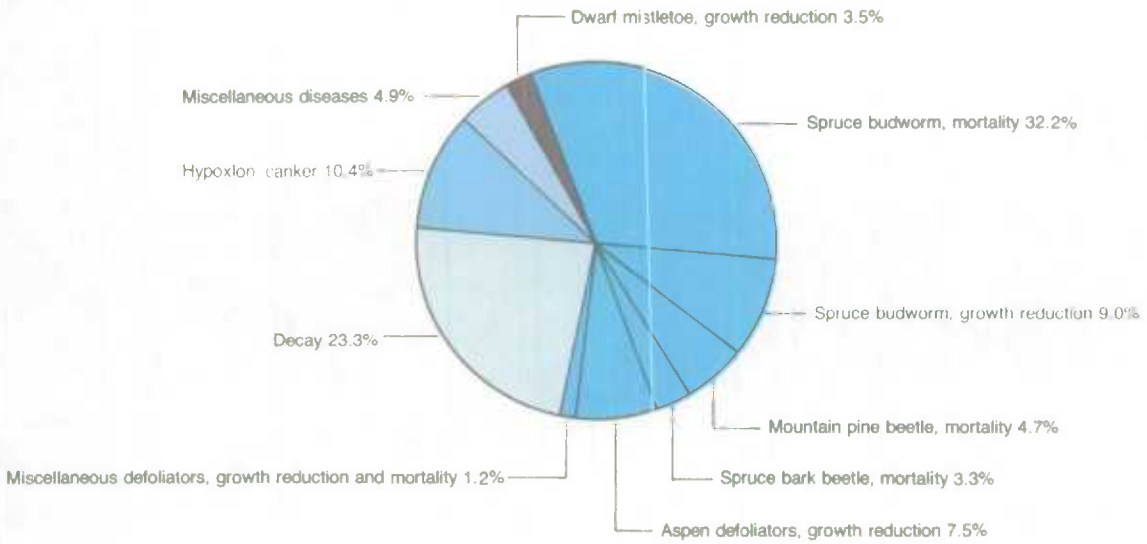
| Province | Area of Pest Control | Stocked Productive Forestland | Proportion of Stocked Productive Forest with Pest Control |
|---|---|---|---|
| | square kilometres | | percent |
| Newfoundland | 919 | 79 790 | 1.2 |
| Nova Scotia | 114 | 28 770 | 0.4 |
| Prince Edward Island | 0 | 2 480 | 0 |
| New Brunswick | 22 820 | 59 120 | 38.6 |
| Québec | 17 800 | 489 290 | 3.6 |
| Ontario | 1 651 | 339 330 | 0.6 |
| Manitoba | 0 | 121 060 | 0 |
| Saskatchewan | 0 | 82 380 | 0 |
| Alberta | 0 | 149 900 | 0 |
| British Columbia | 24 | 420 340 | -- |
| Northwest Territories and Yukon | 0 | 192 270 | 0 |
| **Canada** | **43 528** | **1 964 730** | **2.2** |

¹ Refers to inventoried, stocked, productive forestland. See Technical Box 3.2.1 for definitions.

**Source:**
Environment Canada, Canadian Forestry Service, *Canada's Forest Inventory*, 1981.
Environment Canada, Canadian Forestry Service, *Silvicultural Statistics for Canada*, 1975-1980, 1982.

**Notes:**
There were two major kinds of pest control activities during this period. British Columbia mainly carried out mistletoe control using mechanical methods, while other provinces focussed their activities on spruce budworm spraying.

Chart 3.2.15
## Estimated Forest Loss From Insects and Disease
(five year annual average, 1977 to 1981)



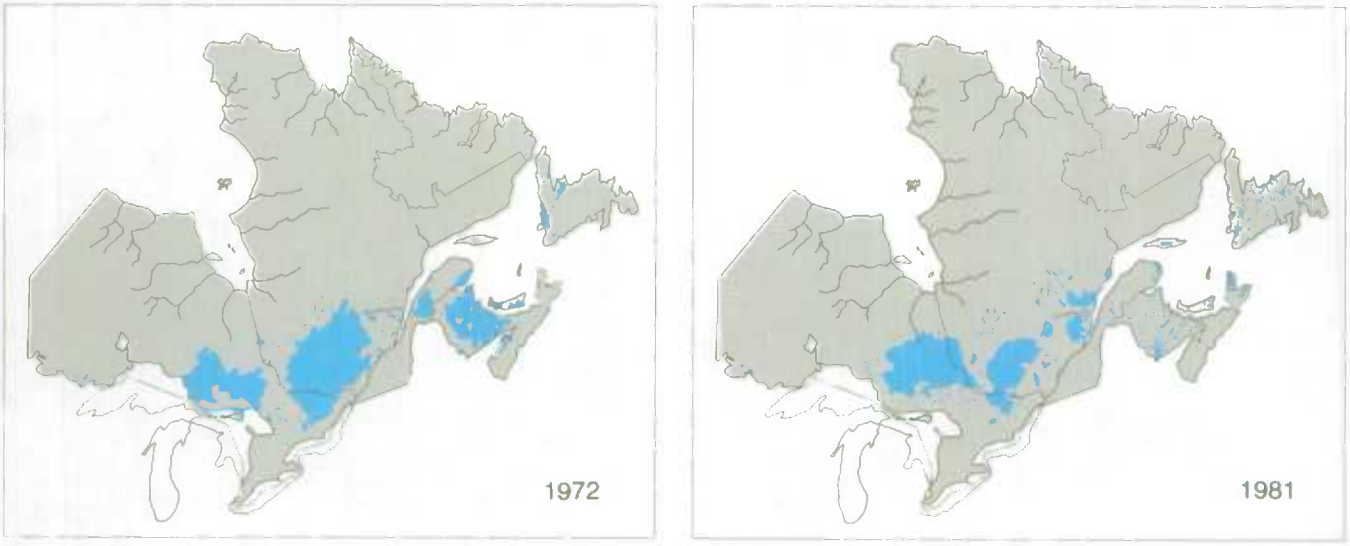

**Note:**
Average annual loss of forest over the 5 year period amounted to 107.4 million cubic metres or roughly 73.1 percent of the 1982 harvest of 147 million cubic metres.
Spruce budworm - a shoot and bud tunnelling worm
Mountain pine beetle - a bark and wood boring beetle
Spruce bark beetle - a bark and wood boring beetle
Aspen defoliators - various carterpillar species
Decay - micro-organisms which consume bark and wood
Hypoxlon canker - a growth impeding disease
Dwarf mistletoe - a parasitic plant

**Source:**
Environment Canada, Canadian Forestry Service, *Forest Insect and Disease Conditions in Canada, 1981*, Ottawa, 1982.

Map 3.2.16
## Spread of Dutch Elm Disease in Canada, 1945 to 1982


**Sources:**
Environment Canada, Canadian Forestry Service, *Forest Insect and Disease Conditions in Canada*, 1982.

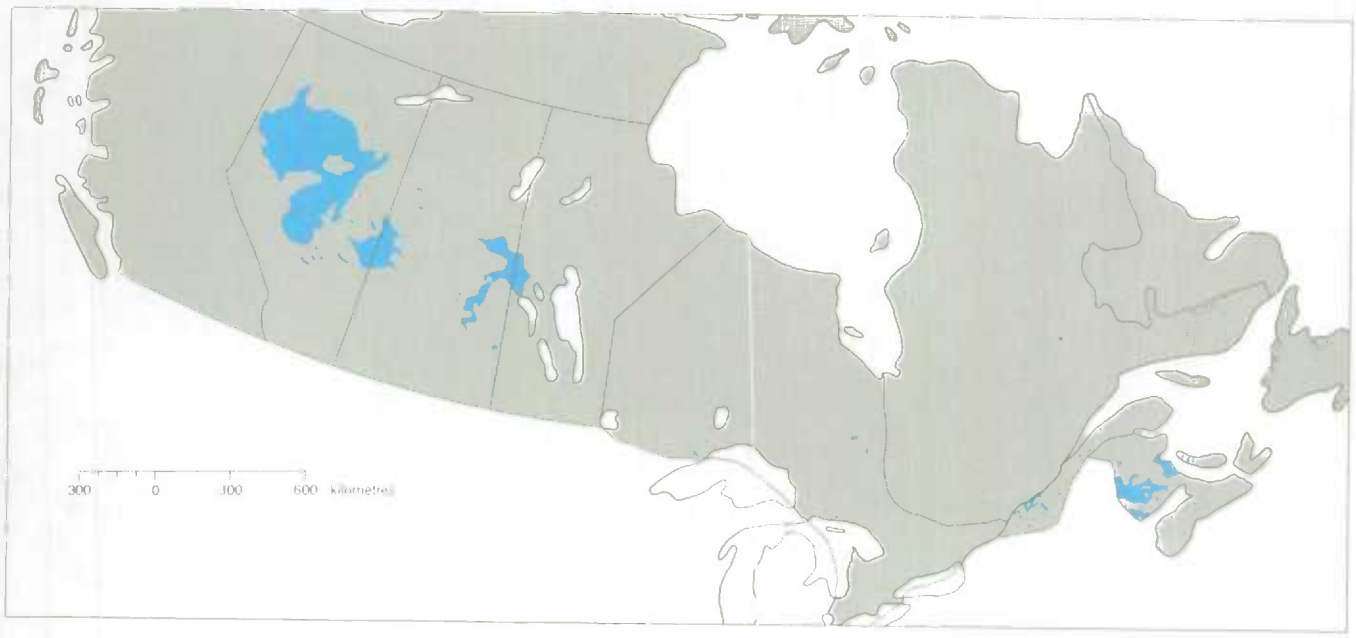
Map 3.2.17
## Spruce Budworm Defoliation in Eastern Canada, 1972 and 1981




**Source:**
Environment Canada, Canadian Forestry Service, *A Cartographic History of Spruce Budworm Defoliation, 1967 to 1981, in Eastern Canada*, 1983.

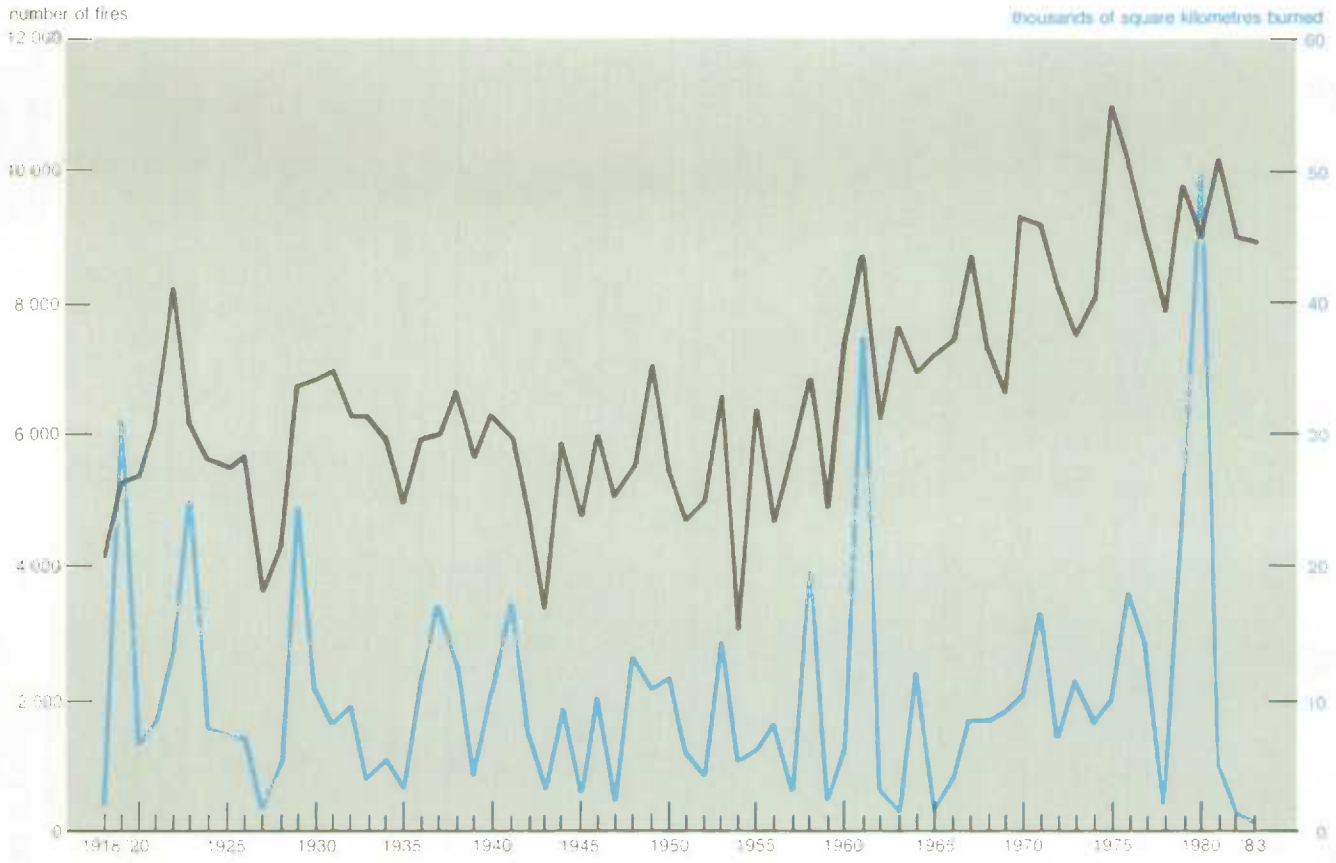
**Note:**
The primary hosts for spruce budworm are balsam fir, white, red, and black spruce. Outbreaks of this pest are natural phenomena associated with spruce-fir forests.

Map 3.2.18
## Tent Caterpillar Defoliation in Canada, 1982




**Source:**
Environment Canada, Canadian Forestry Service, *Forest Insect and Disease Conditions in Canada*, 1982.

Chart 3.2.19
**Number of Forest Fires and Area Burned, 1918 to 1983**




**Source:**
Agriculture Canada, Canadian Forestry Service, Petawawa Forest Experimentation Station, 1985.

Chart 3.2.20
**Number of Forest Fires by Cause**
(ten year annual average, 1973-1982)

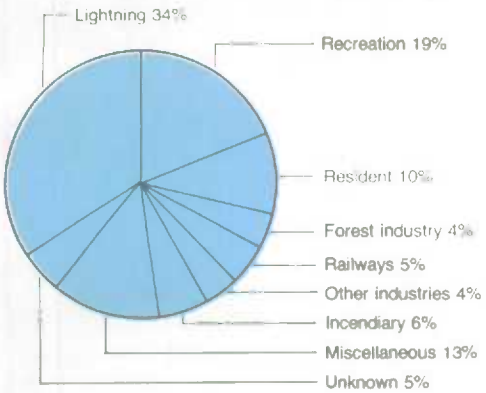
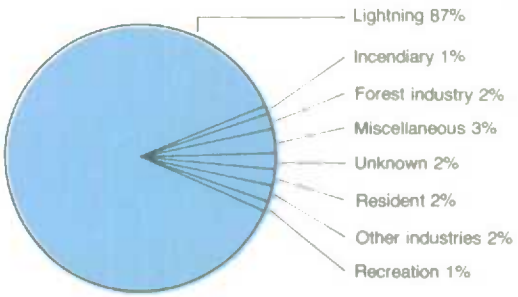



Chart 3.2.21
**Area Burned by Forest Fires by Cause**
(ten year annual average, 1973-1982)




**Source:**
Agriculture Canada, Canadian Forestry Service, Petawawa Forest Experimentation Station, 1985.

**Note:**
Recreation - applies to fires caused by people engaged in any recreational activity.
Resident - applies to fires resulting from activity associated with people living in a forested or partly forested area, including agriculture.
Forest industry - applies to fires caused by men or machines involved in forestry.
Railways - applies to fires caused by any machine, employee, or contractor with railroad operations or any passengers riding on a train.
Other industry - applies to fires caused by any industrial activity other than the forest industry or railroads.
Incendiary - applies to fires started willfully for the purpose of mischief, grudge, or gain.
Miscellaneous - applies to any fire whose cause is known but does not fit any of the preceding.
Unknown - applies to fires of undeterminable cause.

Table 3.2.22

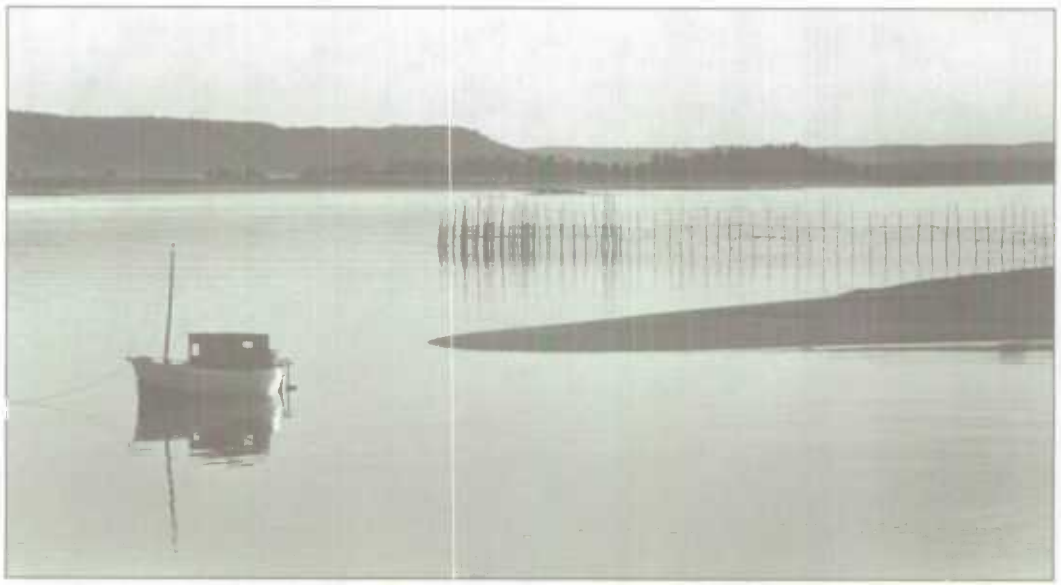
## Socio - Economic Profile of Persons Employed in the Forestry and Logging Industry[1] by Ecozone, 1981

| Ecozone | Total Employed[2] | | Full Time Employed[3] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Persons | Average Income | Persons | Percentage of Total Employed | Average Income | Self Employed[4] | 45 years and Over | Education Level | |
| | | | | | | | | Less than Grade Nine | Post Secondary |
| | | dollars | | percent | dollars | | percent | | |
| **Atlantic Maritime** | **20 130** | **8 400** | **8 180** | **41** | **13 400** | **14** | **27** | **36** | **26** |
| Prince Edward Island | 330 | 6 000 | 145 | 44 | 9 800 | 17 | 3 | 13 | 47 |
| Nova Scotia | 4 895 | 8 800 | 2 900 | 59 | 12 400 | 15 | 27 | 34 | 24 |
| New Brunswick | 9 975 | 8 000 | 3 805 | 38 | 13 800 | 16 | 27 | 40 | 27 |
| Québec | 4 935 | 9 000 | 1 335 | 27 | 15 200 | 7 | 28 | 34 | 21 |
| **Mixed-Wood Plain** | **11 035** | **10 200** | **5 815** | **53** | **14 700** | **15** | **31** | **38** | **28** |
| Québec | 7 315 | 10 600 | 3 905 | 53 | 14 400 | 16 | 30 | 46 | 21 |
| Ontario | 3 720 | 9 400 | 1 915 | 51 | 15 500 | 14 | 33 | 20 | 45 |
| **Boreal Shield** | **30 870** | **13 600** | **19 325** | **63** | **18 100** | **10** | **28** | **37** | **22** |
| Newfoundland | 4 010 | 9 400 | 2 115 | 53 | 13 500 | 7 | 30 | 48 | 16 |
| Québec | 14 255 | 13 300 | 8 560 | 60 | 17 300 | 8 | 26 | 39 | 17 |
| Ontario | 11 865 | 15 500 | 8 295 | 70 | 20 000 | 12 | 29 | 31 | 29 |
| Manitoba | 525 | 11 900 | 255 | 49 | 19 500 | 11 | 30 | 52 | 10 |
| Saskatchewan | 220 | 9 300 | 90 | 41 | 16 600 | 11 | 28 | 33 | 22 |
| **Prairie** | **1 815** | **11 000** | **1 070** | **59** | **15 600** | **12** | **23** | **12** | **46** |
| Manitoba | 475 | 10 400 | 280 | 59 | 14 600 | 14 | 27 | 16 | 34 |
| Saskatchewan | 270 | 12 300 | 160 | 59 | 17 500 | 10 | 20 | 16 | 58 |
| Alberta | 1 075 | 10 900 | 635 | 59 | 15 600 | 12 | 26 | 10 | 48 |
| **Boreal Plain** | **5 485** | **13 900** | **3 510** | **64** | **18 500** | **14** | **21** | **24** | **37** |
| Manitoba | 800 | 8 800 | 360 | 45 | 14 600 | 15 | 23 | 41 | 25 |
| Saskatchewan | 1 150 | 14 500 | 710 | 62 | 18 900 | 17 | 26 | 27 | 33 |
| Alberta | 3 065 | 14 800 | 2 140 | 70 | 19 300 | 13 | 18 | 20 | 40 |
| British Columbia | 460 | 14 700 | 295 | 64 | 16 700 | 14 | 21 | 23 | 39 |
| **Montane Cordillera** | **14 345** | **18 300** | **10 780** | **75** | **21 500** | **19** | **26** | **20** | **30** |
| Alberta | 150 | 13 800 | 105 | 70 | 17 800 | 14 | 10 | 10 | 50 |
| British Columbia | 14 205 | 18 300 | 10 675 | 75 | 21 500 | 19 | 26 | 20 | 30 |
| **Pacific Maritime** | **24 700** | **20 700** | **19 390** | **79** | **23 900** | **7** | **29** | **15** | **36** |
| British Columbia | 24 700 | 20 700 | 19 390 | 79 | 23 900 | 7 | 29 | 15 | 36 |
| **Boreal Cordillera** | **180** | **14 800** | **110** | **61** | **18 800** | **14** | **9** | **24** | **38** |
| British Columbia | 90 | 17 000 | 60 | 67 | 20 900 | 33 | .. | .. | .. |
| Yukon | 95 | 12 600 | 50 | 53 | 16 200 | .. | .. | .. | 40 |
| **Taiga Plain** | **165** | **7 400** | **40** | **24** | **18 000** | **19** | **9** | .. | .. |
| Northwest Territories | 95 | 8 800 | 35 | 37 | 17 300 | 19 | 9 | .. | .. |
| **Taiga Shield** | **130** | **7 800** | **45** | **35** | **16 600** | .. | .. | .. | .. |
| Newfoundland | 90 | 6 600 | 25 | 28 | 16 500 | .. | .. | .. | .. |
| **Hudson Bay Plain** | **100** | **4 100** | **20** | **20** | **10 600** | .. | .. | .. | .. |
| Ontario | 80 | 3 900 | 15 | 19 | 12 100 | .. | .. | .. | .. |

[1] Standard industrial classification categories 031-039: logging and forestry services.
[2] Employed in 1980.
[3] Employed 27 or more weeks in 1980.
[4] Self employed persons are full-time workers who are not wage-earners or unpaid family workers.

**Source:**
Statistics Canada, 1981 Census of Population, special tabulations.

# 3.3
# Fisheries



Technical Box 3.3.1

## Fish Catch: an Indicator of Fish Stock

The management of fishing resources on a sustainable yield basis requires knowledge of fish stocks. Scientists are continuing to refine their estimation techniques by applying a combination of catch statistics, data on units of fishing effort (i.e. time/energy/equipment used to catch fish), biological sampling of fish landings for size and age, and direct sampling of fish populations by research survey vessels. These data, with the aid of models, provide the basis for fish population estimates by species and their geographic distributions. With current knowledge of the geographic distribution and dynamics of fish populations, it is possible to estimate stocks with well-defined feeding and breeding behavior. Many pelagic stocks (see definitions) are subject to unknown factors and thus estimates are less reliable.

A measure of historical trends and the assessment of the current state of stocks can be obtained from catch statistics. During the 1960s, the relationship between stock and catch in the Northwest Atlantic and Northeast Pacific began to trouble fish biologists. Their concern centred on the potential collapse of certain "over-fished" stocks, caused in part by the influx of foreign fishing fleets. This was made worse by the introduction of more efficient harvesting technology (for example, sonar detection devices, more powerful vessels and more efficient gear). Fisheries management responded to the high pressure on stocks (and the subsequent decline of "over-fished" stocks) by introducing more stringent controls on fishing activities. These controls were further expanded with the promulgation of the 200 nautical mile limit of Canada's fisheries jurisdiction in 1977 (See Maps 3.3.2 and 3.3.12).

Stocks are now managed by establishing total allowable catch for most species in designated management zones. The annual harvest quotas are based both on biological (i.e. sustainable yield) and socio-economic criteria (i.e. viability of the fishing industry). It should be noted that naturally occurring environmental changes (for example, changes in ocean currents) are for many species at least as important as fishing in determining long-term population fluctuations. It is believed that fishing pressure can accentuate or depress natural fluctuations and delay recoveries of stock.

Data presented in this section show trends in catch of major fish species by commercial fishermen. Abrupt changes in trends are usually footnoted to place them in context with changes in human activities (for example, technological changes, new fleet entries, or regulations).

### Definitions and Concepts

**Groundfish** is a collective term to describe species that feed near the ocean bottom. These fish, for the most part, are caught by trawlers using a net that is towed along the ocean floor scooping up the fish. Principal species caught are cod, haddock, rockfish, flounders and sole, turbot, pollock, hake, halibut and skate.

**Pelagic** species are fish that swim near the surface often in large schools. They are usually captured using the purse seine method; the fishing boat circles the school with a seine net and the bottom is drawn up, trapping the fish. Principal pelagic species are herring, mackerel, capelin, and tuna.

**Anadromous** fish spend their adult life at sea and migrate to the streams and lakes in which they hatched to spawn. Principal commercial species are salmon, alewife and smelt. Salmon are caught by purse seines, hook and line and gill nets (floating nets).

**Invertebrates** (shellfish) On the Atlantic, the main species caught are lobsters, scallops, shrimps, crabs, oysters, squids and clams. On the Pacific, the important species are now geoducks, oysters, crabs, clams, shrimp, and abalone.

**Catch** All data presented are the weight of fish and shellfish brought ashore by fishermen. This is live weight, or if fish are processed at sea, live weight equivalent (nominal catch).

**Two Hundred Mile Limit** As of January 1, 1977, the area under Canadian jurisdiction was extended to 200 nautical miles on both coasts. This action was taken to ensure conservation and management of marine resources. It conformed with the consensus of the Law of the Sea Conference.

**Total Allowable Catch** For each distinct stock of fish, an annual forecast of the permissible catch level is made by biologists to ensure stability of the population and to rebuild the stock if it has been depleted.

**Quota** Catch limits are issued by the Department of Fisheries and Oceans based on the total allowable catch for each stock, by management zone, and by fleet (domestic and foreign).

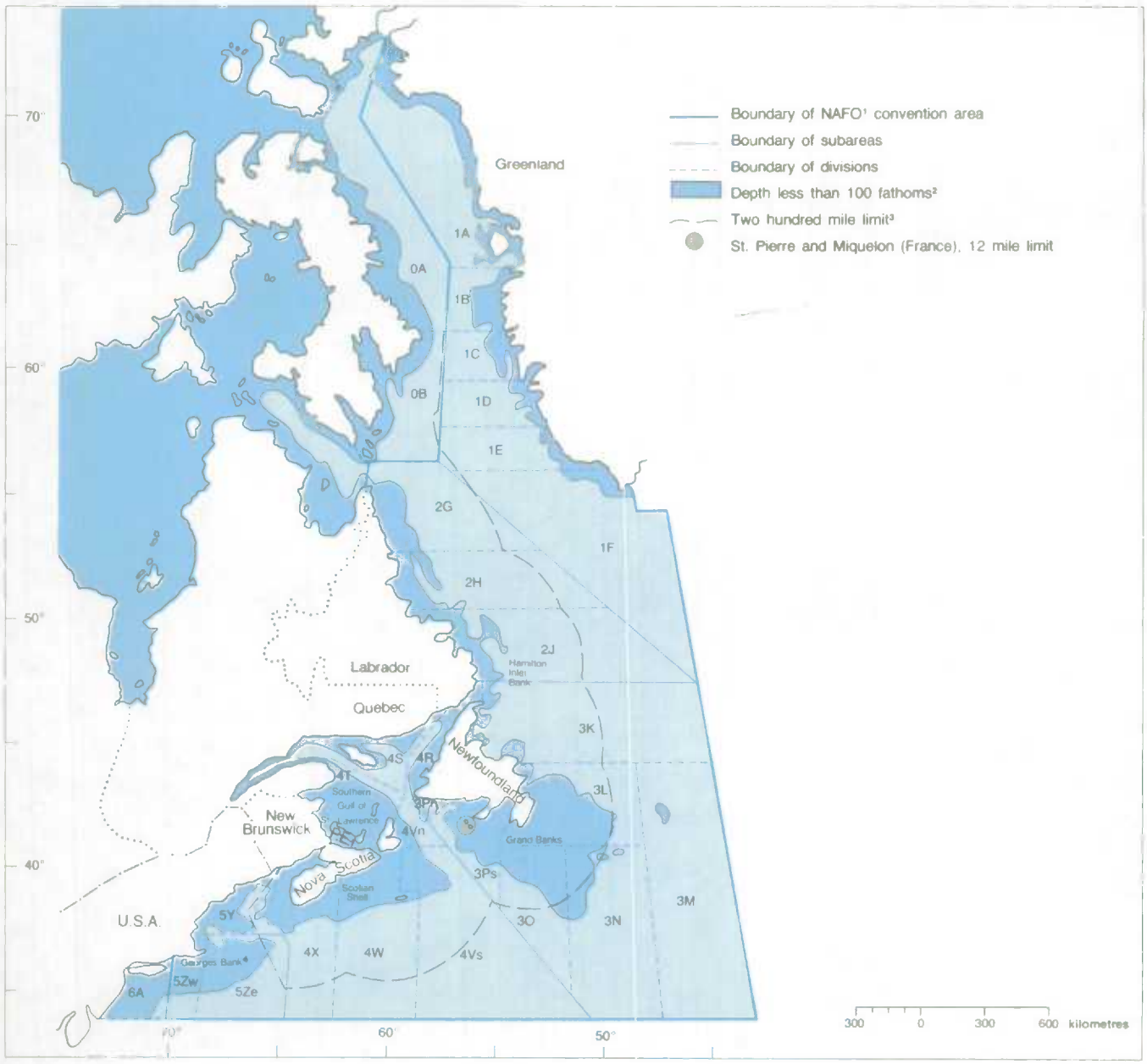
**Fishery** This term refers to the industry of catching, processing and marketing fish but it may also be used to define a fishing ground or the legal jurisdiction to catch fish in specified waters.

### Catch Statistics

All catch statistics are shown in metric tons (1 000 kilograms).

Map 3.3.2

## Northwest Atlantic Fisheries Management Zones




¹ The Northwest Atlantic Fisheries Organization is an international commission that maintains fisheries records, defines fishing areas and coordinates research on the Atlantic fishery.

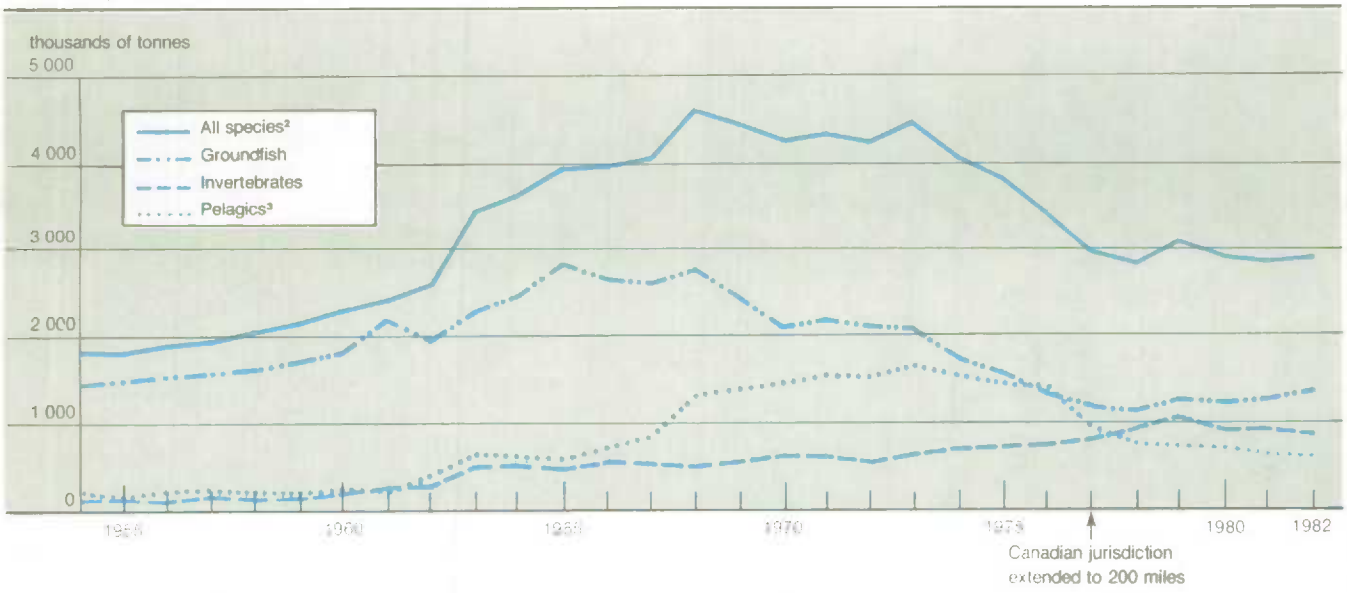
² Depths less than 100 fathoms (200 metres) roughly define principal fishing areas utilized by domestic and foreign fleets. Productivity of marine life is promoted along the edges of the continental shelf by the upwelling of nutrients from deep water.

³ On January 1, 1977, Canada extended its fisheries jurisdiction to 200 nautical miles becoming "owner and manager" of all fisheries within 200 miles of its coasts. Ninety percent of Atlantic fish stocks are concentrated on fishing banks within the zone.

⁴ On October 12, 1984, a new boundary was drawn by the International Court dividing both the fishing zones and the continental shelf in the Gulf of Maine area. The case centred on a dispute between Canada and the U.S. over the rich fishing resources and potential hydrocarbon deposits of the Georges Bank.

**Source:**
Department of Fisheries and Oceans, Fish Management Branch, *Canadian Atlantic Offshore Fisheries Atlas*, edited by D.J. Scarrett, Ottawa, 1982.

Chart 3.3.3
## Catch[1] by Species Groups in the Northwest Atlantic, 1954 to 1982

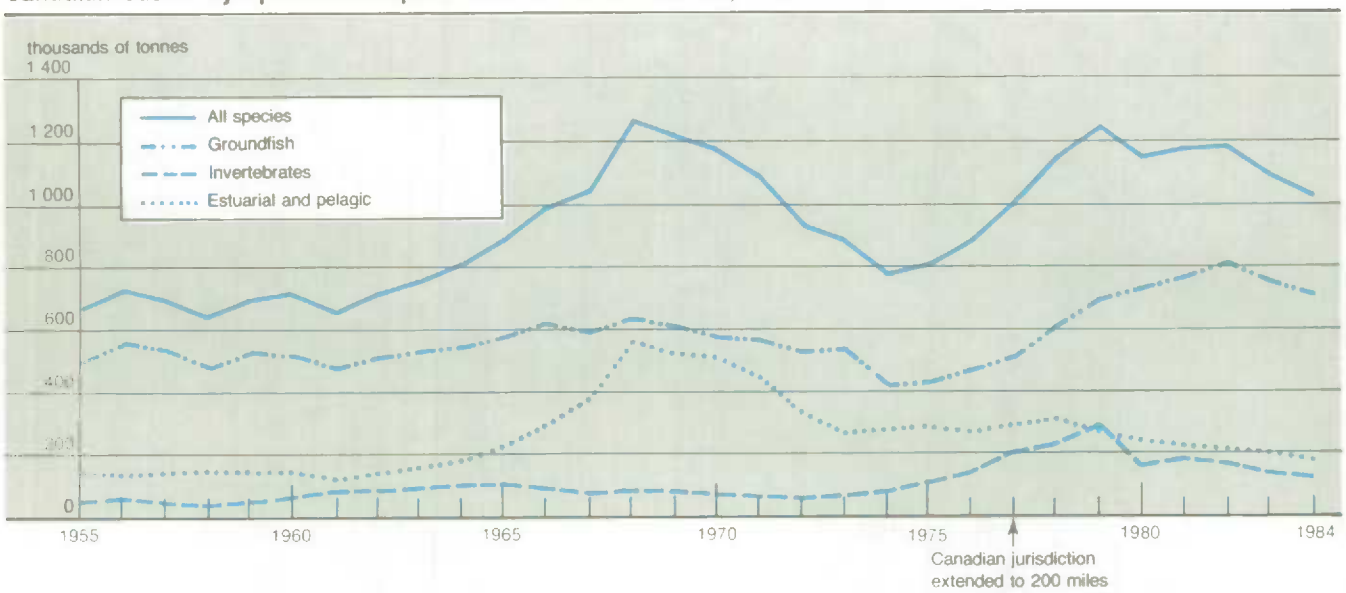



[1] Includes catch by Canadian and foreign vessels.
[2] Includes seaweeds.
[3] Catch of Atlantic salmon and incidental catch of other species are also included with the pelagics.

**Sources:**
International Commission for the Northwest Atlantic Fisheries, *Statistical Bulletins*, Volumes 4 to 28, Dartmouth, years 1956 to 1980 (annual).
Northwest Atlantic Fisheries Organization, *Statistical Bulletins*, Volumes 29 to 32, Dartmouth, years 1981 to 1984 (annual).

**Note:**
Rising catches in the 1960s were mainly due to increased foreign effort; the decline in the 1970s was due to the introduction of regulations brought in as a response to overfishing.

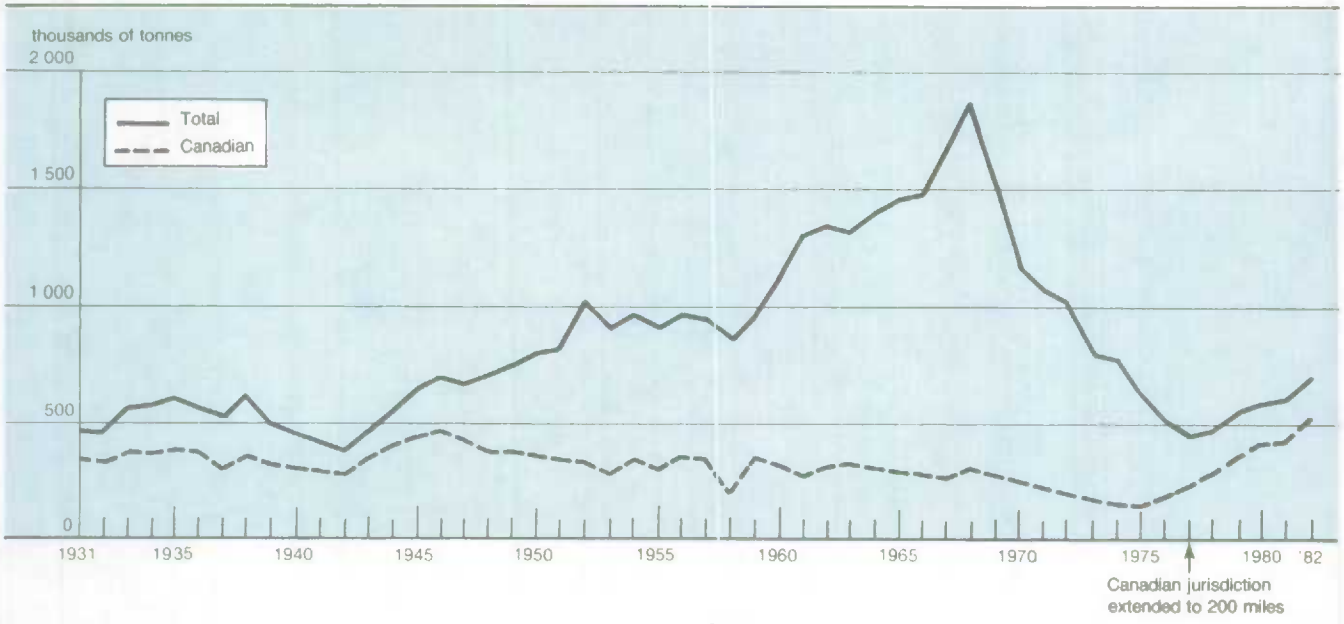
Chart 3.3.4
## Canadian Catch[1] by Species Groups in the Northwest Atlantic, 1955 to 1984[2]




[1] Refers to fish landed in Canadian ports. Since 1978, under cooperative arrangements, foreign vessels have landed small quantities of groundfish (mainly cod) and squid in Atlantic ports.
[2] Figures for 1984 are preliminary.

**Source:**
Department of Fisheries and Oceans, Economic Development Directorate, *Annual Statistical Review of Canadian Fisheries*, Volumes 9 to 15, Ottawa, years 1977 to 1984.

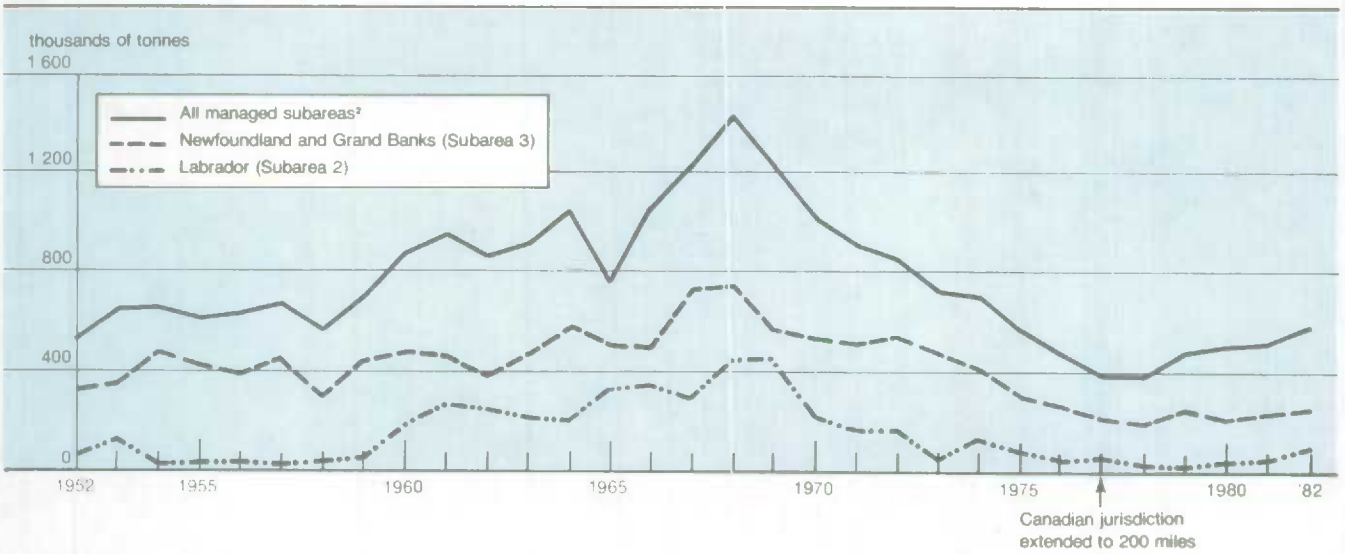
Chart 3.3.5
**Catch[1] of Atlantic Cod in the Northwest Atlantic, 1931 to 1982**




[1] Participating in this fishery in addition to Canada, are the United States of America, the Soviet Union and many European nations. The Soviet Union and Eastern European countries first reported cod catches in 1956 although earlier activity may have taken place.

**Sources:**
International Commission for the Northwest Atlantic Fisheries, *Statistical Bulletins*, Volumes 1 to 28, Dartmouth, years 1953 to 1980 (annual).
Northwest Atlantic Fisheries Organization, *Statistical Bulletins*, Volumes 29 to 32, Dartmouth, years 1981 to 1984 (annual).

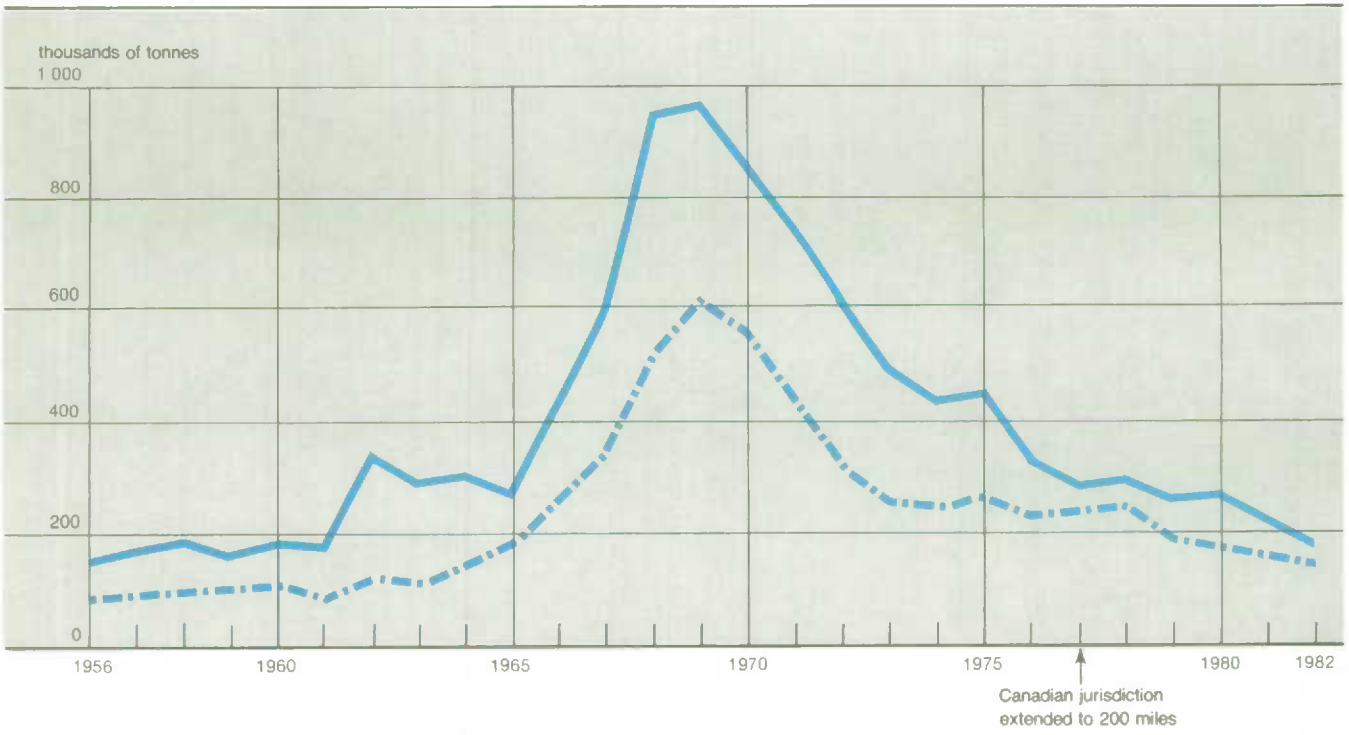
Chart 3.3.6
**Catch of Atlantic Cod on the Canadian Continental Shelf[1], 1952 to 1982**




[1] Canadian management of cod stocks (Map 3.3.1, subareas 2, 3 and 4) began through the use of a quota system introduced in the early 1970s and the extension of the three mile territorial sea to twelve miles in 1971 and to 200 miles in 1977. This progressively restricted the activity of foreign vessels in the Northwest Atlantic. The catch also includes a small fishery beyond the continental shelf in subarea 3.
[2] Cod areas, in addition to the two areas selected for presentation on the graph, are the Gulf of St. Lawrence and the banks on the edge of the Scotia Shelf.

**Sources:**
International Commission for the Northwest Atlantic Fisheries, *Statistical Bulletins*, Volumes 2 to 28 Dartmouth, years 1959 to 1980 (annual).
Northwest Atlantic Fisheries Organization, *Statistical Bulletins*, Volumes 29 to 32, Dartmouth, years 1981 to 1984 (annual).

Chart 3.3.7
**Catch of Herring in the Northwest Atlantic, 1956 to 1982**




[1] This is largely an inshore fishery. The areas of abundant stocks are coastal Newfoundland, the Gulf of St. Lawrence, the Scotia Shelf, Bay of Fundy, and the Gulf of Maine. Fisheries and Oceans Canada feels that the Georges Bank stock is seriously depleted due to overfishing during the late 1960s. Rebuilding of stocks will depend on joint Canada-U.S. management and regulation of the fishery of juvenile herring.

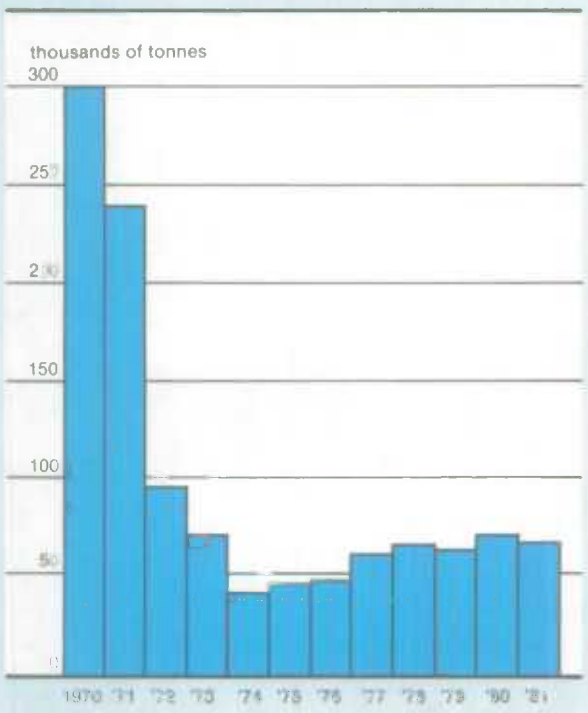
[2] These areas were fished almost exclusively by Canadian vessels until 1962 when USSR and Eastern European vessels entered the fishery. With the expansion of Canadian territorial waters to 200 miles, these areas were closed to foreign vessels.

**Sources:**
International Commission for the Northwest Atlantic Fisheries, *Statistical Bulletins*, Volumes 6 to 28, Dartmouth, years 1958 to 1980 (annual).
Northwest Atlantic Fisheries Organization, *Statistical Bulletins*, Volumes 29 to 32, Dartmouth, years 1981 to 1984 (annual).

Technical Box 3.3.8

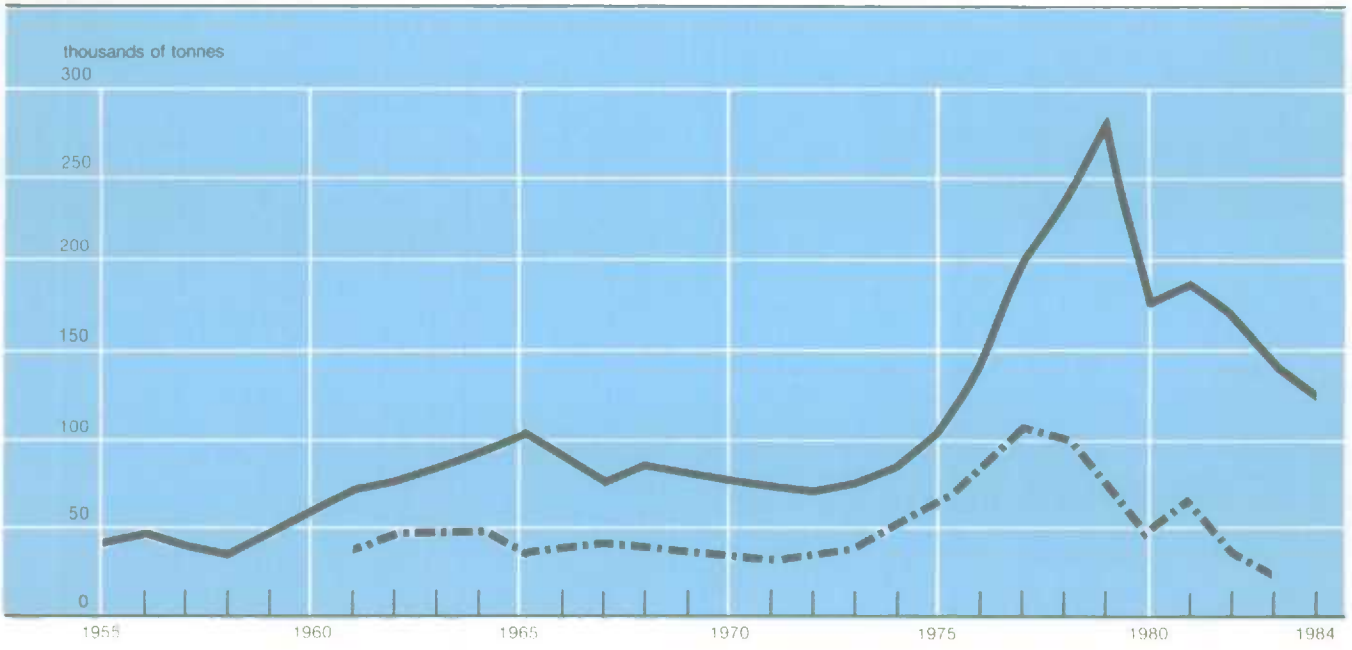
## Gulf of St. Lawrence Herring Catch

The herring fishery is mainly a near-shore operation with the highest catch per unit effort obtained by focussing on schooling fish before they spawn. The fish which are not caught are relied upon to regenerate the stock. The exceptionally large numbers of fish hatched in 1958 and 1959 produced abundant fishable stocks which supported an increasingly large fishing fleet in the years that followed. The high catch levels, however, were not sustainable. Pelagic fish have volatile population cycles controlled by natural factors such as changes in water temperature or nutrient-rich ocean currents. Since the dynamics of these and other factors are not fully understood, pelagic fisheries are difficult to manage. When natural factors reduced the size of later year classes, the catch fell off accordingly and left an over expanded fleet.




**Source:**
Department of Fisheries and Oceans, Resource Services Directorate, *Resource Prospects for Canada's Atlantic Fisheries, 1981-1987*, Ottawa, 1981.

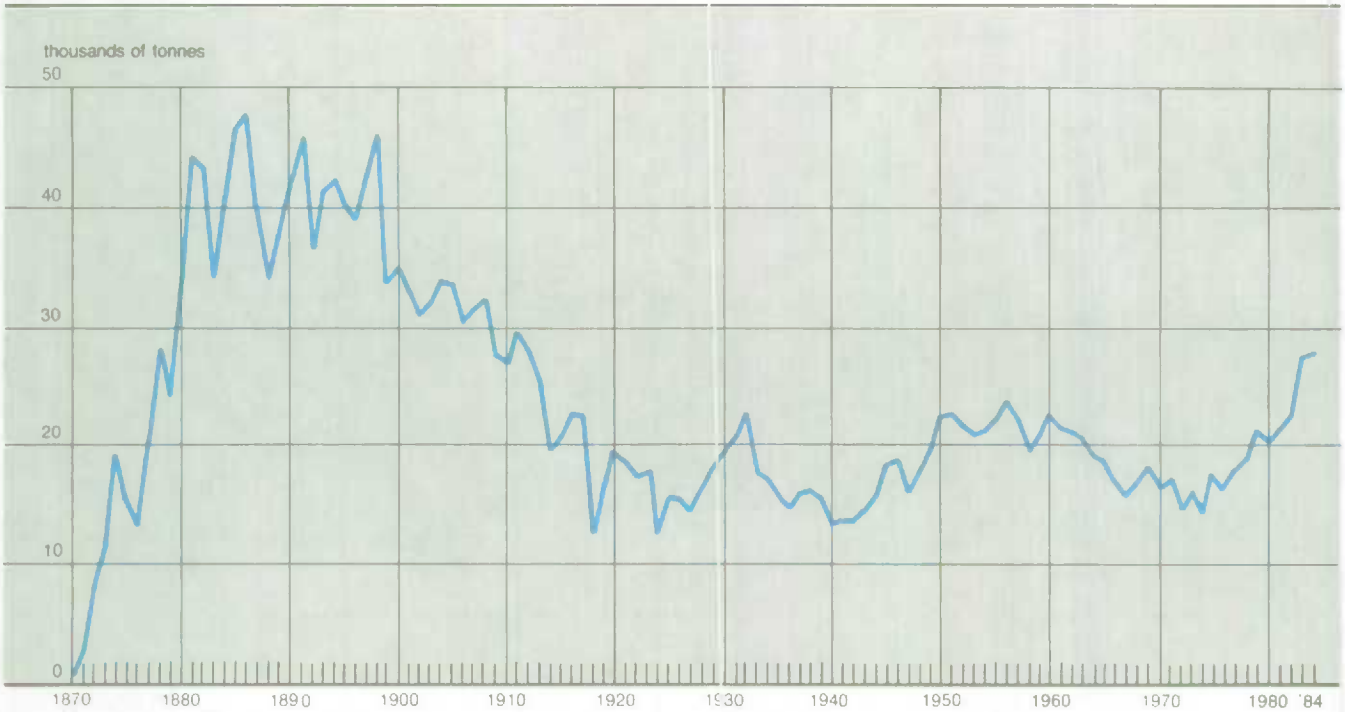
Chart 3.3.9
**Canadian Invertebrate[1] Catch in the Northwest Atlantic, 1955 to 1984**



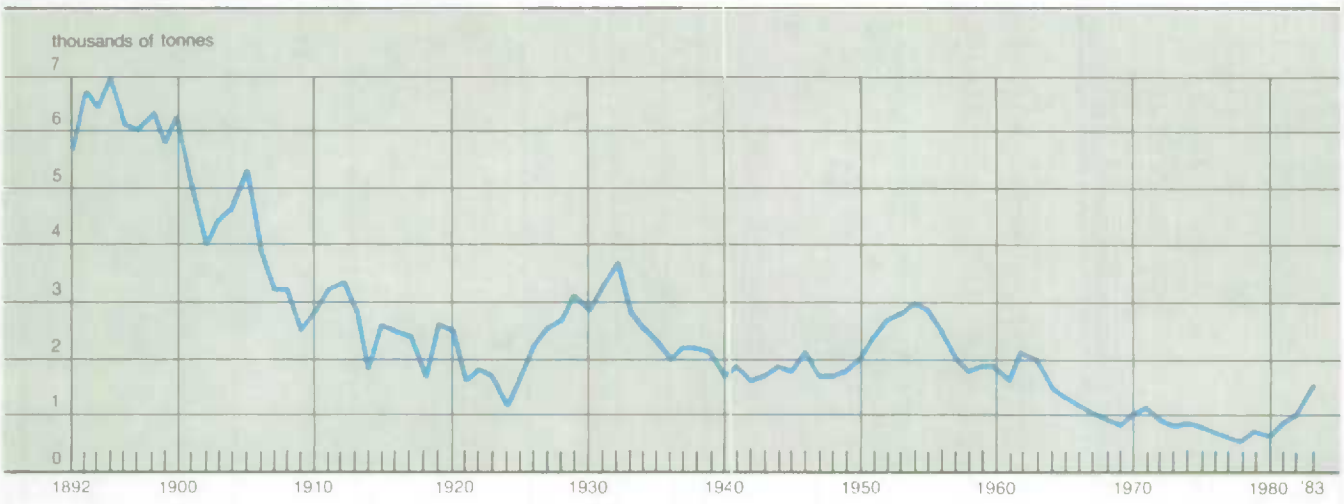

**Footnotes:**
[1] Principal invertebrates caught are lobsters, scallops, snow crab, squid and shrimp. Smaller quantities of oysters, clams, mussels, and periwinkles are also caught. Foreign catch (other than U.S. and Greenland) in the Northwest Atlantic is limited to squid.
[2] The Georges Bank historically provided a large portion of the Canadian scallop catch. Time series data are available from 1961. From the early 1960s until 1977, Canada took ninety percent of the total Canada-U.S.A. scallop harvest on Georges Bank. After 1977, the Total Allowable Catch (TAC) was set lower and the number of licenses was limited in an attempt to conserve the stock. The USA, however, continued to fish without limiting entry. The settlement of the boundary dispute over the jurisdiction of the Georges Bank (see Map 3.3.2, footnote 4) gives Canada the northern portion which contains the major scallop beds.

**Sources:**
Department of Fisheries and Oceans, Economic Development Directorate, *Annual Statistical Review of Canadian Fisheries*, Volumes 9 to 15, Ottawa, years 1977 to 1984.
International Commission for the Northwest Atlantic Fisheries, *Statistical Bulletins* Volumes 11 to 28, Dartmouth, years 1963 to 1980 (annual).
Northwest Atlantic Fisheries Organization, *Statistical Bulletins*, Volumes 29 to 32, Dartmouth, years 1982 to 1984 (annual).

Chart 3.3.10
**Atlantic Lobster Catch,[1] 1870 to 1984**




**Lobster Catch - Eastern Atlantic Coast[2] of Nova Scotia**

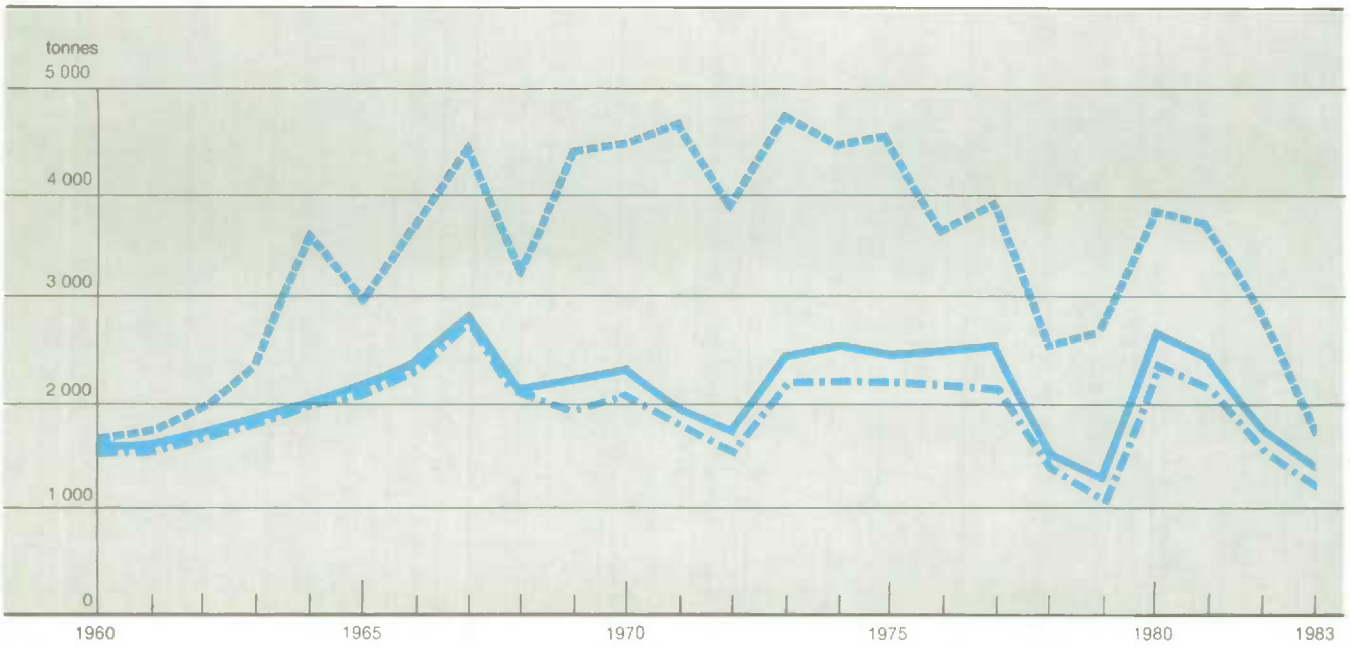



[1] Lobsters from the Southern Gulf of St. Lawrence account for fifty percent of the total. Catch data also include figures for Newfoundland.
[2] Includes shorelines of Richmond, Guysborough, Halifax and Cape Breton counties.

**Sources:**
Department of Fisheries, *History of the Lobster Fishery on the Eastern Shore of Nova Scotia* by D.G. Robinson, Canadian Technical Report, Fisheries and Aquatic Sciences, No. 954, Halifax, 1980.
Department of Fisheries and Oceans, unpublished data.

**Note:**
On the Atlantic coast, the increase in total catch from 1870 to 1890 is an example of the classic "fishing-up" period where the abundance of virgin stock attracted increasing numbers of fishermen. This catch level, however, was not a sustainable one. The average size of lobsters declined in this early period as well. On the eastern shore of Nova Scotia, the size of lobsters in 1900 was about the same as it is today. The drop in catch can be accounted for by over-fishing; this drop was further exacerbated by the catch of juvenile females (before reproductive age). Reduction of the fishing effort in the 1970s has allowed a greater number of females to reach reproductive maturity and this has resulted in the beginning of a return to larger catches.

Chart 3.3.11
**Catch of Salmon in the Northwest Atlantic, 1960 to 1983**



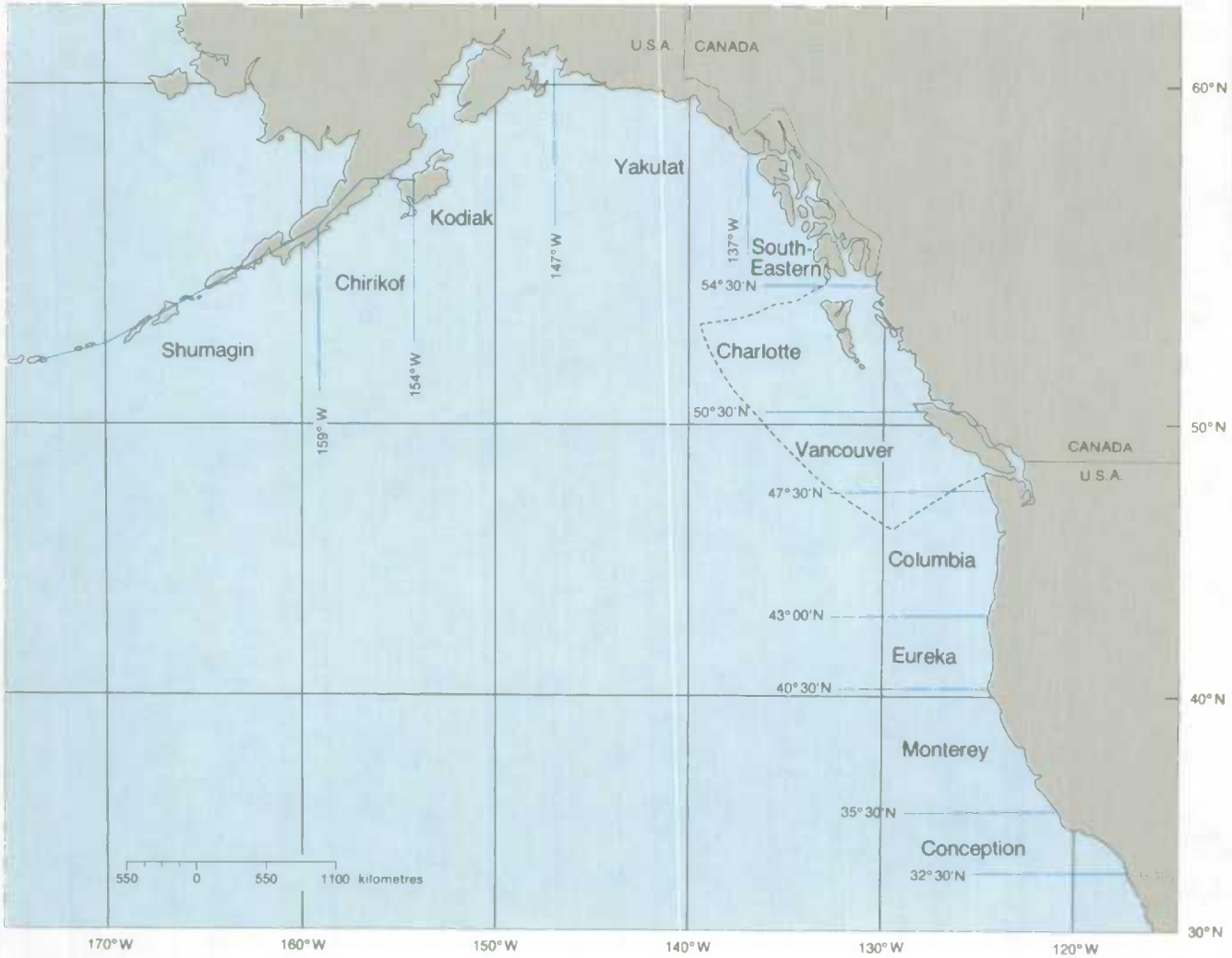

¹ Canada, Denmark (Greenland and Faroe Islands) and Norway.
² Includes commercial, sportfish and native harvests.

**Sources:**
Department of Fisheries and Oceans, Economic Development Directorate, *Annual Statistical Review of Canadian Fisheries*, Volumes 9 to 14, Ottawa, years 1977 to 1983.
International Council for the Exploration of the Sea; data courtesy of Department of Fisheries and Oceans, Resource Research Branch.

**Note:**
Canadian vessels fish exclusively south from Labrador (Map 3.3.2 subareas 2, 3, and 4). The other nations fish off Greenland (subarea 1). In 1976, a catch quota was imposed on the West Greenland fishery (subarea 1) and participation was limited to Greenland vessels. Although not all salmon caught off Greenland originated in Canadian streams, the Greenland salmon fishery is thought to be a factor in the decline of salmon returning to the spawning streams of Atlantic Canada.

Map 3.3.12

## Northeast Pacific Fisheries Management Zones




[1] The International North Pacific Fishing Commission was established in 1953 by convention between Canada, Japan and the United States for conservation of the fisheries resource. It is a management body which sets catch limits and coordinates scientific studies and data collection.

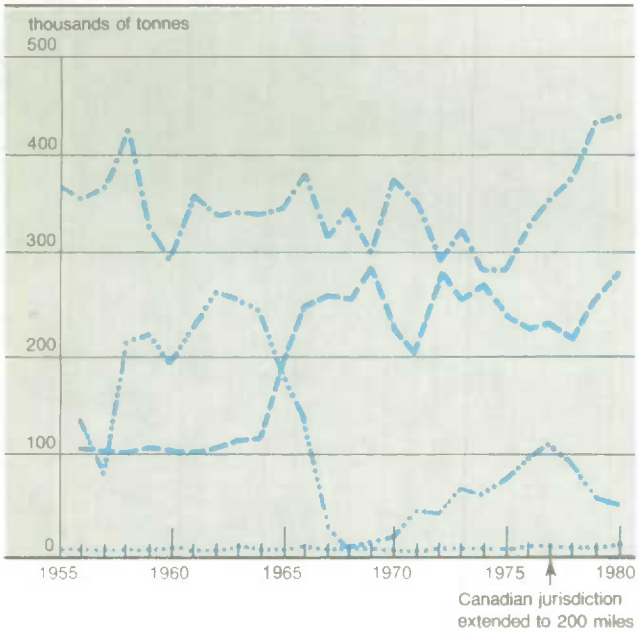
[2] Foreign vessels are not permitted to fish in Canadian waters except in cases where Canadian vessels do not meet catch levels established by the Commission.

**Source:**
International North Pacific Fisheries Commission, *Statistical Yearbook, 1980*, Vancouver.

——— Boundary of INPFC[1] convention areas

- - - - - Boundary of 200 mile limit[2]

Chart 3.3.13
**Catch[1] by Species Groups in the Northeast Pacific[2], 1955 to 1980**

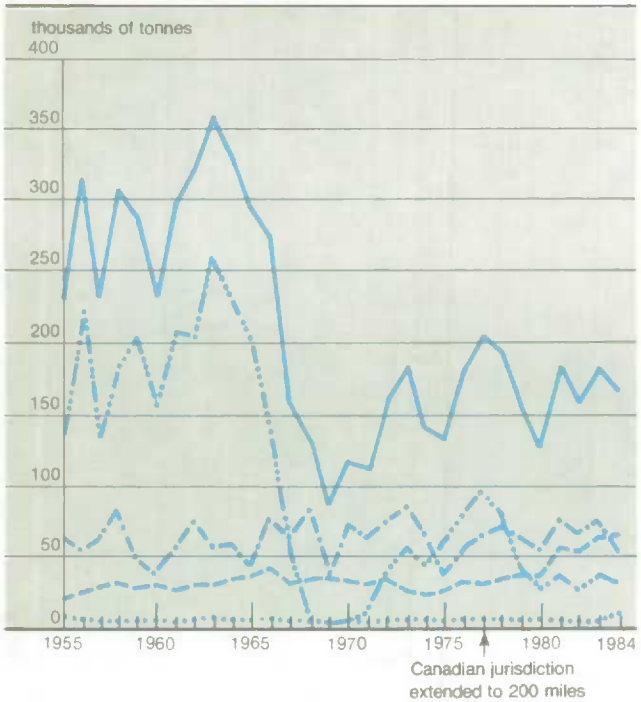



[1] Catch includes Canada, United States and Japan (since 1963) and the USSR and European countries (since 1965). Fish catches are normally reported by the flag of the fishing vessel; however, fish are also sold at sea and this catch is reported by the flag of the buying nation ("joint venture catch").
[2] The area is a management and reporting unit stretching from California to the Aleutian Islands (see Map 3.3.12).
[3] Since invertebrates are less mobile and thus have a limited range, only Canadian catch is considered here.

**Sources:**
International North Pacific Fisheries Commission, *Statistical Yearbooks*, Vancouver, years 1955 to 1980.
Department of Fisheries and Oceans, Offshore Division, Vancouver, unpublished data.

**Note:**
Since "totals" are not actually calculated by the Commission, a total is not plotted on this graph.

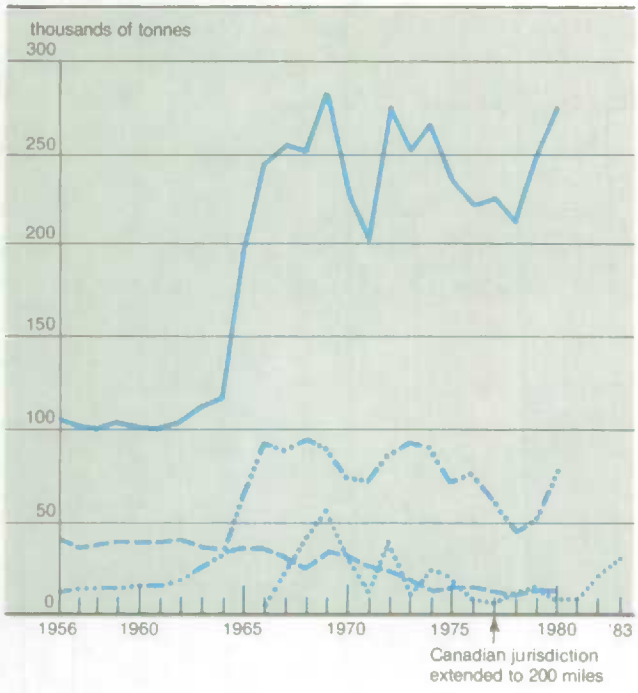
Chart 3.3.14
**Canadian Commercial Catch by Species Groups in the Northeast Pacific[1], 1955 to 1984[2]**




[1] A small quantity of groundfish were caught outside the Northeast Pacific area (i.e. the Bering Sea) by Canadian vessels until 1978. These data were not included in the total. (Catch did not exceed 3 000 tonnes in any one year).
[2] Figures for 1984 are preliminary.
[3] Includes a small quantity of pelagic fish in addition to the categories shown.
[4] Canadian salmon catch is partly made up of U.S. hatchery salmon and vice versa.
[5] Includes halibut caught by Canadian fisherman but landed in U.S. ports.
[6] The collapse of herring stocks in the 1960s is believed to be attributable to the exploitation of the fish since the 1950s for the herring reduction industry (processing of fish for oil and meal). The fishery was virtually closed from 1967 to 1971. The high-valued and extremely volatile roe-herring fishery began in 1972 when Japan relaxed import restrictions on roe. Greater than ninety-five percent of the present herring landings are comprised of roe-herring. (The remainder is a small food and bait fishery.) The mature fish are harvested for their roe when they are about to spawn. In order to keep harbours clean of offal after the removal of the roe, the carcasses are used in "reduction" for oil and meal.

**Source:**
Department of Fisheries and Oceans, Economic Development Directorate, *Annual Statistical Review of Canadian Fisheries*, Volumes 9 to 15, Ottawa, years 1977 to 1984.

Chart 3.3.15
**Catch[1] of Groundfish in the Northeast Pacific, 1956 to 1983**




[1] The sharp rise in catch after 1964 can be explained by the entry of Japan into this fishing area. Data on catch by Eastern European and other countries were collected after 1965.
[2] Groundfish total also includes sablefish, flounders, sole, Pacific cod and pollock.
[3] Rockfish are a large group of species (Family Scorpaenidae).
[4] Hake were not harvested until Eastern European nations began to fish in 1965. Since Canadian vessels do not meet the catch quota set by the Commission, foreign vessels, by arrangement, are allowed to fish within the 200 mile limit. There is also a "joint venture catch" where Canadian vessels sell fish at sea.
[5] Canadian and U.S.A. only, reported catch. Japan, in accordance with the North Pacific Convention, does not fish halibut east of the tip of the Aleutians (175° W).

**Sources:**
International North Pacific Fisheries Commision, *Statistical Yearbooks*, Vancouver, years 1956 to 1980. Department of Fisheries and Oceans, Vancouver, Offshore Division, unpublished data.
The Commission on Pacific Fisheries Policy, *Turning the Tide, A New Policy for Canadian Fisheries*, Peter M. Pearse, Commissioner, Vancouver, 1982.

Table 3.3.16
## Commercial Catch[1] of Freshwater Fish, 1956 to 1983

| Species | 1956 | 1961 | 1966 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | Province of Highest Catch[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | tonnes | | | | | | | | | | | | | | | | |
| Trout[3] | 2 312 | 1 765 | 1 337 | 841 | 645 | 690 | 680 | 590 | 840 | 966 | 693 | 1 075 | 1 214 | 860 | 700 | 599 | Ontario |
| Pike | 3 169 | 3 567 | 3 568 | 3 025 | 3 422 | 3 277 | 3 336 | 3 365 | 3 383 | 3 888 | 3 920 | 4 162 | 4 301 | 3 742 | 4 666 | 3 352 | Manitoba |
| Chub[4] | 3 856 | 4 717 | 4 941 | 1 632 | 1 591 | 1 794 | 2 181 | 2 105 | 2 076 | 1 853 | 1 972 | 1 931 | 2 325 | 2 248 | 1 686 | 1 327 | Ontario |
| Whitefish | 10 380 | 12 331 | 9 303 | 8 040 | 8 289 | 7 632 | 6 769 | 7 660 | 7 852 | 9 205 | 8 550 | 9 479 | 10 263 | 8 275 | 7 849 | 8 273 | Manitoba |
| Perch | 5 806 | 8 945 | 10 149 | 7 260 | 7 948 | 8 963 | 6 401 | 4 672 | 3 322 | 4 667 | 4 936 | 6 140 | 6 526 | 5 042 | 5 223 | 3 787 | Ontario |
| Walleye | 9 490 | 6 054 | 5 075 | 2 859 | 3 176 | 3 534 | 3 602 | 3 788 | 4 572 | 5 681 | 4 339 | 4 588 | 5 533 | 6 214 | 6 857 | 5 991 | Manitoba |
| Sauger | 2 009 | 1 497 | 2 192 | 312 | 1 708 | 1 924 | 1 660 | 1 935 | 1 689 | 1 595 | 1 335 | 1 287 | 1 725 | 1 767 | 1 781 | 1 881 | Manitoba |
| Arctic Char[5] | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 124 | 89 | 81 | 64 | 95 | 52 | N.W.T. |
| **Total High Value Species** | **37 022** | **38 877** | **36 565** | **23 969** | **26 779** | **27 814** | **24 629** | **24 115** | **23 734** | **27 855** | **25 869** | **28 751** | **31 968** | **28 212** | **28 857** | **25 262** | ... |
| Sucker | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 566 | 3 146 | 5 543 | 1 664 | 3 493 | 4 055 | Manitoba |
| Smelt[6] | 1 838 | 5 956 | 7 302 | 6 149 | 5 015 | 7 794 | 7 667 | 7 862 | 8 276 | 10 667 | 12 399 | 10 979 | 11 426 | 13 901 | 19 808 | 13 429 | Ontario |
| Alewife[7] | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 2 221 | 1 671 | 522 | 1 338 | 1 115 | 887 | New Brunswick |
| Carp | 1 109 | 722 | 1 170 | 365 | 380 | 329 | 286 | 329 | 293 | 213 | 711 | 760 | 1 522 | 1 284 | 703 | 643 | Manitoba |
| **Total Low Value Species** | **2 947** | **6 678** | **8 472** | **6 514** | **5 395** | **8 123** | **7 953** | **8 191** | **8 569** | **10 880** | **17 897** | **16 556** | **19 013** | **18 187** | **25 119** | **19 014** | ... |
| Other Fish[8] | 16 547 | 10 271 | 10 014 | 11 028 | 11 352 | 9 592 | 14 425 | 10 173 | 7 367 | 8 300 | 3 805 | 3 845 | 3 316 | 3 557 | 3 758 | 4 542 | ... |
| **Total** | **56 516** | **55 826** | **55 051** | **41 511** | **43 526** | **45 529** | **47 007** | **42 479** | **39 670** | **47 035** | **47 571** | **49 152** | **54 297** | **49 956** | **57 734** | **48 818** | ... |

[1] Liveweight, i.e. weight of fish brought ashore.
[2] Ranked according to tonnage of 1983 catch.
[3] Includes lake and rainbow trout. No commercial catches of rainbows have been reported since 1979.
[4] Ciscos and lake herrings are marketed collectively as chub.
[5] Data are for the Northwest Territories only; however, this fish is also caught commercially in Québec and Labrador.
[6] Over ninety-five percent of smelt caught are from Lake Erie.
[7] Some New Brunswick and all Great Lakes alewife are caught for animal feed and are not reported here.
[8] Other fish include tomcod, eel, salmon, shad, white bass, sturgeon, catfish, burbot, rock bass, sunfish, splake, bullhead, freshwater drum, bowfin.

**Sources:**
Department of Fisheries and Oceans, Economic Development Directorate, *Annual Statistical Review of Canadian Fisheries*, Volumes 9 to 16. Ottawa, years 1977 to 1985. Data are collected by the provinces and forwarded to the federal department.

**Note:**
In 1980, Fisheries and Oceans Canada, in conjunction with the Provincial Agencies, conducted a sportfishing survey. Licensed anglers were asked to report the number of fish caught and retained by species. Estimated total weight nationally (excluding Québec) of fish retained by anglers was 73,200 tonnes.

Table 3.3.17
## Commercial Catch of Freshwater Fish in Ontario[1], 1962 to 1982

| Year | Lake Ontario | Lake Erie[2] | Lake St. Clair[3] | Lake Huron | Lake Superior | Inland Waters | | Total Catch |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Northern | Southern | |
| | tonnes | | | | | | | |
| 1962 | 795 | 20 187 | 468 | 1 895 | 1 428 | 3 892 | 293 | 28 958 |
| 1963 | 929 | 16 027 | 474 | 1 668 | 1 350 | 3 832 | 392 | 24 672 |
| 1964 | 915 | 11 523 | 429 | 1 801 | 1 218 | 3 604 | 264 | 19 754 |
| 1965 | 1 202 | 15 934 | 402 | 1 620 | 1 031 | 3 443 | 199 | 23 831 |
| 1966 | 738 | 18 807 | 426 | 1 325 | 838 | 3 183 | 263 | 25 580 |
| 1967 | 832 | 17 148 | 368 | 1 210 | 1 166 | 3 008 | 288 | 24 020 |
| 1968 | 912 | 17 894 | 509 | 1 103 | 1 538 | 3 092 | 252 | 25 290 |
| 1969 | 1 031 | 21 804 | 417 | 1 058 | 1 340 | 2 759 | 286 | 28 695 |
| 1970 | 1 319 | 14 417 | 39 | 964 | 1 535 | 2 448 | 198 | 20 920 |
| 1971 | 1 319 | 13 201 | 0 | 1 252 | 1 529 | 1 845 | 282 | 19 428 |
| 1972 | 1 156 | 13 703 | 0 | 1 009 | 1 660 | 1 762 | 242 | 19 612 |
| 1973 | 1 070 | 18 082 | 0 | 1 153 | 1 606 | 1 937 | 237 | 24 085 |
| 1974 | 1 073 | 17 563 | 0 | 1 530 | 1 790 | 2 003 | 205 | 24 164 |
| 1975 | 1 250 | 13 747 | 0 | 1 501 | 1 696 | 2 039 | 180 | 20 413 |
| 1976 | 1 311 | 11 570 | 0 | 1 748 | 1 751 | 1 940 | 178 | 18 497 |
| 1977 | 1 107 | 16 134 | 0 | 1 749 | 1 738 | 2 446 | 168 | 23 343 |
| 1978 | 1 112 | 18 072 | 0 | 1 700 | 1 834 | 2 352 | 140 | 25 210 |
| 1979 | 878 | 18 473 | 0 | 1 399 | 1 621 | 2 217 | 307 | 24 895 |
| 1980 | 891 | 19 490 | 37 | 1 277 | 2 151 | 2 080 | 234 | 26 485 |
| 1981 | 1 163 | 20 334 | 93 | 2 121 | 2 060 | 2 154 | 233 | 28 158 |
| 1982 | 939 | 26 989 | 153 | 1 915 | 1 515 | 2 091 | 197 | 33 799 |

[1] Principal species caught in each lake and region are as follows: *Lake Ontario* - carp (declined in 1979), yellow perch; *Lake Erie* - rainbow smelt, yellow perch, white bass; *Lake Huron* - lake whitefish, cisco; *Lake Superior* - lake whitefish, lake herring, walleye (declined in 1968); *northern inland waters* - lake whitefish, walleye.

[2] The species of highest commercial catch in Lake Erie since the early 1960s is smelt.

[3] No commercial catch was reported between 1970 and 1980 in Lake St. Clair as a result of the discovery of mercury contamination and the ensuing closure of the commercial fishery. Similar bans have affected fisheries in other parts of Lakes Ontario and Erie and other inland waters.

**Source:**
Ontario Ministry of Natural Resources, *Statistics*, Toronto, years 1973 to 1983.

Technical Box 3.3.18

## Fish Catch: An Indicator of Change in the Great Lakes Ecosystem

During this century, the Great Lakes have experienced changes in the abundance and the mix of species. While tonnage of landed catch has more than doubled, the contribution of high value species declined to a low during the 1960s. (see chart) In general, high value species are more sensitive to fishing pressure, nutrient loadings, predation and competition from introduced species, and habitat restrictions than are low value species (yellow perch and lake herring are anomalies). Thus, a comparison of landings of the two groups is a general indicator of the state of the Great Lakes environment. Historical overfishing of accessible fish (benthics and large pelagics) allowed the population of the small pelagics to expand in the absence of predation. This is illustrated by the changes in the ratios in the lower lakes. In addition to overfishing, nutrient loadings from human activities seem to have contributed to the destabilization of the lower lakes ecosystem. The possible net effect would be the disruption of harmonic communities of species.

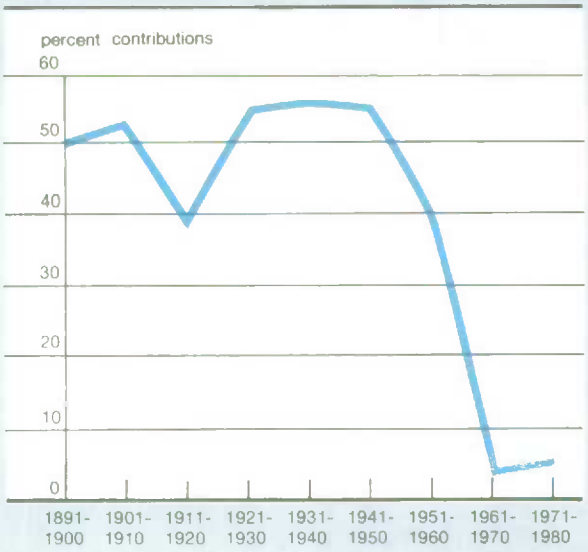
### Changes in Species Composition of Great Lakes Commercial Catch

| Year | Lake Erie Ratios | | Lake Ontario Ratios | |
|---|---|---|---|---|
| | Small Pelagics[1] to Benthics[2] | Small Pelagics to Large Pelagics[3] | Small Pelagics to Benthics | Small Pelagics to Large Pelagics |
| 1901 | 0.3 | 0.1 | 0.4 | 0.2 |
| 1911 | 0.3 | <0.1 | 0.1 | 0.2 |
| 1921 | 0.2 | 0.1 | <0.1 | <0.1 |
| 1931 | 1.2 | 0.6 | <0.1 | <0.1 |
| 1941 | 0.4 | 0.6 | 0.1 | <0.1 |
| 1951 | 0.4 | 0.5 | 0.3 | 0.6 |
| 1961 | 4.4 | 2.7 | 0.4 | 7.9 |
| 1971 | 7.3 | 15.4 | 16.9 | 35.4 |
| 1981 | 12.5 | 9.4 | 18.1 | 113.2 |

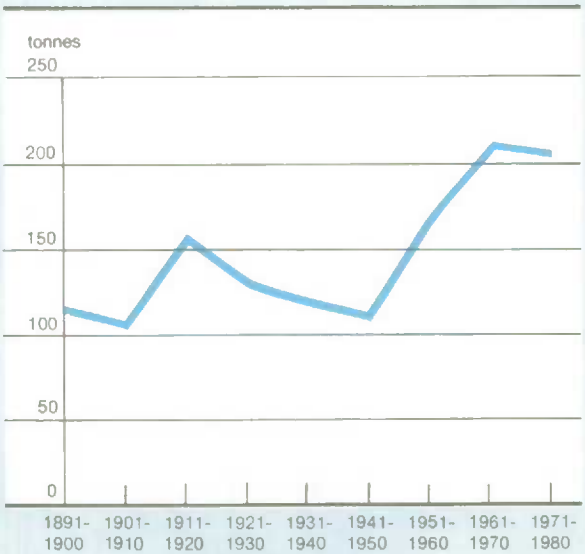
[1] Small pelagics include smelt, alewife, yellow perch.
[2] Benthics (bottom feeders) include lake whitefish, burbot, sturgeon, northern pike, sauger, carp, walleye, channel catfish, lake trout.
[3] Large pelagics (open water fish) include blue pike, lake herring, white bass, sheepshead.

**Source:**
Great Lakes Fisheries Commission, *Technical Report No. 3* (revised) September 1979 and unpublished data.

### Percentage Contribution of High Value Species[1] to Total Catch




### Annual Average Canadian Catch over the Decade




[1] Species of fish preferred by consumers attract high market prices. High value species used for this calculation are blue pike, (now extinct) lake trout, lake whitefish, sauger and walleye.

**Source:**
International Joint Commission, *1981 Report on Great Lakes Water Quality, Appendix, Great Lakes Surveillance*, November 1981 and unpublished data from the Great Lakes Fisheries Commission, Ann Arbor, Michigan.

Table 3.3.19
## Persons Employed in the Fishing Industry, 1951 to 1983

| | Atlantic[1] | | Pacific[2] | | Continental[3] | | Canada | |
|---|---|---|---|---|---|---|---|---|
| | Fishermen[4] | Plant Workers[5] | Fishermen | Plant Workers | Fishermen | Plant Workers | Fishermen | Plant Workers |
| 1951[6] | 36 450 | 14 102 | 13 213 | 4 604 | 15 016 | ... | 64 679 | 18 706 |
| 1961 | 44 652 | 10 506 | 16 805 | 3 632 | 16 903 | 643 | 78 360 | 14 781 |
| 1971 | 39 726 | 14 995 | 11 015 | 2 539 | 8 104 | 916 | 58 845 | 18 510 |
| 1972 | 39 741 | 15 506 | 9 902 | 3 558 | 7 741 | 1 036 | 57 384 | 20 100 |
| 1973 | 38 996 | 16 630 | 11 717 | 3 702 | 8 534 | 1 092 | 59 247 | 21 424 |
| 1974 | 36 464 | 14 236 | 11 906 | 3 413 | 8 247 | 1 125 | 56 617 | 18 774 |
| 1975 | 40 564 | 12 916 | 12 578 | 3 051 | 7 889 | 1 020 | 61 031 | 16 987 |
| 1976 | 40 785 | 14 738 | 14 018 | 3 830 | 8 582 | 1 000 | 63 385 | 19 568 |
| 1977 | ...[7] | 16 922 | 13 753 | 4 074 | ...[7] | 941 | ...[7] | 21 937 |
| 1978 | 48 533 | 19 683 | 16 785 | 4 555 | 8 291 | 993 | 73 609 | 25 231 |
| 1979 | 55 885 | 22 445 | 19 834 | 4 229 | 8 197 | 1 321 | 83 916 | 27 995 |
| 1980 | 59 252 | 21 909 | 18 871 | 3 950 | 7 829 | 1 225 | 85 952 | 27 084 |
| 1981 | 53 250 | 22 168 | 17 454 | 4 208 | 8 056 | 1 110 | 78 760 | 27 486 |
| 1982[8] | 46 973 | 21 604 | 17 298 | 3 040 | 8 201 | 1 208 | 72 472 | 25 852 |
| 1983 | 56 499 | .. | 17 061 | .. | 8 074 | .. | 81 634 | .. |

[1] Includes the sea fisheries of the Atlantic Provinces and Québec.
[2] Includes the sea fishery of British Columbia.
[3] Includes the freshwater fisheries of New Brunswick, Québec, Ontario, Prairie Provinces and the Northwest Territories.
[4] The number of fishermen, historically, was based on field enumeration. Formal licensing of fishermen began in Newfoundland in 1974 and in the Maritime provinces in 1978. All individuals, including crew members, who engage in fishing to sell any part of their catch must purchase a federal commercial fishing license.
[5] Until 1980, the number of persons reported in the Census of Manufactures refers to the "average number of employees". The number of workers in each establishment is obtained by adding the number of persons employed in each month and dividing by twelve. Since 1980, the actual numbers of people employed in fish processing are counted.
[6] Data for Newfoundland and Labrador are not included before 1961.
[7] Data for the Atlantic Provinces are incomplete for 1977 due to the conversion from field enumeration to a licensing system.
[8] The province of Québec did not report data for 1982.

**Sources:**
Department of Fisheries and Oceans, Economic Development Directorate, *Annual Statistical Review of Canadian Fisheries*, Volumes 9 to 15, Ottawa, 1977 to 1984.
Statistics Canada, *Fisheries Statistics of Canada*, Catalogue 24-201, 1951, 1961, 1971 to 75, annual.
Statistics Canada. *Fish Products Industry*, Catalogue 32-216, annual.

**Note:**
The difference between the number of fishermen reported in the Census and by the Department of Fisheries and Oceans is the result of methodological differences. The Fisheries and Oceans figure is obtained from a count of registered fishermen, whereas the Census covers persons who claimed the occupation of fishing one week prior to the Census date (June 1st), unless they were unemployed, in which case the occupation of the longest employment period since January 1st of the previous year is used. The lower figure indicated by the Census is partly accounted for by the seasonality of this industry (low in week of Census), and because part-time fishermen may not consider fishing as primary activity. On the other hand, registered fishermen may not be active in the year of registration, or may only be employed part-time.

Table 3.3.20
## Socio-Economic Profile of Fishermen, 1981

| Region | Total Employed | | Full-Time Employed | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Persons | Average Income | Persons[4] | Average Income | As a Percentage of All Employment | Percentage Self Employed[5] | Age Forty-five Years and Over | Education Level | |
| | | | | | | | | Less than Grade Nine | Post Secondary[6] |
| | | dollars | | dollars | percent | percent | percent of total employed | | |
| Atlantic[1] | 25 215 | 8 823 | 9 400 | 13 072 | 37 | 53.2 | 28 | 42 | 24 |
| Continental[2] | 8 930 | 9 418 | 3 930 | 14 280 | 44 | 30.9 | 33 | 30 | 37 |
| Pacific[3] | 7 685 | 12 766 | 3 440 | 16 349 | 40 | 22.9 | 25 | 11 | 50 |
| Canada | 41 830 | 9 675 | 16 770 | 14 027 | 40 | 43.8 | 29 | 32 | 32 |

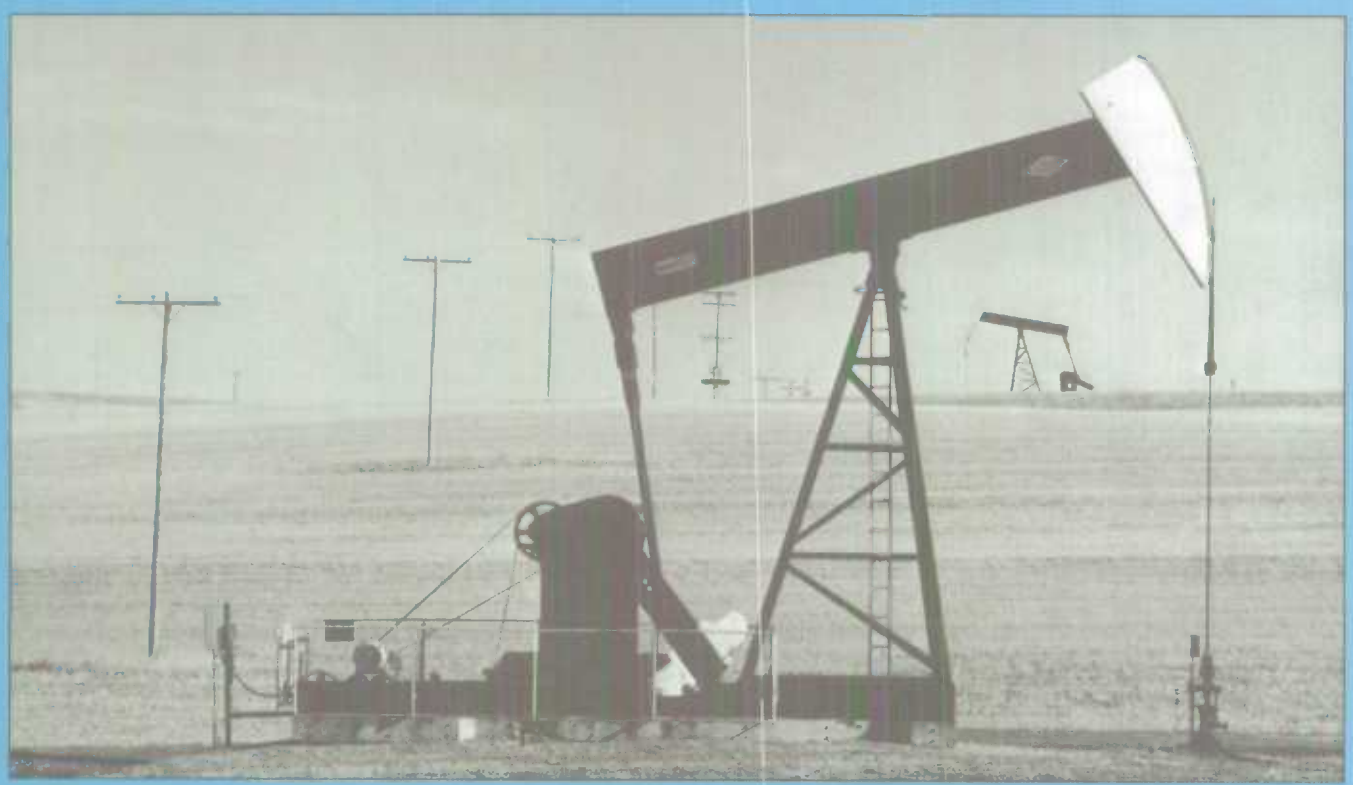
[1] Atlantic region includes Census Divisions in the Atlantic Provinces and Québec in which marine fishermen reside.
[2] Continental region includes Québec, Ontario and the Prairie Provinces.
[3] Pacific region includes Census Divisions in British Columbia in which marine fishermen reside.
[4] A person employed in the fishing industry is defined as having worked at least twenty-seven weeks in 1980 and claimed employment in the fishing industry during the week prior to the Census date or if not employed during that week, having worked in the fishing industry at least twenty-seven weeks in 1980. Unpaid family workers are not included.
[5] Self employed persons are all full-time workers less wage-earners, less unpaid family workers.
[6] Post-secondary education refers to trade certificates and university degrees.

**Sources:**
Statistics Canada, 1981 Census of Canada, special tabulations.

**Note:**
The difference between the number of fishermen reported in the Census and by the Department of Fisheries and Oceans is the result of methodological differences. The Fisheries and Oceans figure is obtained from a count of registered fishermen, whereas Census covers persons who claimed the occupation of fishing one week prior to the Census date (June 1st), unless they where unemployed, in which case the occupation of the longest employment period since January 1st of the previous year issued. The lower figure indicated by the Census is partly accounted for by the seasonality of this industry (low in week of Census), and because part-time fishermen may not consider fishing as their primary activity. On the other hand, registered fishermen may not be active in the year of registration, or may only be employed part-time.

# 4

# Extraction and Depletion of Non-Renewable Resources



# Contents

# 4.1
# Metals and Non-Metallic Minerals

Table 4.1.1
## Production of Metallic Minerals, 1888 to 1982

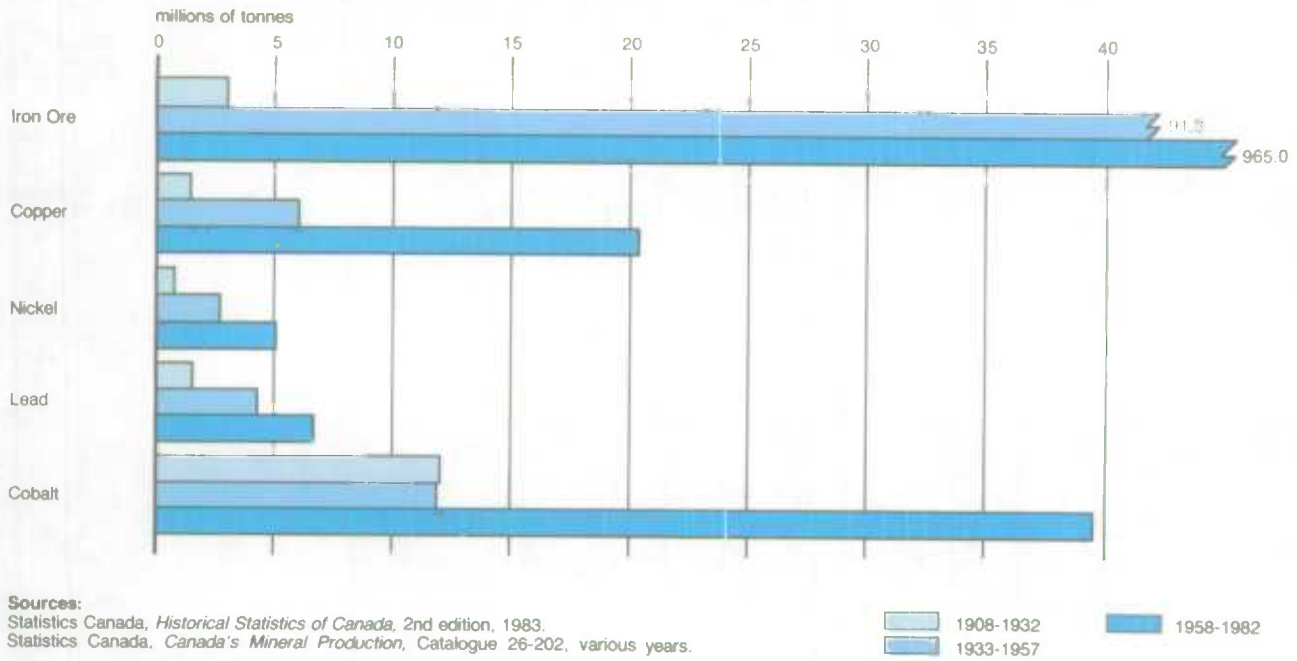
| Five-Year Periods[1] | Iron Ore[2] | Copper | Nickel | Lead | Cobalt |
|---|---|---|---|---|---|
| | thousands of tonnes | | | | |
| 1888-1892 | 374 | 16 | 4 | 0 | 0 |
| 1893-1897 | 437 | 21 | 9 | 40 | 0 |
| 1898-1902 | 883 | 58 | 17 | 87 | 0 |
| 1903-1907 | 1 212 | 111 | 38 | 98 | 1 083 |
| 1908-1912 | 1 081 | 139 | 73 | 82 | 5 117 |
| 1913-1917 | 1 307 | 218 | 150 | 88 | 1 919 |
| 1918-1922 | 559 | 166 | 107 | 132 | 1 245 |
| 1923-1927 | 28 | 261 | 154 | 515 | 2 041 |
| 1928-1932 | 0 | 587 | 185 | 690 | 1 629 |
| 1933-1937 | 0 | 923 | 347 | 792 | 1 423 |
| 1938-1942 | 1 452 | 1 398 | 567 | 1 021 | 1 058 |
| 1943-1947 | 5 260 | 1 096 | 561 | 804 | 439 |
| 1948-1952 | 16 846 | 1 176 | 601 | 744 | 2 323 |
| 1953-1957 | 67 835 | 1 448 | 768 | 894 | 6 629 |
| 1958-1962 | 99 320 | 1 883 | 913 | 930 | 7 300 |
| 1963-1967 | 173 670 | 2 329 | 1 068 | 1 193 | 7 699 |
| 1968-1972 | 208 526 | 3 079 | 1 213 | 1 654 | 8 854 |
| 1973-1977 | 248 213 | 5 665 | 1 234 | 1 523 | 7 271 |
| 1978-1982 | 235 356 | 7 311 | 695 | 1 451 | 8 346 |
| **Total** | **1 062 359** | **27 885** | **8 704** | **12 738** | **64 376** |

| Five-Year Periods[1] | Molybdenum | Magnesium | Uranium | Silver | Gold | Platinum Group |
|---|---|---|---|---|---|---|
| | tonnes | | | | | |
| 1888-1892 | 0 | 0 | 0 | 61 | 8 | 0 |
| 1893-1897 | 0 | 0 | 0 | 361 | 20 | 0 |
| 1898-1902 | 3 | 0 | 0 | 689 | 163 | -- |
| 1903-1907 | 77 | 0 | 0 | 1 059 | 104 | -- |
| 1908-1912 | 0 | 0 | 0 | 4 573 | 78 | -- |
| 1913-1917 | 2 009 | 0 | 0 | 4 187 | 130 | -- |
| 1918-1922 | 455 | 0 | 0 | 2 579 | 138 | -- |
| 1923-1927 | 34 | 0 | 0 | 3 225 | 252 | 1 |
| 1928-1932 | 9 | 0 | 0 | 3 435 | 363 | 4 |
| 1933-1937 | 7 | 0 | 0 | 2 785 | 530 | 16 |
| 1938-1942 | 209 | 372 | 0 | 3 473 | 787 | 25 |
| 1943-1947 | 2 394 | 11 528 | 0 | 2 145 | 472 | 25 |
| 1948-1952 | 588 | 0 | 0 | 3 276 | 652 | 21 |
| 1953-1957 | 1 408 | 16 321 | 8 098 | 4 499 | 678 | 25 |
| 1958-1962 | 1 812 | 33 237 | 54 533 | 4 943 | 695 | 52 |
| 1963-1967 | 24 308 | 39 897 | 25 174 | 5 034 | 552 | 62 |
| 1968-1972 | 62 162 | 39 986 | 18 732 | 6 955 | 374 | 67 |
| 1973-1977 | 71 940 | 38 648 | 27 635 | 6 638 | 272 | 63 |
| 1978-1982 | 66 656 | 54 658 | 36 310 | 5 964 | 264 | 49 |
| **Total** | **234 071** | **234 647** | **170 482** | **65 881** | **6 532** | **410** |

[1] Figures shown are totals for the five-year periods. The totals at the bottom of the columns are the totals for the 1888 to 1982 period.
[2] Iron ore production over the period from 1733 to 1886 is estimated to be one million tonnes: Energy, Mines and Resources Canada, *A Summary View of Canadian Reserves and Resources of Iron Ore*, MR 170, 1977, p.8. This source also estimates that iron ore, concentrates, pellets and sinter contained about fifteen percent iron over the period 1733 to 1975.

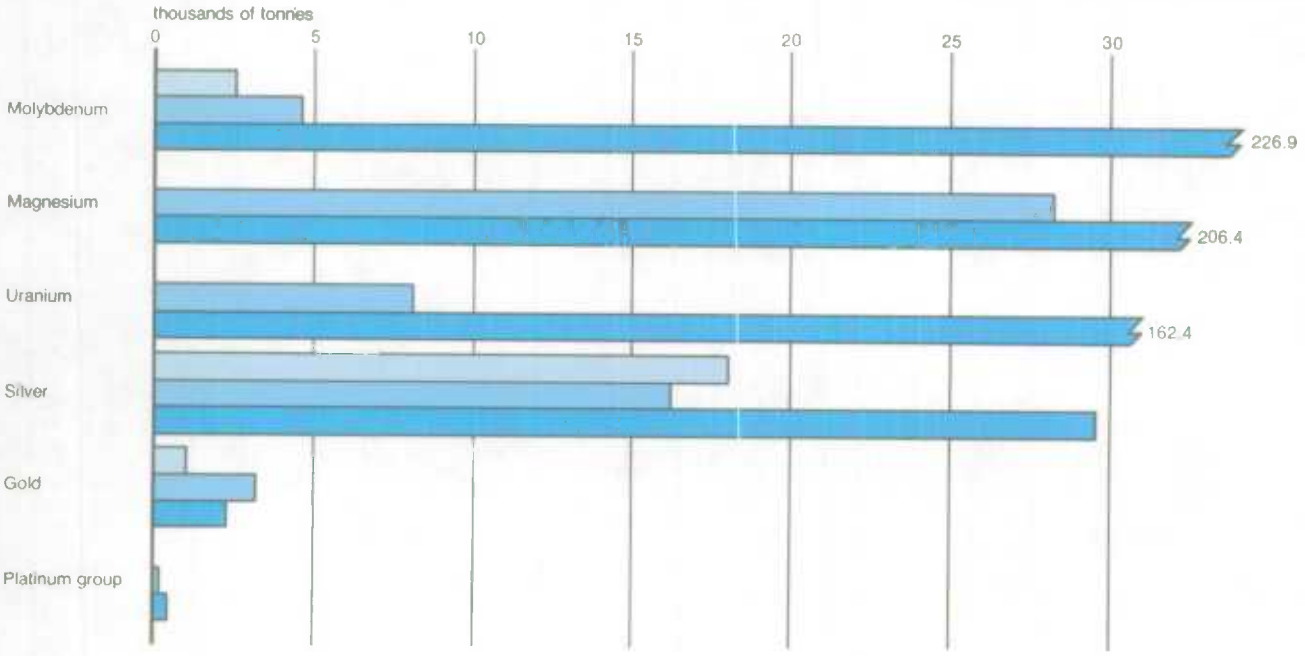
**Sources:**
Statistics Canada, *Historical Statistics Of Canada*, 2nd Edition, 1983.
Statistics Canada, *Canada's Mineral Production*, Catalogue 26-202, various years.

Chart 4.1.2
**Production of Selected Metallic Minerals, Twenty-five Year Periods, 1908 to 1982**




**Sources:**
Statistics Canada, *Historical Statistics of Canada*, 2nd edition, 1983.
Statistics Canada, *Canada's Mineral Production*, Catalogue 26-202, various years.

Chart 4.1.3
**Production of Selected Metallic Minerals, Twenty-five Year Periods, 1908 to 1982**



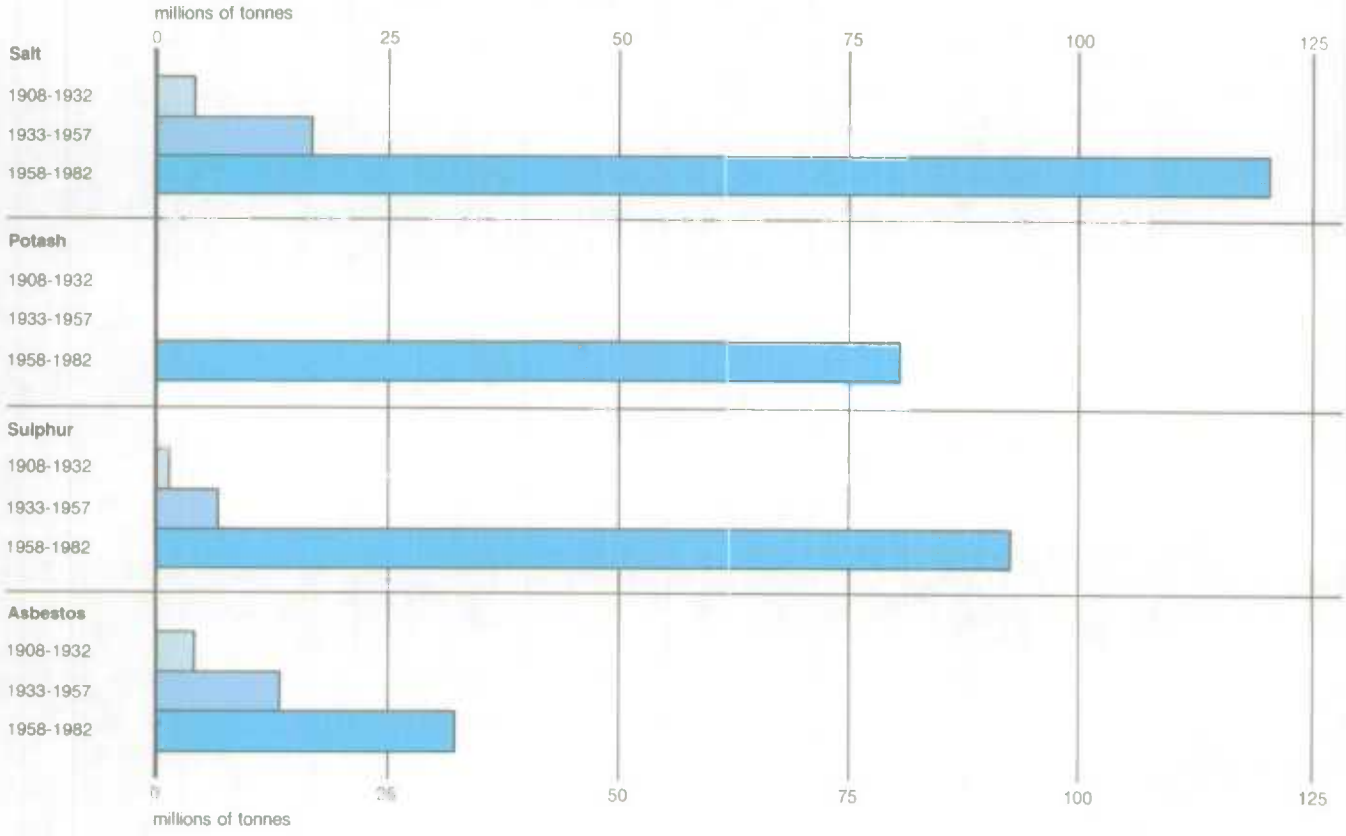

**Sources:**
Statistics Canada, *Historical Statistics of Canada*, 2nd edition, 1983.
Statistics Canada, *Canada's Mineral Production*, Catalogue 26-202, various years.

Table 4.1.4
## Production of Selected Non-Metallic Minerals, 1888 to 1982

| Five-Year Periods | Salt | Potash | Sulphur | Asbestos |
|---|---|---|---|---|
| | thousands of tonnes | | | |
| 1888-1892 | 205 | 0 | 114 | 32 |
| 1893-1897 | 241 | 0 | 75 | 59 |
| 1898-1902 | 273 | 0 | 63 | 144 |
| 1903-1907 | 316 | 0 | 73 | 299 |
| 1908-1912 | 395 | 0 | 123 | 493 |
| 1913-1917 | 544 | 0 | 496 | 657 |
| 1918-1922 | 759 | 0 | 279 | 702 |
| 1923-1927 | 1 067 | 0 | 57 | 1 166 |
| 1928-1932 | 1 292 | 0 | 202 | 1 005 |
| 1933-1937 | 1 644 | 0 | 389 | 1 120 |
| 1938-1942 | 2 309 | 0 | 960 | 1 740 |
| 1943-1947 | 3 015 | 0 | 1 100 | 2 334 |
| 1948-1952 | 3 888 | 0 | 1 440 | 3 691 |
| 1953-1957 | 5 927 | 0 | 2 703 | 4 499 |
| 1958-1962 | 14 393 | 0 | 3 990 | 4 974 |
| 1963-1967 | 19 432 | 6 667 | 10 869 | 6 373 |
| 1968-1972 | 23 442 | 16 041 | 17 448 | 7 430 |
| 1973-1977 | 27 651 | 25 883 | 26 001 | 7 444 |
| 1978-1982 | 35 730 | 31 898 | 34 326 | 6 165 |
| **Total** | **142 523** | **80 489** | **100 708** | **50 327** |

**Sources:**
Statistics Canada, *Historical Statistics of Canada*, 2nd Edition, 1983.
Statistics Canada, *Canada's Mineral Production*, Catalogue 26-202, various years.

Chart 4.1.5
**Production of Selected Non-Metallic Minerals, Twenty-five Year Periods, 1908 to 1982**




**Source:**
Statistics Canada, *Canada's Mineral Production*, Catalogue 26-202, various years.

Map 4.1.6
## Principal Mining Regions


## Key to Principal Mining Regions

**Atlantic Maritime**

| | | |
|---|---|---|
| 1 | Sydney - Cape Breton (N.S.) | Coal, Gypsum |
| 2 | New Glasgow, (N.S.) | Coal |
| 3 | Wolfville - Stewiacke, (N.S.) | Gypsum, Pb, Zn, U |
| 4 | Moncton - Springhill, (N.B. - N.S.) | Coal, Salt, Gypsum |
| 5 | Minto, (N.B.) | Coal, Potash |
| 6 | Fredericton, (N.B.) | Sb |
| 7 | Bathurst, (N.B.) | Pb, Zn, Cu |

**Mixed-Wood Plain**

| | | |
|---|---|---|
| 8 | Eastern Townships, (Que.) | Asbestos, Talc, Soapstone |
| 9 | Montreal, (Que.) | Silica, Magnesite, Magnesitic Dolomite |
| 10 | Ottawa Valley, (Ont. - Que.) | Mg, Ca |
| 11 | Hagersville, (Ont.) | Gypsum |
| 12 | Windsor, (Ont.) | Salt |
| 13 | Sarnia, (Ont.) | Salt |
| 14 | Goderich, (Ont.) | Salt |

**Boreal Shield**

| | | |
|---|---|---|
| 15 | Avalon Peninsula, (Nfld.) | Pyrophyllite |
| 16 | St. Lawrence, (Nfld.) | Silica |
| 17 | Buchans, (Nfld.) | Zn, Pb, Cu, Ag, Au, Cd |
| 18 | Springdale - Baie Verte, (Nfld.) | Cu, Au, Ag, Asbestos |
| 19 | Stephenville, (Nfld.) | Gypsum |
| 20 | Havre St. Pierre, (Que.) | Fe, Ti |
| 21 | Gaspé, (Que.) | Cu, Mo |
| 22 | Baie St. Paul, (Que.) | Fe |
| 23 | Maniwaki, (Que.) | Ni, Cu, Fe |
| 24 | Belleterre, (Que.) | Ni, Cu |
| 25 | Noranda - Val d'Or, (Que.) | Cu, Zn, Ag, Au, Pb |
| 26 | Matagami, (Que.) | Zn, Cu |
| 27 | Chibougamau, (Que.) | Cu, Au, Ag |
| 28 | Bancroft - Marmora, (Ont.) | Talc, Nepheline Syenite, Dolomite, U |
| 29 | Elliot Lake, (Ont.) | U |
| 30 | Sudbury Basin, (Ont.) | Ni, Cu, Au, Ag, Platinum Metals, Co, Se, Te, Fe, U |
| 31 | Kirkland Lake - Cobalt, (Ont.) | Au, Ag, Fe |
| 32 | Timmins - Porcupine, (Ont.) | Zn, Cu, Au, Ag, Pb, Sn, Cd |
| 33 | Algoma, (Ont.) | Fe |
| 34 | Long Lac, (Ont.) | Cu, Zn, Ag, Pb, Au |
| 35 | Steep Lake, (Ont.) | Fe, Ni, Cu |
| 36 | Pickle Crow, (Ont.) | Cu, Ni, Ag |
| 37 | Red Lake, (Ont.) | Au, Cu, Zn, Ag, Fe |

## Key to Principal Mining Regions (concluded)

| | |
|---|---|
| 38 Bissett - Black Island, (Man.) | Silica |
| 39 Flin Flon - Snow Lake, (Man.) | Cu, Zn, Au, Ag, Pb, Cd, Se, Te |
| 40 Thompson, (Man.) | Ni, Cu, Co, Precious Metal Residues |
| 41 Lynn Lake, (Man.) | Cu, Zn, Ag |
| 42 Lac du Bonnet, (Man.) | Ta, Ce |
| 43 La Ronge, (Sask.) | Cu, Ni, Zn, Pb |
| **Prairie** | |
| 44 Morris - Morden, (Man.) | Bentonite |
| 45 Neepawa, (Man.) | Gypsum |
| 46 Estevan - Bienfait, (Sask.) | Coal |
| 47 Regina - Moose Jaw, (Sask.) | Sodium Sulphate, Potash, Salt, Bentonite |
| 48 Saskatoon, (Sask.) | Potash, Sodium Sulphate, Salt |
| 49 Esterhazy, (Sask.) | Potash |
| 50 Edmonton, (Alta.) | Coal, Barite, Silica |
| 51 Forestburg, (Alta.) | Coal, Bentonite |
| 52 Drumheller, (Alta.) | Coal |
| 53 Lethbridge, (Alta.) | Coal |
| 54 Lindbergh, (Alta.) | Salt |
| 55 Metiskow, (Alta.) | Sodium Sulphate |
| **Boreal Plain** | |
| 56 Gypsumville, (Man.) | Gypsum |
| 57 Key Lake, (Sask.) | U |
| 58 Cluff Lake, (Sask.) | U |
| 59 Athabasca Sandstone, - Rabbit Lake, (Sask.) | U |
| 60 Luscar, (Alta.) | Coal |
| 61 Peace River, (B.C.) | Coal |
| **Montane Cordillera** | |
| 62 Grande Cache, (Alta.) | Coal |
| 63 Canmore, (Alta.) | Coal |
| 64 Invermere, (B.C.) | Barite, Gypsum |
| 65 Kimberley, (B.C.) | Pb, Zn, Ag, Sb, Cd, Bi, Sn, In |
| 66 Coleman - Crow's Nest, (Alta. - B.C.) | Coal |
| 67 Revelstoke, (B.C.) | Ag, Zn, Pb |
| 68 Trail - Princeton, (B.C.) | Cu, Mo, Ag, Au, Pb, Zn |
| 69 Highland Valley, (B.C.) | Cu, Mo, Ag, Au |
| 70 Hope, (B.C.) | Cu, Au, Ag |
| 71 Birch Island, (B.C.) | U |
| 72 Caribou, (B.C.) | Cu, Mo, Ag |
| 73 Central B.C., (B.C.) | Cu, Au, Ag, Mo |
| **Pacific Maritime** | |
| 74 Vancouver Island, (B.C.) | Cu, Mo, Au, Ag, Pb, Zn, Re |
| 75 River Jordan, (B.C.) | Cu |
| 76 Britannia Beach, (B.C.) | Au, Ag, Pb, Zn, Cd |
| 77 Queen Charlotte Islands, (B.C.) | Fe, Cu, Ag |
| 78 Stewart, (B.C.) | Cu |
| **Boreal Cordillera** | |
| 79 Cassiar, (B.C.) | Asbestos |
| 80 Fort Nelson, (B.C.) | Cu, Pb, Zn |
| 81 Clinton Creek, (Y.T.) | Asbestos |
| 82 Carmacks, (Y.T.) | Coal |
| 83 Faro, (Y.T.) | Pb, Zn, Ag, Cu, Cd |
| 84 Whitehorse - Carcross, (Y.T.) | Cu, Au, Ag |
| **Tundra Cordillera** | |
| 85 Mayo, (Y.T.) | Ag, Pb, Zn, Cd |
| 86 Tungsten, (Nw.T.) | W, Cu |
| **Taiga Plain** | |
| 87 Pine Point, (Nw.T.) | Zn, Pb |
| **Taiga Shield** | |
| 88 Labrador, (Que. - Nfld.) | Fe |
| 89 Uranium City, (Sask.) | U |
| 90 Great Bear Lake, (Nw.T.) | Ag, Cu |
| 91 Mackay Lake, (Nw.T.) | Au, Base Metals |
| 92 Yellowknife, (Nw.T.) | Au |
| **Southern Arctic** | |
| 93 Baker Lake, (Nw.T.) | U |
| **Northern Arctic** | |
| 94 Purtuniq - Hudson Strait, (Que.) | Asbestos |
| 95 Arctic Bay, (Nw.T.) | Pb, Zn, Ag |
| 96 Little Cornwallis Island, (Nw.T.) | Zn, Pb |

**List of Elements**

| | |
|---|---|
| Ag - silver | Ni - nickel |
| Au - gold | Pb - lead |
| Bi - bismuth | Re - rhenium |
| Ca - calcium | Sb - antimony |
| Cd - cadmium | Se - selenium |
| Ce - cerium | Sn - tin |
| Co - cobalt | Ta - tantalum |
| Cu - copper | Te - tellurium |
| Fe - iron | Ti - titanium |
| In - indium | U - uranium |
| Mg - magnesium | W - tungsten(wolfram) |
| Mo - molybdenum | Zn - zinc |

**Sources:**

Environment Canada, Lands Directorate, *Mining, Land Use and the Environment*, by I.B. Marshall, 1982.

Energy Mines and Resources Canada, *Principal Mineral Areas of Canada* (Map 900 A), 1983.

Technical Box 4.1.7

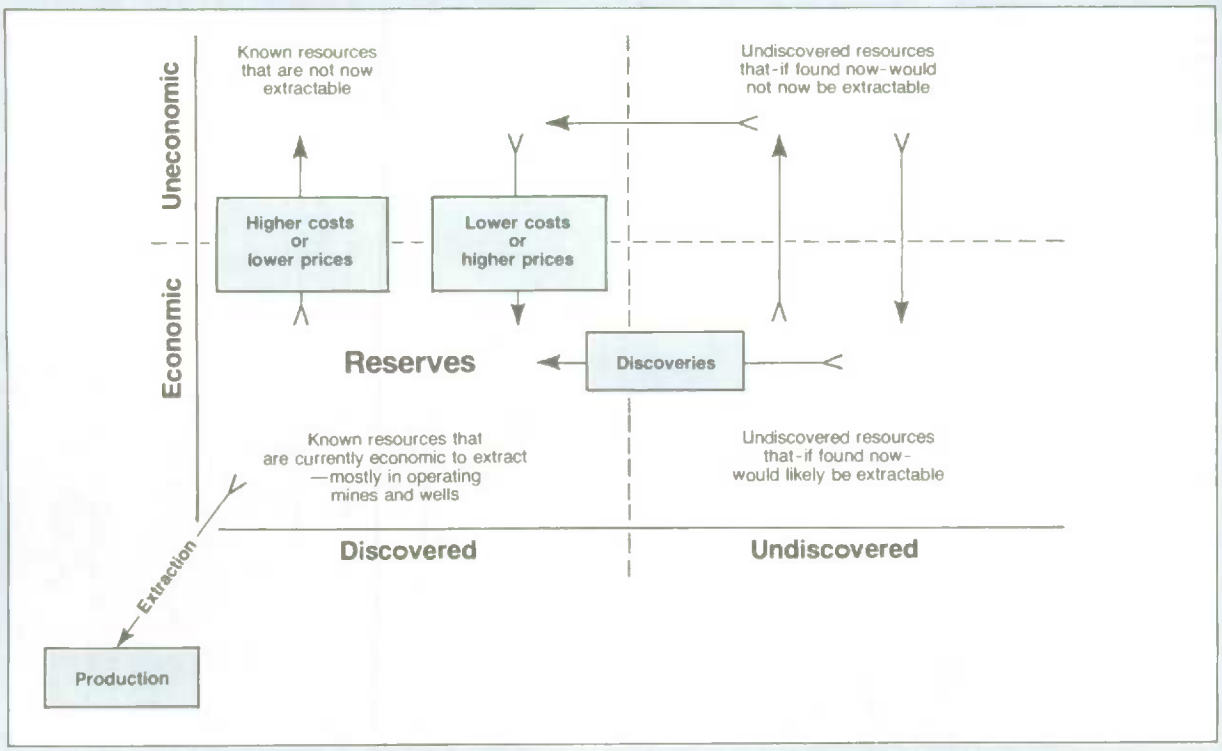
## Non-Renewable Resources and the Measurement of Reserves

Energy, Mines and Resources Canada categorizes the availability of sub-soil resources (i.e. minerals and fossil fuels) on the basis of (i) economic viability and (ii) level of certainty or probability of their existence. **Reserves** refer to the portion of resources that is currently judged to be economic to exploit and is reasonably well measured.

Additions to, or subtractions from, reserves are calculated on the basis of: (i) **production** (i.e. depletion), (ii) **change in costs** which includes both technological improvements and costs of production (i.e. labour, capital, materials) (iii) **changes in price,** which in Canada are largely determined by international competition and world demand, (iv) **revision of previous estimates of reserves,** by more accurate delineation of mineral bodies, for example, and (v) **new discoveries.**

A conventional reserve/production ratio is sometimes used as a rule-of-thumb to determine the level and intensity of mineral exploration considered necessary to provide sufficient reserves to satisfy anticipated medium-term demand[1]. This explains, in part, the counter-intuitive observation of growth in production with a parallel growth in reserves.

### Classification and Flow of Resources




[1] Oil and gas exploration is, in general, an exception to this rule due to the pressure to find new sources of these minerals which, in effect, progressively reduces the margin between discovered **reserves** and those (undiscovered) inferred/speculative resources.

**Source:**
Adapted from Energy, Mines and Resources Canada, *A Summary View of Canadian Reserves and Additional Resources of Nickel, Copper, Zinc, Lead and Molybdenum,* Mineral Bulletin MR 169, 1977.

Table 4.1.8

## Production and Reserves[1] of Metallic Minerals by Ecozone, 1981

| Ecozone | Iron Ore | | Copper | | Nickel | | Lead | | Zinc | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Production | Reserves[2] | Production | Reserves | Production | Reserves | Production | Reserves | Production | Reserves |
| | thousands of tonnes | | | | | | | | | |
| **Atlantic Maritime** | **0** | **0** | **16 789** | **666 400** | **0** | **0** | **80 089** | **4 315 100** | **234 083** | **10 571 100** |
| Nova Scotia | 0 | 0 | 0 | 0 | 0 | 0 | 11 716 | 128 700 | 5 475 | 140 300 |
| New Brunswick | 0 | 0 | 12 034 | 666 400 | 0 | 0 | 68 373 | 4 186 400 | 228 608 | 10 430 800 |
| Québec | 0 | 0 | 4 755 | .. | 0 | 0 | 0 | 0 | 0 | 0 |
| **Boreal Shield** | **22 870** | **1 766 000** | **368 162** | **10 664 900** | **160 247** | **8 304 400** | **6 617** | **288 000** | **377 758** | **7 785 800** |
| Newfoundland | 0 | 0 | 5 154 | 10 500 | 0 | 0 | 2 749 | 21 800 | 39 971 | 179 700 |
| Québec | 17 449 | 1 402 000 | 85 153 | 1 430 600 | 0 | 0 | 2 | 200 | 53 200 | 738 400 |
| Ontario | 5 421 | 364 000 | 225 838 | 8 120 700 | 130 268 | 5 933 400 | 3 386 | 246 000 | 246 027 | 5 988 300 |
| Manitoba | 0 | 0 | 47 061 | 1 063 100 | 29 979 | 2 371 000 | 480 | 20 000 | 31 828 | 848 800 |
| Saskatchewan | 0 | 0 | 4 956 | 40 000 | 0 | 0 | 0 | 0 | 6 732 | 30 600 |
| **Boreal Plain** | **0** | **0** | **8 922** | .. | **0** | **0** | **0** | **0** | **7 713** | **0** |
| Manitoba | 0 | 0 | 8 922 | .. | 0 | 0 | 0 | 0 | 7 713 | 0 |
| Saskatchewan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Montane Cordillera** | **69** | **..** | **225 750** | **4 524 400** | **0** | **0** | **77 855** | **2 157 900** | **65 410** | **2 981 500** |
| British Columbia | 69 | .. | 225 750 | 4 524 400 | 0 | 0 | 77 855 | 2 157 900 | 65 410 | 2 981 500 |
| **Pacific Maritime** | **533** | **10 000** | **62 334** | **934 700** | **0** | **0** | **2 487** | **11 500** | **13 800** | **78 500** |
| British Columbia | 533 | 10 000 | 62 334 | 943 700 | 0 | 0 | 2 487 | 11 500 | 13 800 | 78 500 |
| **Boreal Cordillera** | **0** | **0** | **9 094** | **23 400** | **0** | **0** | **55 985** | **1 455 500** | **78 810** | **2 213 500** |
| British Columbia | 0 | 0 | 0 | .. | 0 | 0 | 15 | 0 | 4 | 0 |
| Yukon | 0 | 0 | 9 094 | 23 400 | 0 | 0 | 55 970 | 1 455 500 | 78 806 | 2 213 500 |
| **Tundra Cordillera** | **0** | **0** | **0** | **7 400** | **0** | **0** | **0** | **156 200** | **0** | **193 500** |
| Northwest Territories | 0 | 0 | 0 | 7 400 | 0 | 0 | 0 | 156 200 | 0 | 193 500 |
| **Taiga Plain** | **0** | **0** | **0** | **0** | **0** | **0** | **38 486** | **0** | **74 079** | **0** |
| Saskatchewan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alberta | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 38 486 | 0 | 74 079 | 0 |
| **Taiga Shield** | **26 079** | **2 745 000** | **277** | **400** | **0** | **0** | **0** | **1 698 800** | **0** | **5 221 900** |
| Newfoundland | 25 686 | 2 655 000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quebec | 393 | 90 000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northwest Territories | 0 | 0 | 277 | 400 | 0 | 0 | 0 | 1 698 800 | 0 | 5 221 900 |
| **Southern Arctic** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Northern Arctic** | **0** | **0** | **0** | **0** | **0** | **0** | **7 037** | **35 900** | **59 525** | **390 000** |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 7 037 | 35 900 | 59 525 | 390 000 |
| **Canada** | **49 551** | **4 521 000** | **691 328** | **16 830 600** | **160 247** | **8 304 400** | **268 556** | **10 118 900** | **911 178** | **29 435 800** |

| Ecozone | Molybdenum | | Uranium | Silver | | Gold | |
|---|---|---|---|---|---|---|---|
| | Production | Reserves | Production[3] | Production | Reserves | Production | Reserves |
| | tonnes | | | | | | |
| **Atlantic Maritime** | **0** | **8 600** | **0** | **196** | **11 393** | **2.0** | **30.0** |
| Nova Scotia | 0 | 0 | 0 | 1 | 4 | 0.0 | 0 |
| New Brunswick | 0 | 8 600 | 0 | 193 | 11 389 | 2.0 | 30.0 |
| Québec | 0 | | 0 | 2 | 0 | 0.0 | 0 |
| **Boreal Shield** | **926** | **25 000** | **4 850** | **416** | **12 002** | **37.2** | **812.6** |
| Newfoundland | 0 | 0 | 0 | 7 | 40 | 0.2 | 0.6 |
| Quebec | 926 | 25 000 | 0 | 56 | 1 103 | 17.3 | 149.1 |
| Ontario | 0 | 0 | 4 850 | 325 | 10 117 | 18.2 | 298.0 |
| Manitoba | 0 | 0 | 0 | 22 | 707 | 1.2 | 362.9 |
| Saskatchewan | 0 | 0 | 0 | 6 | 35 | 0.3 | 2.0 |
| **Boreal Plain** | **0** | **0** | **2 497** | **4** | **0** | **0.1** | **0** |
| Manitoba | 0 | 0 | 0 | 4 | 0 | 0.1 | 0 |
| Saskatchewan | 0 | 0 | 2 497 | 0 | 0 | 0.0 | 0 |
| **Montane Cordillera** | **13 590** | **374 700** | **0** | **339** | **7 008** | **3.8** | **116.3** |
| British Columbia | 13 590 | 374 700 | 0 | 339 | 7 008 | 3.8 | 116.3 |

Table 4.1.8
## Production and Reserves[1] of Metallic Minerals by Ecozone, 1981 (concluded)

| Ecozone | Molybdenum | | Uranium | Silver | | Gold | |
|---|---|---|---|---|---|---|---|
| | Production | Reserves | Production[3] | Production | Reserves | Production | Reserves |
| | tonnes | | | | | | |
| **Pacific Maritime** | **3 307** | **141 800** | **0** | **42** | **436** | **2.7** | **49.7** |
| British Columbia | 3 307 | 141 800 | 0 | 42 | 436 | 2.7 | 49.7 |
| **Boreal Cordillera** | **0** | **0** | **0** | **80** | **2 258** | **1.4** | **11.7** |
| British Columbia | 0 | 0 | 0 | 5 | 59 | 0.8 | 4.8 |
| Yukon | 0 | 0 | 0 | 75 | 2 199 | 0.6 | 6.9 |
| **Tundra Cordillera** | **0** | **0** | **0** | **0** | **275** | **0.0** | **0** |
| Northwest Territories | 0 | 0 | 0 | 0 | 275 | 0.0 | 0 |
| **Taiga Plain** | **0** | **0** | **375** | **0** | **41** | **0.0** | **0** |
| Saskatchewan | 0 | 0 | 375 | 0 | 0 | 0.0 | 0 |
| Alberta | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northwest Territories | 0 | 0 | 0 | 0 | 41 | 0.0 | 0 |
| **Taiga Shield** | **0** | **0** | **0** | **33** | **0** | **4.8** | **55.5** |
| Newfoundland | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Québec | 0 | 0 | 0 | 33 | 0 | 4.8 | 55.5 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| **Southern Arctic** | **0** | **0** | **0** | **0** | **0** | **0** | **20.7** |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 | 0 | 20.7 |
| **Northern Arctic** | **0** | **0** | **0** | **0** | **201** | **0** | **0** |
| Northwest Territories | 0 | 0 | 0 | 0 | 201 | 0 | 0 |
| **Canada** | **17 553** | **550 100** | **7 722** | **1 110** | **33 614** | **52.0** | **1 096.5** |

**Footnotes:**
[1] Current estimates of reserves at existing or planned and committed mining operations are a small part of Canada's discovered resources.
[2] Reserves containing iron refer to the year 1976. Iron ore in Canadian deposits contains anywhere from thirty to fifty percent iron. Reserves of iron are so vast in relation to production that the figures presented here are considered to be approximate.
[3] Measured and indicated reserves of uranium in 1982, assuming a price of up to $115 per kilogram, were estimated by Energy, Mines and Resources Canada to be 185,000 tonnes. No ecozone breakdown can be given for reasons of data confidentiality.

**Sources:**
Energy, Mines Resources Canada, Annual Census of Metal Mines, 1981.
Energy, Mines and Resources Canada, *Canadian Reserves as of January 1, 1981*, MR 191, 1982.
Energy, Mines and Resources Canada, *A Summary View of Canadian Reserves and Additional Resources of Iron Ore*, MR 170, 1977.
Statistics Canada, Office of the Senior Adviser on Integration, special tabulation.

# 4.2
## Fossil Fuels

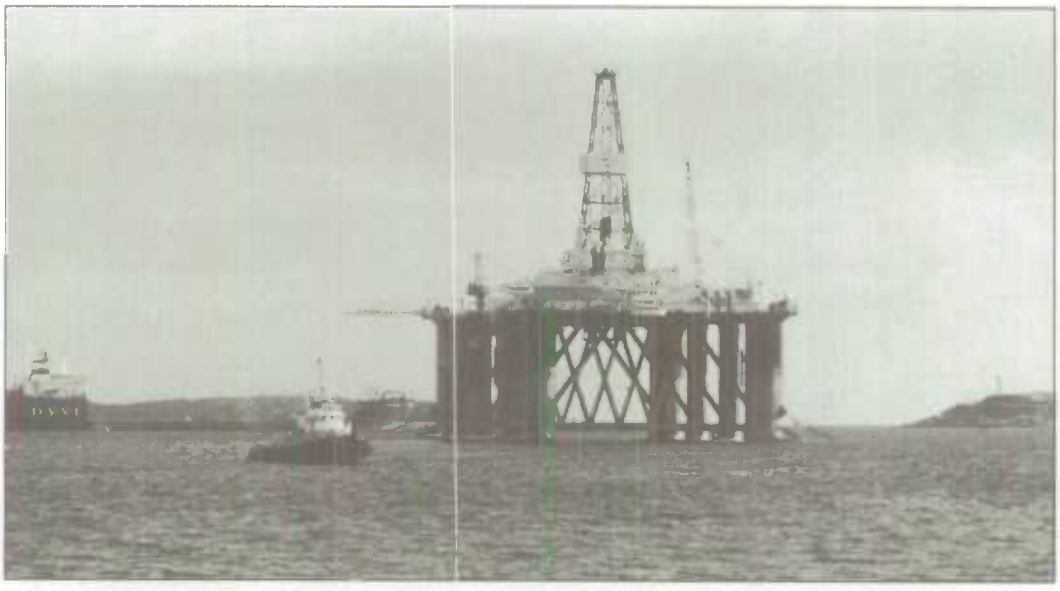
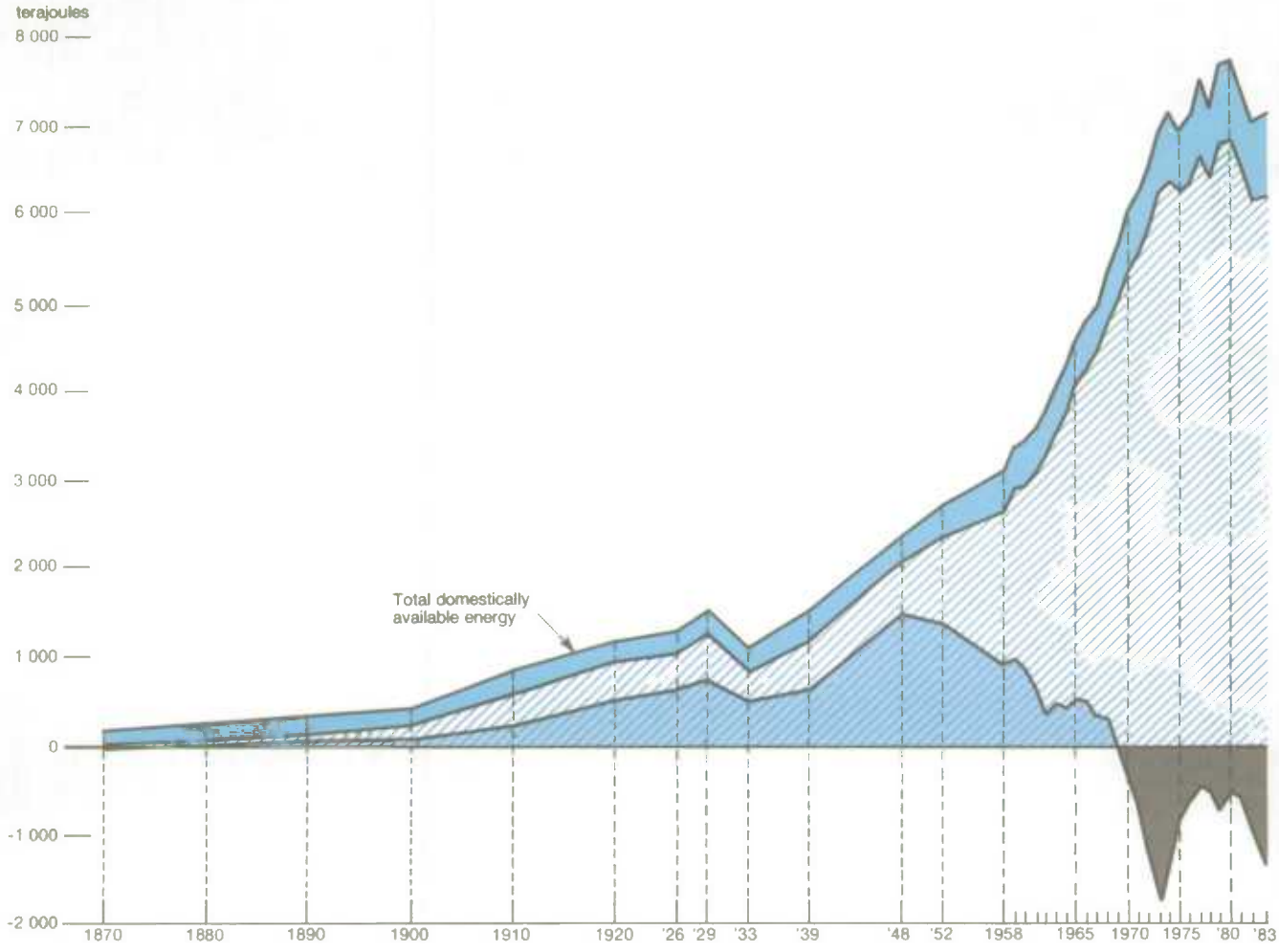


Chart 4.2.1
**Domestically Available Energy and Net Energy Imports, 1870 to 1983[1]**




[1] The top line shows total domestically available energy and is always measured from the zero baseline. Wood fuel is excluded beginning with 1974.

**Sources:**
Statistics Canada, *Human Activity and the Environment*, Catalogue 11-509, 1978.
Statistics Canada, *Detailed Energy Supply and Demand in Canada*, Catalogue 57-207.
Statistics Canada, *Quarterly Report on Energy-Supply Demand in Canada*, Catalogue 57-003, fourth quarter issues for years 1978 to 1983.

Table 4.2.2
## Consumption of Energy[1] by Fuel Type, 1870 to 1983

| | 1870 | 1900 | 1926 | 1948 | 1958 | 1971 | 1976 | 1981 | 1983 |
|---|---|---|---|---|---|---|---|---|---|
| | percent | | | | | | | | |
| Aviation Gasoline | ... | ... | ... | ... | 0.7 | 0.1 | 0.1 | 0.1 | 0.1 |
| Aviation Turbo Fuel | ... | ... | ... | ... | 0.8 | 1.8 | 2.1 | 2.7 | 2.5 |
| Liquefied Petroleum Gases | ... | ... | ... | 0.2 | 0.8 | 1.5 | 1.5 | 1.0 | 1.3 |
| Coke Oven Gas | ... | ... | 1.4 | 1.8 | 0.9 | 0.8 | 0.8 | 0.7 | 0.7 |
| Coke | ... | ... | 4.1 | 2.5 | 3.2 | 2.5 | 2.5 | 2.3 | 2.4 |
| Petroleum Coke | ... | ... | 0.1 | 0.1 | 1.0 | 0.5 | 0.7 | 0.1 | 0.1 |
| Motor Gasoline | ... | ... | 4.0[2] | 11.2[2] | 18.0 | 18.1 | 19.1 | 21.6 | 20.9 |
| Electricity | ... | 0.3 | 3.2 | 7.7 | 11.6 | 13.8 | 15.8 | 19.4 | 21.5 |
| Natural Gas | ... | 0.6 | 1.6[3] | 3.1 | 11.1 | 24.9 | 26.3 | 25.4 | 27.4 |
| Light Fuel Oil | ... | ... | ... | ... | 11.5 | 11.5 | 9.9 | 7.3 | 5.9 |
| Heavy Fuel Oil | ... | ... | ... | ... | 11.4 | 13.0 | 10.0 | 7.6 | 5.2 |
| Diesel Oil | ... | ... | 5.4[4] | 14.0[4] | 4.9 | 5.9 | 6.8 | 9.4 | 9.7 |
| Kerosene | 0.5[5] | 1.1[5] | ... | ... | 3.8 | 2.4 | 1.4 | 0.8 | 0.6 |
| Coal And Coal Briquettes | 6.0[6] | 52.5[6] | 63.4 | 52.4 | 15.8 | 1.8 | 0.6 | 0.8 | 0.8 |
| Steam | ... | ... | ... | ... | ... | ... | ... | 0.8[7] | 0.9[7] |
| Wood | 93.2 | 45.5 | 16.8 | 7.0 | 4.5 | 1.4 | 1.5 | ..[8] | ..[8] |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

[1] Based on heat content of fuel and electricity actually consumed or "final demand". For example, electric energy derived both from coal and hydro power is shown as electricity, with that derived from coal included on the basis of heat content of electricity generated, not on the basis of heat content of coal consumed in generation. Figures for 1870 and 1900 are actually based on the heat content figures for domestically available primary energy products such as crude oil, coal and natural gas. For efficiency ratings of energy forms refer to Appendix 4, Table 1.
[2] Includes naphtha and aviation fuel.
[3] Includes manufactured gas.
[4] Includes other petroleum fuels such as kerosene and fuel oils.
[5] Based on heat content of domestic supply of crude oil. All crude oil prior to about 1910 was refined into kerosene, with other distillates rejected (See Davis Commission Report on Canadian Energy Prospects, 1957).
[6] A substantial portion of early use of coal involved production of coal oil and coal gas for street lighting.
[7] This is steam sold by the nuclear industry, and steam generated from coal and heavy fuel oil.
[8] Wood has been excluded from the calculations in 1981 and 1983 due to lack of data. The few survey results that are available suggest that the consumption of both cordwood and wood residuals (sawdust, chips and bark, for example) may have increased since the rise in prices of fossil fuels in 1973. For example, one study estimates 1982 cordwood consumption in New Brunswick to be 4.2 percent of the province's estimate of total energy consumption. Wood residuals represented another 9.1 percent of the total. Wood consumption in Ontario was estimated to be 2.2 percent of Statistics Canada's estimate of total energy use (excluding wood) for that province. The provincial sources are: New Brunswick, Energy Secretariate, *New Brunswick Energy Review*, 1983 and Ontario, Ministry of Energy, *Ontario Energy Review, 3rd Edition*, September, 1983.

**Sources:**
M.C. Urquhart and K.A.H. Buckley, ed., *Historical Statistics Canada*, Toronto, Macmillian of Canada, 1965; and the following publications of Statistics Canada: *Energy Sources in Canada, Commodity Accounts for 1948 and 1952*, Catalogue 13-506; *Energy Sources in Canada, Commodity Statements for 1926, 1929, 1933 and 1939*, Catalogue 13-507; *Detailed Energy Supply in Canada, 1958-1969*, Catalogue 57-505; *Detailed Energy Supply in Canada*, 1972 and 1976 issues, Catalogue 57-207; and *Quarterly Report on Energy Supply-Demand in Canada*, Catalogue 57-003 (fourth quarter issues for 1981 and 1983).

Table 4.2.3
## Consumption of Energy by Sector and Fuel Type, 1983[1]

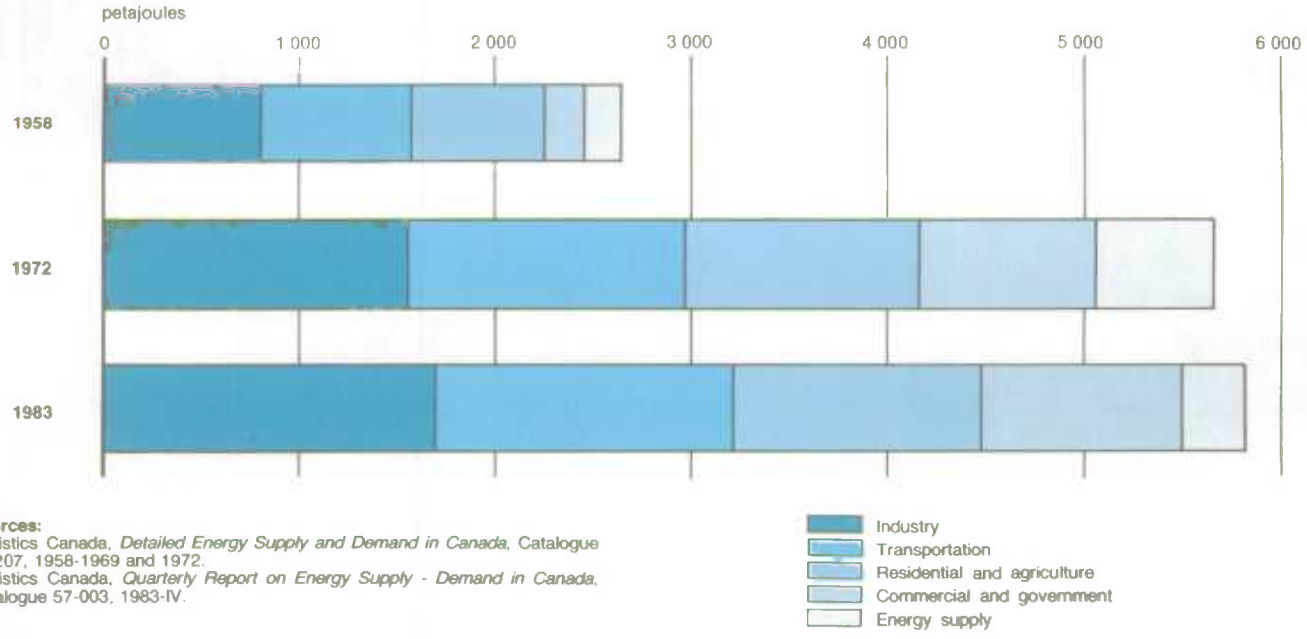
| | Coal, Coke and Coke Oven Gas | Motor Gasoline | Diesel Fuel Oil | Light Fuel Oil | Heavy Fuel Oil | Aviation Gasoline and Turbo Fuel | Other Petroleum Derivatives[2] | Natural Gas and Gas Plant Liquids | Electricity | Steam | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | terajoules | | | | | | | | | | |
| **Energy Supply Industry** | **148** | **996** | **3 308** | **2 842** | **49 739** | **37** | **143 844** | **4 124** | **110 493** | **0** | **315 531[3]** |
| **Transportation** | **0** | **1 001 024** | **266 073** | **0** | **56 213** | **116 383** | **0** | **58 754** | **8 612** | **0** | **1 507 060** |
| Road Transport and Urban Transport | 0 | 1 001 024 | 150 750 | 0 | 0 | 0 | 0 | 6 493 | 2 910 | 0 | 1 161 289 |
| Rail | 0 | 0 | 77 716 | 0 | 1 617 | 0 | 0 | 0 | 0 | 0 | 79 334 |
| Air | 0 | 0 | 0 | 0 | 0 | 116 383 | 0 | 0 | 0 | 0 | 116 383 |
| Marine[4] | 0 | 0 | 34 575 | 0 | 54 596 | 0 | 0 | 0 | 0 | 0 | 89 171 |
| Pipelines | 0 | 0 | 3 032 | 0 | 0 | 0 | 0 | 52 261 | 5 702 | 0 | 60 884 |
| **Agriculture** | **0** | **75 705** | **73 680** | **41 858** | **1 066** | **0** | **3 726** | **20 550** | **29 798** | **0** | **246 383** |
| **Residential** | **3 241** | **0** | **0** | **180 625** | **5 334** | **0** | **20 349** | **483 104** | **345 108** | **0** | **1 037 760** |
| **Commercial and Institutional** | **762** | **58 695** | **52 388** | **61 885** | **45 557** | **13 678** | **5 988** | **383 384** | **257 660** | **781** | **880 777** |
| **Public Administration** | **352** | **14 760** | **27 592** | **16 122** | **4 121** | **16 121** | **1 509** | **20 465** | **32 641** | **0** | **133 683** |
| **Industrial** | **210 741** | **0** | **113 328** | **26 334** | **173 386** | **0** | **8 540** | **613 926** | **513 153** | **49 862** | **1 709 267** |
| **Total** | **215 244** | **1 151 180** | **536 369** | **329 666** | **335 416** | **146 219** | **183 956** | **1 584 307** | **1 297 465** | **50 643** | **5 830 461** |

[1] A table similar to this for the year 1973, appeared in *Human Activity and the Environment*, Catalogue 11-509, 1978.
[2] Includes liquified petroleum gases, still gas, kerosene, and petroleum coke.
[3] Non-energy products are not included in this total.
[4] Does not include Armed Forces equipment.

**Source:**
Statistics Canada, *Quarterly Report on Energy Supply - Demand in Canada*, Catalogue 57-003, 1983 fourth quarter issue.

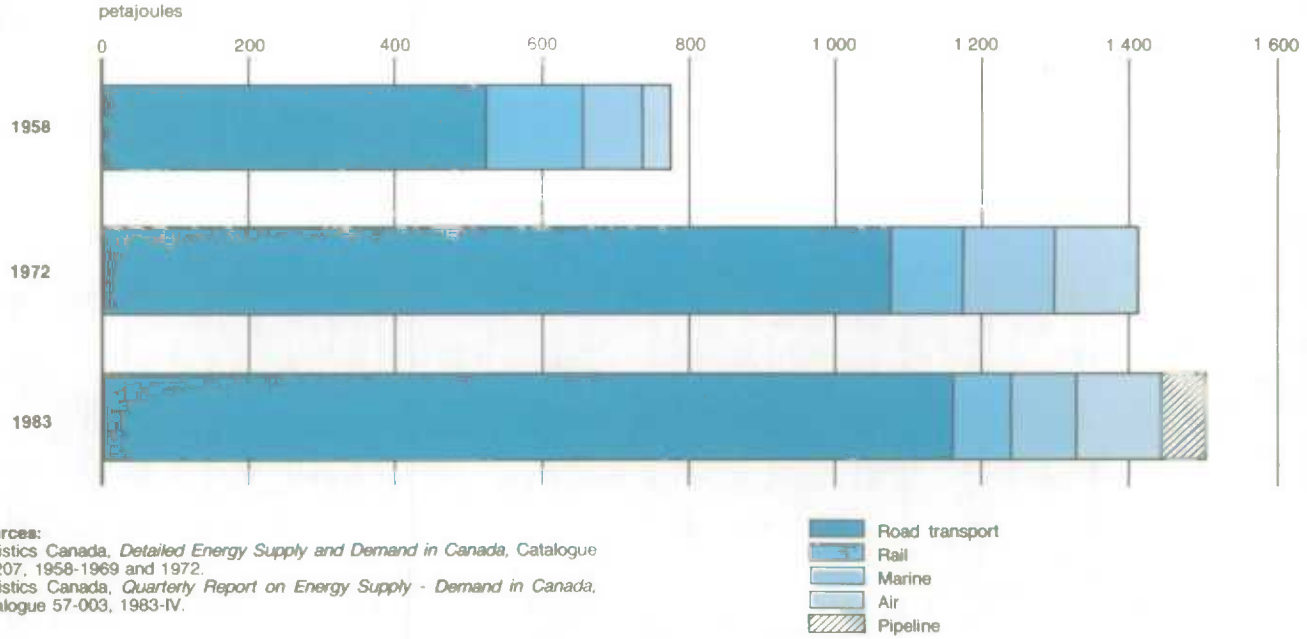
**Note:**
Individual items may not add to total due to rounding.

Chart 4.2.4
**Energy Consumed by Sector, 1958, 1972 and 1983**




**Sources:**
Statistics Canada, *Detailed Energy Supply and Demand in Canada*, Catalogue 57-207, 1958-1969 and 1972.
Statistics Canada, *Quarterly Report on Energy Supply - Demand in Canada*, Catalogue 57-003, 1983-IV.

Chart 4.2.5
**Energy Consumed in the Transportation Sector, by Mode of Transport, 1958, 1972 and 1983**




**Sources:**
Statistics Canada, *Detailed Energy Supply and Demand in Canada*, Catalogue 57-207, 1958-1969 and 1972.
Statistics Canada, *Quarterly Report on Energy Supply - Demand in Canada*, Catalogue 57-003, 1983-IV.

Table 4.2.6
## Energy Consumption by Ecozone and Sector, 1982[1]

| Ecozone | Agriculture | Forestry | Mining | Construction | Manufacturing |
|---|---|---|---|---|---|
| | petajoules | | | | |
| Atlantic Maritime | 7.9 | 1.1 | 12.8 | 3.3 | 108.0 |
| Mixed-Wood Plain | 55.4 | 0.5 | 0.4 | 13.5 | 765.1 |
| Boreal Shield | 5.0 | 8.7 | 53.5 | 2.8 | 223.2 |
| Prairie | 76.6 | 0.1 | 37.6 | 12.2 | 165.1 |
| Boreal Plain | 21.8 | 2.2 | 37.7 | 2.1 | 29.5 |
| Montane Cordillera | 3.8 | 6.5 | 46.8 | 1.1 | 59.6 |
| Pacific Maritime | 3.3 | 1.2 | 4.9 | 2.9 | 103.2 |
| Boreal Cordillera | <0.1 | 1.4 | 3.1 | 0.1 | <0.1 |
| Tundra Cordillera | 0 | 0.1 | 0.7 | <0.1 | 0 |
| Taiga Plain | <0.1 | 0.3 | 1.9 | 0.1 | 0.4 |
| Taiga Shield | 0 | 0.2 | 18.0 | 0.1 | <0.1 |
| Hudson Bay Plain | 0 | 0.1 | <0.1 | <0.1 | <0.1 |
| Southern Arctic | 0 | <0.1 | <0.1 | 0.1 | 0 |
| Northern Arctic | 0 | 0 | 0.5 | 0.1 | 0 |
| Arctic Cordillera | 0 | 0 | <0.1 | 0.1 | 0 |
| **Total[2]** | **173.8** | **22.4** | **217.9** | **38.3** | **1 454.2** |

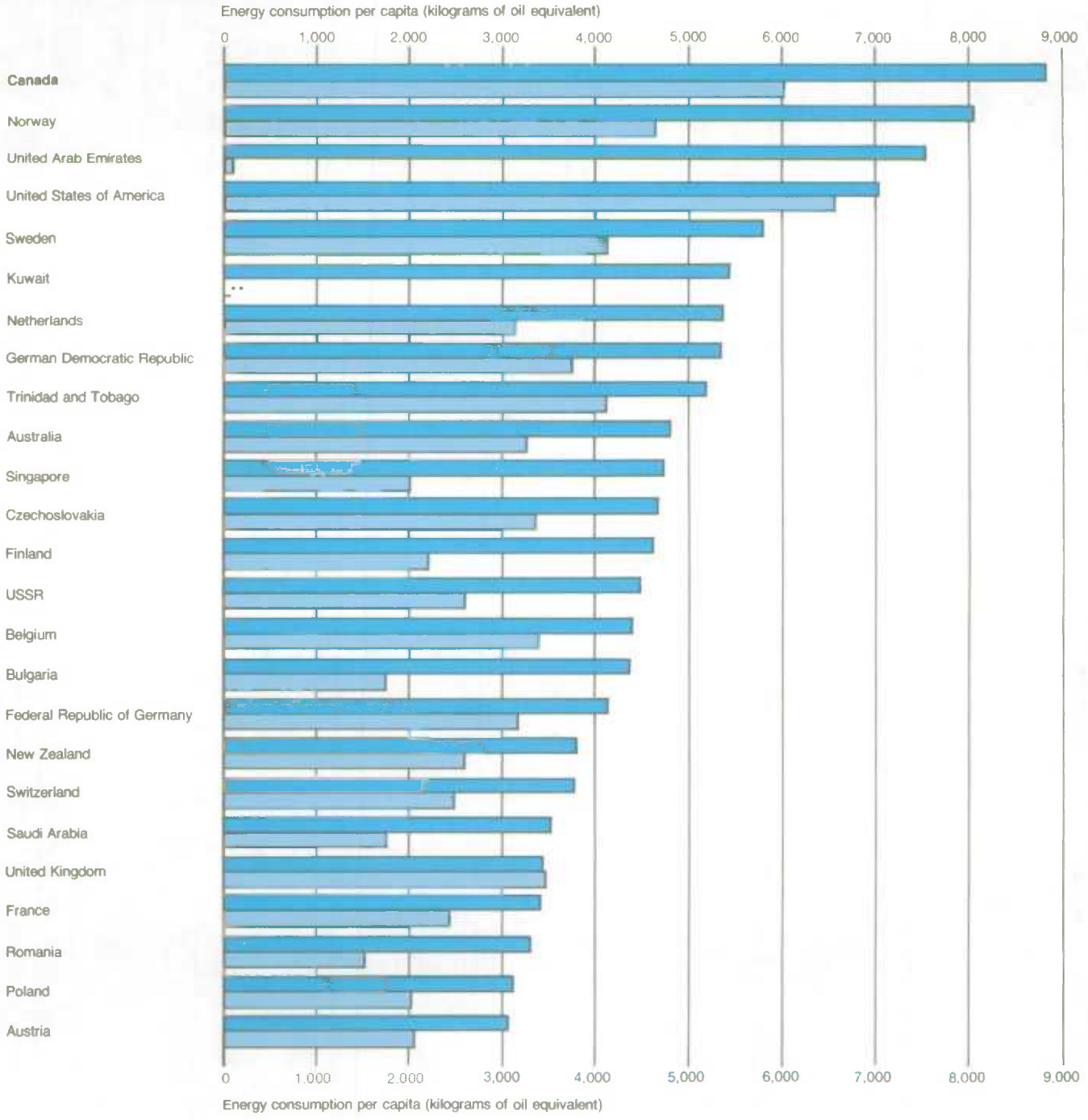
| Ecozone | Transportation | Residential | Public Administration, Commercial and Other Institutional | Total |
|---|---|---|---|---|
| | petajoules | | | |
| Atlantic Maritime | 118.7 | 79.8 | 67.9 | 399.5 |
| Mixed-Wood Plain | 727.8 | 566.3 | 481.0 | 2 610.0 |
| Boreal Shield | 143.7 | 123.3 | 88.2 | 648.4 |
| Prairie | 304.2 | 214.6 | 244.3 | 1 054.6 |
| Boreal Plain | 56.9 | 48.1 | 40.0 | 238.3 |
| Montane Cordillera | 49.4 | 81.8 | 30.3 | 229.3 |
| Pacific Maritime | 162.0 | 74.1 | 85.7 | 437.3 |
| Boreal Cordillera | 2.5 | 1.3 | 3.3 | 11.8 |
| Tundra Cordillera | 0.1 | <0.1 | 0.2 | 1.1 |
| Taiga Plain | 1.1 | 0.6 | 2.1 | 6.5 |
| Taiga Shield | 4.7 | 2.8 | 3.2 | 29.0 |
| Hudson Bay Plain | 1.1 | 0.7 | 0.8 | 2.8 |
| Southern Arctic | 1.0 | 0.6 | 1.7 | 3.4 |
| Northern Arctic | 0.7 | 0.4 | 1.4 | 3.0 |
| Arctic Cordillera | 0.1 | <0.1 | 0.1 | 0.3 |
| **Total[2]** | **1 574.0** | **1 144.5** | **1 050.2** | **5 675.3** |

[1] The published "energy final demand" figures, by province and sector, were disaggregated by ecozone using a number of allocation factors, such as the proportional distribution of population and industry by ecozone within in each province.

[2] This table presents final demand energy use only, and as a result is not strictly comparable with Table 4.2.3 and Chart 4.2.4. These also take into account consumption of energy by thermal power plants in the course of operations, such as boiler start up and certain non-energy uses of refined products.

**Source:**
Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada, 1982-IV*, Catalogue 57-003, and estimates by the Office of the Senior Advisor on Integration, Statistics Canada.

Chart 4.2.7
**Energy Consumption per Capita in Selected Countries[1], 1965 and 1983**




[1] This list includes the countries with the highest energy consumption per capita.

**Source:**
World Bank, *World Development Report 1985*

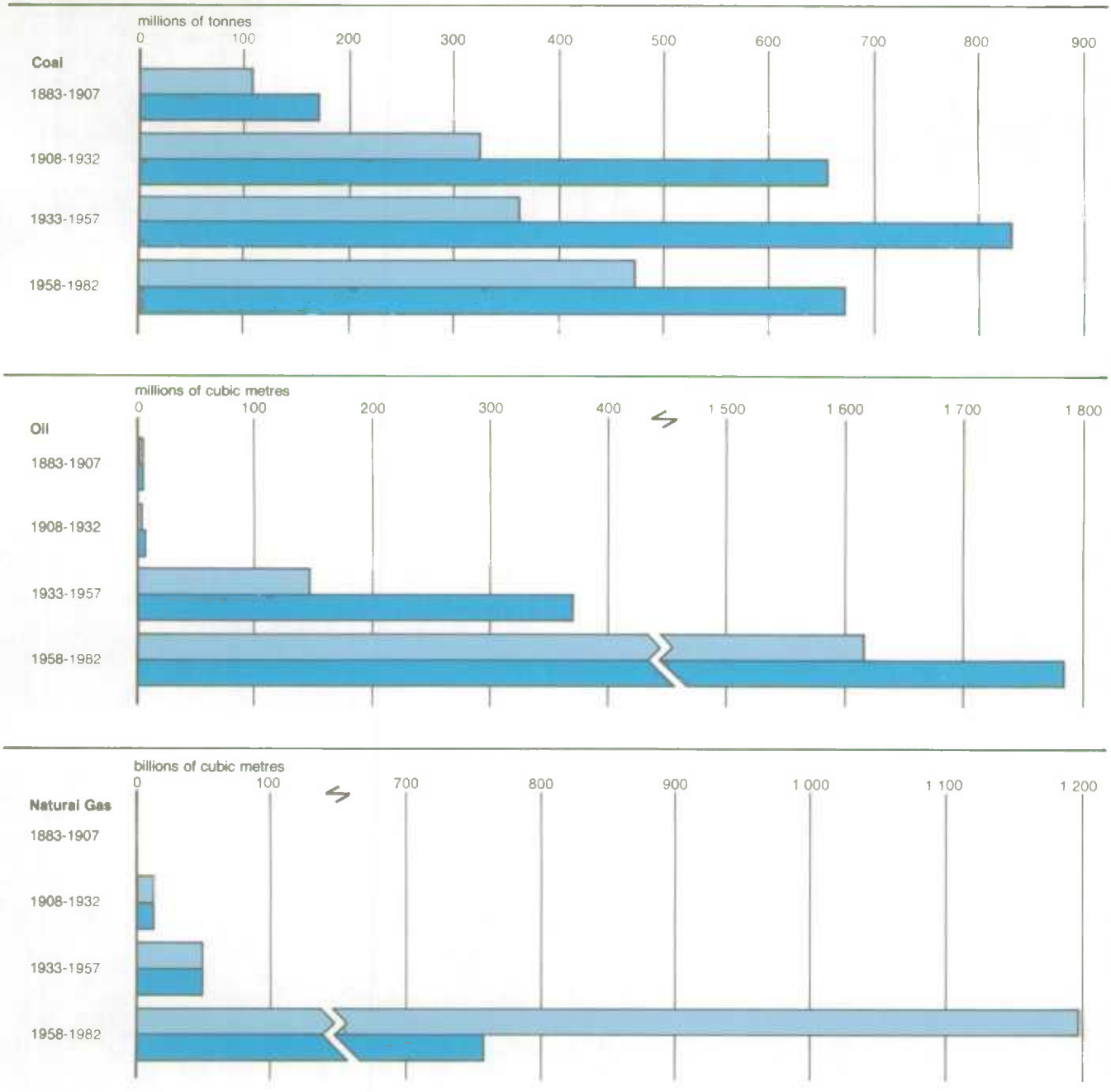
Table 4.2.8
## Fossil Fuel Production and Consumption, 1868 to 1982

| Five Year Period | Production over Five Year Period | | | Consumption Expressed as Percentage of Production | | |
|---|---|---|---|---|---|---|
| | Coal | Oil | Natural Gas | Coal | Oil | Natural Gas |
| | thousands of tonnes | thousands of cubic metres | millions of cubic metres | percent | | |
| 1868-1872 | 4 624 | 197 | .. | 100 | 100 | .. |
| 1873-1877 | 3 743 | 219 | .. | 60 | 107 | .. |
| 1878-1882 | 6 427 | 317 | .. | 122 | 147 | .. |
| 1883-1887 | 9 318 | 466 | .. | 172 | 116 | .. |
| 1888-1892 | 13 801 | 593 | .. | 166 | 118 | .. |
| 1893-1897 | 16 910 | 603 | .. | 158 | 127 | .. |
| 1898-1902 | 26 152 | 545 | .. | 149 | 109 | .. |
| 1903-1907 | 40 966 | 474 | .. | 165 | 159 | .. |
| 1908-1912 | 54 551 | 286 | 763 | 184 | 579 | 100 |
| 1913-1917 | 63 908 | 170 | 3 265 | 207 | 312 | 100 |
| 1918-1922 | 68 999 | 178 | 2 429 | 204 | 483 | 100 |
| 1923-1927 | 70 460 | 239 | 2 504 | 208 | 482 | 101 |
| 1928-1932 | 67 063 | 930 | 3 675 | 203 | 242 | 100 |
| 1933-1937 | 64 107 | 1 343 | 3 733 | 188 | 206 | 100 |
| 1938-1942 | 76 790 | 6 977 | 5 643 | 204 | 567 | 100 |
| 1943-1947 | 77 177 | 6 960 | 6 755 | 256 | 775 | 101 |
| 1948-1952 | 81 134 | 27 265 | 10 064 | 244 | 328 | 102 |
| 1953-1957 | 65 210 | 104 957 | 24 426 | 241 | 152 | 102 |
| 1958-1962 | 48 506 | 159 593 | 74 120 | 219 | 135 | 74 |
| 1963-1967 | 50 315 | 237 357 | 145 812 | 229 | 112 | 62 |
| 1968-1972 | 70 222 | 365 647 | 259 905 | 187 | 95 | 59 |
| 1973-1977 | 135 288 | 428 848 | 354 439 | 109 | 105 | 61 |
| 1978-1982 | 169 127 | 425 417 | 364 756 | 102 | 120 | 67 |
| **Total** | **1 284 798** | **1 769 579** | **1 262 289** | **182** | **125** | **65** |

**Sources:**
Statistics Canada, *Historical Statistics of Canada*, 2nd Edition, 1983.
Statistics Canada, *Canada's Mineral Production*, Catalogue 26-202, years 1978 to 1982.

Chart 4.2.9

## Production and Consumption of Fossil Fuels, Twenty-five Year Periods, 1883 to 1982




**Sources:**
Statistics Canada, *Historical Statistics of Canada*, 2nd Edition, 1983.
Statistics Canada, *Canada's Mineral Production*, Catalogue 26-202, various years.

Table 4.2.10
## Estimated Reserves of Conventional Crude Oil, 1960 to 1984[1]

| Year | Initial Reserves[2] | Cumulative Production[3] | Remaining Reserves[4] | Annual Production | Discoveries, Revisions[5] |
|---|---|---|---|---|---|
| | millions of cubic metres | | | | |
| 1960 | 1 747 | 228 | 1 519 | .. | .. |
| 1961 | 1 754 | 263 | 1 491 | 35 | 7 |
| 1962 | 1 778 | 301 | 1 476 | 38 | 24 |
| 1963 | 1 806 | 342 | 1 464 | 41 | 28 |
| 1964 | 1 857 | 386 | 1 471 | 44 | 51 |
| 1965 | 1 960 | 432 | 1 528 | 46 | 103 |
| 1966 | 2 039 | 488 | 1 550 | 56 | 79 |
| 1967 | 2 154 | 544 | 1 611 | 55 | 115 |
| 1968 | 2 258 | 603 | 1 655 | 59 | 104 |
| 1969 | 2 325 | 665 | 1 659 | 62 | 67 |
| 1970 | 2 349 | 737 | 1 612 | 72 | 24 |
| 1971 | 2 388 | 814 | 1 573 | 77 | 39 |
| 1972 | 2 407 | 893 | 1 514 | 79 | 19 |
| 1973 | 2 417 | 996 | 1 421 | 103 | 10 |
| 1974 | 2 414 | 1 093 | 1 320 | 97 | -3 |
| 1975 | 2 209 | 1 180 | 1 029 | 87 | -205[6] |
| 1976 | 2 207 | 1 253 | 954 | 73 | -2 |
| 1977 | 2 246 | 1 327 | 919 | 73 | 39 |
| 1978 | 2 265 | 1 399 | 866 | 72 | 19 |
| 1979 | 2 288 | 1 480 | 808 | 81 | 23 |
| 1980 | 2 314 | 1 555 | 760 | 75 | 26 |
| 1981 | 2 336 | 1 621 | 716 | 66 | 22 |
| 1982 | 2 421 | 1 685 | 736 | 64 | 85 |
| 1983 | 2 471 | 1 752 | 719 | 67 | 50 |
| 1984 | 2 551 | 1 827 | 724 | 74 | 80 |

[1] Only reserves in conventional producing areas are included. Major exploration activities are underway in Arctic and Atlantic offshore locations. Discoveries are not included here because, as of date of compilation, their economic viability had not been demonstrated.
[2] Initial reserves are the total discovered recoverable reserves as of December 31 of the year indicated.
[3] Cumulative production is the total quantity of crude oil produced from the first year of production until December 31 of the year indicated.
[4] Remaining reserves are the difference of initial reserves minus cumulative production.
[5] The sum of discoveries and revisions can be either a positive or negative value and is based on new information regarding the previous years estimate of initial reserves. The value is added to, or subtracted from (if negative), the previous years estimate of initial reserves to obtain the current year's estimate of initial reserves.
[6] This large number is the result of a change in the method of estimation of reserves introduced by the National Energy Board in 1975.

**Sources:**
Canadian Petroleum Association, *Statistical Yearbook*, 1982.
National Energy Board, *Annual Reports*, years 1975 to 1984.

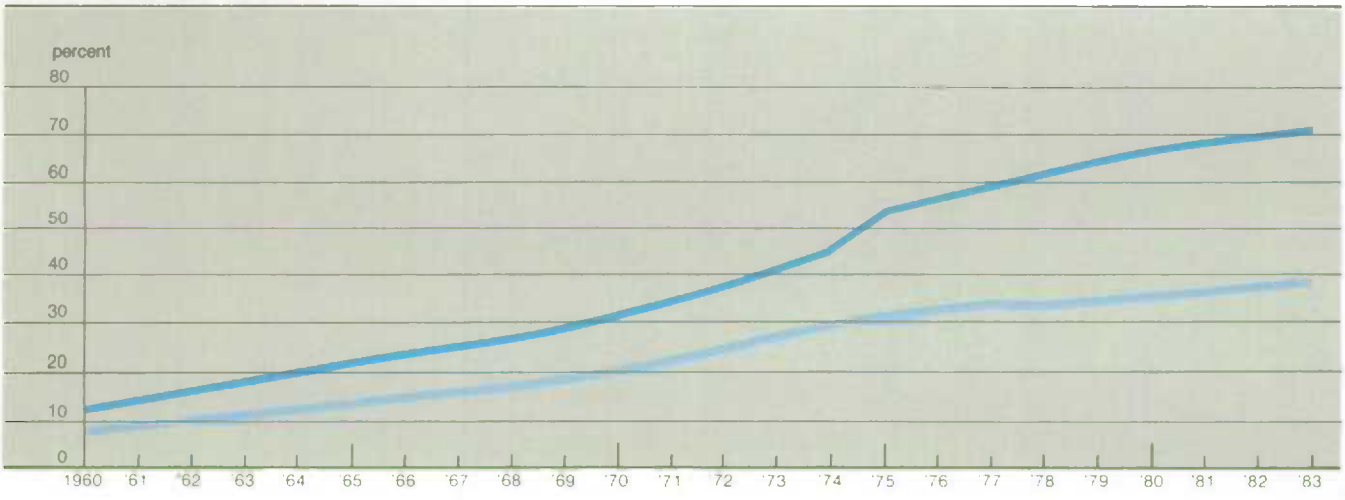
Table 4.2.11
## Estimated Reserves of Natural Gas, 1960 to 1984[1]

| Year | Initial Reserves[2] | Cumulative Production[3] | Remaining Reserves[4] | Annual Production | Discoveries, Revisions[5] |
|---|---|---|---|---|---|
| | billions of cubic metres | | | | |
| 1960 | 1 008 | 83 | 925 | .. | .. |
| 1961 | 1 058 | 98 | 960 | 15 | 50 |
| 1962 | 1 167 | 118 | 1 049 | 20 | 109 |
| 1963 | 1 238 | 143 | 1 095 | 25 | 71 |
| 1964[6] | 1 359 | 168 | 1 332 | 25 | 121 |
| 1965 | 1 462 | 200 | 1 262 | 29 | 104 |
| 1966 | 1 515 | 231 | 1 284 | 31 | 53 |
| 1967 | 1 629 | 266 | 1 363 | 35 | 113 |
| 1968 | 1 719 | 305 | 1 414 | 39 | 91 |
| 1969 | 1 895 | 354 | 1 541 | 49 | 176 |
| 1970 | 1 966 | 404 | 1 562 | 50 | 171 |
| 1971 | 2 110 | 464 | 1 646 | 60 | 143 |
| 1972 | 2 124 | 529 | 1 595 | 66 | 15 |
| 1973 | 2 235 | 600 | 1 635 | 71 | 110 |
| 1974 | 2 293 | 670 | 1 623 | 70 | 158 |
| 1975 | 2 341 | 739 | 1 602 | 69 | 48 |
| 1976 | 2 471 | 804 | 1 667 | 65 | 130 |
| 1977 | 2 637 | 876 | 1 761 | 72 | 166 |
| 1978 | 2 852 | 944 | 1 908 | 68 | 215 |
| 1979 | 2 983 | 1 027 | 1 956 | 69 | 130 |
| 1980 | 3 066 | 1 096 | 1 970 | 89 | 83 |
| 1981 | 3 257 | 1 173 | 2 084 | 77 | 191 |
| 1982 | 3 349 | 1 245 | 2 104 | 71 | 92 |
| 1983 | 3 385 | 1 316 | 2 069 | 71 | 36 |
| 1984 | 3 418p | 1 397p | 2 021 | 75 | 34 |

[1] Only reserves in conventional producing areas are included. Major exploration activities are under way in Arctic and Atlantic offshore locations. Discoveries are not included here because as of the date of compilation their economic viability had not been demonstrated.
[2] Initial reserves are the total discovered recoverable reserves as of December 31 of the year indicated.
[3] Cumulative production is the total quantity of gas produced from the first year of production until December 31 of the year indicated.
[4] Remaining reserves are the difference between initial reserves minus cumulative production.
[5] The sum of discoveries and revisions can be either a positive or a negative value and is based on new information regarding the previous years' estimate of initial reserves. The value is added to, or subtracted from (if negative), the previous years' estimate of initial reserves.
[6] A new method of estimating reserves was introduced in 1964.

**Source:**
National Energy Board, unpublished estimates.

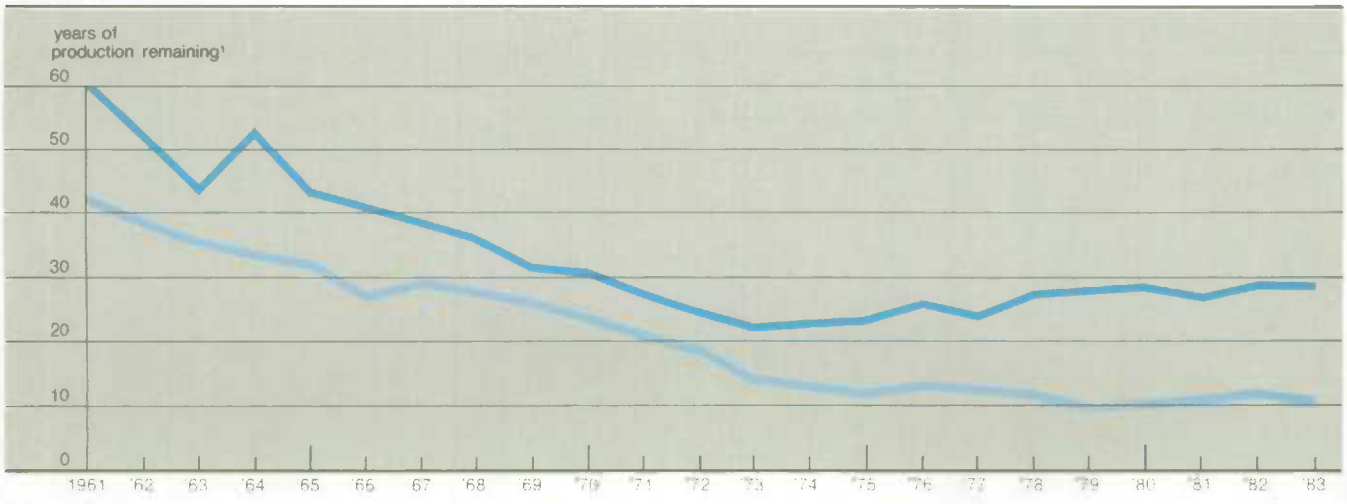
Chart 4.2.12
**Oil and Gas Depletion Indices[1]**




[1] The Depletion Index measures the percentage of initial reserves that are depleted. Specifically, it is the ratio of cumulative production to initial reserves multiplied by 100. For definitions and source statistics refer to Tables 4.2.10 and 4.2.11.

**Sources:**
National Energy Board and the Petroleum Association of Canada. Additional calculations by the Office of the Senior Adviser on Integration.

Chart 4.2.13
**Oil and Gas Reserves, Life Indices**

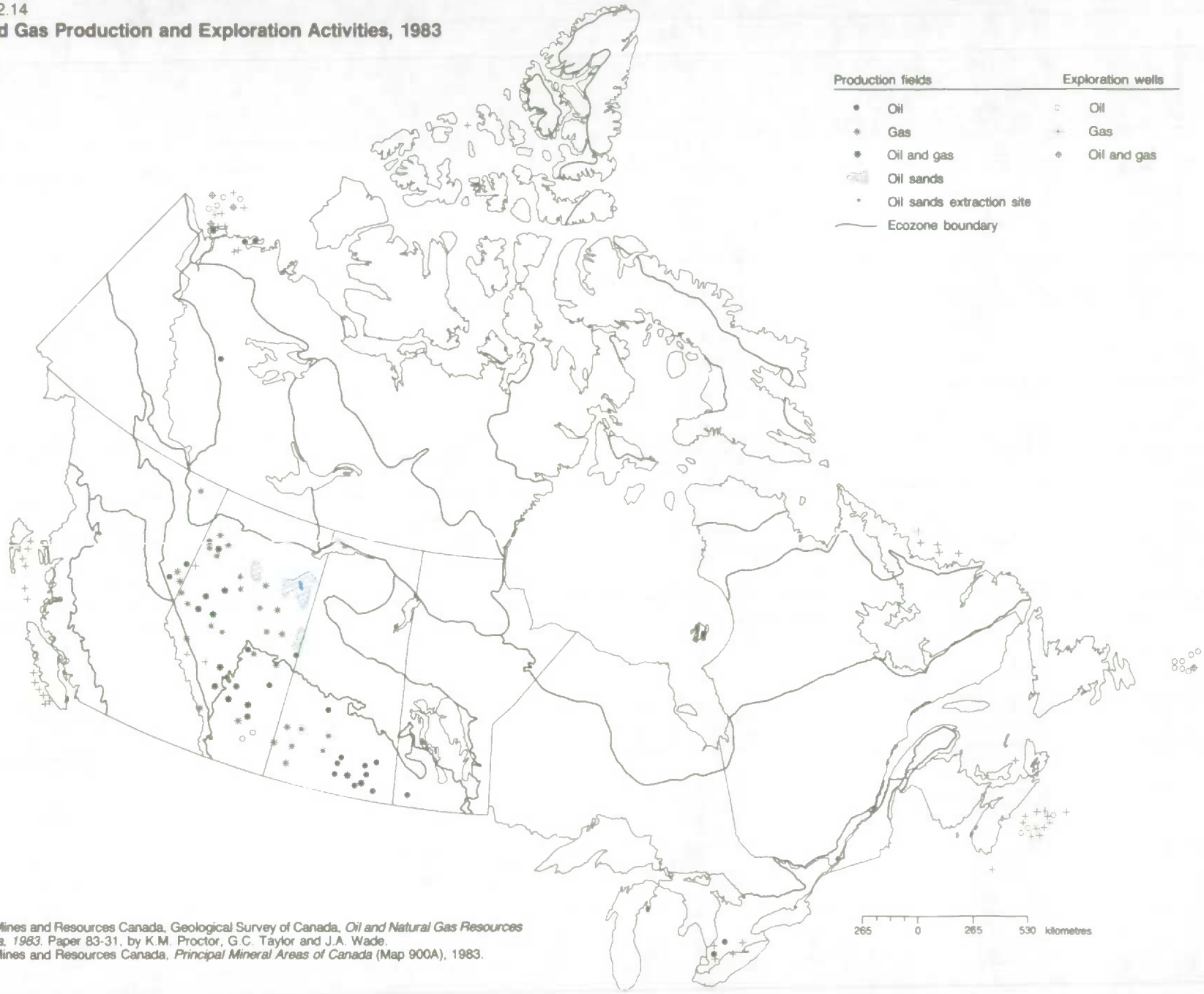



[1] The reserves life index is a measure of the remaining years of production, assuming current rates of extraction. It is the remaining reserves divided by the annual production. For definitions and source statistics refer to Tables 4.2.10 and 4.2.11.

**Sources:**
National Energy Board and Petroleum Association of Canada. Additional calculations by the Office of the Senior Adviser on Integration.

Map 4.2.14

## Oil and Gas Production and Exploration Activities, 1983




**Sources:**
Energy, Mines and Resources Canada, Geological Survey of Canada, *Oil and Natural Gas Resources of Canada, 1983.* Paper 83-31, by K.M. Proctor, G.C. Taylor and J.A. Wade.
Energy, Mines and Resources Canada, *Principal Mineral Areas of Canada* (Map 900A), 1983.

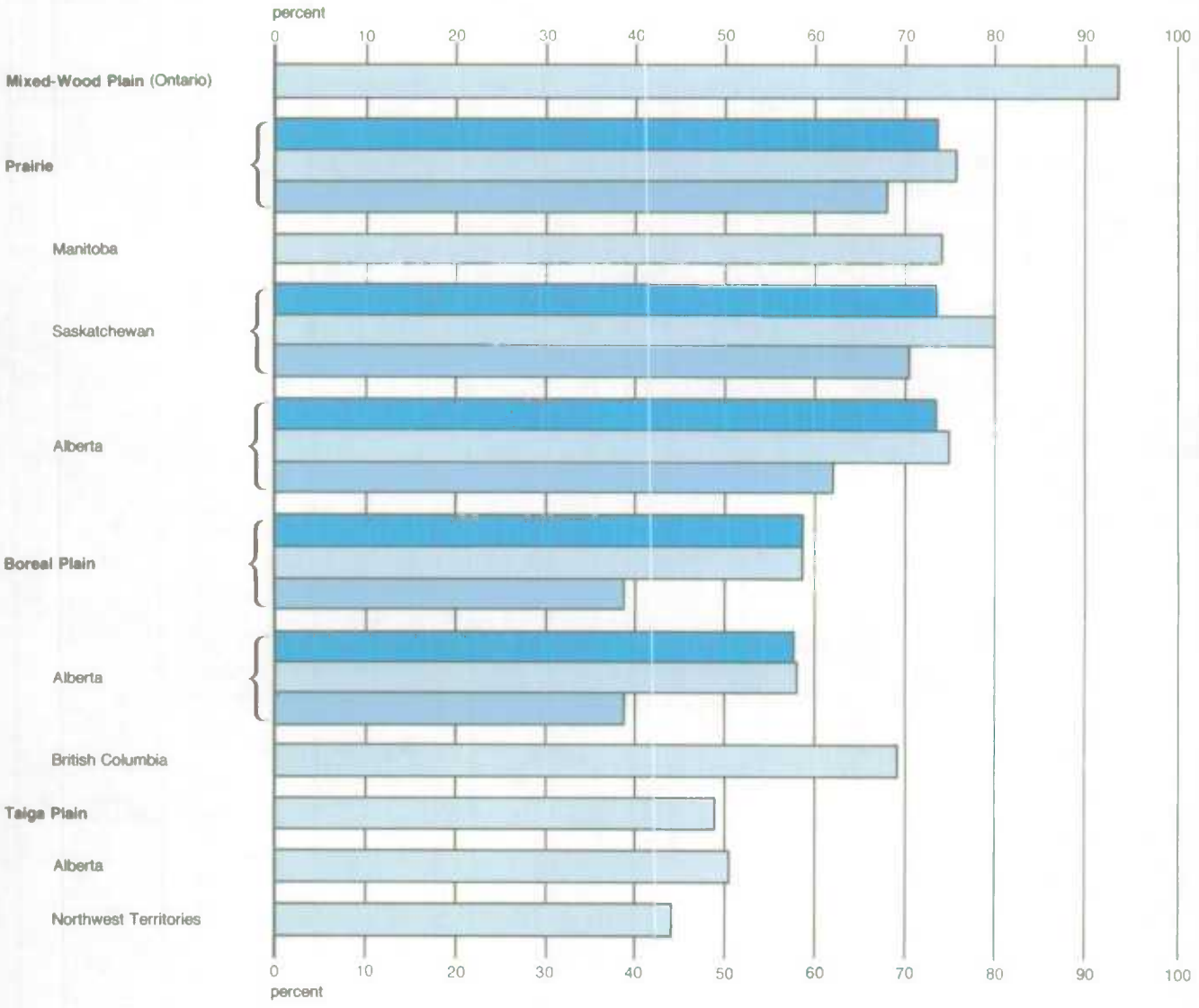
Table 4.2.15
## Estimated Reserves of Conventional Oil by Ecozone, as of December 31, 1981

| Ecozone | Crude Oil | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Initial Reserves | | | Cumulative Production | | | Remaining Reserves | | |
| | Total | Light and Medium Crude | Heavy Crude | Total | Light and Medium Crude | Heavy Crude | Total | Light and Medium Crude | Heavy Crude |
| | millions of cubic metres | | | | | | | | |
| **Mixed-Wood Plain** | **9.7** | **9.7** | **0** | **9.1** | **9.1** | **0** | **0.6** | **0.6** | **0** |
| Ontario | 9.7 | 9.7 | 0 | 9.1 | 9.1 | 0 | 0.6 | 0.6 | 0 |
| **Prairie** | **1 217.0** | **869.7** | **347.2** | **894.5** | **657.8** | **236.6** | **322.5** | **211.9** | **110.6** |
| Manitoba | 28.4 | 28.4 | 0 | 21.1 | 21.0 | 0 | 7.4 | 7.4 | 0 |
| Saskatchewan | 381.9 | 126.7 | 255.2 | 280.9 | 101.4 | 179.5 | 101.0 | 25.3 | 75.6 |
| Alberta | 806.7 | 714.6 | 92.0 | 592.5 | 535.4 | 57.1 | 214.1 | 179.2 | 35.0 |
| **Boreal Plain** | **1 186.6** | **1 183.0** | **3.6** | **696.0** | **694.6** | **1.4** | **490.6** | **488.4** | **2.2** |
| Alberta | 1 108.1 | 1 104.5 | 3.6 | 641.6 | 640.2 | 1.4 | 466.6 | 464.4 | 2.2 |
| British Columbia | 78.5 | 78.5 | 0 | 54.4 | 54.4 | 0 | 24.0 | 24.0 | 0 |
| **Taiga Plain** | **40.6** | **40.6** | **0** | **19.9** | **19.9** | **0** | **20.7** | **20.7** | **0** |
| Alberta | 31.1 | 31.1 | 0 | 15.7 | 15.7 | 0 | 15.3 | 15.3 | 0 |
| Northwest Territories | 9.5 | 9.5 | 0 | 4.2 | 4.2 | 0 | 5.4 | 5.4 | 0 |
| **Canada** | **2 453.9** | **2 103.0** | **350.9** | **1 619.4** | **1 381.4** | **238.1** | **834.4** | **721.6** | **112.8** |

**Sources:**
National Energy Board, *Staff Report on Crude Oil Reserves and Productive Capacity*, February, 1983.
Alberta Energy Conservation Board, *Alberta's Reserves of Crude Oil, Gas, Natural Gas Liquids and Sulphur*, 1981.
Special tabulations by the Office of the Senior Adviser on Integration.

**Note:**
These Canada totals differ from those in Table 4.2.10. Estimation methods employed by the National Energy Board were different from those of the Alberta Energy Conservation Board. The Alberta source, containing data disaggregated by field, had to be used to obtain the ecozone breakdown in that province.
Individual items may not add to totals due to rounding.

Chart 4.2.16
**Oil Depletion Index by Ecozone, as of December 31, 1981[1]**




[1] The depletion index measures the percentage of initial reserves that are depleted. Specifically, it is the ratio of cumulative production to initial reserves multiplied by 100. For source statistics refer to Table 4.2.15.

**Sources:**
National Energy Board, *Staff Report on Crude Oil Reserves and Productive Capacity*, February, 1983.
Alberta Energy Conservation Board, *Alberta's Reserves of Crude Oil, Gas, Natural Gas Liquids and Sulphur*, 1981.
Special tabulation and calculations by the Office of the Senior Adviser on Integration.

Table 4.2.17
## Estimated Tar Sands Oil Reserves, Alberta Boreal Plain, as of December 31, 1981

| Overburden Depth | Synthetic Crude Oil | | | |
|---|---|---|---|---|
| | Initial Reserves | Cumulative Production | Remaining Reserves | Depletion Index[1] |
| | millions of cubic metres | | | percent |
| 0-20 metres | 1 670 | 34 | 1 636 | 2.0 |
| 21-40 metres | 1 330 | 12 | 1 318 | 0.1 |
| 41-80 metres | 820 | 0 | 820 | 0.0 |
| 81-120 metres | 80 | 0 | 80 | 0.0 |
| **Total (0-120 metres)** | **3 900** | **46** | **3 854** | **1.2** |

[1] The depletion index measures the percentage of initial reserves that are depleted. Specifically, it is 100 multiplied by the ratio of cumulative production to initial reserves.

**Source:**
Alberta Energy Conservation Board, *Alberta's Reserves of Crude Oil, Gas, Natural Gas, Liquids and Sulphur*, Report 82-18, 1981.

**Note:**
The Wabiskaw-McMurray oil sands field is the largest in Canada and the only one containing producing mines. No estimate of synthetic crude oil reserves for the Buffalo Head Hills, Cold Lake or Peace River Oil Sands fields are published. Large quantities of tar sands are known to occur below 120 metres but their economic viability has not yet been demonstrated.

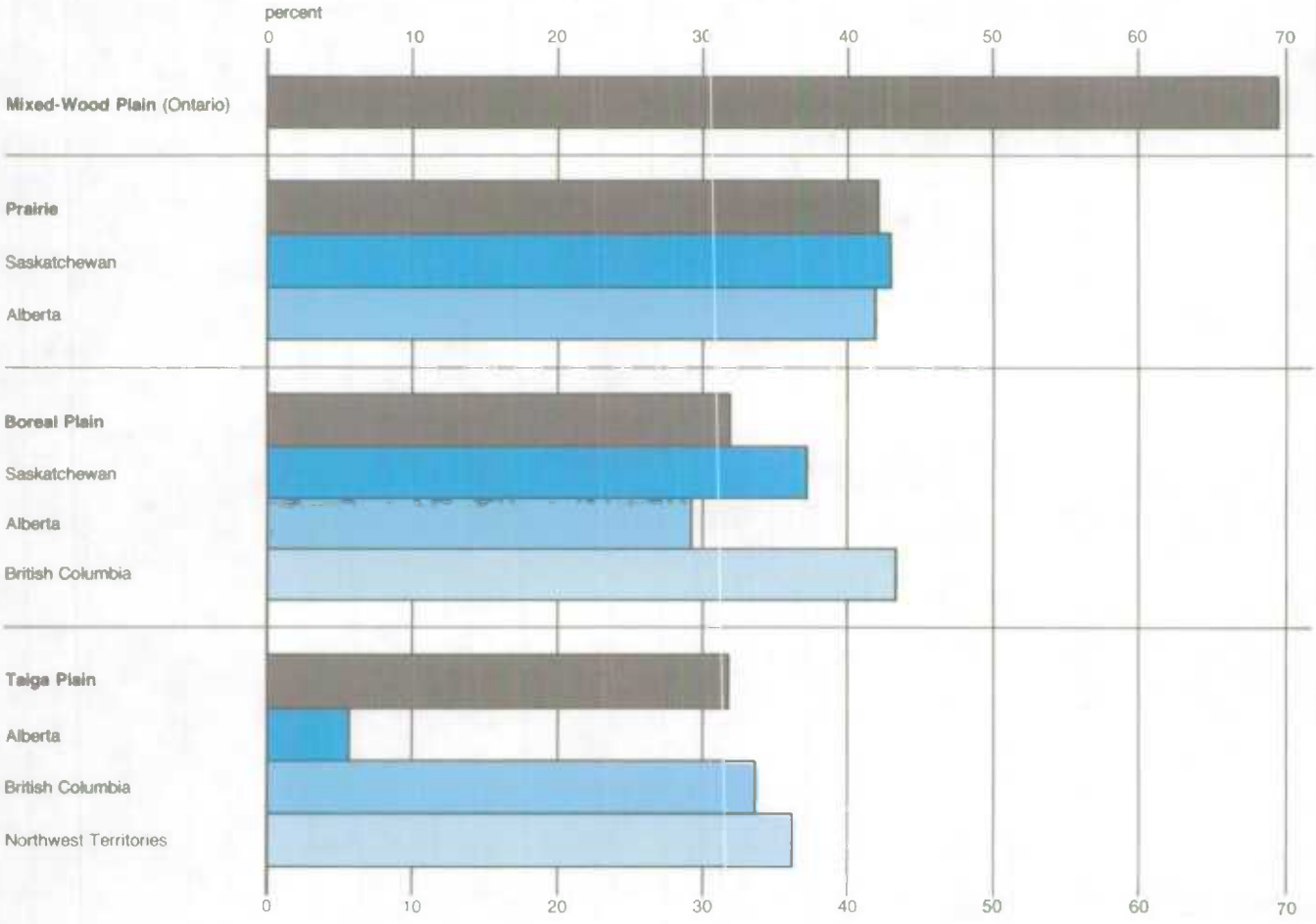
Table 4.2.18
## Estimated Reserves of Natural Gas by Ecozone, as of December 31, 1981

| Ecozone | Marketable Gas | | |
|---|---|---|---|
| | Initial Reserves | Cumulative Production | Remaining Reserves |
| | billions of cubic metres | | |
| **Mixed-Wood Plain** | **29.1** | **20.3** | **8.8** |
| Ontario | 29.1 | 20.3 | 8.8 |
| **Prairie** | **1 470.0** | **618.4** | **851.6** |
| Saskatchewan | 64.8 | 27.8 | 37.0 |
| Alberta | 1 405.2 | 590.6 | 814.6 |
| **Boreal Plain** | **1 567.2** | **500.0** | **1 067.2** |
| Saskatchewan | 5.1 | 1.9 | 3.2 |
| Alberta | 1 285.1 | 377.7 | 907.4 |
| British Columbia | 277.0 | 120.4 | 156.6 |
| **Taiga Plain** | **111.5** | **35.6** | **75.9** |
| Alberta | 8.8 | 0.5 | 8.3 |
| British Columbia | 87.5 | 29.6 | 57.9 |
| Northwest Territories | 15.2 | 5.5 | 9.7 |
| **Canada** | **3 177.8** | **1 174.3** | **2 003.5** |

**Sources:**
National Energy Board, unpublished estimates.
Alberta Energy Conservation Board, *Alberta's Reserves of Crude Oil, Gas, Natural Gas Liquids and Sulphur*, 1981.
British Columbia Ministry of Energy, Mines and Petroleum Resources, *Hydrocarbon and Byproduct Reserves*, 1981.
Saskatchewan Department of Energy, Mines and Resources, *Saskatchewan Reservoir Annual*, 1981.
Special tabulation by the Office of the Senior Advisor on Integration.

**Note:**
These Canada totals differ from those in Table 4.2.11 because different estimation methods were employed by the source agencies, the National Energy Board and the Provincial Government Departments. The National Energy Board source could not be used to obtain disaggregations by ecozone because it contained no information for individual fields, only provincial totals.

Chart 4.2.19
**Natural Gas Depletion Index[1] by Ecozone, as of December 31, 1981**

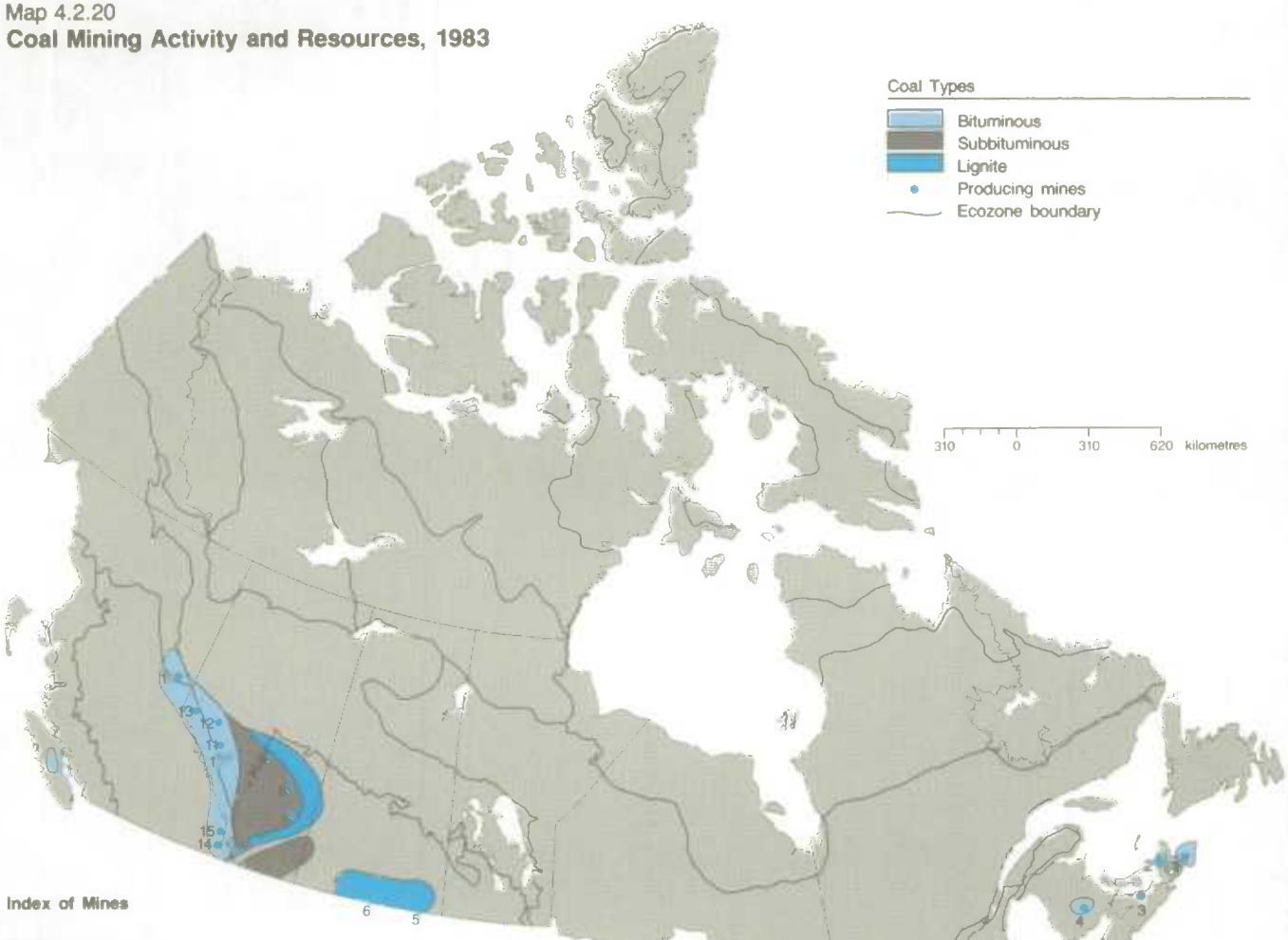



[1] The depletion index measures the percentage of initial reserves that are depleted. Specifically, it is the ratio of cumulative production to initial reserves multiplied by 100. For source statistics refer to Table 4.2.18.

**Sources:**
National Energy Board, unpublished estimates, 1983.
Alberta Energy Conservation Board, *Alberta's Reserves of Crude Oil, Gas, Natural Gas Liquids and Sulphur*, 1981.
British Columbia Ministry of Energy, Mines and Petroleum Resources, *Hydrocarbon and Byproduct Reserves*, 1981.
Saskatchewan Department of Energy, Mines and Resources, *Saskatchewan Reserve Annual*, 1981.
Special tabulation and calculations by the Office of the Senior Adviser on Integration.

Map 4.2.20

## Coal Mining Activity and Resources, 1983




### Index of Mines

**Atlantic Maritime**

Bituminous Coal

[1] Lingan Mine (Cape Breton Development Corporation) (N.S.)
Number Twenty-six Colliery (Cape Breton Development Corporation) (N.S.)
Prince Mine (Cape Breton Development Corporation) (N.S.)
Point Aconi Pit (Novaco Ltd.) (N.S.)
[2] St. Rose Mine (Evans Coal Mines Ltd.) (N.S.)
[3] Drummond Mine (Drummond Coal Co.) (N.S.)
[4] Minto/Chipman Area Pits (N.B. Coal Ltd.) (N.B.)

**Prairie**

Lignitic Coal

[8] Bienfait Mine (Bienfait Coal Co.) (Sask.)
Boundary Dam Mine (M & S Coal Co.) (Sask.)
Costello Mine (formerly Klimax Mine) (Manalta Coal Ltd.) (Sask.)
Souris Valley Mine (Saskatchewan Power Corporation) (Sask.)
Utility Mine (Saskatchewan Power Corporation with Manalta as operator) (Sask.)
[6] Poplar River Mine (Saskatchewan Power Corporation) (Sask.)

Subbituminous Coal

[7] Montgomery Mine (formerly Roselyn Mine) (Manalta Coal Ltd.) (Alta.)
[8] Vesta Mine (Alberta Power Limited with Manalta as operator) (Alta.)
Diplomat Mine (Forestburg Collieries Ltd.) (Alta.)
Paintearth Mine (Forestburg Collieries Ltd.) (Alta.)
[9] Highvale Mine (TransAlta Utilities Corporation with Manalta as operator) (Alta.)
Whitewood Mine (TransAlta Utilities Corporation with Manalta as operator) (Alta.)

**Boreal Plain**

Bituminous Coal

[10] Coal Valley Mine (Luscar Sterco Ltd.) (Alta.)
[11] Luscar Mine (Cardinal River Coals Ltd.) (Alta.)
Gregg River Mine (Manalta Coal Ltd.) (Alta.)
[12] Obed-Marsh Project (Union Oil Company of Canada Ltd.) (Alta.)

**Montane Cordillera**

Bituminous Coal

[13] Number 1765 Mine (underground) (Smoky River Coals Ltd.) (Alta.)
Number 1774 Mine (surface) (Smoky River Coals Ltd.) (Alta.)
[14] Corbin Mine (Byron Creek Collieries Ltd.) (B.C.)
Harmer Surface Mine (Westar Mining Ltd.) (B.C.)
Michel Underground Mine (Westar Mining Ltd.) (B.C.)
[15] Line Creek Mine (Crows Nest Resources Ltd.) (B.C.)
Fording River Mine (Fording Coal Ltd.) (B.C.)
Greenhills Mine (Westar Mining Ltd.) (B.C.)

**Boreal Cordillera**

Bituminous Coal

[16] Quintette Mine (Denison Mines Ltd. and others) (B.C.)
Bullmoose Mine (Teck Corporation and others) (B.C.)

**Sources:**

Energy, Mines and Resources Canada, *National Atlas of Canada, fifth edition, Canada Coal* (Map), 1982.

Energy, Mines and Resources Canada, *Coal Mining in Canada*, CANMET Report 83-20E, 1984.

Table 4.2.21
## Coal Reserves by Ecozone, 1982

| Ecozone | Estimated Reserves of Recoverable Coal | | |
|---|---|---|---|
| | Bituminous | Subbituminous | Lignite |
| | millions of tonnes | | |
| **Atlantic Maritime** | **463** | **0** | **0** |
| Nova Scotia | 445 | 0 | 0 |
| New Brunswick | 18 | 0 | 0 |
| **Prairie** | **0** | **397** | **1 697** |
| Saskatchewan | 0 | 0 | 1 697 |
| Alberta | 0 | 397 | 0 |
| **Boreal Plain** | **526** | **2** | **1** |
| Alberta | 526 | 2 | 1 |
| **Montane Cordillera** | **1 574** | **0** | **566** |
| British Columbia | 1 574 | 0 | 566 |
| **Pacific Maritime** | **15** | **0** | **0** |
| British Columbia | 15 | 0 | 0 |
| **Boreal Cordillera** | **509** | **0** | **0** |
| British Columbia | 509 | 0 | 0 |
| **Canada** | **3 087** | **399** | **2 264** |

**Source:**
Energy, Mines and Resources Canada, *Coal Mining in Canada: 1983*, by A.S. Romaniuk and H.G. Naidu, CANMET Report 83-20E, March, 1984, special tabulation by the Office of the Senior Adviser on Integration.

Table 4.2.22
## Coal Production by Ecozone, 1981[1]

| | Method of Mining | | |
|---|---|---|---|
| | Underground | Surface | Total |
| | thousands of tonnes | | |
| **Atlantic Maritime** | **3 029** | **922** | **3 951** |
| Nova Scotia | 3 029 | 351 | 3 380 |
| New Brunswick | 0 | 571 | 571 |
| **Prairie** | **0** | **9 948** | **9 948** |
| Saskatchewan | 0 | 7 494 | 7 494 |
| Alberta | 0 | 2 454 | 2 454 |
| **Boreal Plain** | **0** | **17 417** | **17 417** |
| Alberta | 0 | 17 417 | 17 417 |
| **Montane Cordillera** | **2 243** | **19 615** | **21 858** |
| Alberta | 1 064 | 3 716 | 4 780 |
| British Columbia | 1 179 | 15 899 | 17 078 |
| **Canada** | **5 272** | **47 902** | **53 174** |

[1] *Coal production* is defined here as net raw coal production: gross production plus (or minus) the net quantity dumped on or reclaimed from the discard heap. Raw coal includes impurities and therefore outweighs clean coal production, which was 40 082 000 tonnes in 1981. Statistics Canada, *Canadian Statistical Review*, Catalogue 11-003, December, 1983.

**Source:**
Statistics Canada, Annual Census Of Coal Mines, 1981, special tabulation by the Office of the Senior Adviser on Integration.

Table 4.2.23
## Socio-Economic Profile of Persons Employed in the Mining and Oil Extraction Industry[1] by Ecozone, 1981

| Ecozone | Total Employed[2] | | Full Time Employed[3] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Percentage of Full Time Employed | | | |
| | | | | | | | | Education Level | |
| | Persons | Average Income | Persons | Average Income | As a Percentage of Total Employed | Migrants | Forty-five Years and Over | Less than Grade Nine | Post Secondary |
| | | dollars | | dollars | percent | percent | | | |
| **Atlantic Maritime** | **13 880** | **15 400** | **10 640** | **18 100** | **77** | **16** | **30** | **27** | **31** |
| Prince Edward Island | 160 | 11 500 | 100 | 12 900 | 63 | 27 | ... | 5 | 50 |
| Nova Scotia | 6 785 | 15 700 | 5 660 | 17 400 | 83 | 14 | 34 | 25 | 31 |
| New Brunswick | 4 235 | 15 000 | 3 045 | 18 600 | 72 | 18 | 26 | 31 | 32 |
| Québec | 2 705 | 15 600 | 1 840 | 19 800 | 68 | 18 | 27 | 27 | 25 |
| **Mixed-Wood Plain** | **23 905** | **17 600** | **18 810** | **20 800** | **79** | **21** | **35** | **21** | **41** |
| Québec | 12 255 | 17 900 | 9 785 | 20 800 | 80 | 17 | 37 | 27 | 36 |
| Ontario | 11 650 | 17 300 | 9 025 | 20 800 | 77 | 26 | 34 | 14 | 47 |
| **Boreal Shield** | **57 650** | **19 400** | **49 085** | **21 600** | **85** | **22** | **31** | **24** | **28** |
| Newfoundland | 3 345 | 15 600 | 2 280 | 18 700 | 68 | 18 | 27 | 29 | 35 |
| Québec | 15 790 | 20 000 | 13 230 | 22 600 | 84 | 21 | 28 | 28 | 28 |
| Ontario | 32 825 | 19 400 | 28 565 | 21 300 | 87 | 21 | 34 | 23 | 27 |
| Manitoba | 5 145 | 20 100 | 4 560 | 21 800 | 89 | 31 | 21 | 13 | 37 |
| Saskatchewan | 550 | 16 700 | 455 | 19 200 | 83 | 22 | 32 | 26 | 33 |
| **Prairie** | **70 390** | **22 600** | **59 245** | **25 300** | **84** | **43** | **19** | **5** | **58** |
| Manitoba | 1 405 | 17 300 | 940 | 21 800 | 67 | 28 | 28 | 17 | 34 |
| Saskatchewan | 11 110 | 20 200 | 9 225 | 22 400 | 83 | 36 | 20 | 11 | 40 |
| Alberta | 57 875 | 23 200 | 49 085 | 25 900 | 85 | 44 | 18 | 4 | 61 |
| **Boreal Plain** | **22 445** | **23 000** | **18 430** | **25 900** | **82** | **54** | **15** | **10** | **40** |
| Manitoba | 635 | 13 600 | 415 | 17 600 | 65 | 18 | 25 | 33 | 27 |
| Saskatchewan | 995 | 14 300 | 545 | 18 900 | 55 | 28 | 15 | 26 | 21 |
| Alberta | 19 055 | 23 700 | 16 035 | 26 200 | 84 | 57 | 15 | 9 | 41 |
| British Columbia | 1 740 | 23 700 | 1 415 | 27 000 | 81 | 52 | 14 | 12 | 32 |
| **Montane Cordillera** | **16 540** | **21 100** | **14 160** | **23 200** | **86** | **44** | **24** | **9** | **44** |
| Alberta | 2 055 | 21 500 | 1 800 | 23 200 | 88 | 39 | 20 | 11 | 37 |
| British Columbia | 14 490 | 21 100 | 12 360 | 23 100 | 85 | 45 | 25 | 9 | 45 |
| **Pacific Maritime** | **7 420** | **20 700** | **5 580** | **24 600** | **75** | **48** | **24** | **7** | **54** |
| British Columbia | 7 420 | 20 700 | 5 580 | 24 600 | 75 | 48 | 24 | 7 | 54 |
| **Boreal Cordillera** | **1 780** | **23 200** | **1 425** | **27 000** | **80** | **51** | **19** | **9** | **48** |
| British Columbia | 540 | 21 500 | 430 | 25 100 | 80 | 56 | 22 | 8 | 52 |
| Yukon | 1 245 | 23 900 | 990 | 27 800 | 80 | 49 | 17 | 10 | 47 |
| **Tundra Cordillera** | **370** | **21 600** | **280** | **25 300** | **76** | **46** | **32** | **9** | **58** |
| Yukon | 225 | 17 500 | 165 | 20 900 | 73 | 36 | 39 | 6 | 64 |
| Northwest Territories | 150 | 27 700 | 115 | 31 400 | 77 | 58 | 30 | 13 | 48 |
| **Taiga Plain[4]** | **785** | **19 600** | **660** | **22 000** | **84** | **45** | **17** | **13** | **45** |
| Northwest Territories | 750 | 19 400 | 620 | 21 900 | 83 | 45 | 18 | 13 | 46 |
| **Taiga Shield** | **7 365** | **23 900** | **6 520** | **25 800** | **89** | **36** | **18** | **10** | **47** |
| Newfoundland | 3 550 | 25 000 | 3 245 | 26 300 | 91 | 26 | 15 | 5 | 53 |
| Québec | 2 130 | 25 300 | 1 885 | 27 300 | 88 | 39 | 22 | 16 | 38 |
| Saskatchewan | 750 | 19 900 | 625 | 22 300 | 83 | 60 | 15 | 12 | 40 |
| Northwest Territories | 930 | 19 700 | 760 | 22 500 | 82 | 52 | 23 | 12 | 45 |
| **Southern Arctic[4]** | **350** | **11 500** | **135** | **18 100** | **39** | **19** | **22** | **41** | **15** |
| Northwest Territories | 315 | 11 600 | 110 | 19 200 | 35 | 23 | 27 | 36 | 18 |
| **Northern Arctic[4]** | **255** | **16 600** | **170** | **21 800** | **67** | **54** | **23** | **29** | **38** |
| Northwest Territories | 210 | 17 100 | 130 | 23 800 | 62 | 70 | 24 | 31 | 42 |

[1] Standard industrial classification division 4: Mines (including milling), Quarries and Oil Wells.
[2] Employed in 1980.
[3] Employed 27 or more weeks in 1980.
[4] Provinces with minimal industry employment are not listed; however, ecozone totals include the statistics for these provinces.

**Source:**
Statistics Canada, 1981 Census of Population, special tabulation.

**Note:**
Individual items may not add to totals due to rounding.

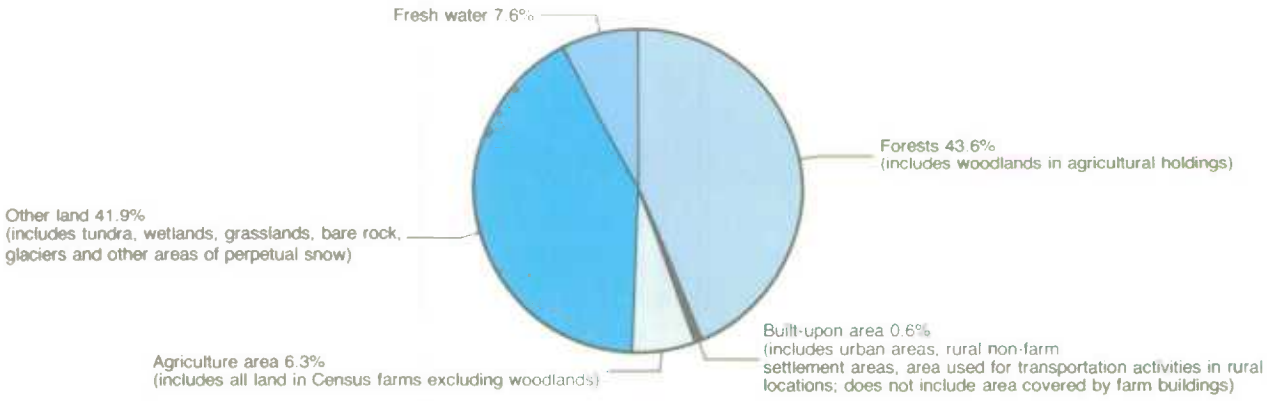
# 5

# Environmental Restructuring

# Contents

# 5.1
# Land Use and Land Conversion

Chart 5.1.1
## General Land Cover[1]

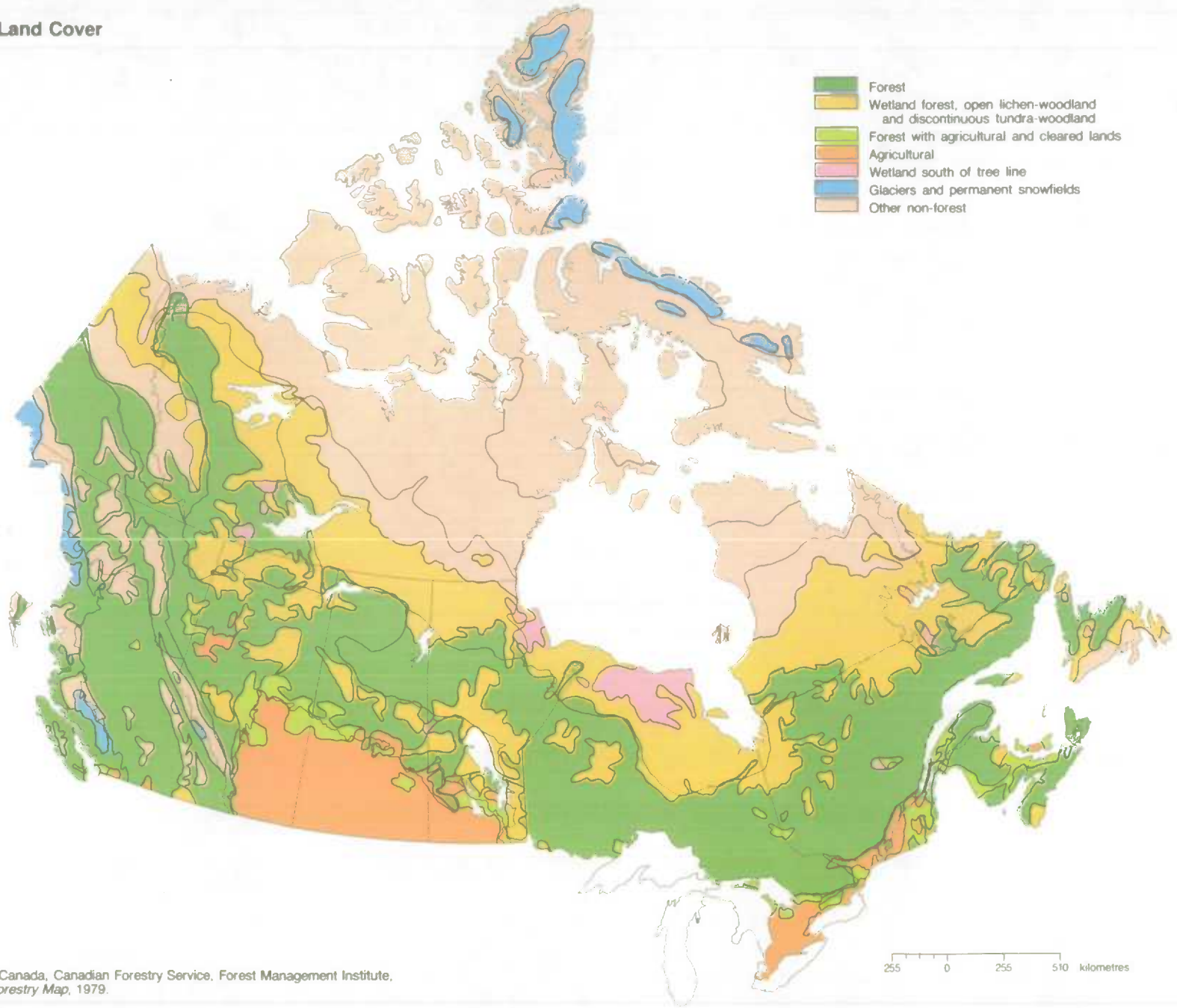



[1] The total area of land and freshwater in Canada is 9 970 610 square kilometres.

**Sources:**
Area of land and freshwater: Energy, Mines and Resources Canada, Surveys and Mapping Branch, Geographical Research Division.
Forest land: Environment Canada, Canadian Forestry Service, *Canada's Forest Inventory, 1981* by G.M. Bonner, Ottawa, 1982. Page 4. The figure presented is the total area of forest land. This includes the inventoried portion of forest land in Canada as well as an estimate made by the Provinces and/or by the Canadian Forestry Service of the additional non-inventoried forest area.
Agricultural land: This is the 1981 Census of Agriculture area of farms figure (improved and unimproved lands) minus the area in woodlots. For further details on definitions see Chapter 3, Section 1.
Built-upon land: There are no comprehensive government statistics on built-upon area. These data are estimates made by John Hansen and are considered to be among the best available at the national level, see J. Hansen, "Built-on Land Definition and Canadian Area Estimates," *Plan Canada*, Volume 23, Number 4, March 1984.

**Note:**
Land statistics can be generated for land cover types (bio-physical classes) or by the human activities taking place on the land (functional use). Statistics on activities using the land can be used as indicators of stress, whereas land cover change provides an indication of environment response. The land use classification systems in use in most municipalities tend to be a mixture of cover and activity; for example, built-upon area (a cover category) is classified as residential, commercial and industrial (activity categories). Problems arise when several uses are made of the same parcel of land; for example, a forest which serves the forestry industry can also provide recreation space and support animal trapping activity. In contrast, cover classes are mutually exclusive. Environment Canada is currently developing the Canada Land Use Monitoring Program (CLUMP) for the purpose of tracking land change in Canada. CLUMP employs a complementary land cover and land activity classification for land statistics.

Map 5.1.2
**General Land Cover**




**Source:**
Environment Canada, Canadian Forestry Service, Forest Management Institute, *Provisional Forestry Map*, 1979.

Table 5.1.3
## Rural to Urban Land Conversion, 1966 to 1976

| Urban Area[1] by Ecozone | Built-up Area 1976 | Land Converted 1966 to 1971 | Land Converted 1971 to 1976 | Urban Area Population 1976 |
|---|---|---|---|---|
| | hectares | | | |
| **Atlantic Maritime** | **38 115** | **4 398** | **4 843** | **652 672** |
| Halifax (N.S.) | 11 617 | 1 424 | 767 | 211 983 |
| Saint John (N.B.) | 6 491 | 1 092 | 1 156 | 106 561 |
| Sydney (N.S.) | 4 437 | 282 | 267 | 76 699 |
| Moncton (N.B.) | 4 244 | 299 | 1 176 | 77 571 |
| Fredericton (N.B.) | 2 740 | 412 | 466 | 45 248 |
| Sept Iles (Qué.) | 2 292 | 235 | 269 | 30 617 |
| Sydney Mines (N.S.) | 1 809 | 104 | 109 | 22 296 |
| Baie Comeau (Qué.) | 1 692 | 182 | 48 | 26 635 |
| Charlottetown (P.E.I.) | 1 677 | 309 | 414 | 24 837 |
| Rimouski (Qué.) | 1 116 | 59 | 171 | 30 225 |
| **Mixed-Wood Plain** | **389 307** | **49 364** | **29 879** | **9 744 594** |
| Toronto (Ont.) | 91 665 | 11 689 | 6 098 | 2 778 720 |
| Montréal (Qué.) | 71 570 | 7 719 | 2 627 | 2 801 262 |
| Ottawa (Ont.) | 27 056 | 3 419 | 2 010 | 478 519 |
| St. Catharines-Niagara (Ont.) | 19 529 | 4 388 | 1 081 | 295 860 |
| Québec (Qué.) | 18 678 | 2 748 | 2 370 | 517 333 |
| Hamilton (Ont.) | 18 509 | 2 046 | 1 005 | 499 784 |
| Windsor (Ont.) | 13 216 | 1 225 | 844 | 223 922 |
| Kitchener (Ont.) | 11 897 | 2 529 | 1 368 | 259 270 |
| London (Ont.) | 10 973 | 1 198 | 738 | 247 263 |
| Oshawa (Ont.) | 8 310 | 609 | 407 | 135 196 |
| Hull (Qué.) | 7 280 | 1 197 | 865 | 182 773 |
| Sarnia (Ont.) | 6 171 | 575 | 632 | 71 135 |
| Kingston (Ont.) | 5 952 | 962 | 432 | 78 623 |
| Trois Rivières (Qué.) | 5 375 | 136 | 1 262 | 96 954 |
| Peterborough (Ont.) | 5 114 | 669 | 230 | 63 219 |
| Brantford (Ont.) | 5 104 | 599 | 393 | 75 718 |
| Sherbrooke (Qué.) | 4 745 | 365 | 335 | 94 691 |
| Shawinigan (Qué.) | 3 975 | 360 | 285 | 55 414 |
| Barrie (Ont.) | 3 634 | 306 | 532 | 36 326 |
| Fort Erie (Ont.) | 3 550 | 698 | 202 | 24 031 |
| Guelph (Ont.) | 3 529 | 491 | 292 | 67 538 |
| Woodstock (Ont.) | 3 166 | 336 | 471 | 26 779 |
| Drummondville (Qué.) | 3 137 | 169 | 647 | 42 073 |
| St. Jean (Qué.) | 3 017 | 551 | 448 | 50 363 |
| Valleyfield (Qué.) | 2 569 | 207 | 353 | 34 163 |
| St. Thomas (Ont.) | 2 447 | 348 | 246 | 28 913 |
| Midland (Ont.) | 2 398 | 279 | 250 | 20 625 |
| Joliette (Qué.) | 2 304 | 880 | 189 | 26 769 |
| Cornwall (Ont.) | 2 299 | 63 | 292 | 46 121 |
| Trenton (Ont.) | 2 201 | 262 | 285 | 24 885 |
| Chatham (Ont.) | 2 166 | 206 | 217 | 38 685 |
| St. Jerome (Qué.) | 2 154 | 340 | 273 | 36 489 |
| Sorel (Qué.) | 2 073 | 300 | 262 | 34 761 |
| Belleville (Ont.) | 2 052 | 231 | 343 | 35 311 |
| St. Hyacinthe (Qué.) | 1 743 | 68 | 244 | 40 202 |
| Stratford (Ont.) | 1 731 | 165 | 152 | 25 657 |
| Granby (Qué.) | 1 711 | 114 | 305 | 37 896 |
| Victoriaville (Qué.) | 1 659 | 344 | 307 | 27 732 |
| Brockville (Ont.) | 1 592 | 177 | 199 | 21 233 |
| Halton Hills (Ont.) | 1 564 | 65 | 199 | 34 477 |
| Thetford Mines (Qué.) | 1 492 | 331 | 189 | 27 909 |
| **Boreal Shield** | **46 900** | **4 224** | **3 577** | **794 966** |
| Sudbury (Ont.) | 10 126 | 1 207 | 510 | 156 840 |
| Thunder Bay (Ont.) | 7 222 | 574 | 600 | 111 476 |
| Chicoutimi-Jonquière (Qué.) | 6 811 | 736 | 642 | 140 782 |
| St. John's (Nfld.) | 6 385 | 685 | 672 | 129 042 |
| Sault Ste. Marie (Ont.) | 5 534 | 464 | 330 | 81 049 |
| North Bay (Ont.) | 4 060 | 254 | 292 | 52 707 |
| Corner Brook (Nfld.) | 1 900 | 22 | 92 | 25 198 |
| Alma (Qué.) | 1 792 | 151 | 118 | 25 638 |
| Timmins (Ont.) | 1 790 | 77 | 266 | 44 747 |
| Rouyn (Qué.) | 1 280 | 54 | 55 | 27 487 |
| **Prairie** | **106 143** | **21 146** | **15 626** | **2 025 590** |
| Edmonton (Alta.) | 29 407 | 6 552 | 5 808 | 527 918 |
| Calgary (Alta.) | 25 133 | 6 417 | 4 964 | 469 917 |
| Winnipeg (Man.) | 23 894 | 4 385 | 1 300 | 560 874 |
| Regina (Sask.) | 7 623 | 380 | 1 164 | 149 593 |
| Saskatoon (Sask.) | 6 709 | 474 | 442 | 133 750 |
| Medicine Hat (Alta.) | 3 231 | 606 | 471 | 35 820 |
| Lethbridge (Alta.) | 2 927 | 422 | 687 | 46 752 |
| Brandon (Man.) | 2 850 | 814 | 141 | 34 901 |
| Red Deer (Alta.) | 2 360 | 701 | 349 | 32 184 |
| Moose Jaw (Sask.) | 2 009 | 395 | 300 | 33 881 |

Table 5.1.3
## Rural to Urban Land Conversion, 1966 to 1976 (concluded)

| Urban Area[1] by Ecozone | Built-up Area 1976 | Land Converted 1966 to 1971 | Land Converted 1971 to 1976 | Urban Area Population 1976 |
|---|---|---|---|---|
| | hectares | | | |
| **Boreal Plain** | **2 234** | **238** | **504** | **28 631** |
| Prince Albert (Sask.) | 2 234 | 238 | 504 | 28 631 |
| **Montane Cordillera** | **11 810** | **2 662** | **2 574** | **170 195** |
| Prince George (B.C.) | 5 197 | 1 187 | 1 027 | 59 929 |
| Kamloops (B.C.) | 3 379 | 856 | 398 | 58 311 |
| Kelowna (B.C.) | 3 234 | 619 | 1 149 | 51 955 |
| **Pacific Maritime** | **65 531** | **5 064** | **5 295** | **1 385 377** |
| Vancouver (B.C.) | 47 499 | 3 661 | 3 471 | 1 106 985 |
| Victoria (B.C.) | 10 944 | 474 | 1 020 | 195 135 |
| Nanaimo (B.C.) | 3 626 | 442 | 325 | 40 336 |
| Chilliwack (B.C.) | 1 857 | 275 | 275 | 21 746 |
| Port Alberni (B.C.) | 1 605 | 212 | 204 | 21 175 |
| **National Total** | **660 040** | **87 096** | **62 298** | **14 802 025** |

[1] All urban areas with a population of greater than 25,000 in 1976 were inventoried by Environment Canada. Many of these urban areas are Census Metropolitan Areas or Census Agglomerations. It should be noted, however, that the area encompassed by this study is often smaller than the total area of the C.M.A. or C.A. The study focussed on the conversion of land in the rural-urban fringe of these centres and excluded municipalities outside this zone. It should also be noted that many of the urban areas here are components of C.M.A.s or C.A.s which have been split. For example, the Ottawa-Hull C.M.A. is divided into its Ottawa and Hull components. Also, urban areas which spread over two or more ecozones are assigned to the ecozone in which they are predominantly located.

**Sources:**
Environment Canada, Lands Directorate, *The Urbanization of Rural Land in Canada: 1966-1971 and 1971-1976*, by C.L. Warren and P.C. Rump, Catalogue En. 73-1/20, 1981.
Environment Canada, Lands Directorate, *Rural to Urban Land Conversion*, by D.M. Gierman, Catalogue En. 66-1/16, 1977.

Table 5.1.4
## Agricultural Land[1] Converted to Urban Use, 1966 to 1976

| Urban Area[2] by Ecozone | Improved Agricultural Land Converted | Unimproved Pasture Converted | Total Converted |
|---|---|---|---|
| | hectares | | |
| **Atlantic Maritime** | **1 870** | **1 040** | **2 910** |
| Halifax (N.S.) | 82 | 23 | 105 |
| Saint John (N.B.) | 383 | 362 | 745 |
| Sydney (N.S.) | 27 | 128 | 155 |
| Moncton (N.B.) | 236 | 228 | 464 |
| Fredericton (N.B.) | 357 | 88 | 445 |
| Sept Iles (Qué.) | ... | 16 | 16 |
| Sydney Mines (N.S.) | 74 | 42 | 116 |
| Baie Comeau (Qué.) | 6 | 21 | 27 |
| Charlottetown (P.E.I.) | 558 | 94 | 652 |
| Rimouski (Qué.) | 147 | 38 | 185 |
| **Mixed-Wood Plain** | **47 337** | **15 934** | **63 271** |
| Toronto (Ont.) | 14 609 | 1 688 | 16 297 |
| Montréal (Qué.) | 4 233 | 3 221 | 7 454 |
| Ottawa (Ont.) | 3 158 | 1 337 | 4 495 |
| St.Catharines-Niagara (Ont.) | 2 839 | 2 026 | 4 865 |
| Québec (Qué.) | 1 771 | 1 274 | 3 045 |
| Hamilton (Ont.) | 2 146 | 548 | 2 694 |
| Windsor (Ont.) | 1 859 | 134 | 1 993 |
| Kitchener (Ont.) | 2 608 | 743 | 3 351 |
| London (Ont.) | 1 196 | 539 | 1 735 |
| Oshawa (Ont.) | 723 | 187 | 910 |
| Hull (Qué.) | 838 | 357 | 1 195 |
| Sarnia (Ont.) | 834 | 132 | 966 |
| Kingston (Ont.) | 912 | 326 | 1 238 |
| Trois-Rivières (Qué.) | 532 | 214 | 746 |
| Peterborough (Ont.) | 597 | 154 | 751 |
| Brantford (Ont.) | 581 | 304 | 885 |
| Sherbrooke (Qué.) | 159 | 190 | 349 |
| Shawinigan (Qué.) | 137 | 210 | 347 |
| Barrie (Ont.) | 501 | 116 | 617 |
| Fort Erie (Ont.) | 295 | 464 | 759 |

Table 5.1.4
## Agricultural Land[1] Converted to Urban Use, 1966 to 1976 (concluded)

| Urban Area[2] by Ecozone | Improved Agricultural Land Converted | Unimproved Pasture Converted | Total Converted |
|---|---|---|---|
| | hectares | | |
| Guelph (Ont.) | 607 | 85 | 692 |
| Woodstock (Ont.) | 640 | 111 | 751 |
| Drummondville (Qué.) | 338 | 196 | 534 |
| St Jean (Qué.) | 585 | 80 | 665 |
| Valleyfield (Qué.) | 391 | 94 | 485 |
| St. Thomas (Ont.) | 458 | 87 | 545 |
| Midland (Ont.) | 91 | 53 | 144 |
| Joliette (Qué.) | 429 | 142 | 571 |
| Cornwall (Ont.) | 176 | 56 | 232 |
| Trenton (Ont.) | 215 | 226 | 441 |
| Chatham (Ont.) | 412 | 3 | 415 |
| St-Jerôme (Qué.) | 127 | 158 | 285 |
| Sorel (Qué.) | 223 | 45 | 268 |
| Belleville (Ont.) | 405 | 70 | 475 |
| St Hyacinthe (Qué.) | 253 | 26 | 279 |
| Stratford (Ont.) | 292 | 4 | 296 |
| Granby (Qué.) | 201 | 69 | 270 |
| Victoriaville (Qué.) | 376 | 123 | 499 |
| Brockville (Ont.) | 280 | 49 | 329 |
| Halton Hills (Ont.) | 167 | 29 | 196 |
| Thetford Mines (Qué.) | 143 | 64 | 207 |
| **Boreal Shield** | **1 943** | **1 050** | **2 993** |
| Sudbury (Ont.) | 166 | 207 | 373 |
| Thunder Bay (Ont.) | 148 | 241 | 389 |
| Chicoutimi-Jonquière (Qué.) | 736 | 187 | 923 |
| St. John's (Nfld.) | 334 | 86 | 420 |
| Sault Ste. Marie (Ont.) | 203 | 139 | 342 |
| North Bay (Ont.) | 66 | 65 | 131 |
| Corner Brook (Nfld.) | 7 | ... | 7 |
| Alma (Qué.) | 121 | 29 | 150 |
| Timmins (Ont.) | 138 | 71 | 209 |
| Rouyn (Qué.) | 24 | 25 | 49 |
| **Prairie** | **26 955** | **7 302** | **34 257** |
| Edmonton (Alta.) | 10 191 | 1 496 | 11 687 |
| Calgary (Alta.) | 7 691 | 3 144 | 10 835 |
| Winnipeg (Man.) | 3 842 | 932 | 4 774 |
| Regina (Sask.) | 1 501 | 43 | 1 544 |
| Saskatoon (Sask.) | 803 | 105 | 908 |
| Medicine Hat (Alta.) | 366 | 682 | 1 048 |
| Lethbridge (Alta.) | 750 | 147 | 897 |
| Brandon (Man.) | 481 | 384 | 865 |
| Red Deer (Alta.) | 814 | 193 | 1 007 |
| Moose Jaw (Sask.) | 516 | 176 | 692 |
| **Boreal Plain** | **327** | **132** | **459** |
| Prince Albert (Sask.) | 327 | 132 | 459 |
| **Montane Cordillera** | **1 167** | **1 656** | **2 823** |
| Prince George (B.C.) | 145 | 155 | 300 |
| Kamloops (B.C.) | 209 | 811 | 1 020 |
| Kelowna (B.C.) | 813 | 690 | 1 503 |
| **Pacific Maritime** | **3 471** | **2 551** | **6 022** |
| Vancouver (B.C.) | 2 604 | 1 470 | 4 074 |
| Victoria (B.C.) | 378 | 577 | 955 |
| Nanaimo (B.C.) | 35 | 247 | 282 |
| Chilliwack (B.C.) | 434 | 77 | 511 |
| Port Alberni (B.C.) | 20 | 180 | 200 |
| **National Total** | **83 070** | **29 665** | **112 735** |

[1] See Footnote 1, Table 5.1.3
[2] Agricultural land, improved agricultural land and unimproved pasture are defined here according to the Canada Land Inventory present use classification. Improved agricultural land includes improved pasture, crop lands, areas in forage crops, orchards and vineyards, and horticulture lands. Unimproved pasture includes grassland, natural range land, abandoned farmland and lightly wooded areas. The data here were derived by comparing the 1966 Canada Land Inventory present uses with airphotos of the same areas for 1971 and 1976.

**Source:**
Environment Canada, Lands Directorate, *The Urbanization of Rural Land in Canada: 1961-1971 and 1971-1976*, by C.L. Warren and P.C. Rump, Catalogue En. 73-1/20, 1981.

Table 5.1.5
**Land with High Capability[1] for Agriculture, Forestry, Recreation or Waterfowl Converted to Urban Use, 1966 to 1976**

| Urban Area by Ecozone | Agriculture | Forestry | Recreation | Waterfowl |
|---|---|---|---|---|
| | hectares | | | |
| **Atlantic Maritime** | **3 177** | **266** | **460** | **192** |
| Halifax (N.S.) | 636 | ... | 126 | 5 |
| Saint John (N.B.) | 49 | 0 | 62 | 17 |
| Sydney (N.S.) | 427 | ... | ... | ... |
| Moncton (N.B.) | 903 | 62 | ... | 164 |
| Fredericton (N.B.) | 208 | 23 | ... | 6 |
| Sept Iles (Qué.) | ... | ... | 146 | ... |
| Sydney Mines (N.S.) | 182 | ... | ... | ... |
| Baie Comeau (Qué.) | 14 | ... | 70 | ... |
| Charlottetown (P.E.I.) | 721 | ... | 50 | ... |
| Rimouski (Qué.) | 37 | 181 | 6 | ... |
| **Mixed-Wood Plain** | **58 071** | **58 867** | **1 304** | **408** |
| Toronto (Ont.) | 17 057 | 12 899 | 42 | 30 |
| Montréal (Qué.) | 7 669 | 8 370 | 213 | 80 |
| Ottawa (Ont.) | 3 182 | 3 013 | 40 | 17 |
| St. Catharines-Niagara (Ont.) | 4 450 | 3 685 | 185 | 56 |
| Québec (Qué.) | 1 971 | 3 090 | 53 | ... |
| Hamilton (Ont.) | 2 640 | 2 023 | 39 | 5 |
| Windsor (Ont.) | 1 891 | 2 007 | 50 | 4 |
| Kitchener (Ont.) | 2 578 | 3 562 | 5 | 51 |
| London (Ont.) | 1 936 | 1 902 | 6 | 4 |
| Oshawa (Ont.) | 907 | 977 | 1 | 22 |
| Hull (Qué.) | 1 187 | 1 209 | 13 | 9 |
| Sarnia (Ont.) | 1 081 | 1 144 | 59 | ... |
| Kingston (Ont.) | 847 | 470 | 3 | 27 |
| Trois Rivières (Qué.) | 388 | 969 | ... | ... |
| Peterborough (Ont.) | 598 | 779 | ... | ... |
| Brantford (Ont.) | 861 | 990 | ... | 62 |
| Sherbrooke (Qué.) | 145 | 532 | 37 | ... |
| Shawinigan (Qué.) | ... | 541 | 46 | ... |
| Barrie (Ont.) | 652 | 733 | 14 | ... |
| Fort Erie (Ont.) | 900 | 621 | ... | ... |
| Guelph (Ont.) | 684 | 777 | 22 | ... |
| Woodstock (Ont.) | 773 | 759 | 12 | ... |
| Drummondville (Qué.) | 286 | 362 | ... | ... |
| St. Jean (Qué.) | 967 | 903 | 300 | 12 |
| Valleyfield (Qué.) | 472 | 363 | ... | 6 |
| St. Thomas (Ont.) | 566 | 542 | 15 | ... |
| Midland (Ont.) | 182 | 369 | 10 | ... |
| Joliette (Qué.) | 251 | 1 017 | ... | ... |
| Cornwall (Ont.) | 264 | 352 | 13 | ... |
| Trenton (Ont.) | 336 | 402 | ... | 4 |
| Chatham (Ont.) | 411 | 423 | ... | ... |
| St. Jerome (Qué.) | 243 | 525 | 13 | ... |
| Sorel (Qué.) | 55 | 562 | 47 | 14 |
| Belleville (Ont.) | 459 | 357 | 2 | 2 |
| St. Hyacinthe (Qué.) | 238 | 244 | ... | ... |
| Stratford (Ont.) | 275 | 316 | ... | ... |
| Granby (Qué.) | 101 | 192 | ... | 3 |
| Victoriaville (Qué.) | 230 | 475 | ... | ... |
| Brockville (Ont.) | 91 | 38 | 13 | ... |
| Halton Hills (Ont.) | 209 | 206 | ... | ... |
| Thetford Mines (Qué.) | 38 | 167 | 18 | ... |
| **Boreal Shield** | **1 656** | **1 740** | **419** | **46** |
| Sudbury (Ont.) | 256 | 592 | 22 | 31 |
| Thunder Bay (Ont.) | 102 | 38 | 86 | 5 |
| Chicoutimi-Jonquière (Qué) | 712 | 852 | 56 | 5 |
| St. John's (Nfld.) | 4 | 9 | ... | ... |
| Sault Ste. Marie (Ont.) | 298 | 61 | 45 | 2 |
| North Bay (Ont.) | 58 | 74 | 175 | ... |
| Corner Brook (Nfld.) | ... | 5 | 24 | ... |
| Alma (Qué.) | 83 | 109 | 7 | ... |
| Timmins (Ont.) | 134 | ... | ... | 1 |
| Rouyn (Qué.) | 9 | ... | 4 | 2 |
| **Prairie** | **28 622** | **35** | **7** | **5 731** |
| Edmonton (Alta.) | 10 281 | ... | 7 | 4 958 |
| Calgary (Alta.) | 6 154 | ... | ... | 651 |
| Winnipeg (Man.) | 5 680 | 35 | ... | ... |
| Regina (Sask.) | 1 507 | ... | ... | 38 |
| Saskatoon (Sask.) | 540 | ... | ... | 25 |
| Medicine Hat (Alta.) | 10 | ... | ... | 6 |
| Lethbridge (Alta.) | 427 | ... | ... | ... |
| Brandon (Man.) | 409 | ... | ... | 19 |
| Red Deer (Alta.) | 975 | ... | ... | ... |

Table 5.1.5
## Land with High Capability[1] for Agriculture, Forestry, Recreation or Waterfowl Converted to Urban Use, 1966 to 1976 (concluded)

| Urban Area by Ecozone | Agriculture | Forestry | Recreation | Waterfowl |
|---|---|---|---|---|
| | | hectares | | |
| Moose Jaw (Sask.) | 639 | ... | ... | 34 |
| **Boreal Plain** | **355** | **...** | **...** | **311** |
| Prince Albert (Sask.) | 355 | ... | ... | 311 |
| **Montane Cordillera** | **1 734** | **66** | **376** | **89** |
| Prince George (B.C.) | 319 | 25 | ... | ... |
| Kamloops (B.C.) | .. | .. | 184 | 73 |
| Kelowna (B.C.) | 1 415 | 41 | 192 | 16 |
| **Pacific Maritime** | **1 385** | **45** | **453** | **3 930** |
| Vancouver (B.C.) | 738 | .. | 226 | 2 827 |
| Victoria (B.C.) | .. | .. | 146 | 216 |
| Nanaimo (B.C.) | 25 | 7 | 44 | 450 |
| Chilliwack (B.C.) | 347 | 38 | 37 | 301 |
| Port Alberni (B.C.) | 275 | .. | .. | 136 |
| **National Total** | **93 000** | **61 019** | **3 019** | **10 707** |

[1] Land capability is based on the Canada Land Inventory capability assessment. It should be noted that high capability land in each of the groups includes land which is actually in that use as well as land which is not currently in the use but which could be, with no significant limitations for that use.

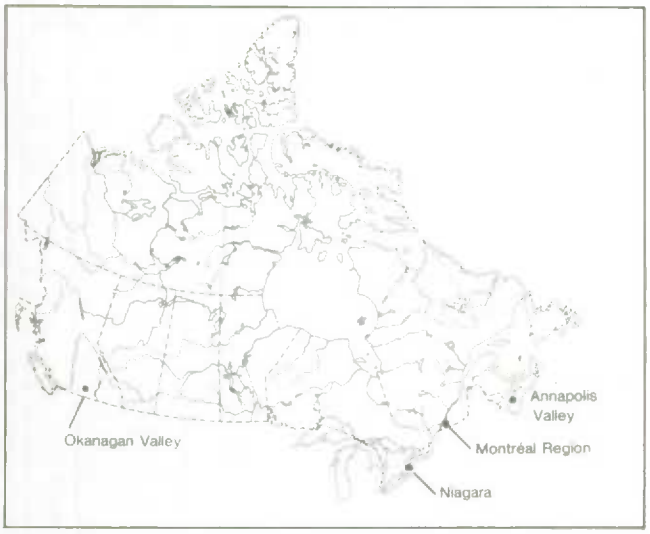
**Source:**
Environment Canada, Lands Directorate *The Urbanization of Rural Land in Canada: 1966-1971 and 1971-1976*, by C.L. Warren and P.C. Rump, Catalogue En. 73-1/20, 1981.

**Note:**

**The Canada Land Inventory**
The Canada Land Inventory program involved the mapping and assessment of 2.5 million square kilometres of land in the settled areas of Canada, for agriculture, forestry, recreation, and wildlife capability as well as present land use. The information for the C.L.I. mapping was gathered between 1960 and 1968, and compiled usually at a scale of 1:50,000. The interpretation of land use was completed by field survey and air photo review.
Land capability refers to the ability of the land to accomodate a particular use or activity without permanent damage. Determination of capability involves interpreting climatic, vegetation, soil, and other data in terms of limitations for use and recognizing the role of technology and money in overcoming limitations. Seven classes of capability were established for each use.

Classes 1 to 3 are considered high capability land for each category of rural land.
*High Capability Agricultural Lands*: These are soils having no significant limitations in use for crops, to soils having moderately severe limitations that restrict the range of crops or require special conservation requirements (for detail refer to Technical Box 3.1.2).
*High Capability Forestry Lands* These range from lands having no important limitations, to moderate limitations that restrict the growth of commercial forests (several regions in Canada have no class 1 forestry land because they lack suitable climate).
*High Capability Recreation Lands*: These have very high to moderately high capability for outdoor recreation.
*High Capability Wildlife-Waterfowl Lands*: These lands have no significant limitations to slight limitations for the production of waterfowl. Ratings are established on the basis of the optimum vegetational stage that can be maintained when good wildlife management is practiced. Ratings assigned do not reflect present land use (except in exteme cases, such as heavily populated areas), ownership, lack of access, distance from cities, or amount of hunting pressure.

Map 5.1.6
## Canada's Major Fruitlands




There are only a few areas in Canada with the combination of soils and climate suitable for the growth of fruit trees and grapes on a commercial scale. The four major ones are the Okanagan Valley, the Niagara Peninsula, the Annapolis Valley and the Montréal region. Canada's tender fruit and grape growing industries are highly concentrated in the Niagara and Okanagan (seventy-six percent of all Canada's area of tender fruit trees and ninety-six percent of total grapevine area), while apples are the main products of the Annapolis Valley and the Montréal fruitlands.

The concentration of orchards and vineyards in small areas that have distinct topographical and climatic features has made them susceptible to external pressures for land use change.

The Okanagan and Niagara fruitlands are particularly under pressure from nearby expanding urban areas and developing industries. The mild climate of the areas has contributed to the attraction of Niagara and the Okanagan as retirement centres which has further stimulated urban growth. The flat fertile terrain of the Annapolis Valley combined with changing markets has fostered pressures for fruitland conversion to other uses in that region.

The Montréal fruitlands have been under less conversion pressure in the past but as the region's rural-urban fringe reaches these areas, land use transformation may accelerate.

Table 5.1.7
## Population in Major Fruitland Regions

| | Population[1] | | | | Population Change 1961 to 1981 | Major Fruits Grown |
|---|---|---|---|---|---|---|
| | 1921 | 1941 | 1961 | 1981 | | |
| | | | | | percent | |
| Annapolis[2] (Nova Scotia) | 42 757 | 48 583 | 67 084 | 74 718 | 11.4 | apples |
| Montréal Area[3] (Québec) | 11 318 | 12 736 | 20 152 | 30 581 | 51.8 | apples |
| Niagara[4] (Ontario) | 82 083 | 109 143 | 223 689 | 300 435 | 34.3 | apples, cherries, grapes, peaches, pears, plums |
| Okanagan[5] (British Columbia) | .. | 36 366 | 74 833 | 171 523 | 128.9 | apples, apricots, cherries, grapes, peaches, plums |

[1] The populations of the fruitlands are actually the populations for Census Sub-Divisions containing, or immediately adjacent to, fruitland areas. The Annapolis and Okanagan fruitlands are situated in long valleys and compete with a variety of other activities, both urban and rural, for land. The Niagara fruitland is also a linear development situated primarily on the eastern side of the Niagara escarpment where tender fruits benefit from both a sheltered climate and favorable soils. In contrast, the fruitlands around Montréal are scattered over a large area concentrating at several points on hillsides with southern exposures. Historically, demands for residential land have been less at these sites in comparison with the linear fruitlands. There are indications, however, that this may be changing as Montréal's commuting fringe of urban population begins to reach into these areas and stimulates residential construction.

[2] Includes the following Census Sub-Divisions (1981 and historical): Annapolis Sub-Divisions A, B and C, Annapolis Royal, Bridgetown, Middleton, Hantsport, Windsor, Kings Sub-Division A, B, C and D, Berwick, Kentville and Wolfville.

[3] Includes the following Census Sub-Divisions (1981 and historical): Oka, Oka-sur-le-lac, l'Annociation N., Hemmingford Sub-Division, Hemmingford, Havelock, Frelighsburg Sub-Division, Frelighsburg, Mont St. Hilaire Sub-Division, St. Michel-de-Rougemont, Otterburn Park, St. Hilaire-sur-Richelieu, Rougement, Mont-St.-Hilaire, St. Paul d'Abbotsford, St. Cesaire Sub-Division and St. Cesaire.

[4] Includes the following Census Sub-Divisions (1981 and historical): Stoney Creek, Saltfleet, Grimsby, Lincoln, Pelham, St. Catharines, Niagara-on-the-Lake, Thorold, Niagara Falls, Clinton, Grimsby North, Lincoln West, Louth, Niagara, Stamford, Willoughby, Merriton, Port Dalhousie, Chippawa and Fonthill.

[5] Includes the following Census Sub-Divisions (1981 and historical): Glenmore, Guisachan, Peachland, Central Okanagan Sub-Divisions A and B, Kelowna, Coldstream, North Okanagan Sub-Division B, Vernon, Penticton, Summerland, Okanagan-Similkameen Sub-Divisions A and B, Keremos, Oliver and Osoyoos.

**Sources:**
Statistics Canada, 1971 Census of Population, *Population: Census Sub-Divisions (historical)*.
Statistics Canada, 1981 Census of Population, *Population: Geographic Distributions* (for Nova Scotia, Québec, Ontario and British Columbia), Catalogues 93-903, 93-905, 93-906 and 93-910.
Environment Canada, Lands Directorate.

Table 5.1.8
**Major Fruitlands: Area and Number of Trees[1], 1961 and 1981**

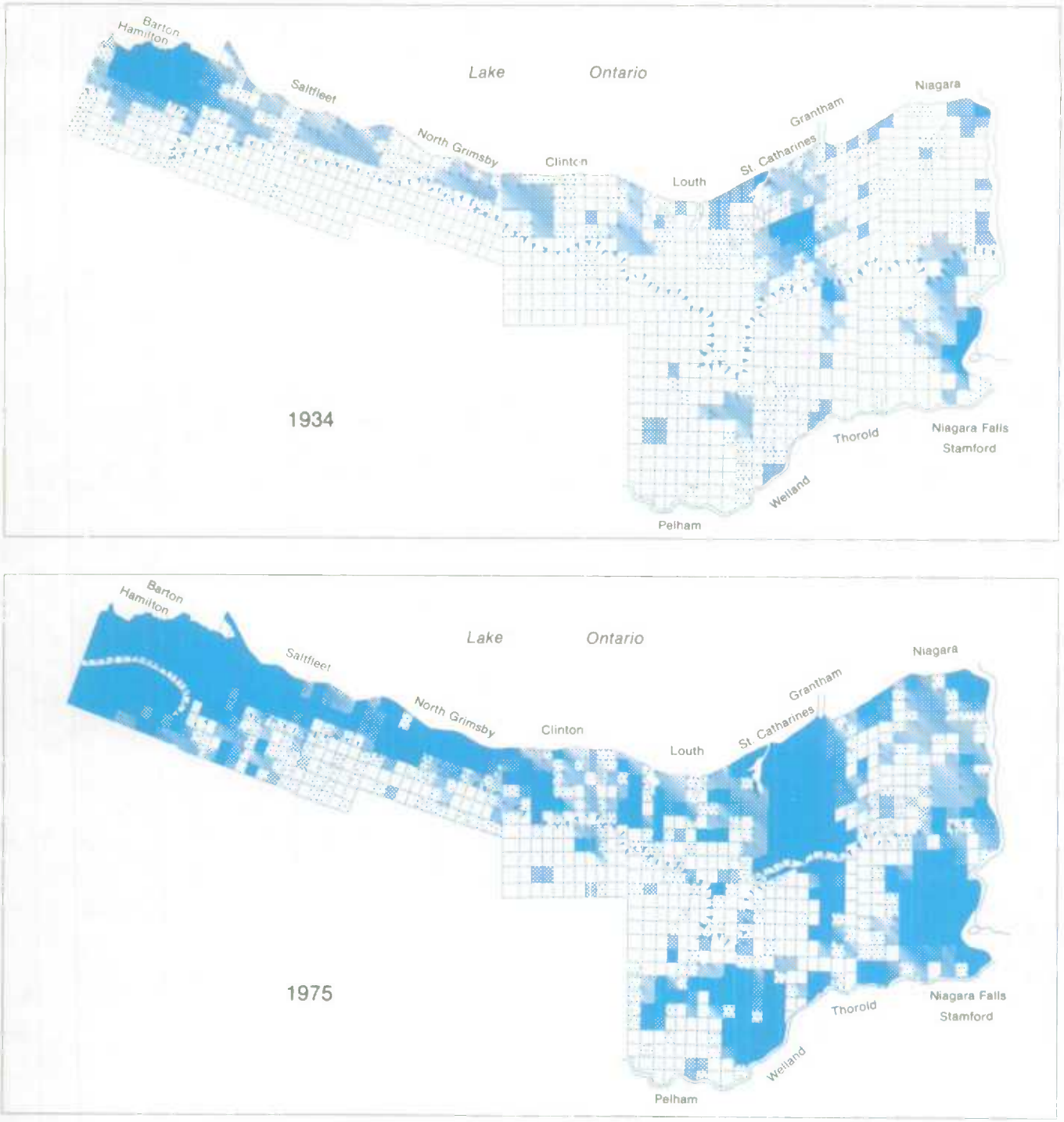
| | Annapolis[2] | | Montréal Area[3] | | Niagara[4] | | Okanagan[5] | | Canada Total | | Major Fruitlands Total as Percent of Canada Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1961 | 1981 | 1961 | 1981 | 1961 | 1981 | 1961 | 1981 | 1961 | 1981 | 1961 | 1981 |
| **Area:** | hectares | | | | | | | | | | percent | |
| Apple Trees | .. | 4 328 | .. | 6 444 | .. | 1 370 | .. | 7 183 | .. | 34 112 | .. | 56.7 |
| Other Tender Fruit Trees[6] | .. | 372 | .. | 32 | .. | 6 242 | .. | 3 244 | .. | 12 414 | .. | 79.7 |
| **All Fruit Trees** | 5 165 | 4 700 | 6 496 | 6 476 | 11 630 | 7 612 | 13 203 | 10 427 | 59 958 | 46 526 | 60.9 | 62.8 |
| Grapes | 1 | 6 | 1 | 5 | 8 820 | 8 853 | 250 | 1 191 | 9 235 | 10 386 | 98.2 | 96.8 |
| **Number of Trees:** | number of trees | | | | | | | | | | percent | |
| Apples | 572 104 | 880 273 | 782 725 | 1 247 002 | 153 747 | 439 135 | 1 298 413 | 2 834 691 | 4 796 955 | 8 811 456 | 58.5 | 61.3 |
| Other Tender Fruits[6] | 67 744 | 79 935 | 4 114 | 5 408 | 2 426 750 | 1 814 007 | 1 148 671 | 1 007 422 | 4 552 778 | 3 414 251 | 80.1 | 85.1 |

[1] Data are for Census Divisions which contain the major fruitland areas.
[2] Includes the following Census Divisions: Annapolis, Hants and Kings.
[3] Includes the following Census Divisions: Deux-Montagnes, Huntington, Missisquoi and Rouville.
[4] Includes the following Census Divisions: Niagara Region (formerly Lincoln and Welland), Hamilton-Wentworth Region (formerly Wentworth).
[5] Includes the following Census Divisions for 1981: Central Okanagan, North Okanagan, Okanagan-Similkameen. The 1961 figures are for Census Division 3 which includes an area not covered in the 1981 figures (Kootenay Boundary, Sub-Division B). However, little fruit is grown in this area due to its geographic characteristics.
[6] Tender fruit includes peaches, pears, apricots, cherries and plums.

**Sources:**
Statistics Canada, 1981 Census of Agriculture, *Horticultural Crops*, Catalogue 96-913, 1982.
Statistics Canada, 1961 Census of Agriculture, *Agriculture* for Nova Scotia, Québec, Ontario, British Columbia and Canada, Catalogues 96-530, 96-533, 96-535, 96-536 and 96-540.

Map 5.1.9

## Urbanization in the Niagara Fruitbelt, 1934 and 1975




**Source:**
R.R. Krueger, "Urbanization of the Niagara Fruitbelt," *The Canadian Geographer*, Volume 22, Number 3, 1978.

Map 5.1.10

## Urbanization in the Okanagan Valley, 1966 and 1981


**Source:**
R.R. Krueger and N.G. Maguire, "Changing Urban and Fruit Growing Patterns in the Okanagan Valley, B.C.," *Environments*, Volume 16, Number 1, 1984.

# 5.2
# Restructuring of Water Systems

Table 5.2.1
## Large Dams[1] by Major Drainage Area, 1982

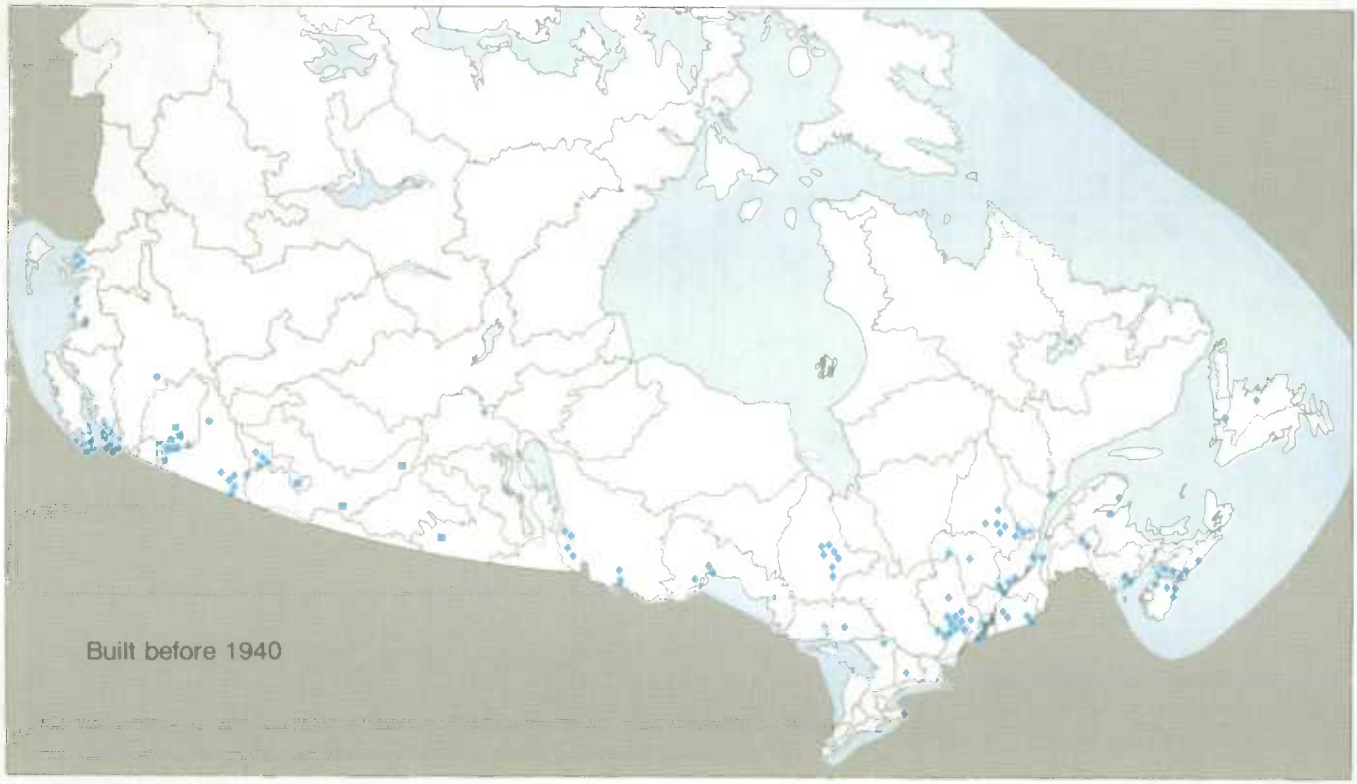
| Major Drainage Area | Primary Purpose of Dam[2] | | | | |
|---|---|---|---|---|---|
| | Irrigation | Hydro Power | Water Supply | Water Control, Navigation, Recreation | Total |
| **Atlantic Ocean Basin** | **1** | **236** | **8** | **17** | **262** |
| Atlantic Ocean Coastal | 0 | 54[3] | 0 | 0 | 54[3] |
| Newfoundland | 0 | 45[3] | 0 | 0 | 45[3] |
| Nova Scotia | 0 | 9 | 0 | 0 | 9 |
| Gulf of St. Lawrence Coastal | 0 | 47[4] | 4 | 1 | 52[4] |
| Newfoundland | 0 | 11 | 0 | 0 | 11 |
| Prince Edward Island | 0 | 0 | 0 | 0 | 0 |
| Nova Scotia | 0 | 7 | 2 | 0 | 9 |
| New Brunswick | 0 | 0 | 2 | 0 | 2 |
| Québec | 0 | 29[4] | 0 | 1 | 30[4] |
| Bay of Fundy Coastal-Saint John River | 1 | 23 | 1 | 3 | 28 |
| Nova Scotia | 1 | 13 | 0 | 1 | 15 |
| New Brunswick | 0 | 10 | 1 | 2 | 13 |
| Québec | 0 | 0 | 0 | 0 | 0 |
| St. Lawrence River | 0 | 46[5] | 1 | 4 | 51[5] |
| Québec | 0 | 44[5] | 1 | 3 | 48[5] |
| Ontario | 0 | 2 | 0 | 1 | 3[5] |
| Ottawa River | 0 | 39 | 0 | 0 | 39 |
| Québec | 0 | 24 | 0 | 0 | 24 |
| Ontario | 0 | 15 | 0 | 0 | 15 |
| Lake Ontario Shore | 0 | 4 | 0 | 3 | 7 |
| Lake Erie and Lake St. Clair Shore | 0 | 0 | 1 | 5 | 6 |
| Lake Huron Shore | 0 | 11 | 1 | 1 | 13 |
| Lake Superior Shore | 0 | 12 | 0 | 0 | 12 |
| **Hudson Bay and Ungava Bay Basin** | **41** | **144** | **14** | **13** | **212** |
| Hudson Bay and Ungava Bay Coastal | 0 | 99 | 0 | 0 | 99 |
| Québec | 0 | 81[6] | 0 | 0 | 81[6] |
| Ontario | 0 | 12 | 0 | 0 | 12 |
| Manitoba | 0 | 4 | 0 | 0 | 4 |
| Saskatchewan | 0 | 2 | 0 | 0 | 2 |
| Alberta | 0 | 0 | 0 | 0 | 0 |
| Northwest Territories | 0 | 0 | 0 | 0 | 0 |
| Nelson River | 0 | 14[7] | 0 | 0 | 14[7] |
| Lake Winnipeg Shore | 0 | 11 | 3 | 6 | 20 |
| Ontario | 0 | 5 | 0 | 4 | 9 |
| Manitoba | 0 | 6 | 3 | 2 | 11 |
| Saskatchewan | 0 | 0 | 0 | 0 | 0 |
| Assiniboine River | 11 | 0 | 6 | 3 | 20 |
| Manitoba | 1 | 0 | 1 | 2 | 4 |
| Saskatchewan | 10 | 0 | 5 | 1 | 16 |
| Saskatchewan River | 30 | 20 | 5 | 4 | 59 |
| Manitoba | 0 | 1 | 0 | 0 | 1 |
| Saskatchewan | 9 | 1 | 2 | 1 | 13 |
| Alberta | 21 | 18 | 3 | 3 | 45 |
| **Arctic Ocean Basin** | **0** | **7** | **0** | **0** | **7** |
| Mackenzie River | 0 | 7 | 0 | 0 | 7 |
| Saskatchewan | 0 | 1 | 0 | 0 | 1 |
| Alberta | 0 | 1 | 0 | 0 | 1 |
| British Columbia | 0 | 2 | 0 | 0 | 2 |
| Yukon | 0 | 0 | 0 | 0 | 0 |
| Northwest Territories | 0 | 3 | 0 | 0 | 3 |
| Arctic Ocean Coastal | 0 | 0 | 0 | 0 | 0 |
| **Pacific Ocean Basin** | **13** | **53** | **23** | **1** | **90** |
| Columbia River | 12 | 17 | 3 | 0 | 32 |
| Fraser River | 1 | 11 | 2 | 0 | 14 |
| Yukon River | 0 | 2 | 0 | 0 | 2 |
| British Columbia | 0 | 0 | 0 | 0 | 0 |
| Yukon | 0 | 2 | 0 | 0 | 2 |
| Pacific Ocean, North Coastal | 0 | 4 | 4 | 0 | 8 |
| British Columbia | 0 | 4 | 4 | 0 | 8 |
| Yukon | 0 | 0 | 0 | 0 | 0 |
| Pacific Ocean, South Coastal | 0 | 19 | 14 | 1 | 34 |
| **Gulf of Mexico Basin** | **1** | **0** | **0** | **1** | **2** |
| Missouri River | 1 | 0 | 0 | 1 | 2 |
| Saskatchewan | 1 | 0 | 0 | 1 | 2 |
| Alberta | 0 | 0 | 0 | 0 | 0 |
| **Canada** | **56** | **440** | **45** | **32** | **573** |

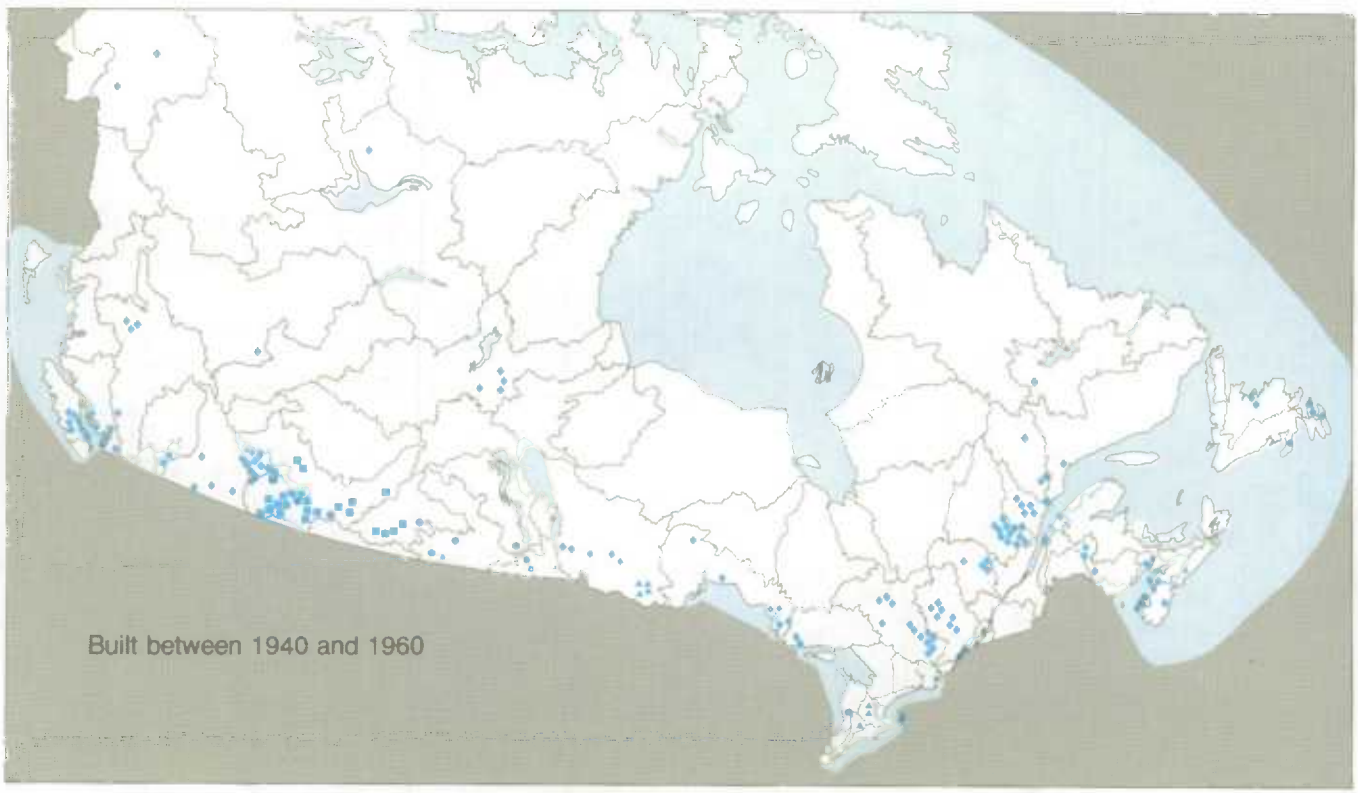
Table 5.2.1
## Large Dams[1] by Major Drainage Area, 1982 (concluded)

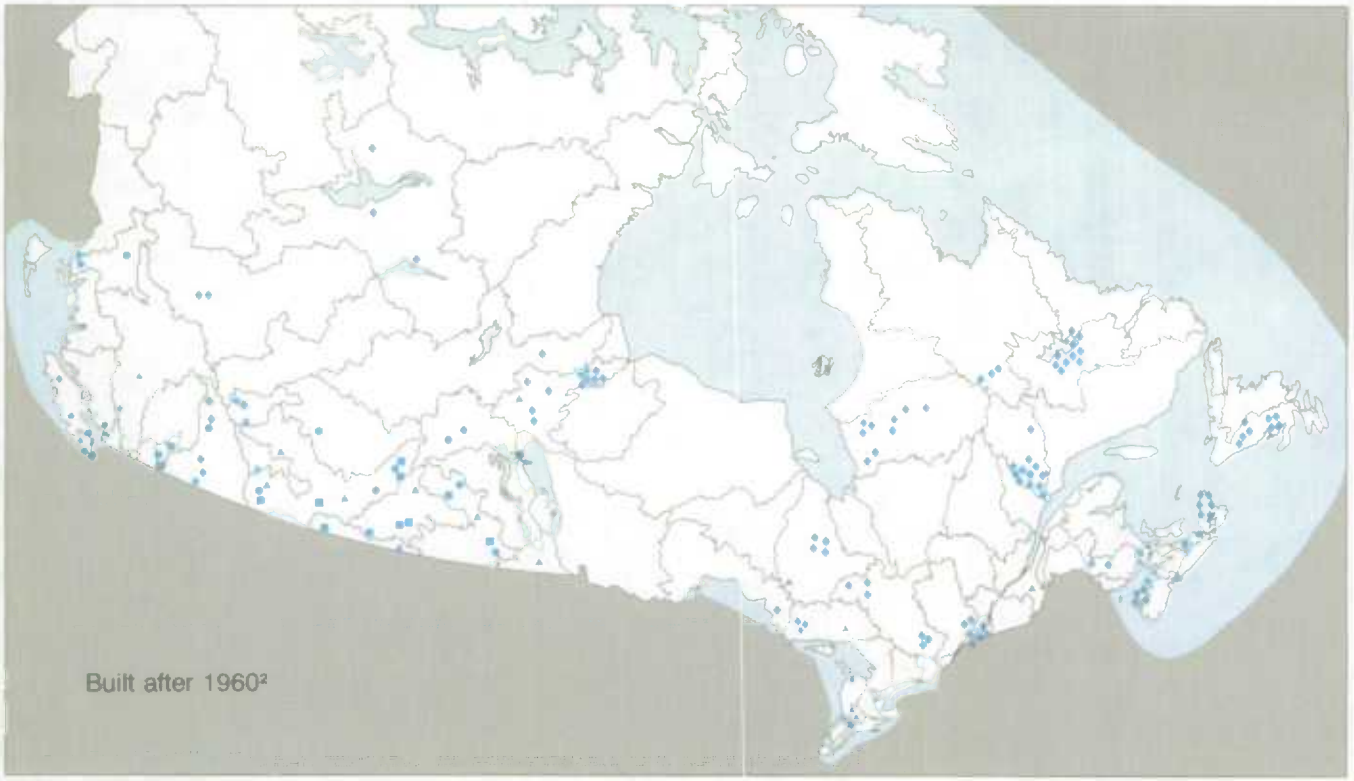
[1] Large dams are defined by the International Commission on Large Dams as any dam higher than 15 metres, as well as any dams between 10 and 15 metres in height, provided one of the following conditions is met: (a) length of crest greater than 500 metres, (b) reservoir capacity greater than 1 million cubic metres, (c) maximum discharge greater than 2,000 cubic metres per second. In addition a dam may be included if it has especially difficult foundation problems or is of unusual design.
[2] Only the primary purpose of the dam is used here for classification. Some dams, however, may serve several purposes; for example, a hydro dam may also control water levels in a supply reservoir.
[3] Thirty-six of these dams are components of the Churchill Falls Power Project.
[4] Six of these dams are components of the Outardes 4 Power Project; some of the other dams are components of projects with multiple dams.
[5] Six of these dams are components of the Isle Maligne Power Project.
[6] These are all component dams and dykes of the James Bay Power Project.
[7] Seven of these dams are components of the Kettle Rapids Power Project; many of the other dams are components of the Nelson River Power Project.

**Source:**
Canadian National Committee, International Commission on Large Dams, *Register of Dams in Canada*, 1982.

Map 5.2.2
**Large Dam Construction**[1]






[1] Large dams are defined by the International Commission on Large Dams, as any dam higher than 15 metres, as well as any dams between 10 and 15 metres in height, provided one of the following conditions is met: (a) length of crest >500 metres, (b) reservoir capacity >1 million cubic metres, (c) maximum discharge >2 000 cubic metres per second; in addition a dam may be included if it has specially difficult foundation problems, or it is of unusual design.

[2] Not all minor dams and side dykes are illustrated for major projects with multiple dams and dykes. These include the Churchill Falls Project, the James Bay Project, the Nelson River Project and the Manicouagan Project.

**Source:**
Canadian National Committee, International Commission on Large Dams, *Register of Dams in Canada*, 1982.

- Water supply
- Water control, navigation, recreation
- Irrigation
- Hydro-power

315 0 315 630 kilometres

Table 5.2.3
**Major Dams[1] by Ecozone, 1984**

| Ecozone | Dam | Province | Drainage Basin and Code | Volume of Dam | Length of Crest | Height above Lowest Foundation | Type | Date of First Power | Generating Capacity |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 000's cubic metres | metres | metres | | | megawatts |
| Boreal Shield | Manicouagan | Québec | Manicouagan(110.2) | 9 175 | 366 | 108 | Earth | | |
| | Outardes 4,#1 | Québec | Outardes(110.2) | 7 533 | 649 | 122 | Rockfill | 1969 | 1 183 |
| | Outardes 4,#2 | Québec | Outardes(110.2) | 4 688 | 726 | 108 | Rockfill | 1969 | 632 |
| | Manicouagan 5 | Québec | Manicouagan(110.2) | 2 255 | 1 314 | 214 | Multi-arch | 1970 | 1 292 |
| | Lower Notch | Ontario | Upper Ottawa(151) | 1 817 | 1 969 | 132 | Earth/ Gravity | 1938 | 228 |
| | Abitibi Canyon | Ontario | Moose(210.3) | 710 | 259 | 106 | Rockfill | 1933 | 234 |
| Prairie | Gardiner | Saskatchewan | South Saskatchewan(253) | 65 440 | 5 090 | 69 | Earth | 1968 | 168 |
| Boreal Plain | Big Horn | Alberta | Upper North Saskatchewan(251) | 4 330 | 472 | 150 | Earth | 1972 | 118 |
| Montane Cordillera | Mica | British Columbia | Columbia(400) | 32 111 | 792 | 242 | Earth | 1976 | 1 736 |
| | NorthRevelstoke | British Columbia | Columbia(400) | 13 000 | 1 620 | 153 | Gravity/ Earth | 1984 | 1 843 |
| | Kenney | British Columbia | Upper Fraser(410) | 3 071 | 457 | 104 | Rockfill | 1954 | 813 |
| Boreal Cordillera | Bennett | British Columbia | Peace(302) | 43 733 | 2 042 | 183 | Earth | 1968 | 2 416 |
| Taiga Shield | La Grande 2 | Québec | La Grande-Eastmain(200.3) | 23 192 | 2 826 | 168 | Rockfill | 1979 | 5 328 |
| | La Grande 4 | Québec | La Grande-Eastmain(200.3) | 18 800 | 3 780 | 125 | Earth/ Rockfill | 1984 | 2 637 |
| | La Grande 3 | Québec | La Grande-Eastmain(200.3) | 13 511 | 2 156 | 93 | Earth | 1982 | 1 920 |

[1] Dams presented here are the largest in Canada in terms of volume and/or height.

**Sources:**
Canadian National Committee, International Commission on Large Dams, *Register of Dams in Canada*, 1982.
Statistics Canada, *Electric Power Statistics, Volume III*, Catalogue 57-206, 1983.

Table 5.2.4
## Major Reservoirs[1] by Ecozone, 1984

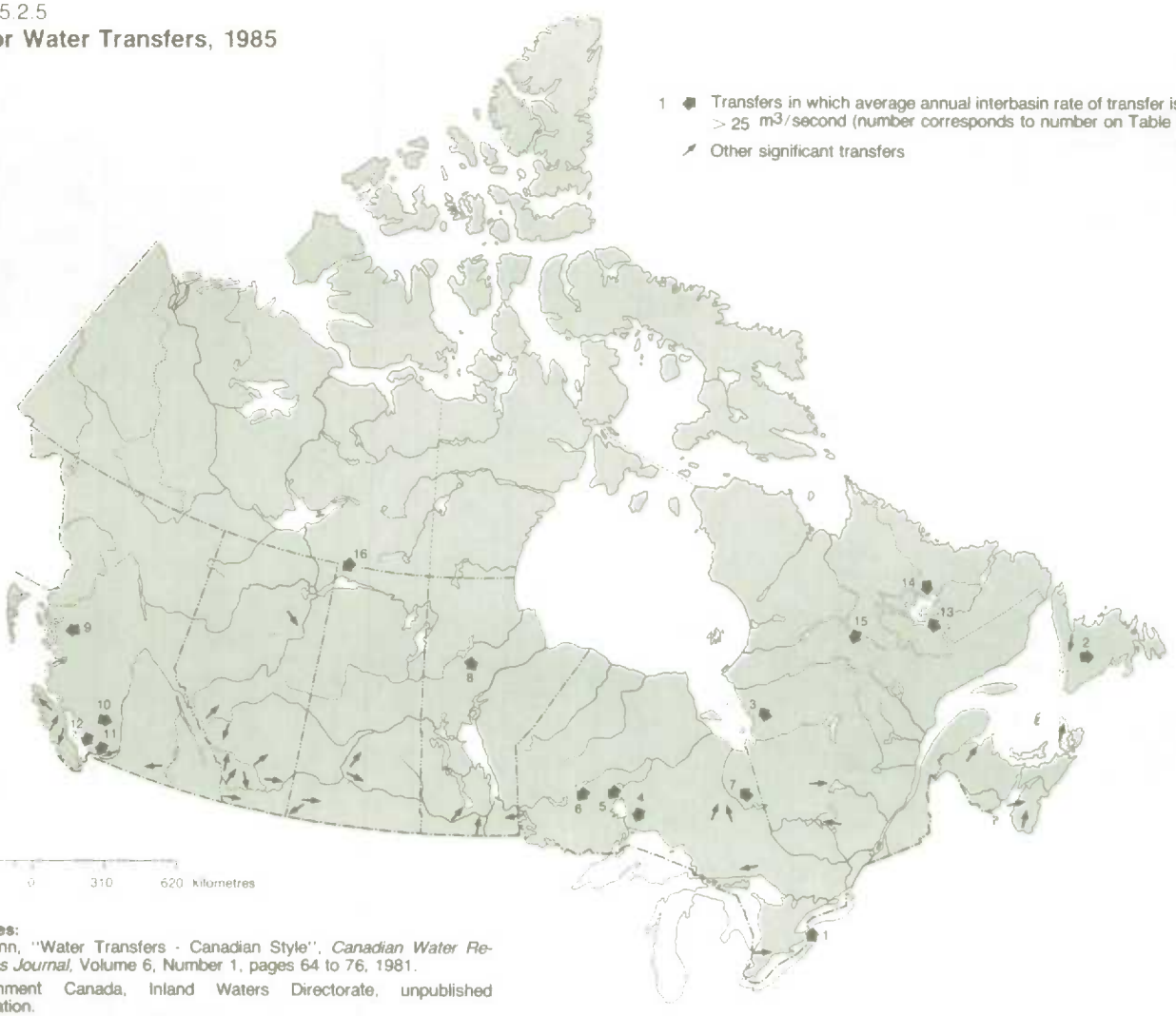
| Ecozone | Reservoir | Project(s) | Province | River(s) Dammed or Diverted | Total Surface Area | Area of Land Flooded | Date of First Hydropower | Generating Capacity |
|---|---|---|---|---|---|---|---|---|
| | | | | | square kilometres | | | megawatts |
| Atlantic Maritime | Mactaquac | Mactaquac | New Brunswick | Saint John | 84 | 61 | 1968 | 637 |
| Mixed-Wood Plain | Lake St. Lawrence | R.H. Saunders | Ontario | St. Lawrence | 137 | 91 | 1958 | 912 |
| Boreal Shield | Meelpaeg | Bay d'Espoir | Newfoundland | Grey | 316 | 111 | 1967 | 613 |
| | Long Pond | Bay d'Espoir | Newfoundland | Salmon | 186 | 130 | [2] | [2] |
| | Victoria | Bay d'Espoir | Newfoundland | Victoria | 140 | 78 | [2] | [2] |
| | Cabonga | Gatineau Projects[3] | Québec | Gatineau | 518 | 212 | 1927 | 453 |
| | Baskatong | Gatineau Projects[3] | Québec | Gatineau | 295 | 155 | [2] | [2] |
| | Matawin | Grand'Mère | Québec | Matawin | 130 | 117 | 1930[4] | 148 |
| | Gouin | Rapide Blanc | Québec | St. Maurice | 1 502 | 961 | 1934 | 184 |
| | Kempt | Rapide Blanc | Québec | Manouane | 166 | .. | [2] | [2] |
| | Peribonca | Peribonca Projects[5] | Québec | Peribonca | 105 | .. | 1942 | 1 117 |
| | Manouane | Peribonca Projects | Québec | Manouane | 190 | .. | [2] | [2] |
| | Temiscamingue | Otto Holden | Québec/Ontario | Ottawa | 316 | .. | 1952 | 205 |
| | Kipawa | Otto Holden | Québec | Kipawa | 274 | .. | 1952 | [2] |
| | Pipmuacan | Bersimis 1 | Québec | Betsiamites | 792 | 376 | 1956 | 912 |
| | Manic 2 | Manic 2 | Québec | Manicouagan | 111 | .. | 1965 | 1 015 |
| | Lac-Ste-Anne | Manic 2 | Québec | Toulnustouc | 251 | 146 | [2] | [2] |
| | Lac-des-Quinze | Rapide-des-Iles | Québec | Ottawa | 407 | .. | 1966 | 146 |
| | Dozois | Rapide-des-Iles | Québec | Ottawa | 319 | 197 | [2] | [2] |
| | Decelles | Rapide-des-Iles | Québec | Ottawa | 236 | .. | [2] | [2] |
| | Victoria | Rapide-des-Iles | Québec | Ottawa | 148 | .. | [2] | [2] |
| | Outardes 4 | Outardes 4 | Québec | Outardes | 653 | 601 | 1969 | 632 |
| | Manicouagan | Manic 5 | Québec | Manicouagan | 1 950 | 1 574 | 1970 | 1 292 |
| | Kelsey | Kelsey | Manitoba | Nelson | 706 | 124 | 1960 | 236 |
| | Stevens Lake | Kettle Rapids | Manitoba | Nelson | 337 | 236 | 1970 | 1 224 |
| | Southern Indian Lake | Nelson River - Missi Falls | Manitoba | Churchill | 2 391 | 414 | 1975[4] | 980[6] |
| | Notigi | Nelson River - Notigi Central | Manitoba | Rat, Churchill | 584 | 431 | 1975[4] | [2] |
| | West Nelson Channel | Jenpeg | Manitoba | Nelson | .. | 76 | 1976 | 186 |
| Prairie | Lake Diefenbaker | Coteau Creek | Saskatchewan | South Saskatchewan | 430 | 186 | 1968 | 168 |
| Boreal Plain | Cedar Lake | Grand Rapids | Manitoba | Saskatchewan | 3 493 | 1 372 | 1965 | 437 |
| | Tobin Lake | Squaw Rapids | Saskatchewan | Saskatchewan | 300 | 246 | 1963 | 280 |
| | Bighorn | Bighorn | Alberta | North Saskatchewan | 62 | 60 | 1972 | 118 |
| Montane Cordillera | Ootsa Lake | Kemano | British Columbia | Nechako | .. | 453 | 1954 | 813 |
| | Arrow Lakes | Arrow | British Columbia | Columbia | .. | 103 | 1968[4] | [2] [7] |
| | McNaughton Lake | Mica Creek | British Columbia | Columbia | 445 | 425 | 1976 | 1 736 |
| | Lake Koocanusa | Libby | British Columbia | Kootenay | 73 | 60 | 1976 | [7] |
| Boreal Cordillera | Williston Lake | G.M. Shrum | British Columbia | Peace | .. | 1 683 | 1968 | 2 416 |
| Taiga Shield | Ossokmanuan | Twin Falls | Newfoundland | Unknown River | 950 | 238 | 1962 | 234 |
| | Smallwood | Churchill Falls | Newfoundland | Churchill, Naskaupi, Kanairiktok | 5 696 | 2 848 | 1971 | 5 225 |
| | LG2 | LG2 | Québec | La Grande | 2 836 | .. | 1979 | 5 328 |
| | Opinaca | LG2 | Québec | Opinaca, Eastmain | 1 036 | 738 | [2] | [2] |
| | LG3 | LG3 | Québec | La Grande | 1 865 | .. | 1982 | 1 920 |
| | LG4 | LG4 | Québec | La Grande | .. | .. | 1984 | 2 637 |
| | Caniapiscau | LG4 | Québec | Caniapiscau | 4 299 | .. | [2] | [2] |

[1] Major reservoirs are defined here as those in which more than 60 square kilometres of land was flooded. In some cases information is not available on area flooded, however information from the sources indicated large scale flooding took place.
[2] Part of a multi-reservoir project; see related listings for the project for power details.
[3] Corbeau, Paugan, Chelsea, Rapide Farmers.
[4] Date of reservoir construction.
[5] Chute a la Savanne, Chute des Passes, Chute du Diable.
[6] Long Spruce.
[7] Powerhouse in U.S.A..

**Sources:**
I.E. Efford, "Assessment of the Impact of Hydro Dams," *Fisheries Research Board Journal*, Volume 32, 1975.
Environment Canada, Inland Waters Directorate, unpublished information.
Société d'énergie de la Baie James, Direction Environnement, *Reseau de surveillance écologique du Complexe La Grande, 1980*, Montréal, 1981.
R.A. Bodaly, R.E. Hecky and R.J.P. Fudge, "Increases in Fish Mercury Levels in Lakes Flooded by the Churchill River Diversion, Northern Manitoba," *Canadian Journal of Fisheries and Aquatic Sciences*, Volume 41, Number 4, 1984.

Map 5.2.5

## Major Water Transfers, 1985




**Sources:**
F. Quinn, "Water Transfers - Canadian Style", *Canadian Water Resources Journal*, Volume 6, Number 1, pages 64 to 76, 1981.

Environment Canada, Inland Waters Directorate, unpublished information.

Table 5.2.6
## Major Water Transfers, 1985

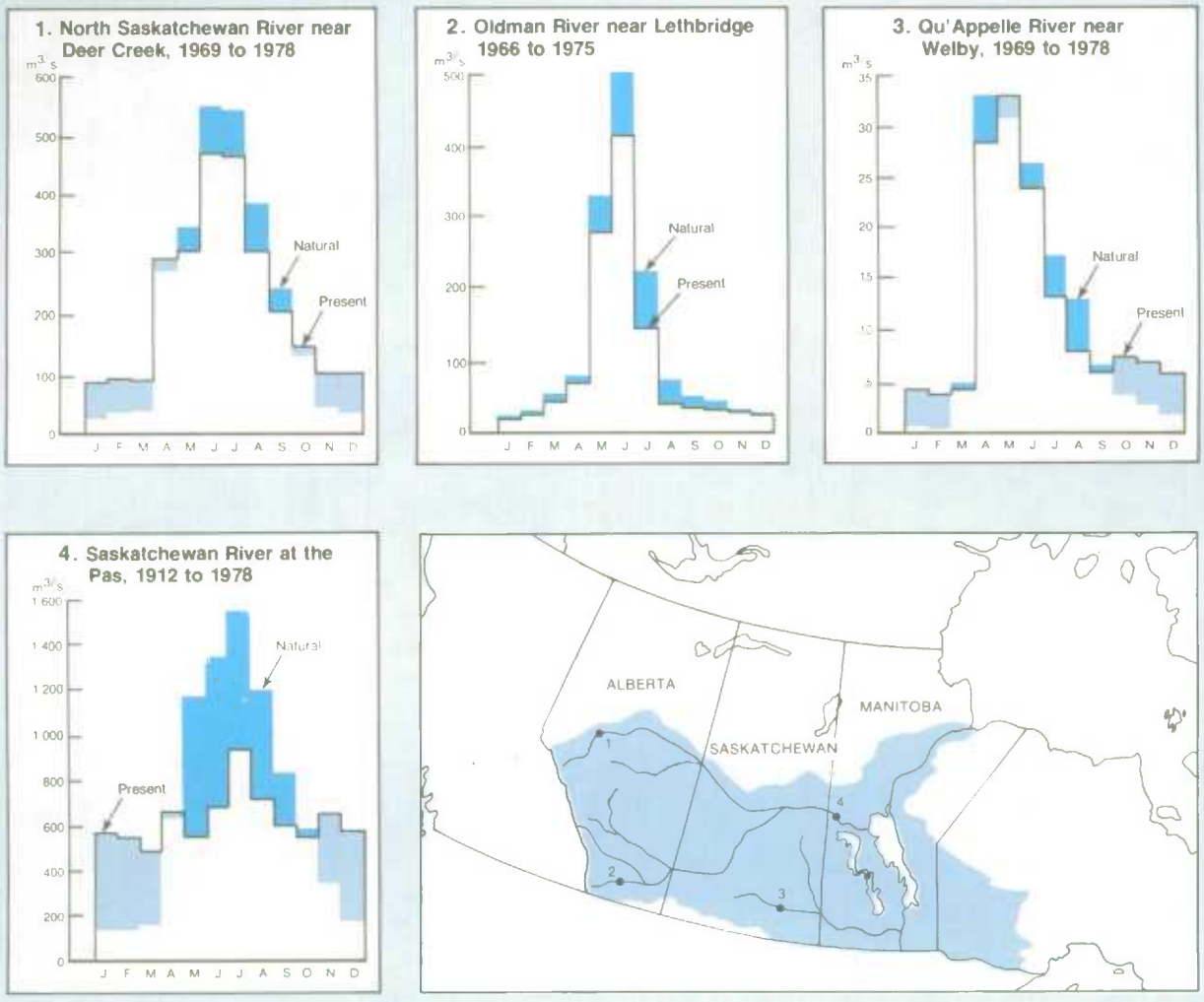
| Number on Map | Ecozone(s) | Province | Contributing Waterbody (code) | Receiving Waterbody (code) | Average Annual Transfer Rate | Uses | Date Operational |
|---|---|---|---|---|---|---|---|
| | | | | | cubic metres/second[1] | | |
| 1. | Mixed-Wood Plain | Ontario | Lake Erie(165) | Lake Ontario(165) | 250 | navigation, hydro | 1829 |
| 2. | Boreal Shield | Newfoundland | Victoria, Whitebear, Grey and Salmon Rivers(101,111) | Northwest Brook (Bay d'Espoir)(111) | 185 | hydro | 1969 |
| 3. | Boreal Shield to Taiga Shield | Québec | Eastmain, Opinaca Rivers(200.3) | La Grande River(200.3) | 798 | hydro | 1980 |
| 4. | Boreal Shield to Mixed-Wood Plain | Ontario | Long Lake (Albany River)(210.4) | Lake Superior(190) | 38 | hydro, logging | 1939 |
| 5. | Boreal Shield to Mixed-Wood Plain | Ontario | Ogoki River (Albany River)(210.4) | Lake Nipigon(190) | 120 | hydro | 1943 |
| 6. | Boreal Shield | Ontario | Lake St. Joseph(Albany River)(210.4) | Root River(230) | 86 | hydro | 1957 |
| 7. | Boreal Shield | Ontario | Little Abitibi River(210.3) | Abitibi River(210.3) | 40 | hydro | 1963 |
| 8. | Boreal Shield | Manitoba | Churchill River(211.3) | Rat, Burntwood Rivers(220) | 752 | hydro | 1976 |
| 9. | Montane Cordillera to Pacific Maritime | British Columbia | Nechako River(410) | Kemano River(431.1) | 102 | hydro | 1952 |
| 10. | Montane Cordillera | British Columbia | Bridge River(410) | Seton Lake(410) | 92 | hydro | 1959 |
| 11. | Pacific Maritime | British Columbia | Coquitlam Lake(412) | Buntzen Lake(432.1) | 28 | hydro | 1912 |
| 12. | Pacific Maritime | British Columbia | Cheakamus River(432.1) | Squamish River(432.1) | 37 | hydro | 1957 |
| 13. | Taiga Shield | Newfoundland | Julian, Unknown Rivers(100.2) | Churchill River(100.2) | 196 | hydro | 1971 |
| 14. | Taiga Shield | Newfoundland | Naskaupi, Kanairiktok Rivers(100.2) | Churchill River(100.2) | 330 | hydro | 1971 |
| 15. | Taiga Shield | Québec | Caniapiscau River(200.2) | La Grande River(200.3) | 771 | hydro | 1983 |
| 16. | Taiga Shield | Québec | Lake Frégate(200.3) | La Grande River(200.3) | 31 | hydro | 1982 |
| 17. | Taiga Shield | Saskatchewan | Tazin Lake(300.2) | Lake Athabasca(300.2) | 25 | hydro | 1958 |

[1] Estimates.

**Sources:**
F. Quinn, "Water Transfers - Canadian Style" *Canadian Water Resources Journal*, Volume 6, Number 1, pages 64 to 76, 1981.
Environment Canada, Inland Waters Directorate, unpublished information.

Technical Box 5.2.7

## Selected Streamflow Alterations in the Saskatchewan-Nelson Basins[1,2]




[1] It should be noted that the vertical axes (streamflow) are not uniform from one figure to another as the intent is to compare variations in monthly flow patterns rather than to compare actual flow levels from one site to another.

[2] Natural flows for selected study periods were calculated by removing the effects on flow of man-made diversions, storage and consumptive uses from recorded flow. Present use flows are shown for Figure 4. These were estimated by calculating what streamflow would have been during the same period had the present level of development and use been in existence for that entire period. In the case of Figures 1, 2 and 3, estimates of present use flows were not available and recorded flows for recent years were used to approximate present use flow conditions.

**Source:**
Prairie Provinces Water Board, *Water Demand Study, Historical and Current Water Uses in the Saskatchewan-Nelson Basin*, Regina, 1982.

**Note:**
The above graphs illustrate the effect of environmental restructuring on natural streamflow levels in the Saskatchewan-Nelson Basins. Streamflow is regulated through the use of dams and associated storage reservoirs; the capacity of the latter relative to natural flow rates largely determines stream control. The degree to which these flows are modified depends on the use made of the water and the natural hydrological cycles of the respective basins. In the case of hydro power generation, municipal supply and flood control, the tendency is to modify the extreme natural flows by reducing the peak levels (April-June) and augmenting the low autumn-winter flows. In agricultural irrigation systems, there is a tendency towards reduced flows throughout the year due to water loss to plants, soil and evaporation. Figure 1, which illustrates stream flow at a point downstream from the Bighorn and Brazeau Reservoirs, is typical of the effect of hydro power generating projects where even flow through the penstocks is required throughout the year. Figure 2 illustrates stream flow modification in an agricultural region of annual water deficits. During the growing season a large volume of water is withdrawn for irrigation. Due to the general scarcity of water, there is a need to contain practically all the water not used in irrigation in the reservoir throughout the year (except during the spring freshet). This leaves little, if any, surplus to augment the stream flow during the low (natural) flow periods. Figure 3 illustrates multipurpose streamflow control for municipal consumption and recreation. In this case water is directed from the Saskatchewan River at Lake Diefenbaker to the Qu'Appelle System and impounded at Buffalo Pound Lake. Therefore water is actually being added to the system. Figure 4 shows the relationship between natural and controlled flows near the outflow of the Saskatchewan River. The controlled flows are determined by many impoundments and flow modications upstream.

Table 5.2.8
## Water Withdrawl and Consumption by Sector, 1981

| Sector | Water Intake | Recirculation | Gross Water Use[1] | Consumption | Discharge[2] |
|---|---|---|---|---|---|
| | billions of cubic metres | | | | |
| Agriculture | 3.1 | | 3.1 | 2.4 | 0.7 |
| Mineral Extraction | 0.8 | 2.8 | 3.6 | 0.2 | 0.7 |
| Manufacturing | 10.2 | 11.3 | 21.5 | 0.5 | 9.7 |
| Power Generation | 19.3 | 1.9 | 21.2 | 0.2 | 19.2 |
| Municipal | 4.4 | 0.0 | 4.4 | 0.6 | 3.7 |
| Rural Domestic | 0.3 | 0.0 | 0.3 | 0.0 | 0.3 |
| **Canada** | **38.1** | **16.0** | **54.1** | **3.9** | **34.3** |

[1] Gross water use equals new water intake plus recycled water.
[2] Discharge equals water intake minus consumption.

**Source:**
Environment Canada, Inland Waters Directorate, unpublished data.

Table 5.2.9
## Water Withdrawal and Consumption, by Major Drainage Area, 1981

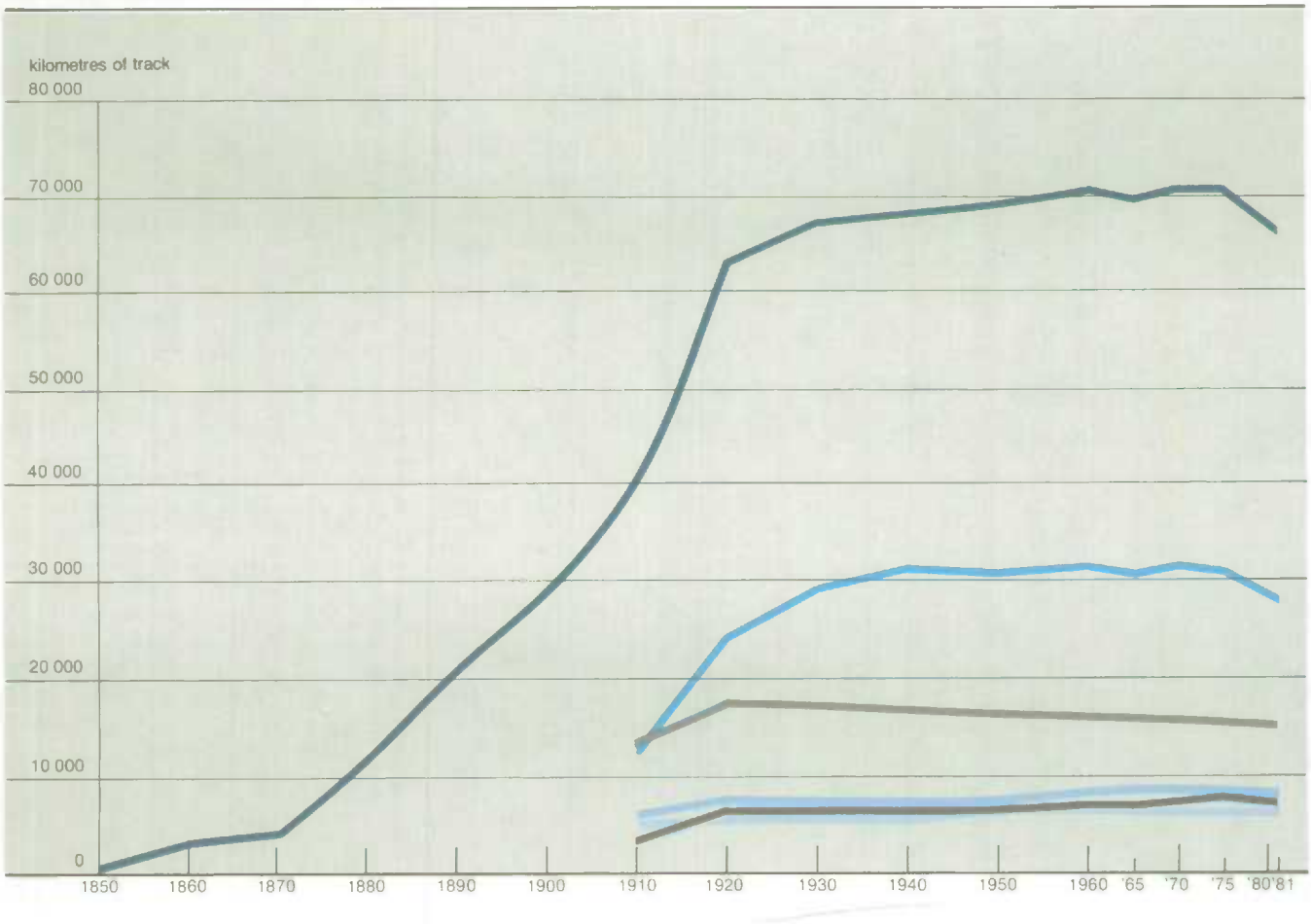
| Major Drainage Area | Water Withdrawals | | | | | | Water Consumption | Percentage of Water Consumption to Water Withdrawal |
|---|---|---|---|---|---|---|---|---|
| | Agriculture | Mining | Manufacturing | Power | Municipal | Total | | |
| | millions of cubic metres | | | | | | | percent |
| Atlantic Ocean Coastal[1] | 17 | 90 | 842 | 1 625 | 382 | 2 956 | 140 | 4.7 |
| St. Lawrence River[2] | 65 | 3 | 1 674 | 308 | 1 207 | 3 257 | 343 | 10.5 |
| Ottawa River | 28 | 61 | 352 | 0 | 182 | 623 | 77 | 12.4 |
| Lake Ontario Shore[3] | 42 | 1 | 1 288 | 4 730 | 885 | 6 946 | 231 | 3.3 |
| Lake Erie and Lake St Clair Shore | 46 | 11 | 1 363 | 4 608 | 272 | 6 300 | 218 | 3.5 |
| Lake Huron Shore | 38 | 35 | 1 299 | 5 300 | 120 | 6 792 | 74 | 1.1 |
| Lake Superior Shore | 3 | 13 | 185 | 292 | 26 | 519 | 9 | 1.7 |
| Hudson Bay and Ungava Bay Coastal[4] | 0 | 56 | 175 | 0 | 15 | 246 | 11 | 4.5 |
| Nelson River | 0 | 3 | 45 | 0 | 3 | 51 | 0 | 0.0 |
| Lake Winnipeg Shore | 41 | 29 | 128 | 0 | 124 | 322 | 55 | 17.1 |
| Assiniboine River | 171 | 14 | 7 | 579 | 52 | 823 | 175 | 21.3 |
| Saskatchewan River | 2 109 | 65 | 223 | 1 157 | 402 | 3 956 | 1 878 | 47.5 |
| Mackenzie River | 0 | 115 | 132 | 4 | 10 | 261 | 143 | 54.8 |
| Yukon River | 17 | 10 | 0 | 0 | 5 | 32 | 0 | 0.0 |
| Columbia River | 270 | 31 | 166 | 0 | 65 | 533 | 274 | 51.4 |
| Fraser River | 258 | 51 | 248 | 0 | 380 | 937 | 219 | 23.4 |
| Pacific Ocean Coastal[5] | 0 | 32 | 1 633 | 360 | 102 | 2 127 | 69 | 3.2 |
| Missouri River | .. | .. | .. | .. | .. | .. | .. | .. |

[1] Here includes Atlantic Ocean Coastal, Gulf of St. Lawrence Coastal, and Bay of Fundy Coastal-Saint John River; also includes the Saguenay Basin.
[2] Here does not include Saguenay Basin and Upper St. Lawrence Basin near Lake Ontario.
[3] Here includes a small portion of the St. Lawrence Basin near Lake Ontario.
[4] Data not available for Churchill and Thelon-Kazan Basins.
[5] Includes north and south coastal drainage.

**Sources:**
Environment Canada, Inland Waters Directorate, unpublished data.

# 5.3
# Transportation Networks

Chart 5.3.1
**Mainline Railroad Track[1] by Region[2], 1850 to 1981**




[1] Mainline or first main track is defined as a single track extending the entire distance between terminals upon which the length of the line is based.
[2] Data were not available on a regional basis before 1910.
[3] Newfoundland included after 1949.

**Source:**
Statistics Canada, *Railway Transport, Part III*, Catalogue 52-209.

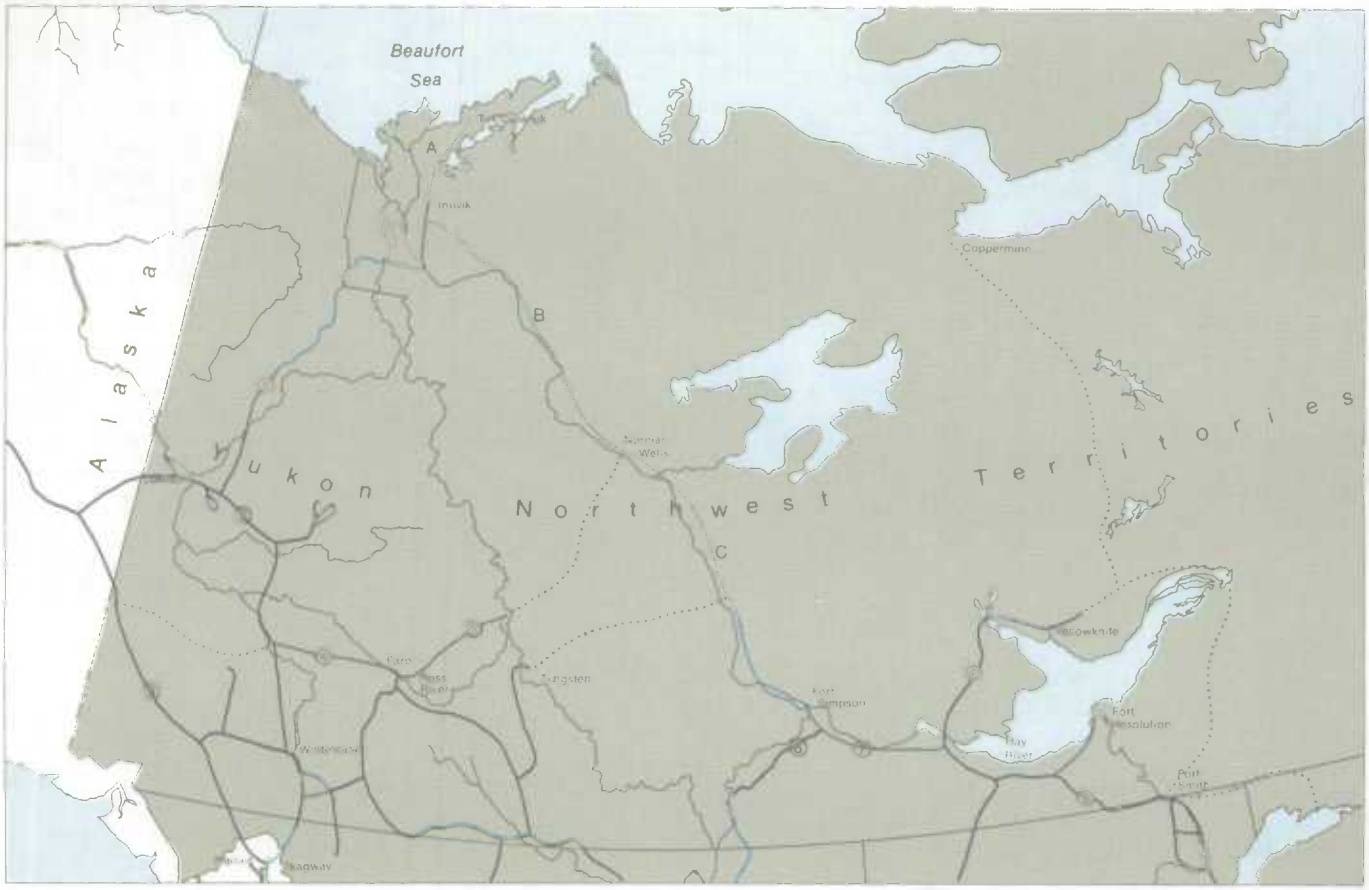
Table 5.3.2
## Length of Federal, Provincial and Territorial Roads and Highways, 1982[1]

| | Freeway[2] | Arterial[3] | Collector[4] | Local[5] | Municipal[6] | Total |
|---|---|---|---|---|---|---|
| | kilometres | | | | | |
| Newfoundland | 14 | 1 027 | 2 881 | 5 005 | 0 | 8 927 |
| Prince Edward Island | 0 | 464 | 675 | 4 180 | 225 | 5 544 |
| Nova Scotia | 132 | 2 456 | 4 741 | 18 287 | 28 | 25 644 |
| New Brunswick | 0 | 2 156 | 2 343 | 12 948 | 40 | 17 487 |
| Québec | 2 594 | 9 323 | 8 484 | 37 814 | 260 | 58 475 |
| Ontario | 2 083 | 13 952 | 5 253 | 395 | 1 316 | 22 999 |
| Manitoba | 0 | 6 552 | 12 055 | 421 | 1 148 | 20 176 |
| Saskatchewan | 13 | 4 221 | 4 996 | 16 272 | 2 510 | 28 012 |
| Alberta | 750 | 13 378 | 2 762 | 23 250 | 113 945 | 154 085 |
| British Columbia | 262 | 11 380 | 11 735 | 18 193 | 861 | 42 431 |
| Yukon | 0 | 3 912 | 508 | 3 | 42 | 4 465 |
| Northwest Territories | 0 | 1 623 | 790 | 1 134 | 0 | 3 547 |
| **Canada** | **5 848** | **70 444** | **57 223** | **137 902** | **120 375** | **391 792** |

[1] Excludes roads under municipal jurisdiction.
[2] A freeway is a multi-lane divided highway that carries relatively large volumes of traffic at high speeds under free-flow conditions. There is full control of access on a freeway with access only at grade-separated interchanges. Freeways provide service within urban areas and also connect major centres and areas of major economic importance either within the province or to adjacent provinces or states. Relatively large volumes of traffic and free-flow conditions are the key elements of freeway classification.
[3] An arterial is a highway, either two-lane or multi-lane, that carries significant volumes of traffic at high speeds, provides service within urban areas and connects major economic areas, cities, towns and points of entry. The primary function of arterials is traffic movement. Some degree of access control is usally applied to regulate or eliminate direct land access. Land access is subservient to the main function of traffic movement.
[4] A collector is a highway that gives equal importance to the traffic movement and land service functions. Collectors form an integrated network throughout developed areas and provide traffic service to resource and resort areas, industrial concentrations, smaller towns and villages, and generally collect traffic from local roads and feed it to arterial roads or distribute traffic from arterial to locals. Access may be regulated. Traffic volumes may vary over a wide range but are generally less than freeways and arterials.
[5] A local is a highway that has land access as its primary function. Access points may be frequent, both to adjacent land and at street and road intersections. Generally traffic volumes are significantly lower than for other classifications.
[6] A municipal road is defined as any road within the boundaries of an incorporated municipal unit or under the control of a local board that is funded jointly by the municipal, provincial, and/or federal governments or totally by the municipal government. Here they correspond mainly to Indian reserve roads. The high number for Alberta corresponds mainly to Improvement District Roads.

**Source:**
Statistics Canada, *Report on Federal, Provincial and Territorial Roads and Highways — Length and Expenditure, 1981-82*, Catalogue 53-006.

Map 5.3.3
## Evolution of the Northern Road Network




**Operating Roads**

1. Dempster Highway
2. Klondike Highway
3. Alaska Highway
4. Campbell Highway
5. Canol Road
6. Liard Highway
7. Mackenzie Highway
8. Yellowknife Highway
9. Fort Smith Highway

**Proposed Roads**

A Inuvik-Tuktoyaktuk extension
B Mackenzie Highway to Inuvik
C Mackenzie Highway to Norman Wells

**Period of Construction**

- Before 1965
- Between 1965 and 1975
- After 1975
- Proposed
- Winter roads

220 0 220 440 kilometres

**Source:**
Department of Indian and Northern Affairs.

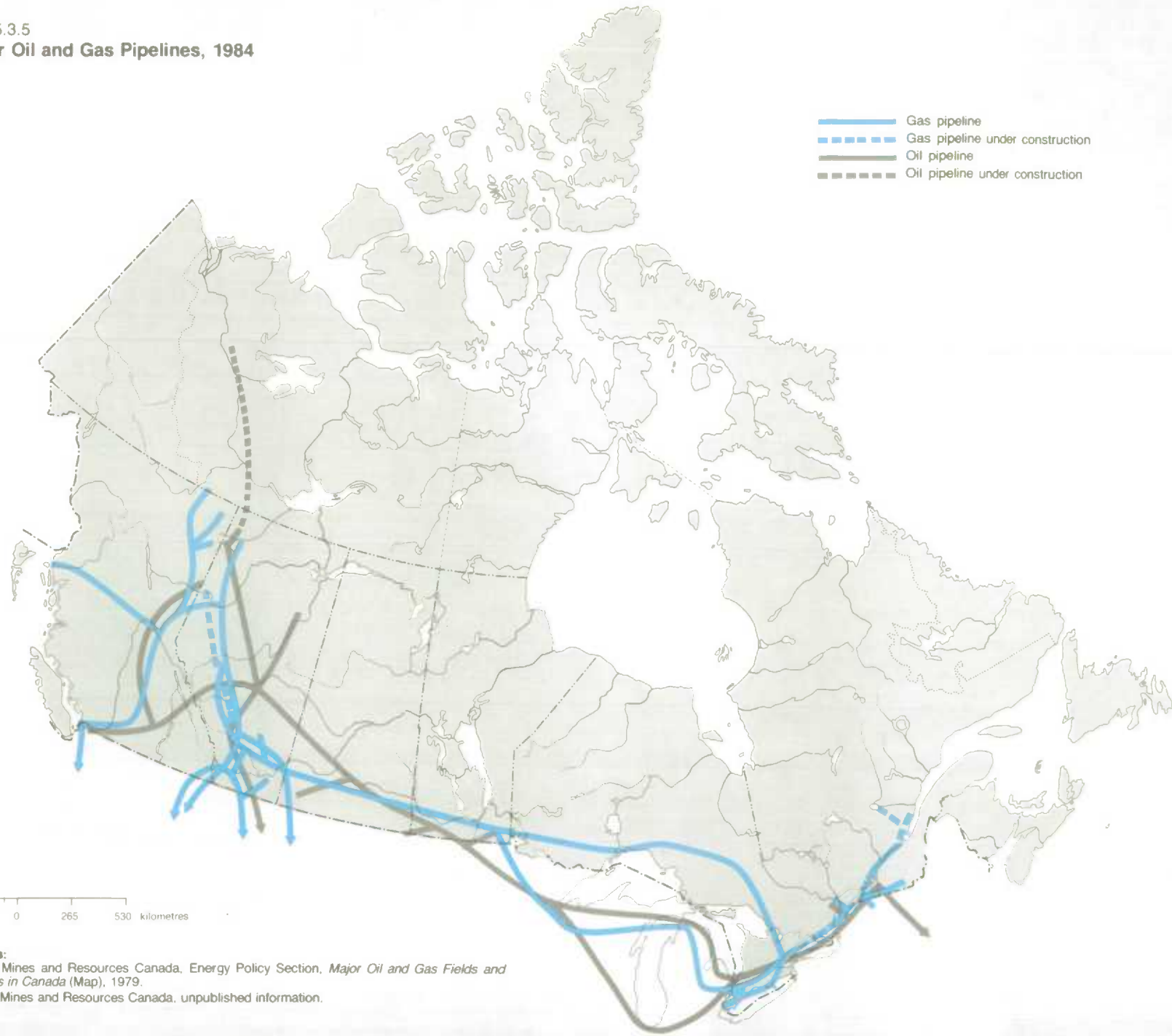
Table 5.3.4
## Aerodromes and Heliports, 1980[1]

| Province or Territory | Aerodromes in Operation by Length of Longest Runway | | | | | | |
|---|---|---|---|---|---|---|---|
| | Less than 914 Metres | 914 to 1 524 Metres | 1 525 to 2 134 Metres | More than 2 134 Metres | Total | Aerodromes Abandonned | Heliports |
| Newfoundland | 13 | 5 | 3 | 4 | 25 | 3 | 3 |
| Prince Edward Island | 1 | 1 | 1 | 1 | 4 | 0 | 1 |
| Nova Scotia | 9 | 3 | 1 | 4 | 17 | 0 | 2 |
| New Brunswick | 14 | 9 | 4 | 2 | 29 | 1 | 5 |
| Québec | 56 | 47 | 30 | 8 | 141 | 5 | 25 |
| Ontario | 105 | 57 | 18 | 6 | 186 | 1 | 29 |
| Manitoba | 75 | 21 | 6 | 1 | 103 | 8 | 9 |
| Saskatchewan | 132 | 27 | 1 | 3 | 163 | 6 | 3 |
| Alberta | 137 | 67 | 14 | 5 | 223 | 4 | 12 |
| British Columbia | 90 | 47 | 24 | 3 | 164 | 3 | 18 |
| Yukon | 22 | 14 | 9 | 0 | 45 | 4 | 2 |
| Northwest Territories | 29 | 53 | 17 | 2 | 101 | 43 | 0 |
| **Total** | **683** | **351** | **128** | **39** | **1 201** | **78** | **109** |

[1] Includes all public, private and military aerodromes and heliports.

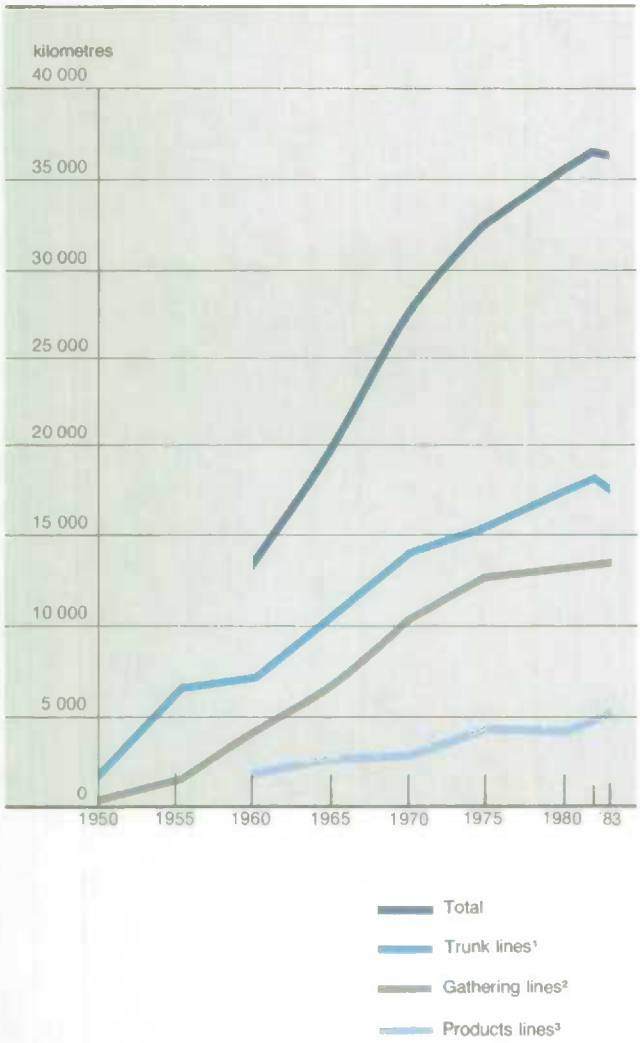
**Source:**
Energy, Mines and Resources Canada, Surveys and Mapping Branch, *VFR Chart Supplement*, 1980.

Map 5.3.5
**Major Oil and Gas Pipelines, 1984**




**Sources:**
Energy, Mines and Resources Canada, Energy Policy Section, *Major Oil and Gas Fields and Pipelines in Canada* (Map), 1979.
Energy, Mines and Resources Canada, unpublished information.

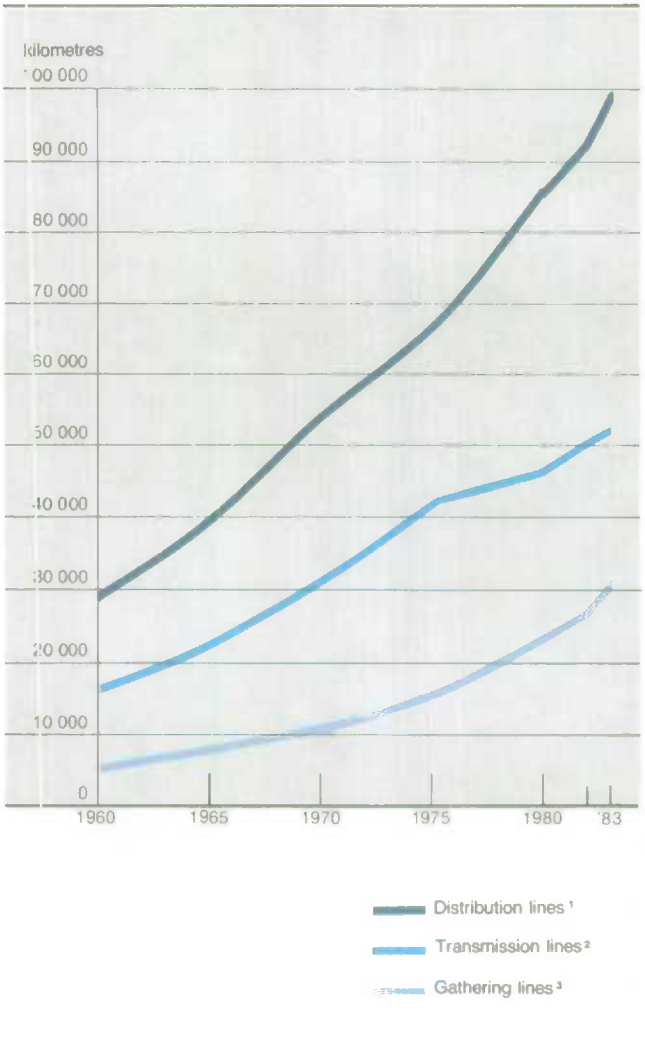
Chart 5.3.6
**Length of Oil Pipelines, 1950 to 1983**




¹ Main transporting lines for unrefined oil.
² Secondary transporting lines operating within oil fields and carrying unrefined oil.
³ Lines built to carry refined products such as gasoline or fuel oil.

**Source:**
Statistics Canada, *Oil Pipeline Transport*, Catalogue 55-201.

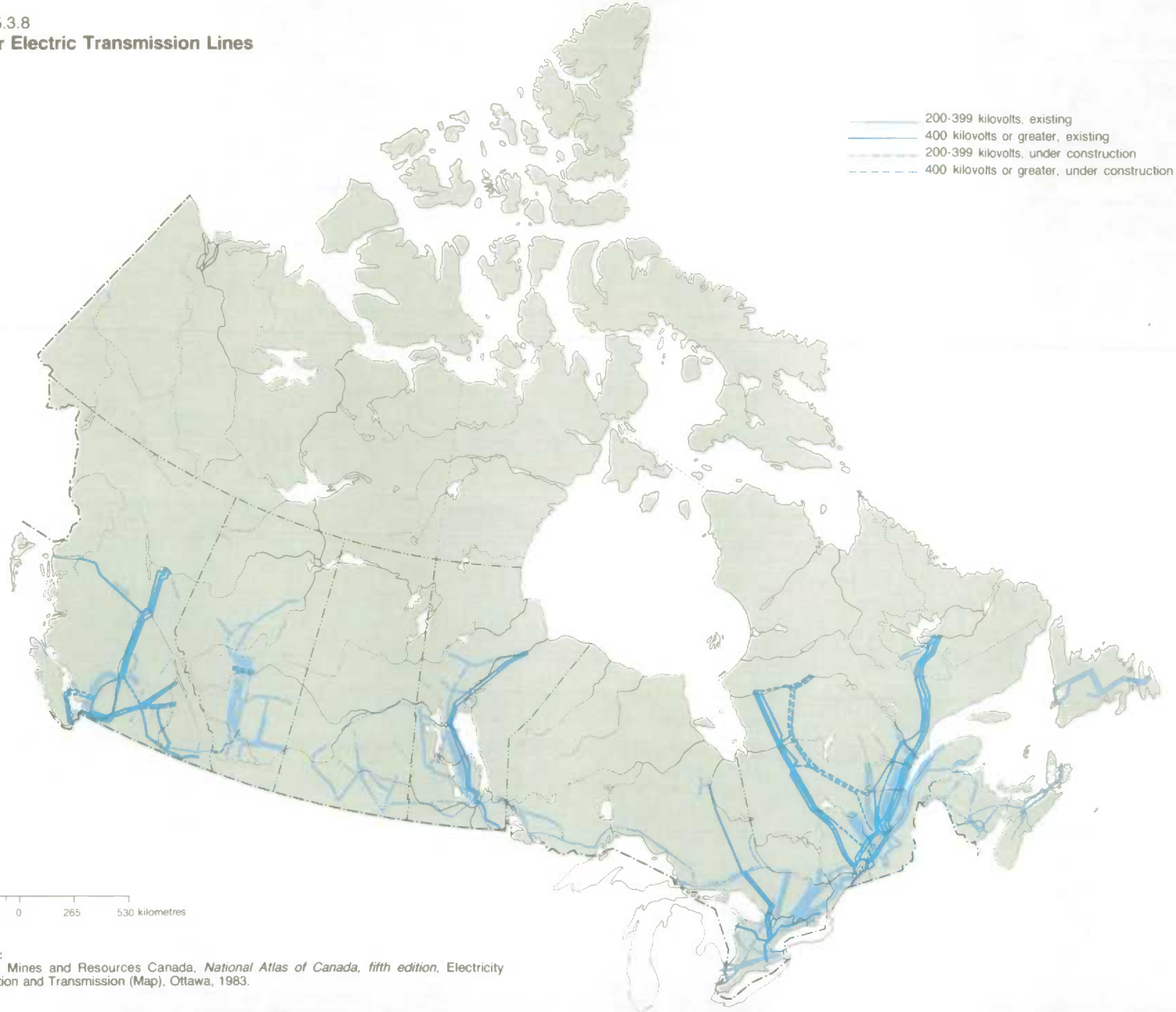
Chart 5.3.7
**Length of Natural Gas Pipelines, 1960 to 1983**




¹ Lines carrying gas from the point of local supply to the point of use.
² Main transporting lines installed for the purpose of carrying gas from a source of supply to one or more distribution centers, or to one or more large volume customers. They may also be installed to connect sources of supply.
³ Secondary transporting lines to carry gas from individual wells to compressor stations, or to/from main transmission lines.

**Source:**
Statistics Canada, *Gas Utilities: Transport and Distribution Systems*, Catalogue 57-205.

Map 5.3.8
## Major Electric Transmission Lines



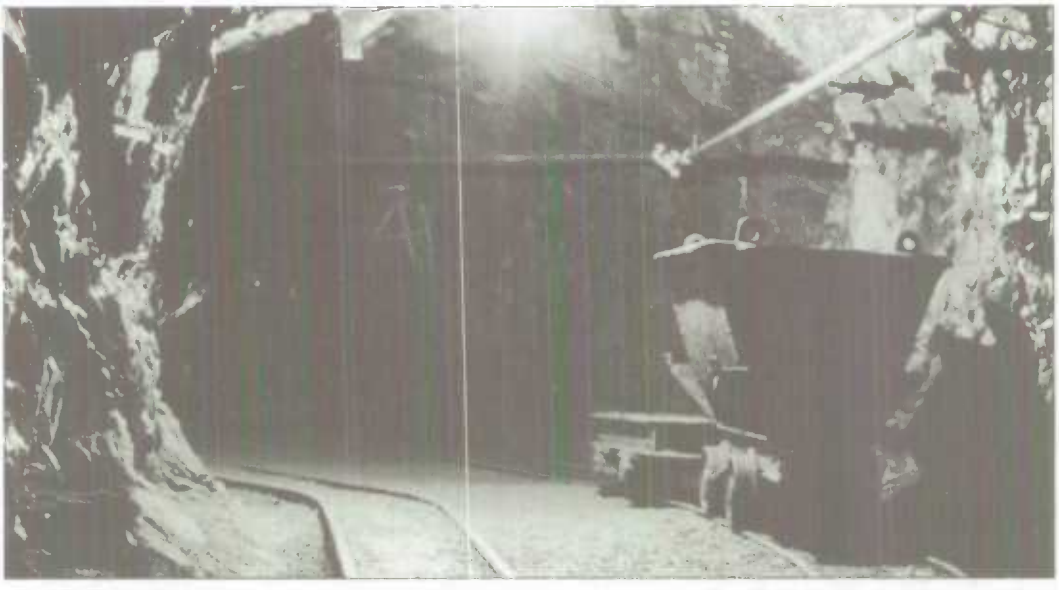

**Source:**
Energy, Mines and Resources Canada, *National Atlas of Canada, fifth edition*, Electricity Generation and Transmission (Map), Ottawa, 1983.

Table 5.3.9
**Length of Electric Transmission Circuit by Power Line Voltage, 1956 to 1982**

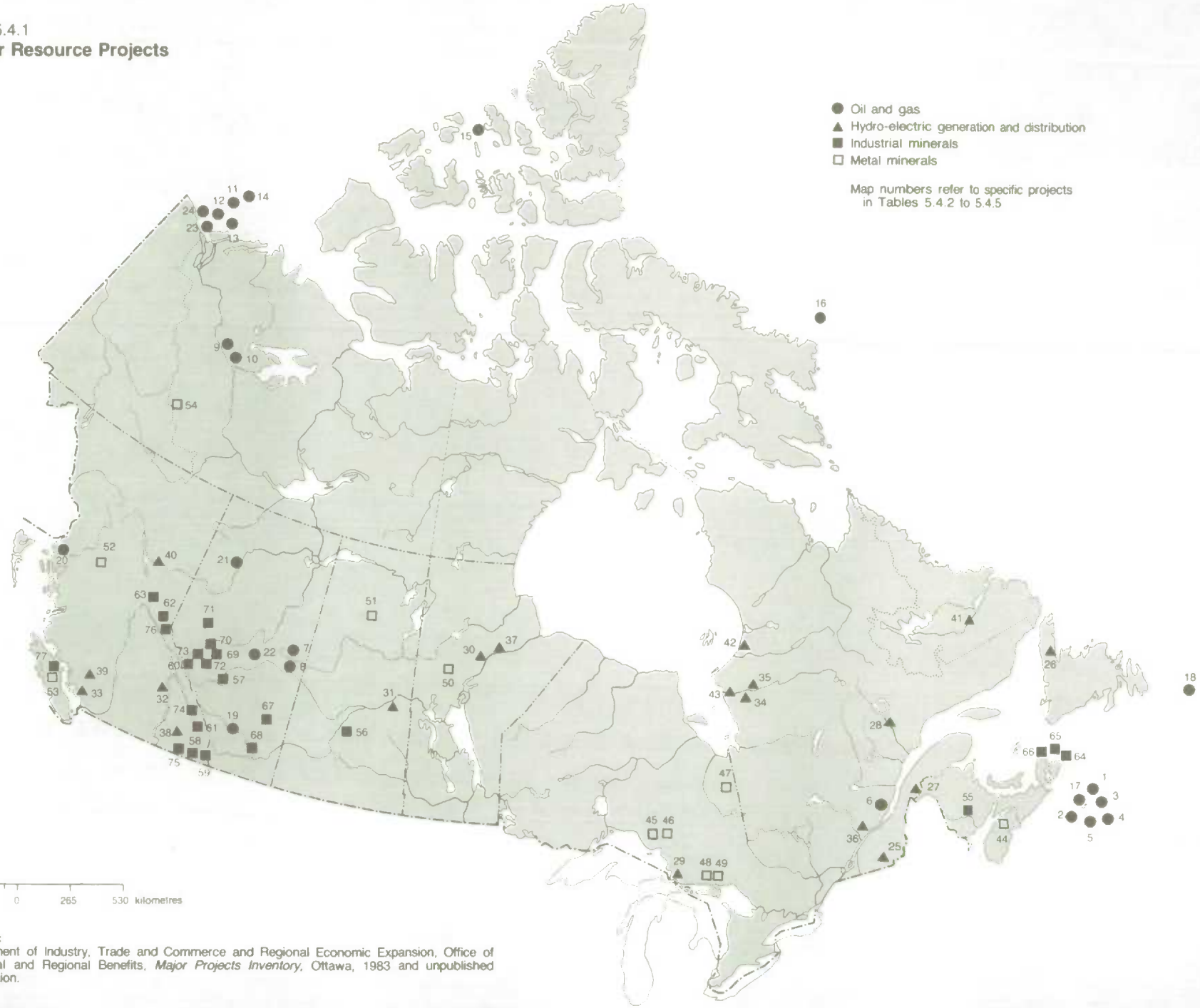
| Power Line Voltage | 1956 | 1961 | 1966 | 1971 | 1976 | 1981 | 1982 |
|---|---|---|---|---|---|---|---|
| | | | | kilometres | | | |
| 20-99 kilovolts | 60 524 | 66 239 | 71 545 | 78 857 | 77 718 | 77 218 | 76 151 |
| 100-199 kilovolts | 20 768 | 26 912 | 33 462 | 40 360 | 42 996 | 47 861 | 48 007 |
| 200-299 kilovolts | 7 076 | 9 257 | 13 228 | 23 641 | 29 386 | 33 373 | 34 764 |
| 300-399 kilovolts | 1 466 | 3 750 | 4 361 | 5 810 | 6 827 | 7 504 | 7 695 |
| 400-599 kilovolts | .. | .. | 702 | 2 530 | 5 480 | 8 691 | 8 828 |
| 600 kilovolts and over | .. | .. | 1 003 | 1 968 | 4 879 | 7 970 | 8 826 |
| **Total Transmission Circuit** | **89 834** | **106 158** | **124 301** | **153 166** | **167 286** | **182 617** | **184 271** |

**Source:**
Statistics Canada, *Electric Power Statistics*, Catalogue 57-202.

# 5.4
# Resource Development



Map 5.4.1
## Major Resource Projects




**Source:**
Department of Industry, Trade and Commerce and Regional Economic Expansion, Office of Industrial and Regional Benefits, *Major Projects Inventory*, Ottawa, 1983 and unpublished information.

Table 5.4.2
**Major Resource Projects[1] - Oil and Gas**

| Map Number | Status Committed (C) Planned (P) (1984) | Ecozone[2] | Project | Sponsor(s) | Investment | Start/ Completion |
|---|---|---|---|---|---|---|
| | | | | | millions of 1982 dollars | |
| 1 | C | Atlantic Maritime* | Scotian Shelf Exploration: Program 1 | Petro Canada Explorations, 50%; Bow Valley, 25%; Husky Oil 25% | 500 | 1982/1985 |
| 2 | C | Atlantic Maritime* | Scotian Shelf Exploration: Program 2 | Shell Canada Resources plus seven other participants | 551 | 1982/1985 |
| 3 | C | Atlantic Maritime* | Sable Island Exploration | Mobil Oil Canada | 270 | 1984/1986 |
| 4 | C | Atlantic Maritime* | Scotian Slope Exploration | Shell Canada Resources and others | 263 | 1982/1987 |
| 5 | C | Atlantic Maritime* | East Sable and Northumberland Blocks Exploration | Dome Petroleum and partners | 127 | 1983/1985 |
| 6 | C | Mixed-Wood Plain | Québec Natural Gas Distribution Network | Gaz Métropolitain, Gaz Inter-Cité Québec | 1 000 | 1982/1986 |
| 7 | C | Boreal Plain | Wolf Lake Oil Sands | B.P. Exploration Canada, 50%; Petro Canada, 50% | 200 | 1983/1985 |
| 8 | C | Boreal Plain | Cold Lake Oil Sands: Phase 1 | Esso Resources Canada | 250 | 1983/1985 |
| 9 | C | Taiga Plain | Norman Wells Oil Development | Esso Resources Canada | 630 | 1982/1985 |
| 10 | C | Taiga Plain | Norman Wells Oil Pipeline | Interprovincial Pipe Line (N.W.) | 467 | 1983/1985 |
| 11 | C | Southern Arctic* | Dome Beaufort Exploration | Dome Petroleum | 969 | 1982/1987 |
| 12 | C | Southern Arctic* | Esso Beaufort Exploration | Esso Resources Canada, Home Oil | 500 | 1981/1985 |
| 13 | C | Southern Arctic* | Gulf Beaufort Drilling | Gulf Canada Resources | 674 | 1981/1988 |
| 14 | C | Southern Arctic* | Gulf Beaufort Exploration | Gulf Canada Resources and others | 1 100 | 1983/1987-89 |
| 15 | C | Northern Arctic | Arctic Exploration | Panarctic Oils | 700 | 1982/1985 |
| 16 | C | Arctic Cordillera* | Davis Strait Exploration | Canterra Energy and others | 200 | 1982/1986 |
| 17 | P | Atlantic Maritime* | Offshore Sable Island-Venture Gas Development | Mobil Oil Canada, Petro Canada and others | 2 000 | 1985/1989 |
| 18 | P | Boreal Shield* | Hibernia Oil Development | Mobil Oil Canada, Petro Canada, Gulf Canada and others | 6 000 | 1985/1989 |
| 19 | P | Prairie, Boreal Plain | Alberta Gas Pipeline Expansion | Nova | 1 200 | 1982/1991 |
| 20 | P | Boreal Cordillera, Montane Cordillera, Pacific Maritime | Canada LNG-Natural Gas Pipeline | NIC Resources & Union Oil | 1 060 | 1985/1989 |
| 21 | P | Boreal Plain | Peace River Oil Sands Development | Shell Canada Resources | .. | 1984/1988 |
| 22 | P | Southern Arctic, Taiga Plain, Boreal Plain, Prairie | Beaufort Sea/Edmonton Oil Pipeline | .. | 2 000 | 1985/1991 |
| 23 | P | Southern Arctic* | Gulf Beaufort Sea Oil Development | Gulf | 4 000 | 1985/1991 |
| 24 | P | Southern Arctic | Dome Beaufort Sea Oil Pilot Development | Dome Petroleum Ltd. | 400 | 1983/1987 |

[1] A major resource project is defined as one with a minimum investment value of $100 million. Projects included here are committed or planned projects. For the purposes of the inventory committed projects are deemed to be 90 percent to 100 percent probable. They are: (a) under construction or (b) about to be started or (c) have received all necessary approvals from appropriate government regulatory agencies to allow it to proceed, or (d) have been given approval by the company's board to be started. Planned projects are deemed to be 60 percent to 90 percent probable. They have received company approval, in principle, and are currently being studied to confirm economic marketing and technical viability.

[2] Ecozones are terrestrial units; for offshore developments closest land ecozone is identified and starred*.

**Sources:**
Department of Industry, Trade and Commerce and Regional Economic Expansion, Office of Industrial and Regional Benefits, *Major Projects Inventory*, Ottawa, 1983.
Department of Industry Trade and Commerce and Regional Economic Expansion, Office of Industrial and Regional Benefits, unpublished information, 1984.

Table 5.4.3
**Major Resource Projects[1] - Hydro Electricity Generation and Distribution**

| Map Number | Status Committed (C) Planned (P) (1984) | Ecozone | Project | Sponsor | Investment | Start/ Completion |
|---|---|---|---|---|---|---|
| | | | | | millions of 1982 dollars | |
| 25 | C | Mixed-Wood Plain | NEPOOL Electric Power Line | Hydro-Québec | 300 | 1983/1986 |
| 26 | C | Boreal Shield | Cat Arm Hydroelectric Project | Newfoundland and Labrador Hydro | 450 | 1981/1985 |
| 27 | C | Boreal Shield | Madawaska Electric Power Lines | Hydro-Québec | 100 | 1983/1985 |
| 28 | C | Boreal Shield | Manic 5 Hydro Site Expansion | Hydro-Québec | 500 | 1984/1989 |
| 29 | C | Boreal Shield | St. Mary's River Hydro Generation | Great Lakes Power Ltd. | 115 | 1979/1982 |
| 30 | C | Boreal Shield | Nelson River Transmission Network | Manitoba Hydro | 144 | 1980/1985 |
| 31 | C | Boreal Plain | Nipawin Hydro Station | Saskatchewan Power | 490 | 1981/1986 |
| 32 | C | Montane Cordillera | Revelstoke Canyon Hydro | B.C. Hydro | 1 280 | 1976/1984 |
| 33 | C | Pacific Maritime | Cheekye-Dunsmuir Transmission Network | B.C. Hydro | 610 | 1980/1984 |
| 34 | C | Taiga Shield | La Grande, Phase 1 | Hydro-Québec | 9 000 | 1974/1985 |
| 35 | C | Taiga Shield, Boreal Shield | James Bay Transmission Network | Hydro-Québec | 3 719 | 1978/1985 |
| 36 | P | Mixed-Wood Plain | Delaney Hydro Project | Hydro-Québec | 961 | 1986/1993 |
| 37 | P | Boreal Shield | Limestone Hydro Station | Manitoba Hydro | 1 171 | 1985/1992 |
| 38 | P | Montane Cordillera | Keenleyside/Murphy Creek Hydro Development | B.C. Hydro | 975 | 1990/1997 |
| 39 | P | Pacific Maritime | Kelly Lake-Cheekye Transmission Network | B.C. Hydro | 230 | 1986/1990 |
| 40 | P | Boreal Cordillera | Peace Site 'C' Hydro Development | B.C. Hydro | 1 370 | 1991/1998 |
| 41 | P | Taiga Shield | Lower Churchill, Phase I | Lower Churchill Development Corp. | 3 100 | 1988/1993 |
| 42 | P | Taiga Shield | Grande Baleine Complex | Hydro-Québec | 2 845 | 1988/1999 |
| 43 | P | Taiga Shield | La Grande, Phase 2 | Hydro-Québec | 1 000 | 1988/1997 |

[1] A major resource project is defined as one with a minimum investment value of $100 million. Projects included here are committed or planned projects. For the purposes of the inventory committed projects are deemed to be 90 percent to 100 percent probable. They are: (a) under construction or (b) about to be started or (c) have received all necessary approvals from appropriate government regulatory agencies to allow it to proceed, or (d) have been given approval by the company's board to be started. Planned projects are deemed to be 60 percent to 90 percent probable. They have received company approval, in principle, and are currently being studied to confirm economic marketing and technical viability.

**Sources:**
Department of Industry, Trade and Commerce and Regional Economic Expansion, Office of Industrial and Regional Benefits, *Major Projects Inventory*, Ottawa, 1983.
Department of Industry Trade and Commerce and Regional Economic Expansion, Office of Industrial and Regional Benefits, unpublished information, 1984.

Table 5.4.4
**Major Resource Projects[1] - Metal Mining**

| Map Number | Status: Committed (C) Planned (P) (1984) | Ecozone | Project | Sponsor(s) | Investment | Start/ Completion |
|---|---|---|---|---|---|---|
| | | | | | millions of 1982 dollars | |
| 44 | C | Atlantic Maritime | East Kemptville, N.S. Tin Mine | Rio Algom | 161 | 1983/1985 |
| 45 | C | Boreal Shield | Hemlo Gold Mine | Lac Minerals | 237 | 1983/1986 |
| 46 | C | Boreal Shield | Hemlo Gold Mine | Noranda, Golden Sceptre, Goliath | 228 | 1983/1985 |
| 47 | C | Boreal Shield | Detour Lake Gold Mine | Campbell Red Lake Mines, 25%; Dome Mines, 25%; Amoco Canada, 50% | 240 | 1980/1987 |
| 48 | C | Boreal Shield | Denison Uranium Mine Expansion | Denison Mines | 300 | 1978/1984 |
| 49 | C | Boreal Shield | Rio Algom Uranium Mine Rehabilitation | Rio Algom Ltd. | 100 | 1979/1984 |
| 50 | C | Boreal Shield | Thompson Open Pit Nickel Mine | INCO | 120 | 1982/1989 |
| 51 | C | Boreal Shield | Key Lake Uranium Mine | Key Lake Mining Corporation | 500 | 1981/1984 |
| 52 | P | Montane Cordillera | Equity Silver Mine[2] | Equity Silver Mines Ltd. | 147 | 1983/1984 |
| 53 | P | Pacific Maritime | Westmin H-W Mine[2] | Westmin Resources | 150 | 1983/1985 |
| 54 | P | Tundra Cordillera | Mactung Mine | Amax Northwest Mining | 200 | 1984/1986 |

Table 5.4.4
## Major Resource Projects[1] - Metal Mining

[1] A major resource project is defined as one with a minimum investment value of $100 million. Projects included here are committed or planned projects. For the purposes of the inventory committed projects are deemed to be 90 percent to 100 percent probable. They are: (a) under construction or (b) about to be started or (c) have received all necessary approvals from appropriate government regulatory agencies to allow it to proceed, or (d) have been given approval by the company's board to be started. Planned projects are deemed to be 60 percent to 90 percent probable. They have received company approval, in principle, and are currently being studied to confirm economic marketing and technical viability.
[2] Status in 1983.

**Sources:**
Department of Industry Trade and Commerce and Regional Economic Expansion, Office of Industrial and Regional Benefits, *Major Projects Inventory*, Ottawa, 1983.
*Northern Miner*, New Mining Projects, July 19, 1984.

Table 5.4.5
## Major Resource Projects[1] - Industrial Minerals

| Map Number | Status Committed (C) Planned (P) (1983) | Ecozone | Project | Sponsor(s) | Investment | Start/ Completion |
|---|---|---|---|---|---|---|
| | | | | | millions of 1982 dollars | |
| 55 | C | Atlantic Maritime | Sussex Potash Mine | Potash Company of America | 285 | 1980/1985 |
| 56 | C | Prairie | Potash Mine Expansion-Lanigan Phase 2 | Potash Corporation of Saskatchewan | 450 | 1979/1984 |
| 57 | C | Boreal Plain | Genesee Thermal Coal Mine | Fording Coal Ltd. and others | 250 | 1983/1986 |
| 58 | C | Montane Cordillera | Line Creek Coal Mine | Crows Nest Resources Ltd. | 330 | 1979/1983 |
| 59 | C | Montane Cordillera | Greenhills Surface Coal Project | B.C. Coal Ltd., 80%; Pohang Iron and Steel Co., 20% | 282 | 1981/1983 |
| 60 | C | Montane Cordillera | Gregg River Open Pit Coal Mine | Gregg River Resources Ltd. | 190 | 1981/1983 |
| 61 | C | Montane Cordillera | Eagle Mountain Coal Mine Expansion | Fording Coal Ltd. | 115 | 1982/1983 |
| 62 | C | Boreal Cordillera | Quinette Coal Development | Quinette Coal Ltd. | 838 | 1981/1984 |
| 63 | C | Boreal Cordillera | Bullmoose Coking Coal Project | Teck Corp., Lornex Mining and others | 290 | 1981/1983 |
| 64 | P | Atlantic Maritime | Donkin Morien Colliery | Cape Breton Development Corp. | 100 + | 1980/1991 |
| 65 | P | Atlantic Maritime | Glace Bay Colliery | Cape Breton Development Corp. | 100 + | 1983/1993 |
| 66 | P | Atlantic Maritime | Lingan-Phelan Mine | Cape Breton Development Corp. | 100 + | 1983/1985 |
| 67 | P | Prairie | Sherness Thermal Coal Mine | Luscar Ltd. and Manalta Coal Ltd. | 200 | .. |
| 68 | P | Prairie | Buffalo Hill Coal Project | Seagull Resources Ltd. | 120 | ../1987 |
| 69 | P | Boreal Plain | Coalspar Thermal Coal Development | Dentherm Resources | 400 | 1983/1986 |
| 70 | P | Boreal Plain | McLeod River Coal Project | McLeod River Coal Ltd., 70%; Electric Power Development Co. of Japan, 30% | 325 | 1984/1986 |
| 71 | P | Boreal Plain | Obed Marsh Thermal Coal | Union Oil of Canada, Norcen Energy | 300 | 1983/1985 |
| 72 | P | Boreal Plain | Mercoal Project | Mercoal Minerals Ltd., 80%; Idemitsukosan, Ltd., 20% | 235 | 1984/1986 |
| 73 | P | Boreal Plain | Hinton East Coal Mine | Esso Resources Canada Ltd. | 175 | 1984/1987 |
| 74 | P[2] | Montane Cordillera | Elk River Coal Mine | Elco Mining | 475 | ../1989 |
| 75 | P | Montane Cordillera | Line Creek Coal Expansion | Crows Nest Resources Ltd. | 250 | 1984/1986 |
| 76 | P | Boreal Cordillera | Monkman Coal Project | Petro Canada, 50%; Canadian Superior Oil, 33.3%; McIntyre Mines, 16.7% | 620 | 1983/1986 |
| 77 | P | Pacific Maritime | Quinsam Coal Mine | Quinsam Coal Ltd. | 100 | 1983/1985 |

[1] A major resource project is defined as one with a minimum investment value of $100 million. Projects included here are committed or planned projects. For the purposes of the inventory committed projects are deemed to be 90 percent to 100 percent probable. They are: (a) under construction or (b) about to be started or (c) have received all necessary approvals from appropriate government regulatory agencies to allow it to proceed, or (d) have been given approval by the company's board to be started. Planned projects are deemed to be 60 percent to 90 percent probable. They have received company approval, in principle, and are currently being studied to confirm economic marketing and technical viability.
[2] Status in 1984.

**Source:**
Department of Industry Trade and Commerce and Regional Economic Expansion, Office of Industrial and Regional Benefits, *Major Projects Inventory*, Ottawa, 1983.
*Northern Miner*, New Mining Projects, July 19, 1984.

Table 5.4.6
## Land Area Utilized by Mining[1]

| Province/ Territory | Metallic and Non-Metallic | Uranium | Asbestos | Potash | Coal | Oil Sands | Construction Materials | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | hectares | | | | |
| Newfoundland | 4 880 | ... | 297 | ... | ... | ... | 2 750 | 7 927 |
| Prince Edward Island | ... | ... | ... | ... | ... | ... | 575 | 575 |
| Nova Scotia | 1 150 | ... | ... | ... | 495 | ... | 4 025 | 5 670 |
| New Brunswick | 1 450 | ... | ... | ... | 6 100 | ... | 3 450 | 11 000 |
| Quebec | 21 885 | ... | 3 525 | ... | ... | ... | 31 050 | 56 460 |
| Ontario | 48 420 | 1 174 | 173 | ... | ... | .. | 46 000 | 95 767 |
| Manitoba | 1 986 | ... | ... | ... | ... | ... | 10 350 | 12 336 |
| Saskatchewan | 411 | 279 | ... | 4 110 | 6 660 | ... | 12 650 | 24 110 |
| Alberta | ... | ... | ... | ... | 8 280 | 4 850 | 10 500 | 23 630 |
| British Columbia | 18 115 | ... | ... | ... | 6 175 | ... | 16 675 | 40 965 |
| Yukon and Northwest Territories | 5 650 | ... | 237 | ... | ... | ... | ... | 5 887 |
| **Canada** | **103 947** | **1 453** | **4 232** | **4 110** | **27 710** | **4 850** | **138 025** | **284 327** |

[1] Includes land area disturbed by mine wastes and facilities and those land areas alienated from alternate uses due to their proximity to, or encirclement by, mine wastes or fixed facilities.

**Source:**
Environment Canada, Lands Directorate, *Mining, Land Use and the Environment, 1. A Canadian Overview* by I.B. Marshall, Ottawa, 1982.

**Note:**
These area estimates exclude townsites and road/rail access routes. The environmental impact of mining activity can be analysed in terms of direct effects (ie. land use, transport of minerals) and indirect effects (ie. establishment of new settlements, the requisite infrastructure to maintain them and the socio-cultural activities of the inhabitants, hunting and fishing for example). These impacts are generally different in remote wilderness areas from those in already settled areas. In the latter the impacts are associated with the competition for alternative land uses and the living conditions of the population surrounding the site (quarrying around urban areas, for example) whereas in the former the impacts relate to stress on habitats and ecosystem stability.

# 6

# Generation of Waste Residuals

# Contents

# 6.1
# Mining

Table 6.1.1
## Mining Activity[1] by Ecozone, 1981[2]

| Ecozone | Metal Mines | | Coal Mines | | Non-Metal Mines[3] | | Sand Pits and Quarries | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] |
| **Atlantic Maritime** | **8** | **2 550** | **14** | **3 500-3 999** | **45** | **1 240** | **20** | **348** | **87** | **7 500-7 999** |
| Nova Scotia | 2 | 100-199 | 13 | 3 471 | 8 | 606 | 7 | 169 | 30 | 4 000-4 499 |
| New Brunswick | 3 | 1 868 | 1 | 200-499 | 13 | 259 | 8 | 140 | 25 | 2 500-2 999 |
| Québec | 3 | 500-999 | 0 | 0 | 24 | 375 | 5 | 39 | 32 | 500-999 |
| **Mixed-Wood Plain** | **0** | **0** | **0** | **0** | **31** | **5 578** | **154** | **2 180** | **185** | **7 758** |
| Québec | 0 | 0 | 0 | 0 | 20 | 4 634 | 80 | 906 | 100 | 5 540 |
| Ontario | 0 | 0 | 0 | 0 | 11 | 944 | 74 | 1 274 | 85 | 2 218 |
| **Boreal Shield** | **67** | **32 799** | **0** | **0** | **15** | **1 011** | **22** | **178** | **104** | **33 988** |
| Newfoundland | 3 | 570 | 0 | 0 | 4 | 542 | 1 | 1-99 | 8 | 1 000-1 499 |
| Québec | 31 | 8 312 | 0 | 0 | 7 | 100-199 | 11 | 81 | 49 | 8 500-8 999 |
| Ontario | 28 | 20 450 | 0 | 0 | 3 | 126 | 9 | 87 | 40 | 20 663 |
| Manitoba | 4 | 3 000-3 499 | 0 | 0 | 1 | 100-199 | 1 | 1-99 | 6 | 3 403 |
| Saskatchewan | 1 | 200-499 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 200-499 |
| **Prairie** | **0** | **0** | **9** | **500-999** | **19** | **3 766** | **13** | **100-199** | **41** | **4 445** |
| Manitoba | 0 | 0 | 0 | 0 | 1 | 1-99 | 6 | 6-99 | 7 | 73 |
| Saskatchewan | 0 | 0 | 6 | 400 | 16 | 3 500-3 999 | 1 | 1-99 | 23 | 4 114 |
| Alberta | 0 | 0 | 3 | 100-199 | 2 | 2-99 | 6 | 103 | 11 | 268 |
| **Boreal Plain** | **3** | **877** | **5** | **1 224** | **7** | **236** | **1** | **1-99** | **16** | **2 000-2 499** |
| Manitoba | 1 | 200-499 | 0 | 0 | 1 | 1-99 | 1 | 1-99 | 3 | 359 |
| Saskatchewan | 2 | 500-999 | 0 | 0 | 1 | 1-99 | 0 | 0 | 3 | 584 |
| Alberta | 0 | 0 | 5 | 1 224 | 5 | 100-199 | 0 | 0 | 10 | 1 000-1 499 |
| **Montane Cordillera** | **21** | **5 414** | **5** | **3 500-3 999** | **2** | **2-99** | **2** | **2-99** | **30** | **9 243** |
| Alberta | 0 | 0 | 2 | 500-999 | 0 | 0 | 0 | 0 | 2 | 500-999 |
| British Columbia | 21 | 5 414 | 3 | 2 767 | 2 | 2-99 | 2 | 2-99 | 28 | 8 000-8 499 |
| **Pacific Maritime** | **7** | **1 633** | **0** | **0** | **3** | **80** | **7** | **100-199** | **17** | **1 500-1 999** |
| British Columbia | 7 | 1 633 | 0 | 0 | 3 | 80 | 7 | 100-199 | 17 | 1 500-1 999 |
| **Boreal Cordillera** | **6** | **928** | **0** | **0** | **1** | **200-499** | **0** | **0** | **7** | **1 000-1 499** |
| British Columbia | 3 | 90 | 0 | 0 | 1 | 200-499 | 0 | 0 | 4 | 500-999 |
| Yukon | 3 | 838 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 838 |
| **Tundra Cordillera** | **1** | **100-199** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **100-199** |
| Northwest Territories | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| **Taiga Plain** | **1** | **200-499** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **200-499** |
| Northwest Territories | 1 | 200-499 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 200-499 |
| **Taiga Shield** | **10** | **4 733** | **0** | **0** | **1** | **100-199** | **0** | **0** | **11** | **4 500-4 999** |
| Newfoundland | 3 | 3 356 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 356 |
| Québec | 1 | 1-99 | 0 | 0 | 1 | 100-199 | 0 | 0 | 2 | 100-199 |
| Saskatchewan | 1 | 500-999 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 500-999 |
| Northwest Territories | 5 | 816 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 816 |
| **Northern Arctic** | **1** | **100-199** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **100-199** |
| Northwest Territories | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| **Canada** | **125** | **49 586** | **33** | **9 188** | **124** | **12 557** | **219** | **3 109** | **501** | **74 440** |

[1] Excludes crude petroleum and natural gas industry and services incidental to mining.

[2] Ranges are used to meet the confidentiality restrictions of the Statistics Act.

[3] Includes asbestos, salt, potash, sulfur and miscellaneous non-metallic mineral mines.

[4] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic indus statistics.

[5] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and ot activities such as storing, inspecting and handling.

**Source:**
Energy, Mines and Resources Canada, Annual Census ol Metal Mines, Non-Metal Mines, and and Pits and Quarries, 1981.
Statistics Canada, Annual Census of Coal Mines, 1981.
Statistics Canada, Office of the Senior Adviser on Integration, special tabulations.

Table 6.1.2
**Mining Activity[1] by Major Drainage Area, 1971, 1976 and 1981[2]**

| Major Drainage Area | Metal Mines | | Coal Mines | | Non-Metal Mines[3] | | Sand Pits and Quarries | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] |
| **Atlantic Ocean Basin** | | | | | | | | | | |
| **1971** | **53** | **29 000-29 499** | **7** | **3 000-3 499** | **86** | **8 467** | **255** | **3 598** | **401** | **44 247** |
| **1976** | **39** | **29 627** | **11** | **3 000-3 499** | **79** | **7 500-7 999** | **234** | **3 500-3 999** | **363** | **44 867** |
| **1981** | **45** | **26 387** | **14** | **3 500-3 999** | **89** | **7 658** | **195** | **2 701** | **342** | **40 466** |
| Atlantic Ocean Coastal | | | | | | | | | | |
| 1971 | 7 | 3 374 | 0 | 0 | 2 | 200-499 | 6 | 6-99 | 15 | 3 936 |
| 1976 | 5 | 4 261 | 0 | 0 | 3 | 868 | 6 | 141 | 14 | 5 270 |
| 1981 | 5 | 3 802 | 0 | 0 | 2 | 200-499 | 5 | 5-99 | 12 | 4 360 |
| Gulf of St. Lawrence Coastal | | | | | | | | | | |
| 1971 | 9 | 4 174 | 6 | 2 929 | 30 | 1 009 | 6 | 48 | 51 | 8 160 |
| 1976 | 10 | 6 522 | 9 | 3 218 | 27 | 885 | 3 | 35 | 49 | 10 660 |
| 1981 | 11 | 5 682 | 13 | 3 471 | 29 | 709 | 5 | 44 | 58 | 9 906 |
| Bay of Fundy Coastal and Saint John River | | | | | | | | | | |
| 1971 | 0 | 0 | 1 | 200-499 | 5 | 308 | 12 | 100-199 | 18 | 688 |
| 1976 | 1 | 1-99 | 2 | 200-499 | 5 | 267 | 10 | 246 | 18 | 861 |
| 1981 | 2 | 100-199 | 1 | 200-499 | 5 | 345 | 9 | 195 | 17 | 892 |
| St. Lawrence River | | | | | | | | | | |
| 1971 | 3 | 441 | 0 | 0 | 34 | 5 659 | 120 | 1 534 | 157 | 7 634 |
| 1976 | 1 | 100-199 | 0 | 0 | 29 | 4 818 | 98 | 1 500-1 999 | 128 | 6 453 |
| 1981 | 2 | 500-999 | 0 | 0 | 38 | 5 054 | 90 | 500-999 | 130 | 6 624 |
| Ottawa River | | | | | | | | | | |
| 1971 | 20 | 3 356 | 0 | 0 | 4 | 174 | 13 | 218 | 37 | 3 748 |
| 1976 | 11 | 2 036 | 0 | 0 | 3 | 135 | 12 | 222 | 26 | 2 393 |
| 1981 | 17 | 2 340 | 0 | 0 | 1 | 1-99 | 10 | 100-199 | 28 | 2 486 |
| Lake Ontario Shore | | | | | | | | | | |
| 1971 | 2 | 200-499 | 0 | 0 | 4 | 100-199 | 55 | 1 033 | 61 | 1 689 |
| 1976 | 2 | 500-999 | 0 | 0 | 5 | 100-199 | 60 | 1 129 | 67 | 1 861 |
| 1981 | 0 | 0 | 0 | 0 | 4 | 231 | 46 | 837 | 50 | 1 068 |
| Lake Erie and Lake St. Clair Shore | | | | | | | | | | |
| 1971 | 0 | 0 | 0 | 0 | 4 | 348 | 28 | 400 | 32 | 748 |
| 1976 | 0 | 0 | 0 | 0 | 4 | 377 | 30 | 449 | 34 | 826 |
| 1981 | 0 | 0 | 0 | 0 | 5 | 446 | 17 | 290 | 22 | 736 |
| Lake Huron Shore | | | | | | | | | | |
| 1971 | 7 | 15 756 | 0 | 0 | 3 | 325 | 12 | 102 | 22 | 16 183 |
| 1976 | 6 | 14 845 | 0 | 0 | 3 | 351 | 15 | 130 | 24 | 15 326 |
| 1981 | 6 | 12 775 | 0 | 0 | 4 | 385 | 11 | 125 | 21 | 13 285 |
| Lake Superior Shore | | | | | | | | | | |
| 1971 | 5 | 1 428 | 0 | 0 | 0 | 0 | 3 | 33 | 8 | 1 461 |
| 1976 | 3 | 1 217 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 217 |
| 1981 | 2 | 1 000-1 499 | 0 | 0 | 0 | 0 | 2 | 2-99 | 4 | 1 109 |
| **Hudson Bay and Ungava Bay Basin** | | | | | | | | | | |
| **1971** | **45** | **14 167** | **..[6]** | **..[6]** | **26** | **2 489** | **24** | **361** | **...** | **...** |
| **1976** | **40** | **12 941** | **12** | **1 000-1 499** | **26** | **3 389** | **16** | **335** | **94** | **17 500-17 999** |
| **1981** | **37** | **13 206** | **11** | **500-999** | **27** | **4 203** | **15** | **199** | **90** | **18 000-18 499** |
| Hudson Bay and Ungava Bay Coastal | | | | | | | | | | |
| 1971 | 31 | 8 403 | 0 | 0 | 2 | 100-199 | 0 | 0 | 33 | 8 500-8 999 |
| 1976 | 21 | 6 501 | 0 | 0 | 3 | 200-499 | 1 | 1-99 | 25 | 6 864 |
| 1981 | 24 | 8 245 | 0 | 0 | 3 | 155 | 0 | 0 | 27 | 8 400 |
| Nelson River | | | | | | | | | | |
| 1971 | 1 | 2 500-2 999 | 0 | 0 | 1 | 1-99 | 0 | 0 | 2 | 2 500-2 999 |
| 1976 | 3 | 3 167 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 167 |
| 1981 | 2 | 2 500-2 999 | 0 | 0 | 0 | 0 | 1 | 1-99 | 3 | 2 506 |

Table 6.1.2
**Mining Activity[1] by Major Drainage Area, 1971, 1976 and 1981[2] (continued)**

| Major Drainage Area | Metal Mines | | Coal Mines | | Non-Metal Mines[3] | | Sand Pits and Quarries | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] |
| Lake Winnipeg Shore | | | | | | | | | | |
| 1971 | 11 | 1 977 | 0 | 0 | 3 | 89 | 8 | 150 | 22 | 2 216 |
| 1976 | 12 | 2 447 | 0 | 0 | 2 | 2-99 | 6 | 100-199 | 20 | 2 650 |
| 1981 | 9 | 1 932 | 0 | 0 | 3 | 193 | 6 | 65 | 18 | 2 190 |
| Assiniboine River | | | | | | | | | | |
| 1971 | 0 | 0 | 3 | 164 | 7 | 1 030 | 6 | 37 | 16 | 1 231 |
| 1976 | 0 | 0 | 4 | 200-499 | 7 | 1 320 | 1 | 1-99 | 12 | 1 559 |
| 1981 | 0 | 0 | 5 | 200-499 | 7 | 1 786 | 1 | 1-99 | 13 | 2 122 |
| Saskatchewan River | | | | | | | | | | |
| 1971 | 2 | 1 000-1 499 | ..[6] | ..[6] | 13 | 1 204 | 10 | 174 | ... | ... |
| 1976 | 4 | 826 | 8 | 874 | 14 | 1 642 | 8 | 177 | 34 | 3 519 |
| 1981 | 2 | 500-999 | 6 | 510 | 14 | 2 069 | 7 | 100-199 | 29 | 3 221 |
| **Arctic Ocean Basin** | | | | | | | | | | |
| **1971** | **8** | **1 025** | ..[6] | ..[6] | **4** | **643** | **2** | **2-99** | ... | ... |
| **1976** | **10** | **1 000-1 499** | **2** | **1 000-499** | **5** | **500-999** | **0** | **0** | **17** | **3 049** |
| **1981** | **12** | **2 000-2 499** | **4** | **1 791** | **4** | **567** | **0** | **0** | **20** | **4 466** |
| Mackenzie River | | | | | | | | | | |
| 1971 | 8 | 1 025 | ..[6] | ..[6] | 4 | 643 | 2 | 2-99 | ... | ... |
| 1976 | 9 | 1 271 | 2 | 1 000-1 499 | 5 | 500-999 | 0 | 0 | 16 | 3 002 |
| 1981 | 11 | 1 924 | 4 | 1 791 | 4 | 567 | 0 | 0 | 19 | 4 282 |
| Arctic Ocean Coastal | | | | | | | | | | |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 1 | 1-99 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1-99 |
| 1981 | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| **Pacific Ocean Basin** | | | | | | | | | | |
| **1971** | **31** | **5 818** | **1** | **1 000-1 499** | **11** | **200-499** | **23** | **200-499** | **66** | **7 744** |
| **1976** | **28** | **5 948** | **3** | **2 058** | **6** | **100-199** | **15** | **200-499** | **52** | **8 366** |
| **1981** | **31** | **7 885** | **3** | **2 767** | **5** | **100-199** | **9** | **200-499** | **48** | **10 990** |
| Columbia River | | | | | | | | | | |
| 1971 | 13 | 1 781 | 1 | 1 000-1 499 | 2 | 2-99 | 2 | 2-99 | 18 | 3 185 |
| 1976 | 9 | 1 580 | 3 | 2 058 | 2 | 2-99 | 2 | 2-99 | 16 | 3 703 |
| 1981 | 9 | 2 534 | 3 | 2 767 | 2 | 2-99 | 2 | 2-99 | 16 | 5 394 |
| Fraser River | | | | | | | | | | |
| 1971 | 6 | 1 445 | 0 | 0 | 9 | 234 | 16 | 208 | 31 | 1 887 |
| 1976 | 6 | 2 034 | 0 | 0 | 4 | 133 | 8 | 67 | 18 | 2 234 |
| 1981 | 10 | 2 544 | 0 | 0 | 3 | 80 | 3 | 63 | 16 | 2 687 |
| Yukon River | | | | | | | | | | |
| 1971 | 3 | 606 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 606 |
| 1976 | 3 | 641 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 641 |
| 1981 | 3 | 838 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 838 |
| Pacific Ocean, North Coastal | | | | | | | | | | |
| 1971 | 4 | 1 023 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 023 |
| 1976 | 5 | 657 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 657 |
| 1981 | 6 | 872 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 872 |
| Pacific Ocean, South Coastal | | | | | | | | | | |
| 1971 | 5 | 963 | 0 | 0 | 0 | 0 | 5 | 80 | 10 | 1 043 |
| 1976 | 5 | 1 036 | 0 | 0 | 0 | 0 | 5 | 95 | 10 | 1 131 |
| 1981 | 3 | 1 097 | 0 | 0 | 0 | 0 | 4 | 102 | 7 | 1 199 |
| **Gulf of Mexico Basin** | | | | | | | | | | |
| **1971** | **0** | **0** | **0** | **0** | **1** | **1-99** | **0** | **0** | **1** | **1-99** |
| **1976** | **0** | **0** | **0** | **0** | **1** | **1-99** | **0** | **0** | **1** | **1-99** |
| **1981** | **0** | **0** | **1** | **1-99** | **0** | **0** | **0** | **0** | **1** | **1-99** |
| Missouri River | | | | | | | | | | |
| 1971 | 0 | 0 | 0 | 0 | 1 | 1-99 | 0 | 0 | 1 | 1-99 |
| 1976 | 0 | 0 | 0 | 0 | 1 | 1-99 | 0 | 0 | 1 | 1-99 |
| 1981 | 0 | 0 | 1 | 1-99 | 0 | 0 | 0 | 0 | 1 | 1-99 |
| **Canada** | | | | | | | | | | |
| **1971** | **137** | **50 033** | **35** | **6 343** | **128** | **11 873** | **304** | **4 282** | **604** | **72 531** |
| **1976** | **117** | **49 834** | **28** | **7 777** | **117** | **12 035** | **265** | **4 412** | **527** | **74 058** |
| **1981** | **125** | **49 586** | **33** | **9 188** | **124** | **12 557** | **219** | **3 109** | **501** | **74 440** |

Table 6.1.2
## Mining Activity[1] by Major Drainage Area, 1971, 1976 and 1981[2] (concluded)

[1] Excludes crude petroleum and natural gas industry and services incidental to mining.
[2] Ranges are used to meet the confidentiality restrictions of the Statistics Act.
[3] Includes asbestos, salt, potash, sulfur and miscellaneous non-metallic mineral mines.
[4] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.
[5] Includes production and related workers, e.g. those of the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.
[6] It was not possible to allocate the 1971 coal mining data by drainage basins for Alberta. The unallocated figures for the province are 24 establishments and 1669 production workers. Coal mining is confined to the Mackenzie and Saskatchewan Drainage Areas. These figures are included in the totals.

**Sources:**
Energy, Mines and Resources Canada, Annual Census of Metal Mines, Non-Metal Mines and Sand Pits and Quarries, 1971, 1976 and 1981.
Statistics Canada, Annual Census of Coal Mines, 1976 and 1981.
Statistics Canada, *Coal Mines*, Catalogue 26-206, 1971.
Statistics Canada, Office of the Senior Adviser on Integration, special tabulations.

Table 6.1.3
## Consumption of Fuel and Electricity[1] by Mining Industries[2], by Ecozone, 1976 and 1981

| Ecozone | Fossil Fuel | | | Electricity | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1976 | 1981 | Percent Change 1976 to 1981 | 1976 | 1981 | Percent Change 1976 to 1981 | 1976 | 1981 | Percent Change 1976 to 1981 |
| | terajoules | | | terajoules | | | terajoules | | |
| **Atlantic Maritime** | **10 404** | **8 281** | **-20.4** | **2 582** | **4 069** | **57.6** | **12 986** | **12 350** | **-4.9** |
| Nova Scotia | 1 282 | 1 460 | 13.9 | 461 | 675 | 46.4 | 1 743 | 2 135 | 22.5 |
| New Brunswick | 1 526 | 1 942 | 27.3 | 1 078 | 1 416 | 31.4 | 2 604 | 3 358 | 29.0 |
| Québec | 7 596 | 4 878 | -35.8 | 1 042 | 1 978 | 89.8 | 8 638 | 6 856 | -20.6 |
| **Mixed-Wood Plain** | **12 249** | **10 545** | **-13.9** | **3 480** | **3 169** | **-8.9** | **15 729** | **13 714** | **-12.8** |
| Québec | 8 254 | 6 418 | -22.2 | 2 664 | 2 517 | -5.5 | 10 918 | 8 935 | -18.2 |
| Ontario | 3 995 | 4 127 | 3.3 | 815 | 652 | -20.0 | 4 810 | 4 779 | -0.6 |
| **Boreal Shield** | **40 169** | **29 281** | **-27.1** | **23 077** | **18 999** | **-17.7** | **63 246** | **48 280** | **-23.7** |
| Newfoundland | 1 389 | 1 252 | -9.9 | 438 | 364 | -16.9 | 1 827 | 1 616 | -11.5 |
| Québec | 11 855 | 11 508 | -2.9 | 7 716 | 7 397 | -4.1 | 19 571 | 18 905 | -3.4 |
| Ontario | 25 272 | 15 191 | -39.9 | 12 438 | 9 555 | -23.2 | 37 710 | 24 746 | -34.4 |
| Manitoba | 1 630 | 1 291 | -20.8 | 2 306 | 1 594 | -30.9 | 3 936 | 2 885 | -26.7 |
| Saskatchewan | 23 | 39 | 69.6 | 179 | 89 | -50.3 | 202 | 128 | -36.6 |
| **Prairie** | **23 122** | **27 629** | **19.5** | **3 302** | **4 034** | **22.2** | **26 424** | **31 663** | **19.8** |
| Manitoba | 119 | 70 | -41.2 | 9 | 7 | -22.2 | 128 | 77 | -39.8 |
| Saskatchewan | 22 212 | 26 888 | 21.1 | 3 212 | 3 912 | 21.8 | 25 424 | 30 800 | 21.1 |
| Alberta | 791 | 672 | -15.0 | 81 | 115 | 42.0 | 872 | 787 | -9.7 |
| **Boreal Plain** | **1 681** | **3 169** | **88.5** | **284** | **526** | **85.2** | **1 965** | **3 695** | **88.0** |
| Manitoba | 219 | 186 | -15.1 | 170 | 215 | 26.5 | 389 | 401 | 3.1 |
| Saskatchewan | 515 | 996 | 93.4 | 2 | 5 | 150.0 | 517 | 1 001 | 93.6 |
| Alberta | 947 | 1 987 | 109.8 | 112 | 305 | 172.3 | 1 059 | 2 292 | 116.4 |
| **Montane Cordillera** | **9 448** | **14 374** | **52.1** | **6 528** | **9 263** | **41.9** | **15 976** | **23 637** | **48.0** |
| Alberta | 2 298 | 1 338 | -41.8 | 632 | 307 | -51.4 | 2 930 | 1 645 | -43.9 |
| British Columbia | 7 149 | 13 036 | 82.3 | 5 897 | 8 957 | 51.9 | 13 046 | 21 993 | 68.6 |
| **Pacific Maritime** | **3 330** | **3 301** | **-0.9** | **1 677** | **1 852** | **10.4** | **5 007** | **5 153** | **2.9** |
| British Columbia | 3 330 | 3 301 | -0.9 | 1 677 | 1 852 | 10.4 | 5 007 | 5 153 | 2.9 |
| **Boreal Cordillera** | **2 524** | **1 842** | **-27.0** | **728** | **586** | **-19.5** | **3 252** | **2 428** | **-25.3** |
| British Columbia | 1 490 | 1 326 | -11.0 | 0 | 0 | ... | 1 490 | 1 326 | -11.0 |
| Yukon | 1 034 | 515 | -50.2 | 728 | 586 | -19.5 | 1 762 | 1 101 | -37.5 |
| **Tundra Cordillera** | **0** | **391** | **...** | **0** | **0** | **...** | **0** | **391** | **...** |
| Northwest Territories | 0 | 391 | ... | 0 | 0 | ... | 0 | 391 | ... |
| **Taiga Plain** | **838** | **764** | **-8.8** | **405** | **377** | **-6.9** | **1 243** | **1 141** | **-8.2** |
| Northwest Territories | 838 | 764 | -8.8 | 405 | 377 | -6.9 | 1 243 | 1 141 | -8.2 |
| **Taiga Shield** | **21 557** | **18 794** | **-12.8** | **7 626** | **4 981** | **-34.7** | **29 183** | **23 775** | **-18.5** |
| Newfoundland | 19 002 | 17 162 | -9.7 | 7 351 | 4 836 | -34.2 | 26 353 | 21 998 | -16.5 |
| Québec | 1 620 | 516 | -68.1 | 137 | 9 | -93.4 | 1 757 | 525 | -70.1 |
| Saskatchewan | 0 | 560 | ... | 0 | 7 | ... | 0 | 567 | ... |
| Northwest Territories | 935 | 556 | -40.5 | 138 | 130 | -5.8 | 1 073 | 686 | -36.1 |

Table 6.1.3
## Consumption of Fuel and Electricity[1] by Mining Industries[2], by Ecozone, 1976 and 1981 (concluded)

| Ecozone | Fossil Fuel | | | Electricity | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1976 | 1981 | Percent Change 1976 to 1981 | 1976 | 1981 | Percent Change 1976 to 1981 | 1976 | 1981 | Percent Change 1976 to 1981 |
| | terajoules | | | terajoules | | | terajoules | | |
| **Northern Arctic** | **100** | **335** | **235.0** | **0** | **0** | ... | **100** | **335** | **235.0** |
| Northwest Territories | 100 | 335 | 235.0 | 0 | 0 | ... | 100 | 335 | 235.0 |
| **Canada** | **125 420** | **118 705** | **-5.4** | **49 688** | **47 855** | **-3.7** | **175 108** | **166 560** | **-4.9** |

[1] Data include purchased fuel and electricity and exclude any self produced fuel and electricity, fuel used for non-fuel purposes (production processes), and other energy sources such as steam or wood. Figures apply only to larger establishments reporting detail in their mining and non-mining(e.g. transportation, space heating) operations.
[2] Includes metal mines, coal mines, non-metal mines and sand pits and quarries.

**Sources:**
Energy, Mines and Resources Canada, Annual Census of Metal Mines, Non-Metal Mines and Sand Pits and Quarries, 1976 and 1981.
Statistics Canada, Annual Census of Coal Mines, 1976 and 1981.
Statistics Canada, Office of the Senior Adviser on Integration, special tabulations.

**Note:**
Individual items may not add to totals due to rounding.

Table 6.1.4
## Consumption of Fuel and Electricity[1] by Mining Industries[2], by Major Drainage Area, 1976 and 1981

| Major Drainage Area | Fossil Fuel | | | Electricity | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1976 | 1981 | Percent Change 1976 to 1981 | 1976 | 1981 | Percent Change 1976 to 1981 | 1976 | 1981 | Percent Change 1976 to 1981 |
| | terajoules | | | terajoules | | | terajoules | | |
| **Atlantic Ocean Basin** | **65 905** | **57 939** | **-12.1** | **28 147** | **23 732** | **-15.7** | **94 051** | **81 671** | **-13.2** |
| Atlantic Ocean Coastal | 20 717 | 18 327 | -11.5 | 7 833 | 5 069 | -35.3 | 28 550 | 23 396 | -18.1 |
| Gulf of St.Lawrence Coastal | 20 551 | 10 812 | -47.4 | 8 114 | 7 395 | -8.9 | 28 664 | 18 207 | -36.5 |
| Bay of Fundy Coastal and Saint John River | 378 | 851 | 124.9 | 158 | 294 | 85.7 | 537 | 1 145 | 113.3 |
| St.Lawrence River | 7 473 | 12 947 | 73.2 | 2 446 | 4 347 | 77.7 | 9 919 | 17 294 | 74.4 |
| Ottawa River | 2 262 | 2 683 | 18.6 | 1 661 | 1 564 | -5.8 | 3 923 | 4 247 | 8.3 |
| Lake Ontario Shore | 2 102 | 1 158 | -44.9 | 494 | 332 | -32.8 | 2 596 | 1 490 | -42.6 |
| Lake Erie and Lake St.Clair Shore | 1 196 | 1 104 | -7.7 | 215 | 223 | 3.7 | 1 411 | 1 327 | -5.9 |
| Lake Huron Shore | 7 086 | 6 565 | -7.4 | 6 419 | 3 783 | -41.1 | 13 504 | 10 348 | -23.4 |
| Lake Superior Shore | 4 140 | 3 492 | -15.6 | 807 | 725 | -10.2 | 4 947 | 4 217 | -14.7 |
| **Hudson Bay and Ungava Bay Basin** | **42 187** | **37 238** | **-11.7** | **12 310** | **11 601** | **-5.8** | **54 496** | **48 837** | **-10.4** |
| Hudson Bay and Ungava Bay Coastal | 4 413 | 4 832 | 9.5 | 3 803 | 4 032 | 6.0 | 8 216 | 8 864 | 7.9 |
| Nelson River | 1 001 | 792 | -20.9 | 1 753 | 1 091 | -37.8 | 2 754 | 1 882 | -31.7 |
| Lake Winnipeg Shore | 12 244 | 3 262 | -73.4 | 2 992 | 2 144 | -28.4 | 15 235 | 5 405 | -64.5 |
| Assiniboine River | 14 447 | 18 391 | 27.3 | 1 540 | 1 808 | 17.4 | 15 987 | 20 199 | 26.3 |
| Saskatchewan River | 10 082 | 9 961 | -1.2 | 2 222 | 2 526 | 3.7 | 12 304 | 12 487 | 1.5 |
| **Arctic Ocean Basin** | **6 266** | **6 666** | **6.4** | **1 166** | **1 084** | **-7.0** | **7 431** | **7 750** | **4.3** |
| Mackenzie River | 6 166 | 6 331 | 2.7 | 1 166 | 1 084 | -7.0 | 7 331 | 7 415 | 1.1 |
| Arctic Ocean Coastal | 100 | 335 | 236.6 | 0 | 0 | ... | 100 | 335 | 236.6 |
| **Pacific Ocean Basin** | **10 870** | **16 851** | **55.0** | **8 064** | **11 395** | **41.3** | **18 933** | **28 248** | **49.2** |
| Columbia River | 4 969 | 9 857 | 98.4 | 2 500 | 4 869 | 94.8 | 7 468 | 14 726 | 97.2 |
| Fraser River | 2 262 | 3 026 | 33.8 | 2 931 | 3 665 | 25.0 | 5 193 | 6 692 | 28.9 |
| Yukon River | 390 | 515 | 32.0 | 728 | 586 | -19.5 | 1 118 | 1 102 | -1.5 |
| Pacific Ocean, North Coastal | 2 189 | 2 040 | -6.8 | 495 | 484 | -2.3 | 2 684 | 2 524 | -6.0 |
| Pacific Ocean, South Coastal | 1 060 | 1 413 | 33.3 | 1 410 | 1 791 | 27.0 | 2 470 | 3 204 | 29.7 |
| **Gulf of Mexico Basin** | **196** | **12** | **-93.7** | **3** | **43** | **1 439.3** | **199** | **55** | **-72.1** |
| Missouri River | 196 | 12 | -93.7 | 3 | 43 | 1439.3 | 199 | 55 | -72.1 |
| **Canada** | **125 420** | **118 705** | **-5.4** | **49 688** | **47 855** | **-3.7** | **175 108** | **166 560** | **-4.9** |

[1] Data include purchased fuel and electricity and exclude any self produced fuel and electricity, fuel used for non fuel purposes(production processes), and other energy sources such as steam or wood. Figures apply only to larger establishments reporting detail in their mining and non-mining (e.g. transportation, space heating) operations.
[2] Includes metal mines, coal mines, non-metal mines and sand pits and quarries.

**Sources:**
Energy, Mines and Resources Canada, Annual Census of Metal Mines, Non-Metal Mines and Sand Pits and Quarries, 1976 and 1981.
Statistics Canada, Annual Census of Coal Mines, 1976 and 1981.
Statistics Canada, Office of the Senior Adviser on Integration, special tabulations.

**Note:**
Individual items may not add to totals due to rounding.

Table 6.1.5
## Metal Mining Waste Generation by Ecozone, 1981[1]

| Ecozone | Open Pit | | | Underground | | | Total Rock Waste[2] | Tailings and Residues[3] | |
|---|---|---|---|---|---|---|---|---|---|
| | Rock Waste[4] | Ore | Proportion of Waste to Ore[5] | Rock Waste[4] | Ore | Proportion of Waste to Ore[5] | | Total | Amount Used in Backfill |
| | thousands of tonnes | | | thousands of tonnes | | | thousands of tonnes | thousands of tonnes | |
| **Atlantic Maritime** | **1 200-2 600** | **5 000-10 100** | **0.2** | **100-400** | **3 500-7 000** | **--** | **1 300-3 000** | **7 700-15 500** | **0-300** |
| Nova Scotia | 0 | 0 | ... | 100-200 | 500-1 000 | 0.2 | 100-200 | 200-500 | 0-100 |
| New Brunswick | 0-100 | 0-100 | -- | 0-100 | 2 500-5 000 | -- | 0-200 | 2 500-5 000 | 0-100 |
| Québec | 1 200-2 500 | 5 000-10 000 | 0.2 | 0-100 | 500-1 000 | -- | 1 200-2 600 | 5 000-10 000 | 0-100 |
| **Boreal Shield** | **58 700-70 300** | **56 000-66 500** | **1.0** | **3 600-5 100** | **38 500-52 000** | **0.1** | **62 300-75 400** | **73 200-86 500** | **4 500-8 700** |
| Newfoundland | 0 | 0 | ... | 0-100 | 500-1 000 | 0.1 | 0-100 | 500-1 000 | 0-100 |
| Québec | 39 300-44 300 | 40 000-45 000 | 1.0 | 800-1 500 | 5 000-10 000 | 0.2 | 40 100-45 800 | 35 000-40 000 | 1 500-2 500 |
| Ontario | 19 300-25 800 | 15 000-20 000 | 1.3 | 2 500-2 900 | 30 000-35 000 | 0.1 | 21 800-28 700 | 35 000-40 000 | 2 500-5 000 |
| Manitoba | 100-200 | 1 000-1 500 | 0.1 | 300-500 | 2 500-5 000 | 0.1 | 400-700 | 2 500-5 000 | 500-1 000 |
| Saskatchewan | 0 | 0 | ... | 0-100 | 500-1 000 | 0.1 | 0-100 | 200-500 | 0-100 |
| **Boreal Plain** | **1 600-3 200** | **500-1 000** | **3.2** | **0-100** | **500-1 000** | **--** | **1 600-3 300** | **1 000-2 000** | **200-600** |
| Manitoba | 0 | 0 | ... | 0-100 | 500-1 000 | -- | 0-100 | 500-1 000 | 200-500 |
| Saskatchewan | 1 600-3 200 | 500-1 000 | 3.2 | 0 | 0 | ... | 1 600-3 200 | 500-1 000 | 0-100 |
| **Montane Cordillera** | **171 732** | **92 954** | **1.8** | **249** | **3 809** | **0.1** | **171 981** | **91 034** | **26** |
| British Columbia | 171 732 | 92 954 | 1.8 | 249 | 3 809 | 0.1 | 171 981 | 91 034 | 26 |
| **Pacific Maritime** | **37 999** | **14 087** | **2.7** | **273** | **1 957** | **0.1** | **38 272** | **15 266** | **125** |
| British Columbia | 37 999 | 14 087 | 2.7 | 273 | 1 957 | 0.1 | 38 272 | 15 266 | 125 |
| **Boreal Cordillera** | **30 938** | **2 511** | **12.3** | **17** | **822** | **--** | **30 955** | **3 003** | **7** |
| British Columbia | 0 | 0 | ... | 4 | 57 | 0.1 | 4 | 57 | 0 |
| Yukon | 30 938 | 2 511 | 12.3 | 13 | 765 | -- | 30 951 | 2 946 | 7 |
| **Tundra Cordillera** | **0** | **0** | **...** | **0-100** | **200-500** | **--** | **0-100** | **200-500** | **0-100** |
| Northwest Territories | 0 | 0 | ... | 0-100 | 200-500 | -- | 0-100 | 200-500 | 0-100 |
| **Taiga Plain** | **10 000-20 000** | **2 500-5 000** | **4.0** | **0** | **0** | **...** | **10 000-20 000** | **2 500-5 000** | **0-100** |
| Northwest Territories | 10 000-20 000 | 2 500-5 000 | 4.0 | 0 | 0 | ... | 10 000-20 000 | 2 500-5 000 | 0-100 |
| **Taiga Shield** | **18 000-20 000** | **60 100-65 400** | **0.3** | **200-600** | **700-1 500** | **0.4** | **18 200-20 600** | **30 700-36 600** | **100-500** |
| Newfoundland | 17 800-18 400 | 60 000-65 000 | 0.3 | 0 | 0 | ... | 17 800-18 400 | 30 000-35 000 | 0-100 |
| Québec | 0-800 | 0-100 | 8.1 | 0 | 0 | ... | 0-800 | 0-100 | 0-100 |
| Saskatchewan | 0-400 | 0-100 | 3.6 | 100-400 | 200-500 | 0.7 | 100-800 | 200-500 | 100-200 |
| Northwest Territories | 200-400 | 100-200 | 1.8 | 100-200 | 500-1 000 | 0.2 | 300-600 | 500-1 000 | 0-100 |
| **Northern Arctic** | **0** | **0** | **...** | **100-200** | **500-1 000** | **0.2** | **100-200** | **200-500** | **0-100** |
| Northwest Territories | 0 | 0 | ... | 100-200 | 500-1 000 | 0.2 | 100-200 | 200-500 | 0-100 |
| **Canada** | **338 780** | **243 108** | **1.4** | **5 448** | **58 423** | **0.1** | **344 228** | **235 684** | **6 528** |

[1] Ranges are used to meet the confidentiality restrictions of the Statistics Act.
[2] Rock waste produced by mining operations before processing.
[3] Tailings and residues are wastes generated in the processing of ores.
[4] Rock waste include overburden.
[5] Amount of rock waste produced per tonne of ore produced.

Source:
Energy, Mines and Resources Canada, Annual Census of Metal Mines, 1981.
Statistics Canada, Office of the Senior Adviser on Integration, Special tabulation.

Table 6.1.6
## Coal Mining Rock Waste Generation by Ecozone, 1981[1]

| Ecozone | Surface | | | Underground | | |
|---|---|---|---|---|---|---|
| | Rock Waste[2] | Coal Extracted | Proportion of Rock Waste to Coal Extracted[3] | Rock Waste | Coal Extracted | Proportion of Rock Waste to Coal Extracted[3] |
| | thousands of tonnes | | | thousands of tonnes | | |
| **Atlantic Maritime** | **2 700-6 800** | **700-1 500** | **4.8** | **400-580** | **1 500-2 500** | **0.3** |
| Nova Scotia | 2 700-6 700 | 200-500 | 13.5 | 400-580 | 1 500-2 500 | 0.3 |
| New Brunswick | 0-100 | 500-1 000 | -- | 0 | 0 | ... |
| **Prairie** | **54 343** | **9 599** | **5.7** | **0** | **0** | **...** |
| Saskatchewan | 40 031 | 7 363 | 5.4 | 0 | 0 | ... |
| Alberta | 14 312 | 2 236 | 6.4 | 0 | 0 | ... |
| **Boreal Plain** | **49 139** | **14 934** | **3.3** | **0** | **0** | **...** |
| Alberta | 49 139 | 14 934 | 3.3 | 0 | 0 | ... |
| **Montane Cordillera** | **75 700-116 500** | **11 500-17 500** | **6.4** | **0-200** | **2 000-3 000** | **--** |
| Alberta | 17 700-29 500 | 1 500-2 500 | 11.8 | 0-100 | 1 000-1 500 | -- |
| British Columbia | 58 000-87 000 | 10 000-15 000 | 5.8 | 0-100 | 1 000-1 500 | -- |
| **Canada** | **209 034** | **41 151** | **5.1** | **580** | **4 489** | **0.1** |

[1] Ranges are used to meet the confidentiality restrictions of the Statistics Act.
[2] Rock waste includes overburden.
[3] Amount of rock waste produced per tonne of coal extracted.

**Source:**
Statistics Canada, Annual Census of Coal Mines, 1981, special tabulation by the Office of the Senior Adviser on Integration.

# 6.2
# Manufacturing

## Stressor Type:
## a Classification of Industrial Stress

This three-way classification of the Standard Industrial Classification by stressor type was developed in response to the need for spatial analysis of environmental stress. The group classes are underpinned by the relationship between industrial processes and the generation of waste residuals. The stress impact of individual establishments varies with the scale of operation, the type of industrial process employed, and the effectiveness of pollution abatement equipment. Moreover, the relationship between plant location and neighbouring human activities, ecological characteristics of the surrounding area and meteorological conditions must also be taken into account for any environmental impact assessment. The data displayed here (Section 6.2) should be considered as a first approximation of potential stress of industrial activity in geographic space.

The **high stressor group** is identified with what are sometimes referred to as heavy industries which include pulp and paper, metal smelting and refining, industrial chemicals, mining and thermal power generation. These industries are associated with large-scale activities of extraction, concentration, refining, and energy conversion. These are characterized as processes which draw raw materials from the environment and transform them into early stage products in the industrial chain. Typically, they exhibit high energy consumption per unit of output, generate high levels of waste residuals and are frequently associated with large-scale landscape change. Not surprisingly, a large part of the expenditure on industrial pollution abatement equipment is concentrated in these industries; they account for approximately eighty percent of expenditures on water treatment and seventy-five percent of expenditures on air pollution abatement (see Table 8.1.2). In manufacturing, the high stressor type industries accounted for only 1.2 percent of manufacturing establishments in 1981, yet consumed sixty percent of the energy[1], contributed twenty percent of the value added, and employed twelve percent of the production workers (see Table 6.2.2).

[1] The figure here is based on purchased electricity and fuels - some of these industries also produce energy for their own needs. See Technical Box 6.6.1, Energy Intensity of Industrial Processes: an Indicator of Environmental Stress.

The **medium stressor group** is composed of industries associated with further processing of materials into specialized products required for the next and final stage of manufacturing although some finished manufacturing goods are included because of special pollution concerns (e.g. food processing, pharmaceuticals). In these industries, unlike those of the high stressor category, stresses tended to be more specific to either air or water. For this reason it was considered useful to further classify them by media. The criteria delineating medium stressor industries are not as clear-cut as those for the high stressor category. First, there is a greater range of variability between individual establishments with respect to scale of operation, process employed, and product produced. Second, the distinction between the low and medium stress levels is subject to some degree of arbitrariness. The list was ultimately drawn-up after discussions with experts who were knowledgeable regarding the pollution characteristics of particular industries, and by taking into account industries identified for development of pollution control guidelines by the Environmental Protection Service of Environment Canada. This group must be considered as preliminary until better data become available on actual emission measures. About thirty percent of all manufacturing establishments fall into this category for water and thirteen percent for air.

The **low stressor group** contains the remaining industries and in this sense can be considered as a residual category. Nevertheless, it accounts for a large proportion of the industries which produce final goods. They tend to fall under the process headings of assembly, construction, or packaging and are generally characterized by high labour input per unit of output, with relatively low energy and raw material inputs. According to 1981 data, the low stressor to water group accounted for sixty-nine percent of the establishments, employed sixty-one percent of the production workers and consumed eighteen percent of the energy. Low stressor to air accounted for eighty-six percent of establishments, seventy-eight percent of the production workers, and twenty-six percent of the energy consumed.

## Industries by Stressor Type — Industries Defined by the Standard Industrial Classification[1] (continued)

### High Stressor (Pollutants to Air and Water)

| | |
|---|---|
| Metal mines | 051-059 |
| Coal mines | 061 |
| Crude petroleum and natural gas industry | 064 |
| Non-metal mines | 071-079 |
| Pulp and paper mills | 271 |
| Iron and steel mills | 291 |
| Smelting and refining | 295 |
| Petroleum refining | 3651 |
| Manufacturers of industrial chemicals | 378 |
| Electric power (Thermal and nuclear) | 572 |

### Medium Stressor (Pollutants to Air)

| | |
|---|---|
| Quarries and sand pits | 083-087 |
| Bakery products | 107 |
| Sawmills, planing and shingle mills | 251 |
| Veneer and plywood mills | 252 |
| Iron foundries | 294 |
| Manufacturers of miscellaneous electrical products | 339 |
| Clay products manufacturers | 351 |
| Cement manufacturers | 352 |
| Stone products manufacturers | 353 |
| Concrete products manufacturers | 354 |
| Glass and glass products manufacturers | 356 |
| Abrasives manufacturers | 357 |
| Lime manufacturers | 358 |
| Miscellaneous non-metallic mineral products | 359 |
| Miscellaneous petroleum and coal products | 369 |
| Manufacturers of mixed fertilizers | 372 |
| Manufacturers of plastics and synthetic resins | 373 |

### Medium Stressor (Pollutants to Water)

| | |
|---|---|
| Logging | 031 |
| Quarries and sand pits | 083-087 |
| Meat and poultry products | 101 |
| Fish products | 102 |
| Fruit and vegetable processing | 103 |
| Dairy | 104 |
| Flour and breakfast cereal products | 105 |
| Feed industry | 106 |
| Beverage industry | 109 |
| Tire and tube manufacturers | 1623 |
| Leather tanneries | 172 |
| Textile industries | 181-189 |
| Asphalt roofing manufacturers | 272 |
| Steel pipe and tube mills | 292 |
| Iron foundries | 294 |
| Aluminum rolling, casting and extruding | 296 |
| Copper and copper alloy rolling, casting and extruding | 297 |
| Metal rolling, casting and extruding, n.e.s. | 298 |
| Metal fabricating | 301-309 |
| Clay products manufacturers | 351 |
| Cement manufacturers | 352 |
| Ready-mix concrete manufacturers | 355 |
| Lime manufacturers | 358 |
| Manufacturers of lubricating oils and greases | 3652 |
| Miscellaneous petroleum and coal products | 369 |
| Manufacturers of mixed fertilizers | 372 |
| Manufacturers of synthetic plastics and resins | 373 |
| Manufacturers of pharmaceuticals and medicines | 374 |
| Paint and varnish | 375 |
| Soap and cleaning compounds | 376 |
| Miscellaneous chemicals | 379 |

### Low Stressor (Pollutants to Air)

| | |
|---|---|
| Logging | 031 |
| Food and beverage industries | 101-109, except 107 |
| Tobacco products | 151 and 153 |
| Rubber and plastics products | 162-165 |
| Leather industries | 172-179 |
| Textile industries | 181-189 |
| Knitting mills | 231 and 239 |
| Clothing industries | 243-249 |
| Wood industries | 254-259 |
| Furniture and fixtures | 261-268 |
| Asphalt roofing manufacturers | 272 |
| Paper box and bag manufacturers | 273 |
| Miscellaneous paper converters | 274 |
| Printing, publishing and allied | 286-289 |
| Steel pipe and tube mills | 292 |
| Aluminum rolling, casting and extruding | 296 |
| Copper and copper alloy rolling, casting and extruding | 297 |
| Metal fabricating | 301-309 |
| Machinery | 311-318 |
| Transportation equipment | 321-329 |
| Electrical products | 331-338 |
| Ready-mix concrete manufacturers | 355 |
| Manufacturers of lubricating oils and greases | 3652 |
| Manufacturers of pharmaceuticals and medicines | 374 |
| Paint and varnish | 375 |
| Soap and cleaning compounds | 376 |
| Manufacturers of toilet preparations | 377 |
| Miscellaneous chemicals | 379 |
| Miscellaneous manufacturing | 391-399 |

### Low Stressor (Pollutants to Water)

| | |
|---|---|
| Bakery products | 107 |
| Miscellaneous food industries | 108 |
| Tobacco products | 151 and 153 |
| Rubber footwear | 1624 |
| Miscellaneous rubber products | 1629 |
| Plastic fabricating, n.e.s. | 185 |
| Shoe factories | 174 |
| Leather glove factories | 175 |
| Luggage, handbag and small leather goods | 179 |
| Knitting mills | 231 and 239 |
| Clothing industries | 243-249 |
| Wood industries | 251-259 |
| Furniture and fixtures | 261-268 |
| Paper box and bag manufacturers | 273 |
| Miscellaneous paper converters | 274 |
| Printing, publishing and allied | 286-289 |
| Machinery | 311-318 |
| Transportation equipment | 321-329 |
| Electrical products | 331-339 |
| Stone products | 353 |
| Concrete products | 354 |
| Glass and glass products | 356 |
| Abrasive manufacturers | 357 |
| Miscellaneous non-metallic mineral products | 359 |
| Manufacturers of toilet preparations | 377 |
| Miscellaneous manufacturing | 391-399 |

[1] Includes primary industries (excluding agriculture), manufacturing industries and the electric power generation industry.

Table 6.2.1
## Manufacturing Activity[1] by Stressor Type: Stress to Air, 1971, 1976 and 1981

| Stressor Type | Establishments[2] | | Workers[3] | | Value Added[4] | | Purchased Energy | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fossil Fuels | | Electricity | |
| | number | percent | number | percent | millions of constant 1971 dollars | percent | terajoules | percent | terajoules | percent |
| High: | | | | | | | | | | |
| 1971 | 404 | 1.3 | 143 934 | 12.3 | 3 601 | 15.5 | .. | .. | .. | .. |
| 1976 | 403 | 1.4 | 149 762 | 11.7 | 4 624 | 17.5 | 532 316 | 56.1 | 182 492 | 66.6 |
| 1981 | 420 | 1.2 | 156 499 | 11.7 | 6 130 | 19.8 | 567 849 | 57.7 | 221 566 | 66.3 |
| Medium: | | | | | | | | | | |
| 1971 | 5 049 | 15.8 | 135 492 | 11.6 | 2 295 | 9.9 | .. | .. | .. | .. |
| 1976 | 4 130 | 14.2 | 140 223 | 11.0 | 2 775 | 10.5 | 153 134 | 16.1 | 29 121 | 10.6 |
| 1981 | 4 485 | 12.5 | 142 435 | 10.7 | 2 717 | 8.8 | 148 671 | 15.1 | 35 825 | 10.7 |
| Low: | | | | | | | | | | |
| 1971 | 26 455 | 82.9 | 888 384 | 76.1 | 17 292 | 74.6 | .. | .. | .. | .. |
| 1976 | 24 520 | 84.4 | 986 708 | 77.3 | 19 065 | 72.0 | 263 895 | 27.8 | 62 502 | 22.8 |
| 1981 | 30 875 | 86.3 | 1 038 395 | 77.6 | 22 140 | 71.4 | 267 777 | 27.2 | 76 692 | 23.0 |
| Total: | | | | | | | | | | |
| 1971 | 31 908 | 100.0 | 1 167 810 | 100.0 | 23 188 | 100.0 | .. | .. | .. | .. |
| 1976 | 29 053 | 100.0 | 1 276 693 | 100.0 | 26 464 | 100.0 | 949 344 | 100.0 | 274 115 | 100.0 |
| 1981 | 35 780 | 100.0 | 1 337 329 | 100.0 | 30 987 | 100.0 | 984 296 | 100.0 | 334 083 | 100.0 |

[1] Standard Industrial Classification Codes, 101 to 399.
[2] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.
[3] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.
[4] Constant values are obtained by using the gross domestic product deflator for manufacturing industries.

**Sources:**
Statistics Canada, Annual Census of Manufactures, 1976 and 1981.
Statistics Canada, *General Review of the Manufacturing Industries of Canada*, Catalogue 31-203, 1971.
Statistics Canada, *Gross Domestic Product by Industry*, Catalogue 61-213.
Statistics Canada, Office of the Senior Adviser on Integration, special tabulations.

Table 6.2.2
## Manufacturing Activity[1] by Stressor Type: Stress to Water, 1971, 1976 and 1981

| Stressor Type | Establishments[2] | | Workers[3] | | Value Added[4] | | Purchased Energy | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fossil Fuels | | Electricity | |
| | number | percent | number | percent | millions of constant 1971 dollars | percent | terajoules | percent | terajoules | percent |
| High: | | | | | | | | | | |
| 1971 | 404 | 1.3 | 143 934 | 12.3 | 3 601 | 15.5 | .. | .. | .. | .. |
| 1976 | 403 | 1.4 | 149 762 | 11.7 | 4 624 | 17.5 | 532 316 | 56.1 | 182 492 | 66.6 |
| 1981 | 420 | 1.2 | 156 499 | 11.7 | 6 130 | 19.8 | 567 849 | 57.7 | 221 566 | 66.3 |
| Medium: | | | | | | | | | | |
| 1971 | 10 223 | 32.0 | 325 801 | 27.9 | 7 067 | 30.5 | .. | .. | .. | .. |
| 1976 | 9 189 | 31.6 | 356 320 | 27.9 | 7 856 | 29.7 | 241 792 | 25.5 | 40 598 | 14.8 |
| 1981 | 10 786 | 30.1 | 370 208 | 27.7 | 8 831 | 28.5 | 237 106 | 24.1 | 49 408 | 14.8 |
| Low: | | | | | | | | | | |
| 1971 | 21 281 | 66.7 | 698 075 | 59.8 | 12 520 | 54.0 | .. | .. | .. | .. |
| 1976 | 19 461 | 67.0 | 770 611 | 60.4 | 13 984 | 52.8 | 175 236 | 18.4 | 51 025 | 18.6 |
| 1981 | 24 574 | 68.7 | 810 622 | 60.6 | 16 026 | 51.7 | 179 341 | 18.2 | 63 109 | 18.9 |
| Total: | | | | | | | | | | |
| 1971 | 31 908 | 100.0 | 1 167 810 | 100.0 | 23 188 | 100.0 | .. | .. | .. | .. |
| 1976 | 29 053 | 100.0 | 1 276 693 | 100.0 | 26 464 | 100.0 | 949 844 | 100.0 | 274 115 | 100.0 |
| 1981 | 35 780 | 100.0 | 1 337 329 | 100.0 | 30 987 | 100.0 | 984 296 | 100.0 | 334 083 | 100.0 |

[1] Standard Industrial Classification Codes, 101 to 399.
[2] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.
[3] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.
[4] Constant values are obtained by using the gross domestic product deflator for manufacturing industries.

**Sources:**
Statistics Canada, Annual Census of Manufactures, 1976 and 1981.
Statistics Canada, *General Review of the Manufacturing Industries of Canada*, Catalogue 31-203, 1971.
Statistics Canada, *Gross Domestic Product by Industry*, Catalogue 61-213.
Statistics Canada, Office of the Senior Adviser on Integration, special tabulations.

Table 6.2.3
## Manufacturing Activity by Ecozone, 1981[1]

| Ecozone | High Stressor Manufacturing Activity | | | | | Total Manufacturing Activity | | |
|---|---|---|---|---|---|---|---|---|
| | Establishments[2] | Workers[3] | | Energy Consumption[4] | | Establishments[2] | Workers[3] | Energy Consumption[4] |
| | | | Percent of Total Manufacturing Workers | | Percent of Total Manufacturing Energy Consumption | | | |
| | | | | terajoules | | | | terajoules |
| **Atlantic Maritime** | **38** | **14 408** | **21.5** | **76 401** | **77.0** | **2 048** | **66 987** | **99 279** |
| Prince Edward Island | 0 | 0 | 0.0 | 0 | 0.0 | 150 | 2 382 | 716 |
| Nova Scotia | 13 | 4 498 | 15.7 | 15 321 | 60.2 | 814 | 28 590 | 25 440 |
| New Brunswick | 17 | 5 803 | 23.8 | 31 422 | 76.2 | 623 | 24 355 | 41 242 |
| Quebec | 8 | 4 107 | 35.2 | 29 658 | 93.0 | 461 | 11 660 | 31 881 |
| **Mixed-Wood Plain** | **207** | **70 458** | **7.4** | **325 781** | **47.2** | **23 508** | **947 246** | **690 888** |
| Quebec | 101 | 28 619 | 8.3 | 152 545 | 55.8 | 9 688 | 346 329 | 273 551 |
| Ontario | 106 | 41 839 | 7.0 | 173 236 | 41.5 | 13 820 | 600 917 | 417 335 |
| **Boreal Shield** | **61** | **43 295** | **49.5** | **181 442** | **89.6** | **1 835** | **87 403** | **202 404** |
| Newfoundland | 6 | 2 923 | 19.4 | 13 446 | 76.7 | 313 | 15 034 | 17 542 |
| New Brunswick | 0 | 0 | 0.0 | 0 | 0.0 | 3 | 59 | 0-99 |
| Quebec | 18 | 12 986 | 45.2 | 56 447 | 89.8 | 766 | 28 708 | 62 829 |
| Ontario | 34 | 26 218 | 62.0 | 103 904 | 90.7 | 733 | 42 292 | 114 550 |
| Manitoba | 2 | 500-999 | 87.9 | 4 000-4 499 | 99.6 | 19 | 1 000-1 499 | 4 000-4 499 |
| Saskatchewan | 1 | 200-499 | 95.5 | 2 500-2 999 | 99.9 | 2 | 2 000-2 499 | 2 500-2 999 |
| **Prairie** | **44** | **5 347** | **5.0** | **102 790** | **63.4** | **4 079** | **106 758** | **162 218** |
| Manitoba | 7 | 328 | 0.9 | 3 914 | 18.3 | 1 187 | 38 756 | 21 348 |
| Saskatchewan | 7 | 294 | 2.3 | 1 951 | 16.9 | 673 | 12 959 | 11 546 |
| Alberta | 30 | 4 725 | 8.6 | 96 925 | 74.9 | 2 219 | 55 043 | 129 324 |
| **Boreal Plain** | **10** | **2 770** | **25.8** | **14 833** | **55.8** | **425** | **10 722** | **26 580** |
| Manitoba | 5 | 1 352 | 57.5 | 6 153 | 82.2 | 81 | 2 352 | 7 482 |
| Saskatchewan | 1 | 200-499 | 17.7 | 3 000-3 499 | 58.1 | 88 | 2 000-2 499 | 5 500-5 999 |
| Alberta | 3 | 890 | 18.5 | 4 636 | 38.9 | 209 | 4 819 | 11 908 |
| British Columbia | 1 | 100-199 | 10.8 | 500-999 | 50.7 | 45 | 1 000-1 499 | 1 500-1 999 |
| Yukon | 0 | 0 | 0.0 | 0 | 0.0 | 2 | 2-99 | 0-99 |
| **Montane Cordillera** | **17** | **6 711** | **20.8** | **27 715** | **54.8** | **905** | **32 234** | **50 545** |
| Alberta | 0 | 0 | 0.0 | 0 | 0.0 | 24 | 533 | 4 872 |
| British Columbia | 17 | 6 711 | 21.2 | 27 715 | 60.7 | 881 | 31 701 | 45 673 |
| **Pacific Maritime** | **40** | **13 487** | **15.7** | **60 064** | **69.8** | **2 947** | **85 660** | **88 029** |
| British Columbia | 40 | 13 487 | 15.7 | 60 064 | 69.8 | 2 947 | 85 660 | 86 029 |
| **Boreal Cordillera** | **2** | **2-99** | **4.9** | **0-99** | **30.0** | **7** | **7-99** | **0-99** |
| Yukon | 2 | 2-99 | 4.9 | 0-99 | 30.0 | 7 | 7-99 | 0-99 |
| **Taiga Plain** | **1** | **1-99** | **16.4** | **200-499** | **96.2** | **8** | **100-199** | **200-499** |
| Northwest Territories | 1 | 1-99 | 16.4 | 200-499 | 96.2 | 8 | 100-199 | 200-499 |
| **Taiga Shield** | **0** | **0** | **0.0** | **0** | **0.0** | **12** | **111** | **17** |
| Newfoundland | 0 | 0 | 0.0 | 0 | 0.0 | 4 | 4-99 | 0-99 |
| Saskatchewan | 0 | 0 | 0.0 | 0 | ... | 1 | 1-99 | 0 |
| Northwest Territories | 0 | 0 | 0.0 | 0 | 0.0 | 7 | 66 | 0-99 |
| **Hudson Bay Plain** | **0** | **0** | **0.0** | **0** | **0.0** | **1** | **1-99** | **0-99** |
| Manitoba | 0 | 0 | 0.0 | 0 | 0.0 | 1 | 1-99 | 0-99 |
| **Southern Arctic** | **0** | **0** | **0.0** | **0** | **0.0** | **2** | **2-99** | **0-99** |
| Northwest Territories | 0 | 0 | 0.0 | 0 | 0.0 | 2 | 2-99 | 0-99 |
| **Northern Arctic** | **0** | **0** | **0.0** | **0** | **...** | **3** | **27** | **0** |
| Northwest Territories | 0 | 0 | 0.0 | 0 | ... | 3 | 27 | 0 |
| **Canada** | **420** | **156 499** | **11.7** | **789 415** | **59.9** | **35 780** | **1 337 329** | **1 318 379** |

[1] Ranges are used to meet the confidentiality restrictions of the Statistics Act.
[2] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.
[3] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.
[4] Data include purchased fuel and electricity and exclude any self produced fuel and electricity, fuel used for non-fuel purposes (production processes), and other energy sources such as steam or wood. Figures apply only to larger establishments reporting detail in their manufacturing and non-manufacturing (e.g. transportation, space heating) operations.

**Source:**
Statistics Canada, Annual Census of Manufactures, 1981, special tabulation by the Office of the Senior Adviser on Integration.

Table 6.2.4
**Manufacturing Activity by Stressor Type: Stress to Water, by Major Drainage Area, 1973[1], 1976 and 1981[2]**

| Major Drainage Area | High Stressor | | Medium Stressor | | Low Stressor | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Establishments[3] | Workers[4] | Establishments[3] | Workers[4] | Establishments[3] | Workers[4] | Establishments[3] | Workers[4] |
| **Atlantic Ocean Basin** | | | | | | | | |
| **1973** | **277** | **113 453** | **7 510** | **297 565** | **16 057** | **650 555** | **23 844** | **1 061 573** |
| **1976** | **275** | **116 513** | **7 138** | **298 896** | **14 831** | **639 973** | **22 244** | **1 055 382** |
| **1981** | **292** | **20 450** | **8 245** | **304 590** | **18 607** | **661 363** | **27 144** | **1 086 403** |
| Atlantic Ocean Coastal | | | | | | | | |
| 1973 | 9 | 2 142 | 178 | 7 802 | 342 | 6 320 | 529 | 16 264 |
| 1976 | 9 | 2 217 | 178 | 8 554 | 281 | 5 926 | 468 | 16 697 |
| 1981 | 8 | 2 120 | 243 | 11 381 | 378 | 6 241 | 629 | 19 742 |
| Gulf of St. Lawrence Coastal | | | | | | | | |
| 1973 | 28 | 12 344 | 339 | 12 028 | 492 | 8 486 | 859 | 32 858 |
| 1976 | 29 | 12 193 | 302 | 11 318 | 410 | 7 240 | 741 | 30 751 |
| 1981 | 25 | 11 715 | 351 | 15 475 | 554 | 8 507 | 930 | 35 697 |
| Bay of Fundy and Saint John River | | | | | | | | |
| 1973 | 10 | 2 556 | 215 | 7 623 | 461 | 14 110 | 686 | 24 289 |
| 1976 | 10 | 2 683 | 196 | 7 618 | 413 | 14 189 | 619 | 24 490 |
| 1981 | 10 | 2 988 | 232 | 8 350 | 493 | 13 636 | 735 | 24 974 |
| St. Lawrence River | | | | | | | | |
| 1973 | 106 | 32 890 | 2 525 | 103 273 | 6 730 | 242 849 | 9 361 | 379 012 |
| 1976 | 106 | 34 403 | 2 340 | 102 839 | 6 096 | 235 839 | 8 542 | 373 081 |
| 1981 | 118 | 37 842 | 2 631 | 101 532 | 7 532 | 233 361 | 10 281 | 372 735 |
| Ottawa River | | | | | | | | |
| 1973 | 17 | 6 716 | 309 | 8 521 | 722 | 21 773 | 1 048 | 37 010 |
| 1976 | 18 | 7 433 | 284 | 7 890 | 646 | 21 545 | 948 | 36 868 |
| 1981 | 19 | 7 166 | 308 | 8 078 | 841 | 23 432 | 1 168 | 38 676 |
| Lake Ontario Shore | | | | | | | | |
| 1973 | 59 | 32 230 | 2 497 | 98 594 | 5 073 | 230 674 | 7 629 | 361 498 |
| 1976 | 56 | 30 770 | 2 438 | 100 108 | 4 913 | 233 098 | 7 407 | 363 976 |
| 1981 | 59 | 29 973 | 2 894 | 99 284 | 6 221 | 254 565 | 9 174 | 383 822 |
| Lake Erie and Lake St. Clair Shore | | | | | | | | |
| 1973 | 23 | 5 306 | 1 055 | 48 640 | 1 480 | 101 885 | 2 558 | 155 831 |
| 1976 | 24 | 5 694 | 1 023 | 49 288 | 1 404 | 98 973 | 2 451 | 153 955 |
| 1981 | 27 | 7 747 | 1 183 | 48 495 | 1 739 | 96 002 | 2 949 | 152 244 |
| Lake Huron Shore | | | | | | | | |
| 1973 | 16 | 14 588 | 358 | 10 596 | 678 | 21 701 | 1 052 | 46 885 |
| 1976 | 15 | 16 329 | 346 | 10 774 | 592 | 20 373 | 953 | 47 476 |
| 1981 | 17 | 15 794 | 375 | 11 658 | 761 | 22 218 | 1 153 | 49 670 |
| Lake Superior Shore | | | | | | | | |
| 1973 | 9 | 4 681 | 34 | 488 | 79 | 2 757 | 122 | 7 926 |
| 1976 | 8 | 4 791 | 31 | 507 | 76 | 2 790 | 115 | 8 088 |
| 1981 | 9 | 5 105 | 28 | 337 | 88 | 3 401 | 125 | 8 843 |
| **Hudson Bay and Ungava Bay Basin** | | | | | | | | |
| **1973** | **69** | **12 500-12 999** | **277** | **32 000-32 499** | **2 521** | **55 500-55 999** | **3 867** | **100 000-100 499** |
| **1976** | **67** | **13 000-13 499** | **1 207** | **36 500-36 999** | **2 371** | **61 000-61 499** | **3 645** | **111 500-111 999** |
| **1981** | **66** | **15 000-15 499** | **1 484** | **40 500-40 999** | **3 033** | **72 000-72 499** | **4 583** | **128 000-128 499** |
| Hudson Bay and Ungava Bay Coastal | | | | | | | | |
| 1973 | 8 | 3 394 | 55 | 367 | 132 | 5 179 | 195 | 8 940 |
| 1976 | 8 | 3 501 | 46 | 401 | 114 | 5 646 | 168 | 9 548 |
| 1981 | 7 | 4 062 | 51 | 424 | 145 | 6 477 | 203 | 10 963 |
| Nelson River | | | | | | | | |
| 1973 | 2 | 500 - 999 | 3 | 3 - 99 | 2 | 2 - 99 | 7 | 500 - 999 |
| 1976 | 2 | 500 - 999 | 3 | 3 - 99 | 3 | 3 - 99 | 8 | 500 - 999 |
| 1981 | 1 | 500 - 999 | 3 | 3 - 99 | 5 | 5 - 99 | 9 | 500 - 999 |
| Lake Winnipeg Shore | | | | | | | | |
| 1973 | 13 | 3 484 | 350 | 10 039 | 859 | 25 849 | 1 222 | 39 372 |
| 1976 | 13 | 4 198 | 330 | 10 739 | 759 | 26 092 | 1 102 | 41 029 |
| 1981 | 14 | 4 058 | 352 | 10 320 | 845 | 28 314 | 1 211 | 42 692 |
| Assiniboine River | | | | | | | | |
| 1973 | 8 | 451 | 67 | 3 832 | 280 | 3 398 | 455 | 7 681 |
| 1976 | 7 | 330 | 153 | 4 246 | 253 | 4 116 | 413 | 8 692 |
| 1981 | 6 | 319 | 180 | 4 687 | 312 | 4 368 | 498 | 9 374 |

Table 6.2.4
**Manufacturing Activity by Stressor Type: Stress to Water, by Major Drainage Areas, 1973[1], 1976 and 1981[2] (concluded)**

| Major Drainage Area | High Stressor | | Medium Stressor | | Low Stressor | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Establishments[3] | Workers[4] | Establishments[3] | Workers[4] | Establishments[3] | Workers[4] | Establishments[3] | Workers[4] |
| Saskatchewan River | | | | | | | | |
| 1973 | 38 | 4 434 | 702 | 17 708 | 1 248 | 21 221 | 1 988 | 43 453 |
| 1976 | 37 | 4 675 | 675 | 21 412 | 1 242 | 25 582 | 1 954 | 51 669 |
| 1981 | 38 | 6 239 | 898 | 25 412 | 1 726 | 32 922 | 2 662 | 64 573 |
| **Arctic Ocean Basin** | | | | | | | | |
| **1973** | **4** | **508** | **41** | **200 - 499** | **133** | **3 000 - 3 499** | **178** | **4 000 - 4 499** |
| **1976** | **4** | **992** | **48** | **500 - 999** | **117** | **2 500 - 2 999** | **169** | **4 000 - 4 499** |
| **1981** | **4** | **793** | **68** | **500 - 999** | **145** | **4 000 - 4 499** | **217** | **5 500 - 5 999** |
| Mackenzie River | | | | | | | | |
| 1973 | 4 | 508 | 41 | 339 | 131 | 3 187 | 176 | 4 034 |
| 1976 | 4 | 992 | 47 | 541 | 115 | 2 867 | 166 | 4 400 |
| 1981 | 4 | 793 | 67 | 703 | 142 | 4 131 | 213 | 5 627 |
| Arctic Ocean Coastal | | | | | | | | |
| 1973 | 0 | 0 | 0 | 0 | 2 | 2 - 99 | 2 | 2 - 99 |
| 1976 | 0 | 0 | 1 | 1 - 99 | 2 | 2 - 99 | 3 | 3 - 99 |
| 1981 | 0 | 0 | 1 | 1 - 99 | 3 | 3 - 99 | 4 | 4 - 99 |
| **Pacific Ocean Basin** | | | | | | | | |
| **1973** | **57** | **18 000-18 499** | **862** | **21 500-21 999** | **2 335** | **70 000-70 499** | **3 254** | **110 000-110 499** |
| **1976** | **57** | **18 500-18 999** | **795** | **20 000-20 499** | **2 140** | **66 000-66 499** | **2 992** | **105 000-105 499** |
| **1981** | **58** | **19 500-19 999** | **988** | **24 000-24 499** | **2 785** | **72 500-72 999** | **3 831** | **116 500-116 999** |
| Columbia River | | | | | | | | |
| 1973 | 5 | 3 328 | 84 | 1 253 | 272 | 8 170 | 361 | 12 751 |
| 1976 | 5 | 3 257 | 88 | 1 325 | 258 | 7 295 | 351 | 11 877 |
| 1981 | 5 | 4 131 | 119 | 1 831 | 348 | 7 903 | 472 | 13 865 |
| Fraser River | | | | | | | | |
| 1973 | 29 | 3 578 | 609 | 16 777 | 1 586 | 47 250 | 2 224 | 67 605 |
| 1976 | 28 | 3 986 | 557 | 15 248 | 1 446 | 45 413 | 2 031 | 64 647 |
| 1981 | 29 | 4 186 | 643 | 16 980 | 1 764 | 49 236 | 2 436 | 70 402 |
| Yukon River | | | | | | | | |
| 1973 | 1 | 1 - 99 | 0 | 0 | 4 | 4 - 99 | 5 | 5 - 99 |
| 1976 | 1 | 1 - 99 | 1 | 1 - 99 | 3 | 3 - 99 | 5 | 5 - 99 |
| 1981 | 2 | 2 - 99 | 1 | 1 - 99 | 3 | 3 - 99 | 6 | 6 - 99 |
| Pacific Ocean, North Coastal | | | | | | | | |
| 1973 | 5 | 3 449 | 24 | 1 354 | 42 | 1 861 | 71 | 6 664 |
| 1976 | 5 | 3 454 | 22 | 1 135 | 38 | 1 109 | 65 | 5 698 |
| 1981 | 4 | 3 054 | 27 | 1 594 | 48 | 1 451 | 79 | 6 099 |
| Pacific Ocean, South Coastal | | | | | | | | |
| 1973 | 17 | 7 912 | 145 | 2 203 | 431 | 12 926 | 593 | 23 043 |
| 1976 | 18 | 8 152 | 127 | 2 345 | 395 | 12 425 | 540 | 22 922 |
| 1981 | 18 | 8 617 | 198 | 3 625 | 622 | 14 214 | 838 | 26 456 |
| **Gulf of Mexico Basin** | | | | | | | | |
| **1973** | **0** | **0** | **0** | **0** | **2** | **2 - 99** | **2** | **2 - 99** |
| **1976** | **0** | **0** | **1** | **1 - 99** | **2** | **2 - 99** | **3** | **3 - 99** |
| **1981** | **0** | **0** | **1** | **1 - 99** | **4** | **100 - 199** | **5** | **100 - 199** |
| Missouri River | | | | | | | | |
| 1973 | 0 | 0 | 0 | 0 | 2 | 2 - 99 | 2 | 2 - 99 |
| 1976 | 0 | 0 | 1 | 1 - 99 | 2 | 2 - 99 | 3 | 3 - 99 |
| 1981 | 0 | 0 | 1 | 1 - 99 | 4 | 100 - 199 | 5 | 100 - 199 |
| **Canada** | | | | | | | | |
| **1973** | **407** | **144 780** | **9 690** | **351 542** | **21 048** | **779 663** | **31 145** | **1 275 985** |
| **1976** | **403** | **149 762** | **9 189** | **356 320** | **19 461** | **770 611** | **29 053** | **1 276 693** |
| **1981** | **420** | **156 499** | **10 786** | **370 208** | **24 574** | **810 622** | **35 780** | **1 337 329** |

[1] Census of Manufacturing introduced the Standard Geographical Code in 1973, earlier data could not be readily allocated to river basins.

[2] Ranges are used to meet the confidentiality restrictions of the Statistics Act.

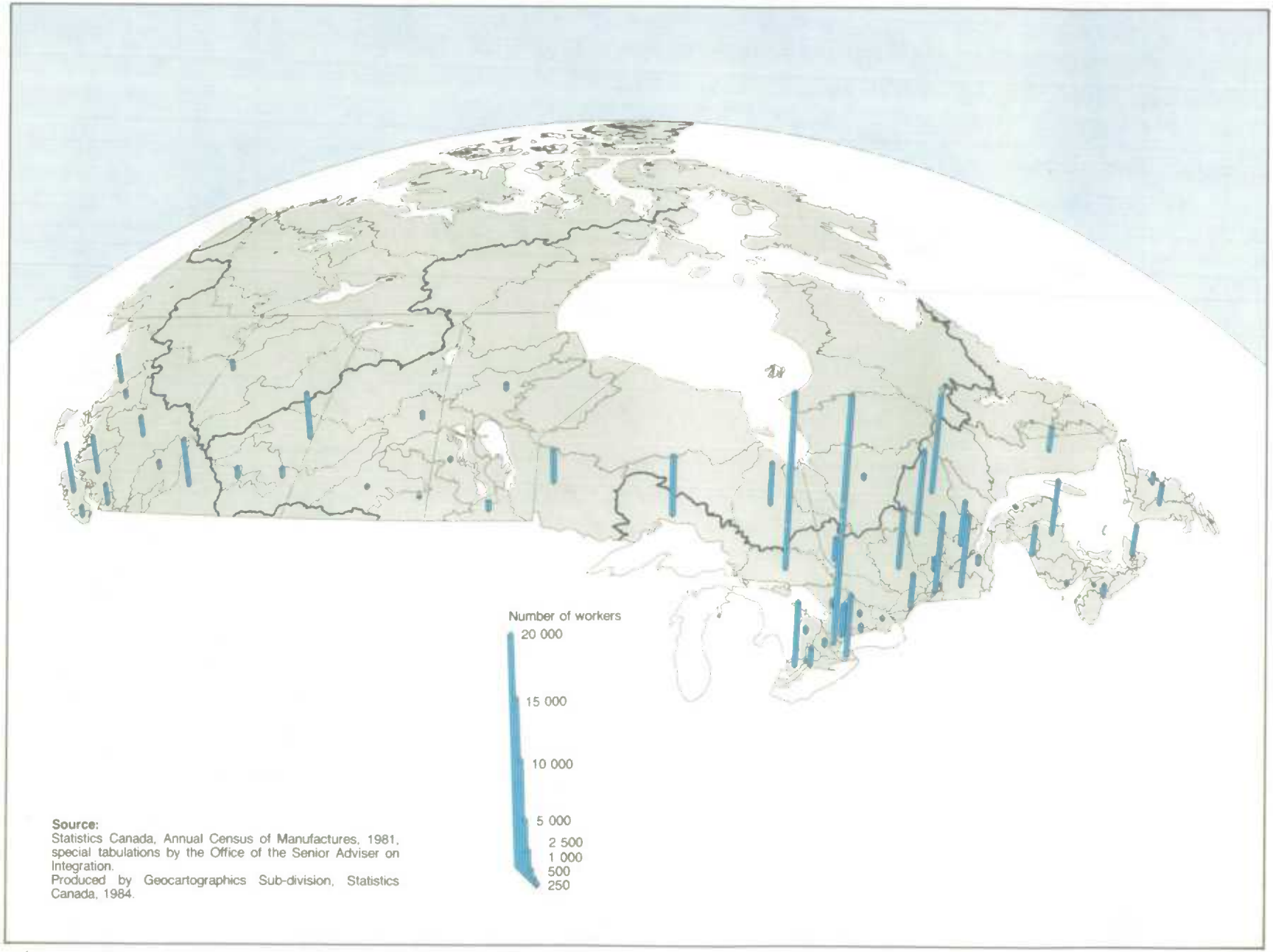
[3] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.

[4] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.

**Source:**
Statistics Canada, Annual Census of Manufactures, 1973, 1976 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

Map 6.2.5

## Production Workers in High Stressor Manufacturing Industries, by Drainage Basin, 1981




**Source:**
Statistics Canada, Annual Census of Manufactures, 1981, special tabulations by the Office of the Senior Adviser on Integration.
Produced by Geocartographics Sub-division, Statistics Canada, 1984.

Table 6.2.6
## Consumption of Fuel and Electricity[1] by Manufacturing Industries, by Ecozone, 1976 and 1981[2]

| Ecozone | Fossil Fuel | | | | | Electricity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Percent Change 1976 to | Percent Consumed by High Stressor Industries | | | | Percent Change 1976 to | Percent Consumed by High Stressor Industries | |
| | 1976 | 1981 | 1981 | 1976 | 1981 | 1976 | 1981 | 1981 | 1976 | 1981 |
| | terajoules | | | | | terajoules | | | | |
| **Atlantic Maritime** | **74 238** | **61 182** | **-17.6** | **75.8** | **70.2** | **25 912** | **38 095** | **47.0** | **86.2** | **87.8** |
| Prince Edward Island | 481 | 558 | 16.0 | 0.0 | 0.0 | 131 | 158 | 20.6 | 0.0 | 0.0 |
| Nova Scotia | 20 315 | 18 641 | -8.2 | 66.7 | 57.0 | 5 799 | 6 799 | 17.2 | 69.6 | 69.0 |
| New Brunswick | 37 782 | 30 308 | -19.8 | 76.3 | 73.2 | 8 944 | 10 934 | 22.2 | 85.8 | 84.4 |
| Québec | 15 661 | 11 676 | -25.4 | 88.8 | 86.8 | 11 039 | 20 205 | 83.0 | 96.3 | 96.6 |
| **Mixed-Wood Plain** | **504 871** | **507 743** | **0.6** | **41.2** | **44.0** | **147 385** | **183 145** | **24.3** | **54.3** | **58.0** |
| Québec | 163 877 | 176 636 | 7.8 | 41.3 | 47.9 | 73 805 | 96 915 | 31.3 | 67.8 | 70.2 |
| Ontario | 340 993 | 331 106 | -2.9 | 41.1 | 41.9 | 73 580 | 86 229 | 17.2 | 40.7 | 40.1 |
| **Boreal Shield** | **145 496** | **145 905** | **0.3** | **90.5** | **89.1** | **46 379** | **56 499** | **21.8** | **92.8** | **91.0** |
| Newfoundland | 12 709 | 10 738 | -15.5 | 74.9 | 67.8 | 5 303 | 6 804 | 28.3 | 90.6 | 90.6 |
| New Brunswick | 0 | 0-99 | ... | ... | 0.0 | 0 | 0-99 | ... | ... | 0.0 |
| Québec | 38 874 | 44 851 | 15.4 | 90.6 | 90.6 | 15 817 | 17 978 | 13.7 | 91.5 | 88.0 |
| Ontario | 88 738 | 86 571 | -2.4 | 92.9 | 90.3 | 20 529 | 27 979 | 36.3 | 92.9 | 91.8 |
| Manitoba | 2 500-2 999 | 1 000-1 499 | -64.4 | 99.5 | 98.9 | 4 500-4 999 | 3 000-3 499 | -24.6 | 99.9 | 99.8 |
| Saskatchewan | 2 000-2 499 | 2 500-2 999 | 22.0 | 100.0 | 100.0 | 100-199 | 200-499 | 60.9 | 100.0 | 99.7 |
| **Prairie** | **75 656** | **142 829** | **88.8** | **43.2** | **64.9** | **13 393** | **19 389** | **44.8** | **49.2** | **51.9** |
| Manitoba | 18 347 | 17 484 | -4.7 | 16.0 | 16.1 | 3 650 | 3 864 | 5.9 | 35.5 | 28.6 |
| Saskatchewan | 7 972 | 8 492 | 6.5 | 14.3 | 13.0 | 1 882 | 3 054 | 62.3 | 14.3 | 27.8 |
| Alberta | 49 337 | 116 853 | 136.8 | 58.1 | 76.0 | 7 860 | 12 471 | 58.7 | 63.9 | 65.0 |
| **Boreal Plain** | **32 170** | **22 425** | **-30.3** | **70.6** | **54.5** | **2 410** | **4 155** | **72.4** | **58.5** | **62.8** |
| Manitoba | 4 507 | 5 305 | 17.7 | 66.7 | 77.0 | 827 | 2 177 | 163.2 | 87.5 | 95.1 |
| Saskatchewan | 6 000-6 499 | 4 500-4 999 | -21.6 | 66.3 | 59.1 | 200-499 | 500-999 | 41.3 | 43.5 | 50.2 |
| Alberta | 19 500-19 999 | 10 500-10 999 | -44.9 | 72.5 | 41.2 | 500-999 | 1 000-1 499 | 13.3 | 43.9 | 15.4 |
| British Columbia | 1 500-1 999 | 1 000-1 499 | -21.1 | 76.1 | 56.9 | 100-199 | 200-499 | 35.7 | 40.8 | 20.7 |
| Yukon | 0 | 0-99 | ... | ... | 0.0 | 0 | 0-99 | ... | ... | 0.0 |
| **Montane Cordillera** | **41 983** | **42 075** | **0.2** | **60.4** | **56.3** | **15 499** | **8 470** | **-45.4** | **76.0** | **47.5** |
| Alberta | 4 746 | 4 498 | -5.2 | 0.0 | 0.0 | 301 | 374 | 24.3 | 0.0 | 0.0 |
| British Columbia | 37 237 | 37 577 | 0.9 | 68.1 | 63.1 | 15 198 | 8 096 | -46.7 | 77.5 | 49.7 |
| **Pacific Maritime** | **74 592** | **61 717** | **-17.3** | **74.3** | **69.1** | **23 127** | **24 312** | **5.1** | **74.9** | **71.7** |
| British Columbia | 74 592 | 61 717 | -17.3 | 74.3 | 69.1 | 23 127 | 24 312 | 5.1 | 74.9 | 71.7 |
| **Boreal Cordillera** | **0-99** | **0-99** | **750.0** | **50.0** | **29.4** | **0-99** | **0-99** | **0.0** | **0.0** | **33.3** |
| Yukon | 0-99 | 0-99 | 750.0 | 50.0 | 29.4 | 0-99 | 0-99 | 0.0 | 0.0 | 33.3 |
| **Taiga Plain** | **200-499** | **200-499** | **24.2** | **94.3** | **96.9** | **0-99** | **0-99** | **40.0** | **0.0** | **57.1** |
| Northwest Territories | 200-499 | 200-499 | 24.2 | 94.3 | 96.9 | 0-99 | 0-99 | 40.0 | 0.0 | 57.1 |
| **Taiga Shield** | **0-99** | **0-99** | **-35.0** | **0.0** | **0.0** | **0-99** | **0-99** | **100.0** | **0.0** | **0.0** |
| Newfoundland | 0-99 | 0-99 | -85.7 | 0.0 | 0.0 | 0 | 0-99 | ... | ... | 0.0 |
| Northwest Territories | 0-99 | 0-99 | 83.3 | 0.0 | 0.0 | 0-99 | 0-99 | 50.0 | 0.0 | 0.0 |
| **Hudson Bay Plain** | **0-99** | **0** | **-100.0** | **0.0** | **...** | **0-99** | **0-99** | **500.0** | **0.0** | **0.0** |
| Manitoba | 0-99 | 0 | -100.0 | 0.0 | ... | 0-99 | 0-99 | 500.0 | 0.0 | 0.0 |
| **Southern Arctic** | **0-99** | **0-99** | **0.0** | **0.0** | **0.0** | **0** | **0** | **...** | **...** | **...** |
| Newfoundland | 0-99 | 0 | -100.0 | 0.0 | ... | 0 | 0 | ... | ... | ... |
| Northwest Territories | 0 | 0-99 | ... | ... | 0.0 | 0 | 0 | ... | ... | ... |
| **Canada** | **949 344** | **984 296** | **3.7** | **56.1** | **57.7** | **274 115** | **334 083** | **21.9** | **66.6** | **66.3** |

[1] Data include purchased fuel and electricity and exclude any self produced fuel and electricity, fuel used for non fuel purposes (production processes), and other energy sources such as steam or wood. Figures apply only to larger establishments reporting detail in their manufacturing and non-manufacturing (e.g. transportation, space heating) operations.

[2] Ranges are used to meet the confidentiality restrictions of the Statistics Act.

**Source:**
Statistics Canada, Annual Census of Manufactures, 1976 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

Table 6.2.7
## Consumption of Fuel and Electricity[1] by Manufacturing Industries, by Major Drainage Area, 1976 and 1981[2]

| Major Drainage Area | Fossil Fuel | | | | | Electricity | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Percent Change 1976 to 1981 | Percent Consumed by High Stressor Industries | | | | Percent Change 1976 to 1981 | Percent Consumed by High Stressor Industries | |
| | 1976 | 1981 | | 1976 | 1981 | 1976 | 1981 | | 1976 | 1981 |
| | terajoules | | | | | terajoules | | | | |
| **Atlantic Ocean Basin** | **698 187** | **689 393** | **-1.2** | **53.2** | **54.3** | **207 202** | **264 849** | **27.8** | **64.6** | **66.5** |
| Atlantic Ocean Coastal | 7 531 | 7 044 | -6.5 | 58.3 | 61.2 | 2 810 | 3 618 | 28.7 | 70.2 | 73.1 |
| Gulf of St. Lawrence Coastal | 52 938 | 42 667 | -19.4 | 86.8 | 82.0 | 20 348 | 30 409 | 49.4 | 92.2 | 93.5 |
| Bay of Fundy Coastal and Saint John River | 25 703 | 22 711 | -11.6 | 59.0 | 52.7 | 6 355 | 8 474 | 33.3 | 73.8 | 72.9 |
| St. Lawrence River | 194 553 | 212 446 | 9.2 | 45.6 | 51.2 | 84 231 | 109 330 | 29.8 | 69.1 | 70.6 |
| Ottawa River | 33 424 | 31 214 | -6.6 | 78.8 | 78.7 | 11 846 | 14 568 | 23.0 | 84.9 | 84.4 |
| Lake Ontario Shore | 178 228 | 166 500 | -6.6 | 31.0 | 31.2 | 46 958 | 52 313 | 11.4 | 41.8 | 39.5 |
| Lake Erie and Lake St. Clair Shore | 114 855 | 130 851 | 13.9 | 50.0 | 57.4 | 17 164 | 21 659 | 26.2 | 33.0 | 35.6 |
| Lake Huron Shore | 68 174 | 52 335 | -23.2 | 85.6 | 78.8 | 12 120 | 16 275 | 34.3 | 81.2 | 81.9 |
| Lake Superior Shore | 22 781 | 23 625 | 3.7 | 86.4 | 89.6 | 5 370 | 8 203 | 52.8 | 92.3 | 93.6 |
| **Hudson Bay and Ungava Bay Basin** | **127 500-127 999** | **189 500-189 999** | **48.7** | **55.2** | **65.6** | **28 000-28 499** | **36 000-36 499** | **28.4** | **69.3** | **66.2** |
| Hudson Bay and Ungava Bay Coastal | 13 409 | 12 323 | -8.1 | 88.2 | 77.6 | 4 537 | 5 713 | 25.9 | 81.8 | 75.0 |
| Nelson River | 100-199 | 0-99 | -52.0 | 98.7 | 94.5 | 2 500-2 999 | 2 000-2 499 | -21.6 | 99.9 | 99.8 |
| Lake Winnipeg Shore | 31 141 | 30 472 | -2.1 | 43.9 | 45.9 | 7 808 | 8 751 | 12.1 | 67.2 | 65.8 |
| Assiniboine River | 8 602 | 8 468 | -1.6 | 34.3 | 29.0 | 2 421 | 2 883 | 19.1 | 44.4 | 36.1 |
| Saskatchewan River | 74 358 | 138 512 | 86.3 | 56.3 | 71.0 | 10 454 | 16 452 | 57.4 | 62.8 | 64.2 |
| **Arctic Ocean Basin** | **11 878** | **7 000-7 499** | **-38.7** | **83.8** | **58.8** | **620** | **989** | **59.5** | **28.1** | **24.5** |
| Mackenzie River | 11 878 | 7 282 | -38.7 | 83.8 | 58.8 | 620 | 989 | 59.5 | 28.1 | 24.5 |
| Arctic Ocean Coastal | 0 | 0-99 | ... | ... | 0.0 | 0 | 0 | ... | ... | ... |
| **Pacific Ocean Basin** | **111 500-111 999** | **97 500-97 999** | **-12.4** | **72.3** | **66.6** | **38 000-38 499** | **32 000-32 499** | **-15.7** | **76.1** | **66.3** |
| Columbia River | 12 418 | 12 565 | 1.2 | 73.7 | 73.6 | 9 287 | 1 937 | -79.1 | 90.0 | 43.5 |
| Fraser River | 43 901 | 45 390 | 3.4 | 50.2 | 42.4 | 11 224 | 12 566 | 12.0 | 43.4 | 37.9 |
| Yukon River | 0-99 | 0-99 | 750.0 | 50.0 | 35.3 | 0-99 | 0-99 | 0.0 | 0.0 | 33.3 |
| Pacific Ocean, North Coastal | 14 217 | 10 881 | -23.5 | 95.3 | 88.2 | 1 626 | 1 754 | 7.9 | 79.6 | 71.5 |
| Pacific Ocean, South Coastal | 41 067 | 28 898 | -29.6 | 87.7 | 93.4 | 16 114 | 15 969 | -0.9 | 90.4 | 90.9 |
| **Gulf of Mexico Basin** | **0-99** | **0-99** | **50.0** | **0.0** | **0.0** | **0-99** | **0-99** | **350.0** | **0.0** | **0.0** |
| Missouri River | 0-99 | 0-99 | 50.0 | 0.0 | 0.0 | 0-99 | 0-99 | 350.0 | 0.0 | 0.0 |
| **Canada** | **949 344** | **984 296** | **3.7** | **56.1** | **57.7** | **274 115** | **334 083** | **21.9** | **66.6** | **66.3** |

[1] Data include purchased fuel and electricity and exclude any self produced fuel and electricity, fuel used for non fuel purposes (production processes), and other energy sources such as steam or wood. Figures apply only to larger establishments reporting detail in their manufacturing and non-manufacturing (e.g. transportation, space heating) operations.

[2] Ranges are used to meet the confidentiality restrictions of the Statistics Act.

**Source:**
Statistics Canada, Annual Census of Manufactures, 1976 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

Table 6.2.8
## Heavy Metals: Major End Use by Manufacturing Industries[1], 1961 to 1982

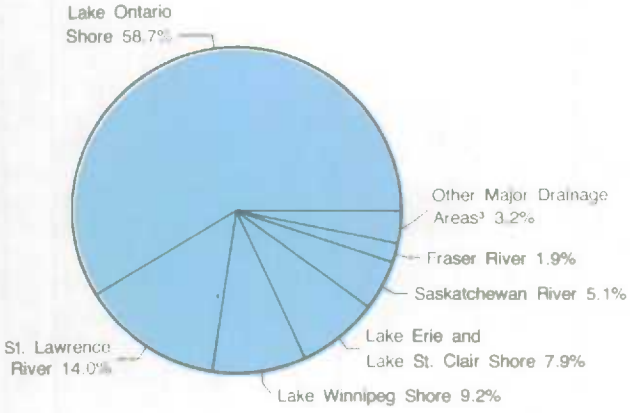
| | 1961 | 1966 | 1971 | 1976 | 1981 | 1982 |
|---|---|---|---|---|---|---|
| **Lead:[2]** | | | percent | | | |
| Used in the Production of: | | | | | | |
| Batteries and Battery Oxides | 39.0 | 38.7 | 39.7 | 46.7 | 47.9 | 34.5 |
| Chemicals | 20.6 | 16.5 | 19.3 | 17.6 | 17.7 | 18.3 |
| Other[3] | 40.4 | 44.8 | 41.0 | 35.7 | 34.4 | 47.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Total Tonnes Used** | **65 487** | **92 067** | **80 240** | **117 588** | **110 931** | **116 115** |
| **Metallic Cadmium:** | | | percent | | | |
| Used in the Production of: | | | | | | |
| Plating | 86.2 | 78.8 | 74.0 | 48.6 | 47.0 | 45.5 |
| Solders | 10.8 | 8.5 | 3.7 | 6.3 | 4.1 | 0.7 |
| Other[4] | 3.0 | 12.7 | 22.3 | 45.1 | 48.9 | 53.7 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Total Kilograms Used** | **77 555** | **77 386** | **53 250** | **53 816** | **34 092** | **33 818** |
| **Metallic Mercury:** | | | percent | | | |
| Used in the Production of: | | | | | | |
| Heavy Chemicals (Electrolytic Cells) | 64.0 | 85.1 | 93.8 | 47.8 | 17.6 | 14.8 |
| Electrical Apparatus | 2.1 | 12.9 | 5.4 | 47.1 | 8.8 | 14.1 |
| Gold Recovery | 2.7 | 1.3 | 0.5 | 0.9 | .. | .. |
| Other[5] | 31.2 | 0.7 | 0.3 | 4.2 | 73.6 | 71.1 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Total Kilograms Used** | **68 307** | **77 832** | **87 984** | **26 039** | **35 635** | **38 746** |

[1] Data is collected only for major consumers of these heavy metals.
[2] Includes recycled lead.
[3] Includes antimonial lead, cable covering, copper and lead alloys, semi-finished products and other lead products.
[4] Includes chemicals, pigments and alloys other than solders.
[5] Includes pharmaceuticals and fine chemicals and, starting in 1981, gold recovery.

**Sources:**
Statistics Canada, *Metals and Minerals*, Catalogue 41-010 for years 1961, 1966, 1971 and 1976.
Energy Mines and Resources Canada, *Canadian Minerals Yearbook, 1982*, Mineral Report no. 32.

Chart 6.2.9
## Lead Used[1] by Manufacturing Industries, by Major Drainage Area, 1981

Total Quantity: 173.9 tonnes[2]




[1] Data are obtained from the 1981 Census of Manufactures and include lead and lead alloy scrap, antimonial lead and lead in primary forms.
[2] Note that lead consumption in Table 6.2.8 is only the lead inputs to the major lead using industries whereas the data here include all lead inputs reported in the Manufactures Census. The latter is probably also incomplete since establishments using small quantities of lead do not report these inputs.
[3] Gulf of St. Lawrence Coastal, Bay of Fundy Coastal and Saint John River, Ottawa River, Lake Huron Shore and Pacific Ocean, South Coastal.

**Source:**
Statistics Canada, Annual Census of Manufactures, 1981, special tabulation by the Office of the Senior Adviser on Integration.

Table 6.2.10
## Manufacturing Water Use by Industry Group, 1981[1]

| Industry Group | Number of Plants | Total Water Intake[2] | Recirculated[3] | Gross Water Use[4] | Consumption[5] | Total Water Discharge[6] | Use Rate[7] | Consumption Rate[8] |
|---|---|---|---|---|---|---|---|---|
| | | millions of cubic metres | | | | | | percent |
| Paper and Allied | 271 | 2 899 | 4 612 | 7 511 | 159 | 2 740 | 2.6 | 5.5 |
| Chemical and Chemical Products | 572 | 2 853 | 1 284 | 4 137 | 197 | 2 656 | 1.4 | 6.9 |
| Primary Metals | 171 | 2 719 | 1 692 | 4 411 | 38 | 2 681 | 1.6 | 1.4 |
| Petroleum and Coal Products | 42 | 563 | 1 457 | 2 020 | 34 | 529 | 3.6 | 6.0 |
| Food and Beverage | 1 513 | 430 | 117 | 547 | 31 | 399 | 1.3 | 7.2 |
| Textiles | 162 | 124 | 50 | 174 | 6 | 118 | 1.4 | 4.8 |
| Transportation Equipment | 329 | 109 | 73 | 182 | 3 | 106 | 1.7 | 2.7 |
| Non-Metallic Mineral Products | 674 | 83 | 530 | 613 | 15 | 68 | 7.4 | 18.1 |
| Wood | 360 | 73 | 57 | 130 | 4 | 69 | 1.8 | 5.5 |
| Rubber and Plastics | 450 | 54 | 744 | 798 | 7 | 47 | 14.8 | 13.0 |
| Metal Fabricating | 324 | 30 | 130 | 160 | 1 | 29 | 5.3 | 2.6 |
| **Total** | **4 868** | **9 936** | **10 747** | **20 683** | **494** | **9 442** | **2.1** | **5.0** |

[1] Data obtained from the 1981 survey of Industrial Water Use. Only the larger establishments (i.e. those that had received the long-form questionnaires during the 1981 Census of Manufactures) and the eleven major SIC industrial groups identified as the largest users of water in manufacturing were covered by this survey. Of these industrial groups some of the minor water-using components identified in the 1976 Water Use Survey were eliminated. See Appendix 6, Table 5 for a 1976 breakdown of manufacturing water use by industry group.

[2] Total amount of water added to the water system of the plant to replace water discharged or consumed during production.

[3] Water used at least twice in the manufacturing process.

[4] New water intake plus recycled water.

[5] Water which is lost in the production process.

[6] Water returned to the environment.

[7] The ratio of gross water use to water intake; represents an index of recirculation.

[8] Proportion of the water lost during production, most commonly through evaporation or incorporation of water into products.

**Source:**
Environment Canada, Inland Waters Directorate, *Water Use in the Canadian Manufacturing Industry, 1981* by D.M. Tate and D.N. Scharf, unpublished.

**Note:**
Individual items may not add to totals due to rounding.

Table 6.2.11
## Manufacturing Water Use by Major Drainage Area, 1976[1]

| Major Drainage Area | Total Water Intake[2] | Recirculated[3] | Gross Water Use[4] | Consumption[5] | Total Water Discharged[6] | Use Rate[7] | Consumption Rate[8] |
|---|---|---|---|---|---|---|---|
| | millions of cubic metres | | | | | | percent |
| **Atlantic Ocean Basin** | **6 479** | **7 127** | **13 603** | **317** | **6 160** | **2.1** | **4.9** |
| Atlantic Ocean Coastal | 320 | 237 | 555 | 8 | 311 | 1.7 | 2.5 |
| Gulf of St. Lawrence Coastal | 551 | 588 | 1 138 | 23 | 527 | 2.1 | 4.2 |
| Bay of Fundy Coastal and Saint John River | 201 | 336 | 537 | 22 | 179 | 2.7 | 10.9 |
| St. Lawrence River | 1 665 | 1 877 | 3 542 | 89 | 1 577 | 2.1 | 5.3 |
| Ottawa River | 298 | 622 | 920 | 16 | 281 | 3.1 | 5.4 |
| Lake Ontario Shore | 1 445 | 1 578 | 3 023 | 61 | 1 383 | 2.1 | 4.2 |
| Lake Erie and Lake St. Clair Shore | 1 025 | 839 | 1 865 | 75 | 951 | 1.8 | 7.3 |
| Lake Huron Shore | 739 | 500 | 1 238 | 15 | 723 | 1.7 | 2.0 |
| Lake Superior Shore | 235 | 550 | 785 | 8 | 228 | 3.3 | 3.4 |
| **Hudson Bay and Ungava Bay Basin** | **556** | **1 846** | **2 401** | **50** | **506** | **4.3** | **9.0** |
| Hudson Bay and Ungava Bay Coastal | 170 | 114 | 284 | 7 | 164 | 1.7 | 4.1 |
| Nelson River | 49 | 10 | 59 | 0 | 49 | 1.2 | 0.0 |
| Lake Winnipeg Shore | 164 | 515 | 678 | 11 | 152 | 4.1 | 6.7 |
| Assiniboine River | 11 | 81 | 92 | 4 | 7 | 8.4 | 36.4 |
| Saskatchewan River | 162 | 1 126 | 1 288 | 28 | 134 | 8.0 | 17.3 |
| **Arctic Ocean Basin** | **126** | **26** | **153** | **9** | **117** | **1.2** | **7.1** |
| Mackenzie River | 126 | 26 | 153 | 9 | 117 | 1.2 | 7.1 |
| Arctic Ocean Coastal | 0 | 0 | 0 | 0 | 0 | ... | ... |
| **Pacific Ocean Basin** | **1 501** | **2 363** | **3 864** | **80** | **1 421** | **2.6** | **5.3** |
| Columbia River | 209 | 181 | 390 | 13 | 196 | 1.9 | 6.2 |
| Fraser River | 418 | 593 | 1 012 | 27 | 391 | 2.4 | 6.5 |
| Yukon River | 0 | 0 | 0 | 0 | 0 | ... | ... |
| Pacific Ocean, North Coastal | 155 | 74 | 229 | 3 | 152 | 1.5 | 1.9 |
| Pacific Ocean, South Coastal | 719 | 1 515 | 2 233 | 37 | 682 | 3.1 | 5.1 |
| **Gulf of Mexico Basin** | **0** | **0** | **0** | **0** | **0** | ... | ... |
| Missouri River | 0 | 0 | 0 | 0 | 0 | ... | ... |
| **Canada** | **8 664** | **11 360** | **20 024** | **456** | **8 207** | **2.3** | **5.3** |

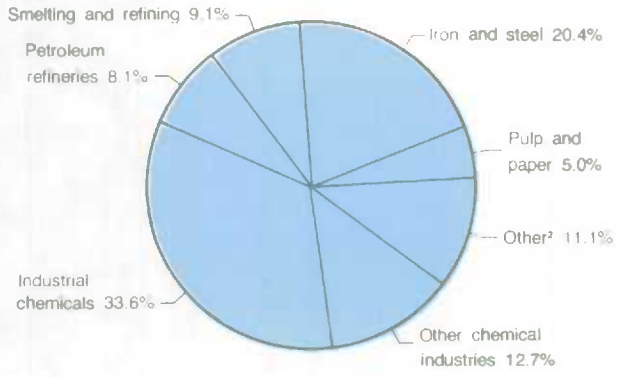
[1] Data obtained from the 1976 Water Use Survey. Only the larger establishments (i.e. those receiving the long form questionnaire) during the 1976 Census of Manufactures and the ten major SIC industrial groups identified as the largest users of water in manufacturing were covered by this survey. Due to technical difficulties it was not possible to provide a breakdown by Major Drainage Area by using the 1981 Water Use Survey.
[2] Total amount of water added to the water system of the plant to replace water discharged or consumed during production.
[3] Water used at least twice in the manufacturing process.
[4] New water intake plus recycled water.
[5] Water which is lost in the production process.
[6] Water returned to the environment.
[7] The ratio of gross water use to water intake; represents an index of recirculation.
[8] Proportion of the water lost during production, most commonly through evaporation or incorporation of water into products.

**Source:**
Environment Canada, Water Use in Manufacturing Industries, 1976 survey, special tabulation by Office of the Senior Adviser on Integration, Statistics Canada.

**Note:**
Individual items may not add to totals due to rounding.

Chart 6.2.12
## Hazardous Waste Generated by Manufacturing Industries[1]

Total Quantity: 3.3 million tonnes per year in wet weight




[1] The estimates for hazardous waste were derived for Canada by applying American (Environmental Protection Agency) industrial hazardous waste coefficients to corresponding Canadian industrial activity. The 1980 employment figures by industry were used as an allocator. The data were obtained from a special study (Canadian National Inventory of Hazardous and Toxic Wastes) prepared for Environment Canada. These data should be treated as approximate values. For a detailed listing of hazardous wastes see "Interim List of Environmentally Dangerous Wastes of the Transportation of Dangerous Goods Act", Bill C-18, Canada, July 17, 1980.
[2] Includes metal fabricating industries (207.4 thousand tonnes per year), textile industries (49.1 thousand tonnes per year), transportation equipment industries (32.8 thousand tonnes per year) and other minor sources.

**Source:**
Environment Canada, Environmental Protection Service, *Canadian National Inventory of Hazardous and Toxic Wastes*, January 1982. (special study prepared by Gore and Storrie, Limited).

Table 6.2.13
## Pollutants Loadings[1] to Water by Pulp and Paper Mills, by Major Drainage Area, 1973, 1976 and 1982

| Major Drainage Area | 1973 | | | | 1976 | | | | 1982 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Mills[2] | Production[3] | $BOD_5$ | Total Suspended Solids (TSS) | Number of Mills[2] | Production[3] | $BOD_5$ | Total Suspended Solids (TSS) | Number of Mills[2] | Production[3] | $BOD_5$ | Total Suspended Solids (TSS) |
| | | tonnes per day | | | | tonnes per day | | | | tonnes per day | | |
| **Atlantic Ocean Basin** | **79** | **39 019** | **2 210** | **1 324** | **82** | **36 879** | **2 235** | **1 002** | **84** | **38 590** | **1 834** | **733** |
| Atlantic Ocean Coastal | 3 | 1 664 | 85 | 84 | 3 | 1 438 | 93 | 72 | 3 | 1 289 | 71 | 38 |
| Gulf of St. Lawrence Coastal | 13 | 8 285 | 524 | 264 | 13 | 6 950 | 507 | 164 | 13 | 7 134 | 432 | 140 |
| Bay of Fundy Coastal and Saint John River | 4 | 2 432 | 128 | 45 | 7 | 3 065 | 248 | 88 | 9 | 3 609 | 72 | 38 |
| St. Lawrence River | 29 | 14 415 | 891 | 684 | 29 | 13 777 | 765 | 414 | 29 | 14 255 | 703 | 336 |
| Ottawa River | 11 | 4 175 | 139 | 133 | 11 | 4 274 | 319 | 157 | 10 | 4 031 | 246 | 111 |
| Lake Ontario Shore | 9 | 1 964 | 67 | 29 | 9 | 1 881 | 43 | 22 | 9 | 1 782 | 22 | 14 |
| Lake Huron Shore | 3 | 1 522 | 111 | 37 | 3 | 1 317 | 60 | 35 | 4 | 1 416 | 48 | 20 |
| Lake Superior Shore | 7 | 4 562 | 265 | 48 | 7 | 4 177 | 200 | 50 | 7 | 5 074 | 190 | 36 |
| **Hudson Bay and Ungava Bay Basin** | **13** | **6 961** | **392** | **164** | **11** | **6 000-6 499** | **429** | **137** | **11** | **6 500-6 999** | **253** | **75** |
| Hudson Bay and Ungava Bay Coastal | 5 | 3 122 | 227 | 105 | 5 | 2 984 | 269 | 68 | 5 | 3 228 | 159 | 37 |
| Lake Winnipeg Shore | 5 | 2 602 | 147 | 49 | 4 | 2 299 | 138 | 59 | 4 | 2 598 | 85 | 27 |
| Saskatchewan River | 3 | 1 237 | 18 | 10 | 2 | 1 000-1 499 | 22 | 10 | 2 | 1 000-1 499 | 9 | 11 |
| **Arctic Ocean Basin** | **2** | **1 000-1 499** | **14** | **14** | **3** | **1 809** | **18** | **23** | **4** | **2 092** | **12** | **20** |
| Mackenzie River | 2 | 1 000-1 499 | 14 | 14 | 3 | 1 809 | 18 | 23 | 4 | 2 092 | 12 | 20 |
| **Pacific Ocean Basin** | **20** | **16 000-16 499** | **1 013** | **479** | **21** | **14 500-14 999** | **570** | **362** | **21** | **16 000-16 499** | **351** | **236** |
| Columbia River | 2 | 500-999 | 32 | 22 | 2 | 500-999 | 22 | 20 | 2 | 500-999 | 29 | 11 |
| Fraser River | 6 | 3 852 | 50 | 38 | 7 | 3 425 | 27 | 44 | 8 | 4 380 | 26 | 38 |
| Pacific Ocean, North Coastal | 3 | 1 711 | 443 | 118 | 3 | 1 633 | 36 | 43 | 2 | 1 500-1 999 | 50 | 26 |
| Pacific Ocean, South Coastal | 9 | 9 986 | 488 | 301 | 9 | 8 660 | 485 | 255 | 9 | 9 168 | 246 | 161 |
| **Canada** | **114** | **63 949** | **3 629** | **1 981** | **117** | **59 682** | **3 252** | **1 524** | **120** | **63 848** | **2 450** | **1 064** |

[1] Pollutant loadings are estimated for individual plants and are based on daily production, process technology and pollution abatement equipment installed. These are calculated for Total Suspended Solids (TSS) and Biochemical Oxygen Demand ($BOD_5$). These measures are used to control the amount of effluent discharge by the Pulp and Paper industry under the Pulp and Paper Effluent Regulations of the Federal Fisheries Act. These data should be treated as approximations rather than "measured values". Note: Figures do not include small mills and those that discharge into municipal treatment systems and for this reason underestimation occurs in some areas.

[2] Due to new mill openings, shut downs and occasional non-reporting, the number of mills does not always refer to the same set of establishments.

[3] A range is used in order to meet the confidentiality restrictions of the Statistics Act for drainage areas with a small number of mills.

**Source:**
Environment Canada, Environmental Protection Service, unpublished data.

Table 6.2.14
## Water Pollution Compliance Levels of Pulp and Paper Mills, by Major Drainage Area, 1982[1]

| Major Drainage Area | Number of Mills[2] | Biochemical Oxygen Demand ($BOD_5$) | | | | Total Suspended Solids (TSS) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Loadings | Compliance Level[2] | Compliance Index[3] | Number of Mills Not in Compliance | Loadings | Compliance Level[2] | Compliance Index[3] | Number of Mills Not in Compliance |
| | | tonnes per day | tonnes per day | | | tonnes per day | tonnes per day | | |
| **Atlantic Ocean Basin** | **84** | **1 834** | **1 526** | **1.2** | **37** | **733** | **555** | **1.3** | **40** |
| Atlantic Ocean Coastal | 3 | 71 | 55 | 1.3 | 1 | 38 | 16 | 2.4 | 1 |
| Gulf of St. Lawrence Coastal | 13 | 432 | 356 | 1.2 | 7 | 140 | 104 | 1.3 | 7 |
| Bay of Fundy Coastal and Saint John River | 9 | 72 | 58 | 1.2 | 3 | 38 | 37 | 1.0 | 4 |
| St. Lawrence River | 29 | 703 | 551 | 1.3 | 16 | 336 | 203 | 1.7 | 19 |
| Ottawa River | 10 | 246 | 189 | 1.3 | 4 | 111 | 54 | 2.1 | 6 |
| Lake Ontario Shore | 9 | 22 | 39 | 0.6 | 1 | 14 | 17 | 0.8 | 1 |
| Lake Huron Shore | 4 | 98 | 54 | 1.8 | 2 | 20 | 27 | 0.7 | 1 |
| Lake Superior Shore | 7 | 190 | 224 | 0.8 | 3 | 36 | 97 | 0.4 | 1 |
| **Hudson Bay and Ungava Bay Basin** | **11** | **253** | **292** | **0.9** | **4** | **75** | **99** | **0.8** | **4** |
| Hudson Bay and Ungava Bay Coastal | 5 | 159 | 156 | 1.0 | 2 | 37 | 49 | 0.8 | 1 |
| Lake Winnipeg Shore | 4 | 85 | 86 | 1.0 | 2 | 27 | 42 | 0.6 | 1 |
| Saskatchewan River | 2 | 9 | 50 | 0.2 | 0 | 11 | 8 | 1.4 | 2 |
| **Arctic Ocean Basin** | **4** | **12** | **70** | **0.2** | **0** | **20** | **22** | **0.9** | **1** |
| Mackenzie River | 4 | 12 | 70 | 0.2 | 0 | 20 | 22 | 0.9 | 1 |
| **Pacific Ocean Basin** | **21** | **351** | **684** | **0.5** | **2** | **236** | **150** | **1.6** | **15** |
| Columbia River | 2 | 29 | 44 | 0.7 | 1 | 11 | 8 | 1.4 | 2 |
| Fraser River | 8 | 26 | 143 | 0.2 | 0 | 38 | 30 | 1.3 | 4 |
| Pacific Ocean, North Coastal | 2 | 50 | 67 | 0.7 | 1 | 26 | 14 | 1.9 | 2 |
| Pacific Ocean, South Coastal | 9 | 246 | 430 | 0.6 | 0 | 161 | 98 | 1.6 | 7 |
| **Canada** | **120** | **2 450** | **2 572** | **1.0** | **43** | **1 064** | **826** | **1.3** | **60** |

[1] Loadings are presented in terms of Total Suspended Solids (TSS) and Biochemical Oxygen Demand ($BOD_5$). Note: figures do not include small mills and those that discharge into municipal treatment systems; for this reason underestimation occurs in some areas.

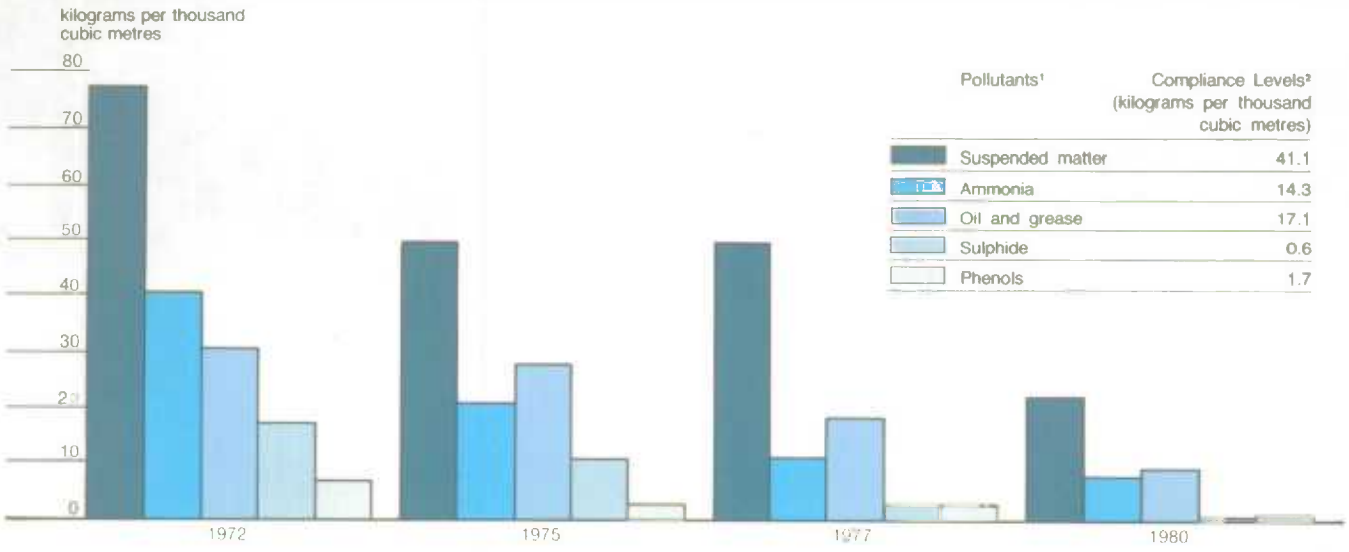
[2] Compliance refers to permitted deposits of either $BOD_5$ and TSS in pounds per air-dry ton of product rather than the assimilative capacity of receiving waters. Further, note that the compliance is variable according to the technology in place at the plant.

[3] Index value of one or less indicates that the compliance has been met, a value greater than one indicates that the mills are discharging effluents which exceed compliance.

**Source:**
Environment Canada, Environmental Protection Service, unpublished data.

**Note:**
The Environmental Protection Service of Environment Canada acting under the authority of pulp and paper effluent regulations of the Federal Fisheries Act sets individual compliance levels for each plant.

Chart 6.2.15
## Pollutant Loadings to Water by Petroleum Refineries, 1972 to 1980

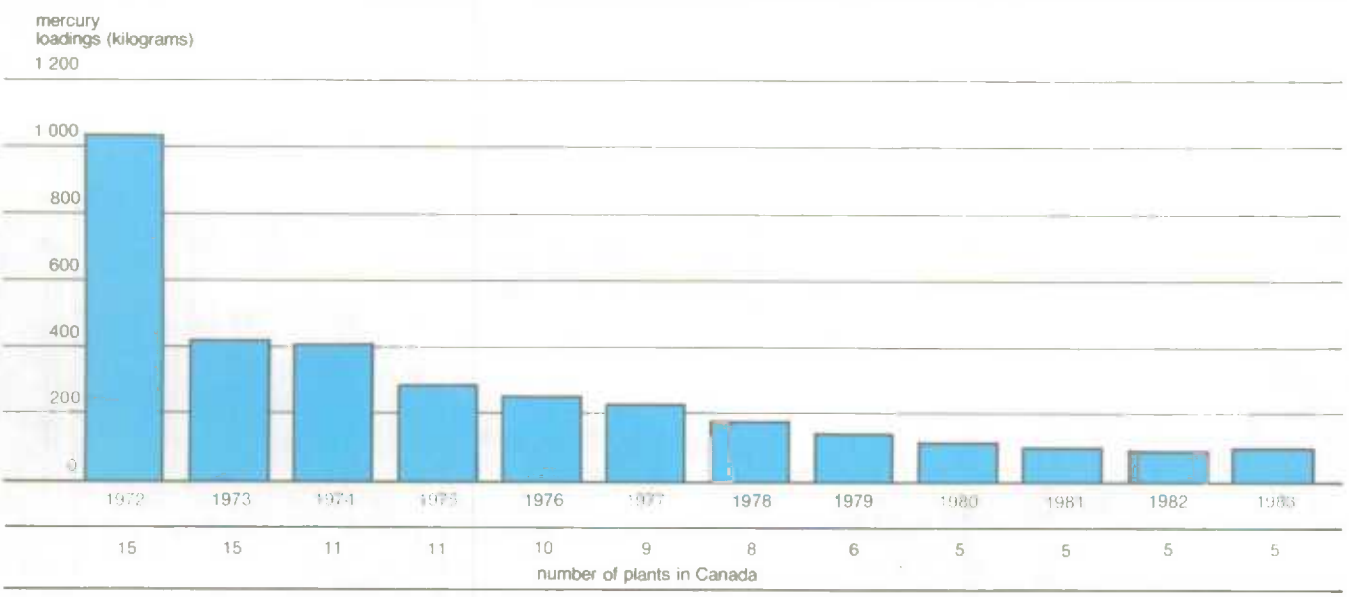



¹ These substances are monitored by Environment Canada under the Petroleum Refinery Effluent Regulations and Guidelines pursuant to the Federal Fisheries Act of 1973.

² Compliance levels are in kilograms per thousand cubic metres of crude oil refined and allowable discharge is variable according to the technology in place at the refinery.

**Source:**
Environment Canada, *Status Report on Abatement of Water Pollution from the Canadian Petroleum Refining Industry, 1980*, Report EPS 3-WP-83-3, 1983.

Chart 6.2.16
## Mercury Loadings to Water by Chlor-Alkali Plants¹, 1972 to 1983




¹ In 1972, May to December only; total for the year would be somewhat higher.

**Source:**
Environment Canada, Environmental Protection Service, *Status Report on Compliance with the Chlor-Alkali Mercury Liquid Effluent Regulations 1982-1983*, by J. McBeath, Report EPS1/HA/1, March 1985.

**Note:**
In 1972, chlor-alkali plants became regulated under the Federal Fisheries Act. The regulations state that deposition of mercury to water may not exceed 2.5 grams per tonne of chlorine produced. In 1983, all plants remaining in operation had complied.

# 6.3
# Thermal Energy Generation

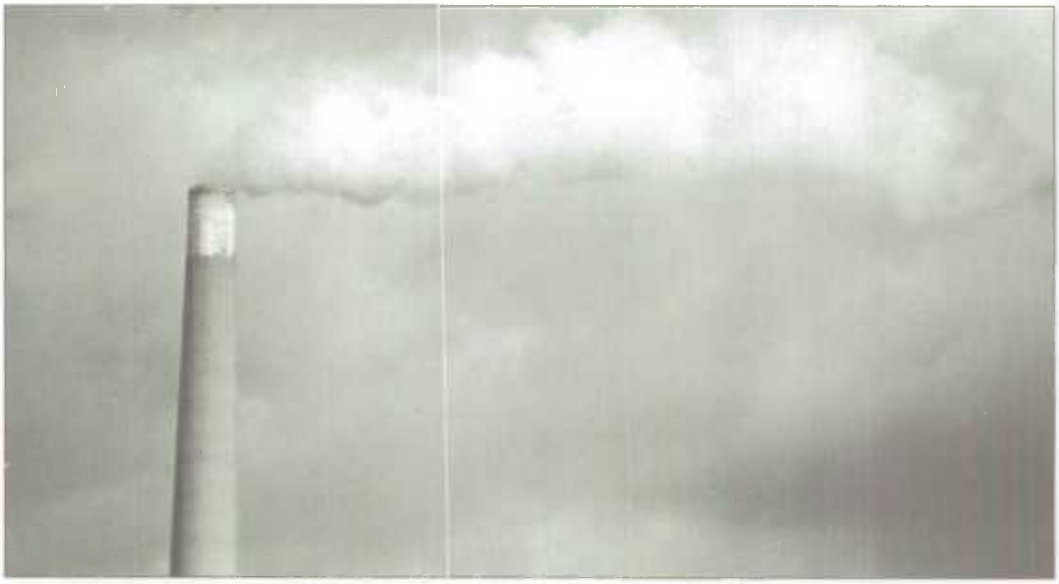
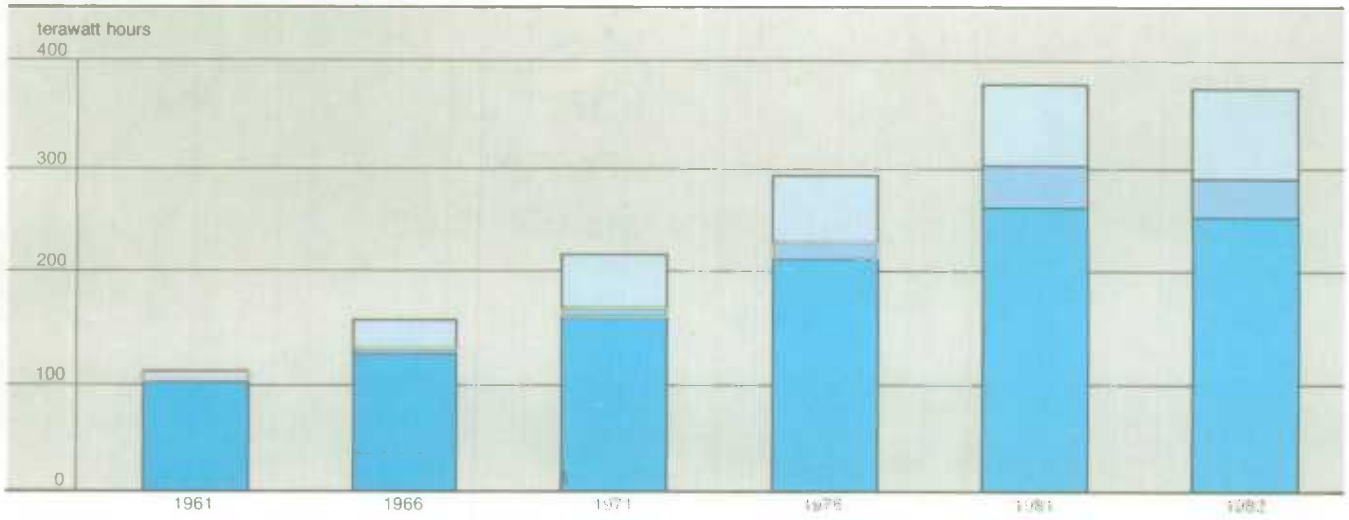


Chart 6.3.1
**Generation[1] of Electricity, 1961 to 1982**




[1] Net generation i.e. total generation less energy used in generating station service. This includes power generated by utilities and industries for their own use.
[2] Other thermal includes internal combustion and gas turbine.

**Source:**
Statistics Canada, *Electric Power Statistics*, Volume II, Catalogue 57-202, various years.

Table 6.3.2
## Generation[1] of Electricity[2] by Province/Territory, 1982

| | Hydro | Thermal | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Steam | Nuclear | Internal Combustion | Gas Turbine | Total Thermal | |
| | gigawatt hours | | | | | | |
| Newfoundland | 43 096 | 1 146 | 0 | 90 | 8 | 1 244 | 44 340 |
| Prince Edward Island | 0 | 34 | 0 | <1 | <1 | 35 | 35 |
| Nova Scotia | 1 025 | 5 542 | 0 | 0 | 1 | 5 543 | 6 568 |
| New Brunswick | 2 645 | 5 536 | 254 | <1 | <1 | 5 790 | 8 435 |
| Québec | 99 810 | 23 | 0 | 207 | -4 | 227 | 100 037 |
| Ontario | 37 611 | 35 881 | 35 899 | 2 | 1 046 | 72 828 | 110 439 |
| Manitoba | 20 495 | 243 | 0 | 52 | <1 | 295 | 20 790 |
| Saskatchewan | 2 360 | 7 411 | 0 | 14 | 61 | 7 486 | 9 846 |
| Alberta | 1 590 | 24 026 | 0 | 64 | 1 432 | 25 522 | 27 112 |
| British Columbia | 46 126 | 1 980 | 0 | 280 | -24 | 2 236 | 48 363 |
| Yukon | 272 | 0 | 0 | 72 | 0 | 72 | 344 |
| Northwest Territories | 275 | 0 | 0 | 222 | 0 | 222 | 497 |
| **Canada** | **255 306** | **81 823** | **36 154** | **1 003** | **2 520** | **121 499** | **376 805** |

[1] Net generation is total generation less energy used in generating station service; the negative figures which appear in several places result from this calculation.
[2] Includes electricity generated by both electric utilities and industrial establishments.

**Source:**
Statistics Canada, *Electric Power Statistics*, Volume II, Catalogue 57-202, 1982.

**Note:**
Individual items may not add to totals due to rounding.

Table 6.3.3
## Fuel Consumption by Thermal Generating Stations[1], 1961 to 1982

| | Coal | | | | Petroleum Fuels | | | | Natural Gas | Uranium |
|---|---|---|---|---|---|---|---|---|---|---|
| | Bituminous | Sub-bituminous | Lignite | Total | Light Fuel Oil | Heavy Fuel Oil | Diesel | Total | | |
| | kilotonnes | | | | megalitres | | | | million cubic metres | tonnes |
| 1961 | 863 | 211 | 971 | 2 044 | 13 | 332 | 51 | 397[2] | 1 168 | .. |
| 1966 | 4 599 | 1 565 | 984 | 7 148 | 31 | 771 | 149 | 952[3] | 1 820 | .. |
| 1971 | 9 358 | 3 684 | 2 574 | 15 616 | 114 | 1 683 | 154 | 1 957[4] | 1 992 | .. |
| 1976 | 8 976 | 6 132 | 4 032 | 19 140 | 111 | 2 792 | 271 | 3 174 | 3 223 | 282 |
| 1981 | 13 413 | 10 970 | 5 545 | 29 928 | 104 | 1 687 | 189 | 1 980 | 1 335 | 677 |
| 1982 | 14 115 | 12 672 | 6 770 | 33 557 | 91 | 1 852 | 192 | 2 134 | 1 095 | 637 |

[1] Public utilities only.
[2] Includes 1.3 megalitres of crude oil used in British Columbia.
[3] Includes 1.1 megalitres of crude oil used in British Columbia.
[4] Includes 0.2 megalitres of jet fuel used in Manitoba and 5.3 megalitres of crude oil used in British Columbia.

**Source:**
Statistics Canada, *Electric Power Statistics*, Volume II, Catalogue 57-202, for years 1961,1966,1971,1976,1981, and 1982.

**Note:**
Individual items may not add to totals due to rounding.

Table 6.3.4
## Fuel Consumption by Thermal Generating Stations, by Ecozone, 1981[1]

| Ecozone | Coal | | | | Petroleum Fuels | Natural Gas | Nuclear | Total |
|---|---|---|---|---|---|---|---|---|
| | Bituminous | | Sub-bituminous | Lignite | | | | |
| | Canadian | Foreign | | | | | | |
| | terajoules | | | | | | | |
| **Atlantic Maritime** | **48 068** | **0** | **0** | **0** | **64 126** | **0** | **0** | **112 194** |
| Prince Edward Island | 0 | 0 | 0 | 0 | 769 | 0 | 0 | 769 |
| Nova Scotia | 32 974 | 0 | 0 | 0 | 24 119 | 0 | 0 | 57 092 |
| New Brunswick | 15 094 | 0 | 0 | 0 | 38 008 | 0 | 0 | 53 103 |
| Québec | 0 | 0 | 0 | 0 | 1 231 | 0 | 0 | 1 231 |
| **Mixed-Wood Plain** | **69 417** | **260 623** | **0** | **0** | **4 191** | **339** | **135 373** | **469 944** |
| Québec | 0 | 0 | 0 | 0 | 511 | 0 | 0 | 511 |
| Ontario | 69 417 | 260 623 | 0 | 0 | 3 681 | 339 | 135 373 | 469 433 |
| **Boreal Shield** | **0** | **4 333** | **0** | **4 328** | **7 650** | **0** | **703** | **17 014** |
| Newfoundland | 0 | 0 | 0 | 0 | 6 274 | 0 | 0 | 6 274 |
| Québec | 0 | 0 | 0 | 0 | 467 | 0 | 0 | 467 |
| Ontario | 0 | 4 333 | 0 | 4 328 | 323 | 0 | 703 | 9 687 |
| Manitoba | 0 | 0 | 0 | 0 | 585 | 0 | 0 | 585 |
| Saskatchewan | 0 | 0 | 0 | 0 | .. | 0 | 0 | .. |
| **Prairie** | **0** | **0** | **39 911** | **80 638** | **787** | **45 294** | **0** | **166 629** |
| Manitoba | 0 | 0 | 0 | 4 815 | 7 | 8 | 0 | 4 829 |
| Saskatchewan | 0 | 0 | 1 875 | 75 823 | 738 | 5 511 | 0 | 83 948 |
| Alberta | 0 | 0 | 38 035 | 0 | 42 | 39 775 | 0 | 77 852 |
| **Boreal Plain** | **16 670** | **0** | **176 888** | **116** | **443** | **3 446** | **0** | **197 563** |
| Manitoba | 0 | 0 | 0 | 116 | 9 | 0 | 0 | 125 |
| Saskatchewan | 0 | 0 | 0 | 0 | 145 | 0 | 0 | 145 |
| Alberta | 16 670 | 0 | 176 888 | 0 | 104 | 2 742 | 0 | 196 404 |
| British Columbia | 0 | 0 | 0 | 0 | 61 | 704 | 0 | 764 |
| Yukon | 0 | 0 | 0 | 0 | 125 | 0 | 0 | 125 |
| **Montane Cordillera** | **0** | **0** | **0** | **0** | **230** | **289** | **0** | **519** |
| Alberta | 0 | 0 | 0 | 0 | .. | 289 | 0 | 290 |
| British Columbia | 0 | 0 | 0 | 0 | 229 | 0 | 0 | 229 |
| **Pacific Maritime** | **0** | **0** | **0** | **0** | **805** | **325** | **0** | **1 130** |
| British Columbia | 0 | 0 | 0 | 0 | 805 | 325 | 0 | 1 130 |
| **Boreal Cordillera** | **0** | **0** | **0** | **0** | **1 008** | **0** | **0** | **1 008** |
| British Columbia | 0 | 0 | 0 | 0 | 68 | 0 | 0 | 68 |
| Yukon | 0 | 0 | 0 | 0 | 940 | 0 | 0 | 940 |
| **Taiga Plain** | **0** | **0** | **0** | **0** | **672** | **0** | **0** | **672** |
| Alberta | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 |
| Northwest Territories | 0 | 0 | 0 | 0 | 669 | 0 | 0 | 669 |
| **Taiga Shield** | **0** | **0** | **0** | **0** | **526** | **0** | **0** | **526** |
| Northwest Territories | 0 | 0 | 0 | 0 | 526 | 0 | 0 | 526 |
| **Hudson Bay Plain** | **0** | **0** | **0** | **0** | **30** | **0** | **0** | **30** |
| Manitoba | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 30 |
| **Southern Arctic** | **0** | **0** | **0** | **0** | **694** | **0** | **0** | **694** |
| Northwest Territories | 0 | 0 | 0 | 0 | 694 | 0 | 0 | 694 |
| **Northern Arctic** | **0** | **0** | **0** | **0** | **523** | **0** | **0** | **523** |
| Northwest Territories | 0 | 0 | 0 | 0 | 523 | 0 | 0 | 523 |
| **Arctic Cordillera** | **0** | **0** | **0** | **0** | **53** | **0** | **0** | **53** |
| Northwest Territories | 0 | 0 | 0 | 0 | 53 | 0 | 0 | 53 |
| **Canada** | **134 155** | **264 956** | **216 799** | **85 082** | **81 737** | **49 693** | **136 076** | **968 498** |

[1] Public utilities only.

**Source:**
Statistics Canada, Thermal Generating Stations Fuel Consumption Survey, special tabulation by the Office of the Senior Adviser on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Table 6.3.5
## Consumption of Coal by Thermal Generating Stations and Other Industries, by Ecozone, 1981

| Ecozone | Thermal Generating Stations | Cement Manufacturers | Smelting and Refining | Pulp and Paper | Other[1] | Total | Percent Distribution |
|---|---|---|---|---|---|---|---|
| | thousands of tonnes | | | | | | |
| **Atlantic Maritime** | **1 641** | **83** | 1 | **0** | **191** | **1 916** | **6.0** |
| Nova Scotia | 1 126 | 49 | 0 | 0 | 191 | 1 367 | 4.3 |
| New Brunswick | 515 | 33 | 0 | 0 | 0 | 549 | 1.7 |
| Quebec | 0 | 0 | 1 | 0 | 0 | 1 | -- |
| **Mixed-Wood Plain** | **11 034** | **374** | **247** | **1** | **176** | **11 832** | **37.1** |
| Quebec | 0 | 92 | 247 | -- | 65 | 404 | 1.3 |
| Ontario | 11 034 | 283 | 0 | -- | 111 | 11 428 | 35.9 |
| **Boreal Shield** | **427** | **0** | **103** | **212** | **22** | **763** | **2.4** |
| Quebec | 0 | 0 | 46 | 18 | 22 | 85 | 0.3 |
| Ontario | 427 | 0 | 0 | 194 | -- | 621 | 1.9 |
| Manitoba | 0 | 0 | 58 | 0 | 0 | 58 | 0.2 |
| **Prairie** | **7 851** | **0** | **0** | **0** | **396** | **8 247** | **25.9** |
| Manitoba | 321 | 0 | 0 | 0 | 95 | 417 | 1.3 |
| Saskatchewan | 5 036 | 0 | 0 | 0 | 0 | 5 036 | 15.8 |
| Alberta | 2 494 | 0 | 0 | 0 | 300 | 2 794 | 8.8 |
| **Boreal Plain** | **8 962** | **0** | **0** | **86** | **15** | **9 063** | **28.4** |
| Manitoba | 11 | 0 | 0 | 86 | 15 | 112 | 0.4 |
| Alberta | 8 951 | 0 | 0 | 0 | 0 | 8 951 | 28.1 |
| **Montane Cordillera** | **0** | **0** | **49** | **0** | **0** | **49** | **0.2** |
| British Columbia | 0 | 0 | 49 | 0 | 0 | 49 | 0.2 |
| **Canada** | **29 915** | **457** | **400** | **297** | **800** | **31 870** | **100.0** |

[1] Includes industries such as industrial chemicals (inorganic), miscellaneous petroleum and coal products, and iron and steel.

**Source:**
Statistics Canada, Industrial Consumers of Energy, Quarterly Survey, special tabulation by the Office of the Senior Adviser on Integration.

**Note:**
Individual items may not add to totals due to rounding.

Technical Box 6.3.6

## Composition of Canadian Coals

| Characteristics | Nova Scotia Bituminous | New Brunswick Bituminous | Saskatchewan Lignite | Alberta Sub-bituminous | Imports from the United States |
|---|---|---|---|---|---|
| | percent of content | | | | |
| Moisture | 5.0 | 7.5 | 34.4 | 21.1 | 5.1 |
| Ash | 8.7 | 10.1 | 14.2 | 16.7 | 8.8 |
| Volatile Matter | 32.5 | 29.8 | 24.3 | 26.0 | 36.9 |
| Fixed Carbon | 53.8 | 52.6 | 27.1 | 36.2 | 49.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| Sulphur[1] | 2.2 | 4.6 | 0.5 | 0.2 | 2.4 |
| | kilojoules per kilogram of coal | | | | |
| Heating Value | 30 856 | 28 752 | 13 920 | 17 794 | 29 673 |

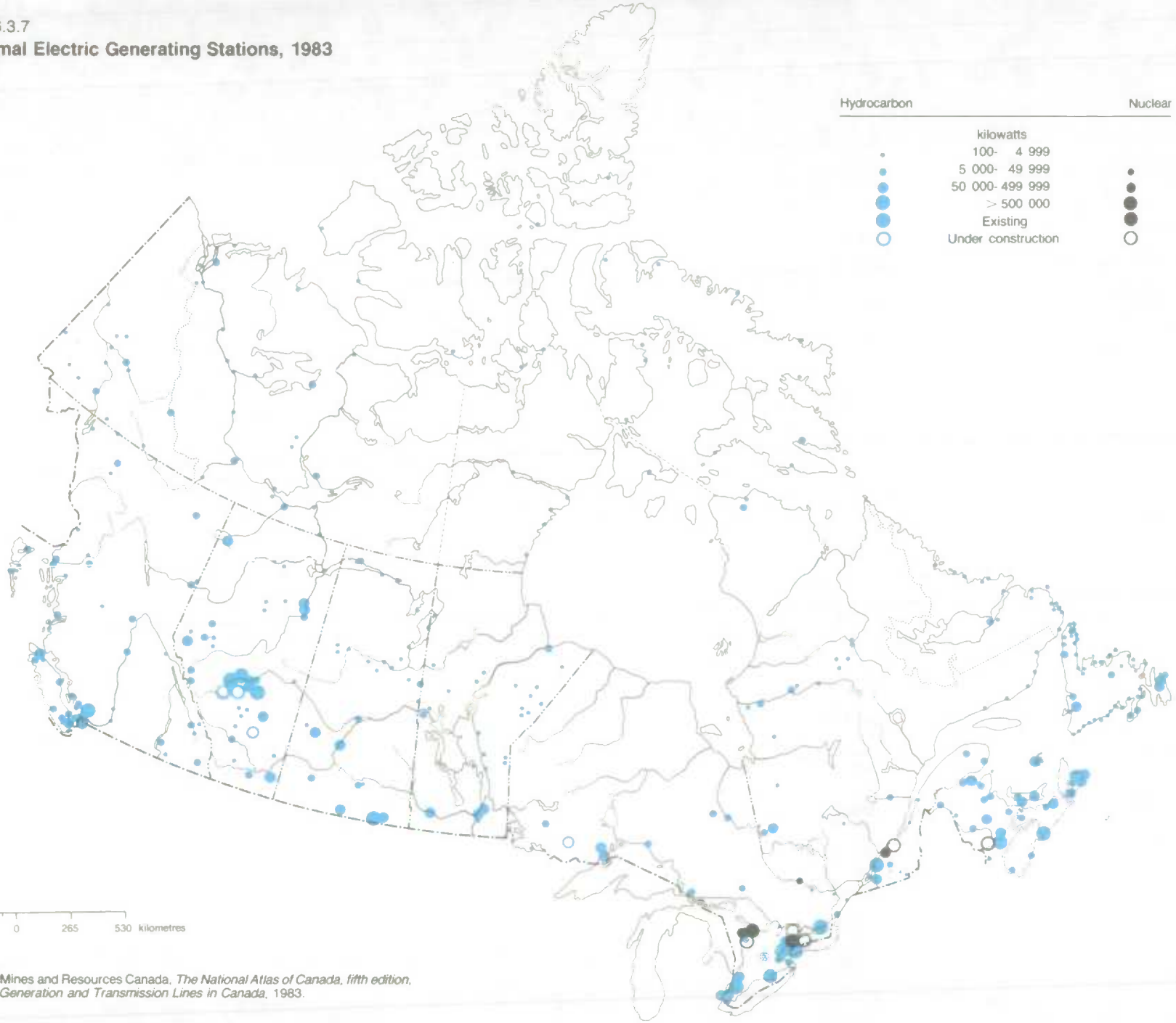
[1] Sulphur occurs in the ash, volatile matter and fixed carbon. The figures present the sulphur content expressed as a percentage of the total weight.

**Source:**
Environment Canada, Environmental Protection Service, *Air Pollution Emissions and Control Technology. Thermal Power Generation Industry*, Volume 2, *Particulate Emissions from Steam-Powered Stations*, Report EPS3-AP-79-6, March 1980.

**Note:**
This table illustrates the percentage by weight content determined by proximate analysis, of potentially polluting substances in various types of coal. Ash content, for example, has an impact on particulate emissions and sulphur content on sulphur dioxide emissions. The heating value is also significant in this context as more of a low value coal must be burned to equal the heat content of a smaller amount of high value coal. Moreover, if low value coal contains relatively high proportions of potentially polluting substances the emission control problem is increased.

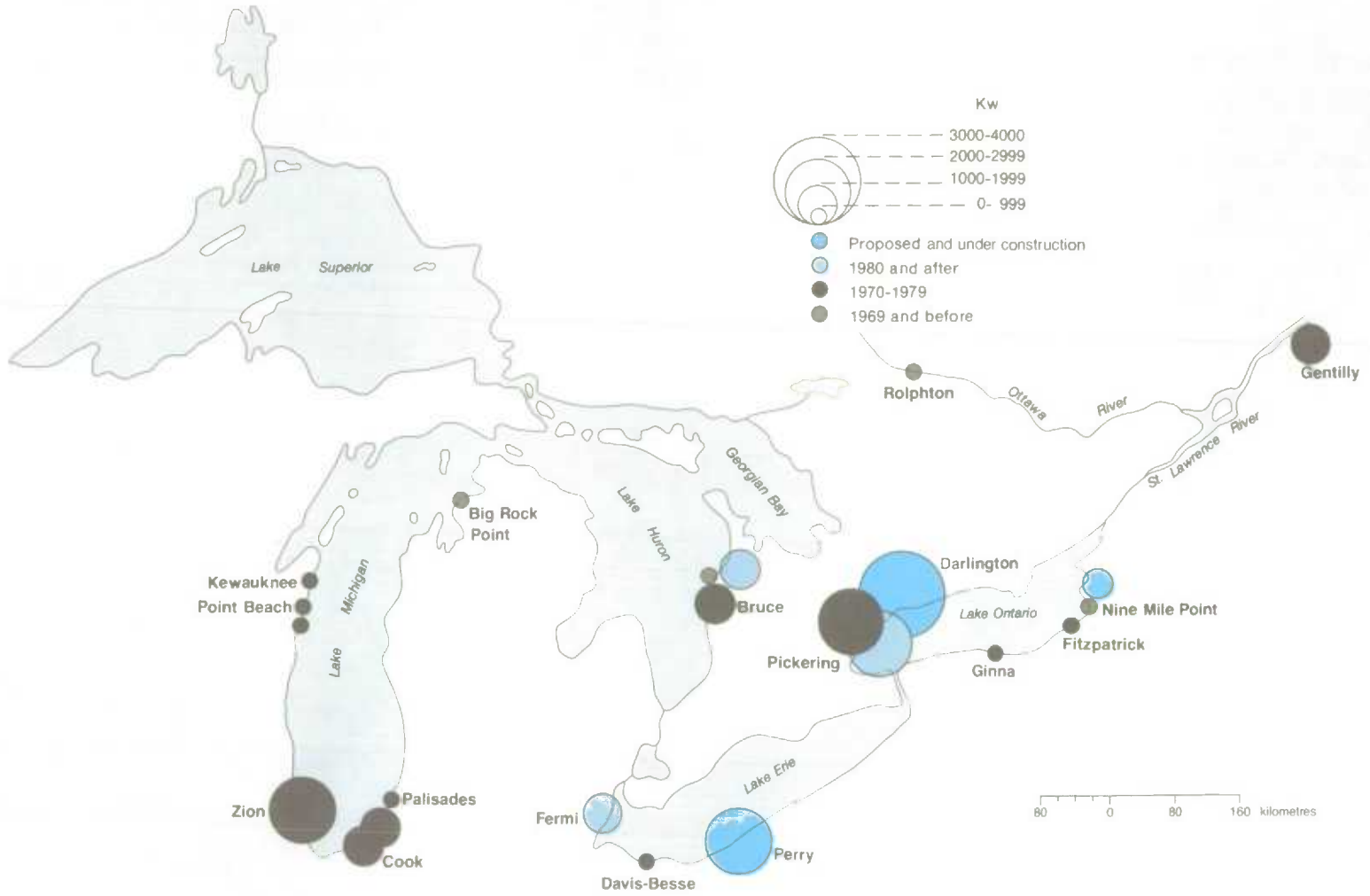
Map 6.3.7

## Thermal Electric Generating Stations, 1983




**Source:**
Energy, Mines and Resources Canada, *The National Atlas of Canada, fifth edition, Electric Generation and Transmission Lines in Canada*, 1983.

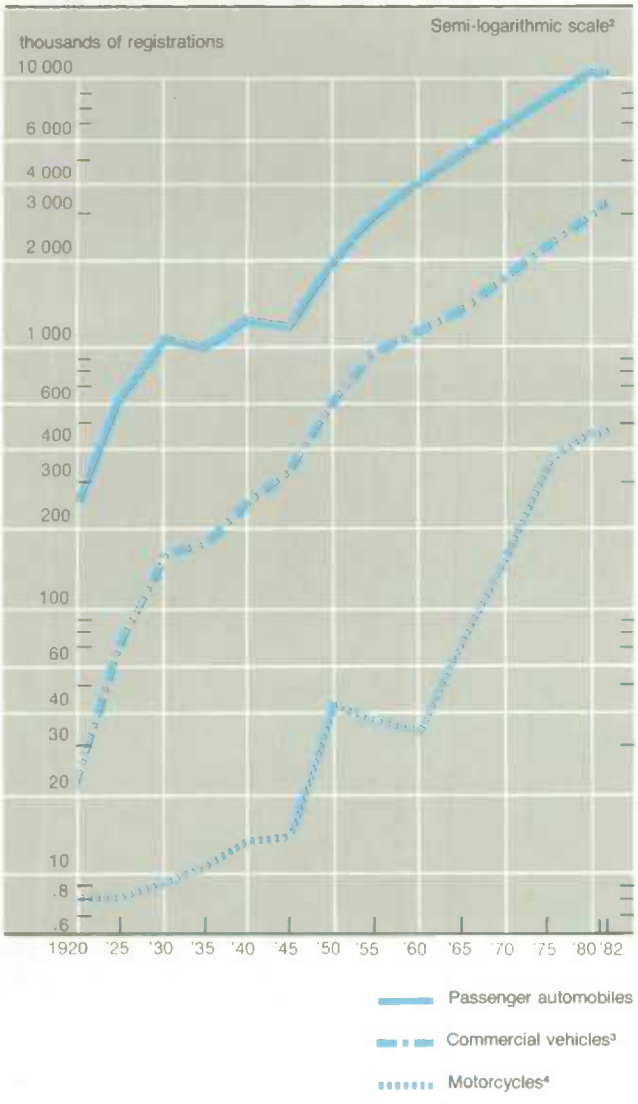
Map 6.3.8
**Nuclear Generating Stations in the St. Lawrence-Great Lakes Basin, 1984**




**Sources:**
Atomic Energy Control Board of Canada, Ottawa, 1984.
U.S. Nuclear Regulatory Commission, Washington.

# 6.4
# Transportation Activity

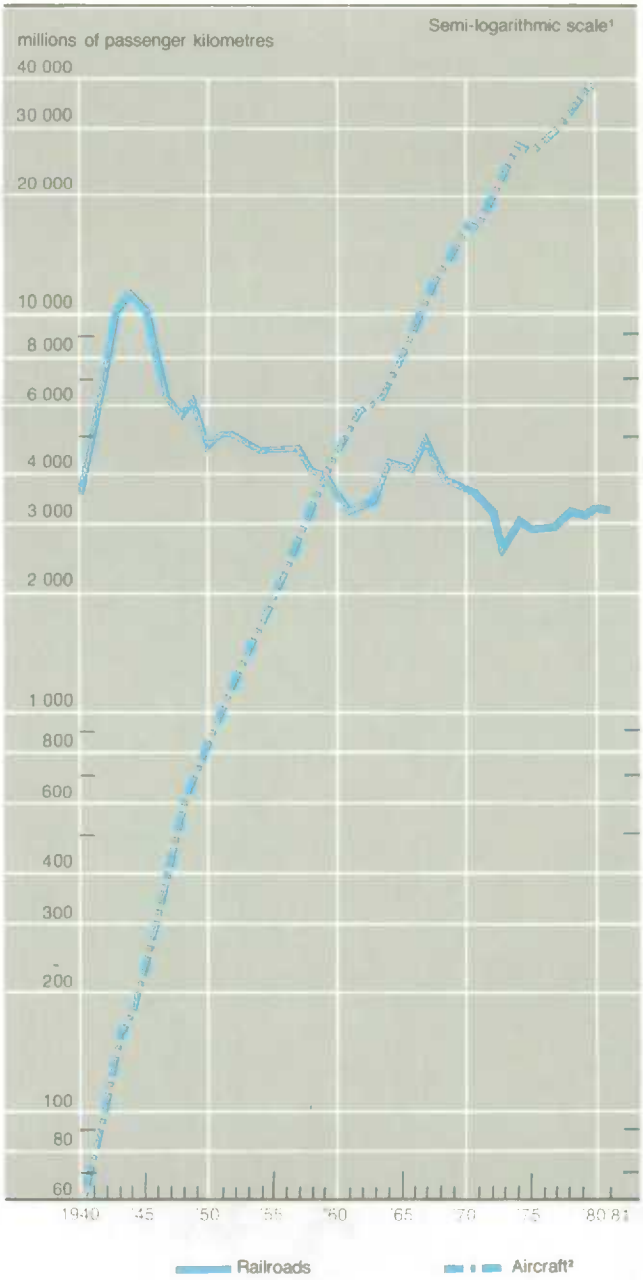
Chart 6.4.1
**Motor Vehicles[1], 1910 to 1982**




[1] Road motor vehicle registrations.
[2] A semi-logarithmic scale is employed to allow comparison of rates of growth.
[3] Includes buses, trucks, truck tractors, ambulances and other vehicles.
[4] Includes mopeds.

**Source:**
Statistics Canada, *Road Motor Vehicles: Registrations*, Catalogue 53-219.

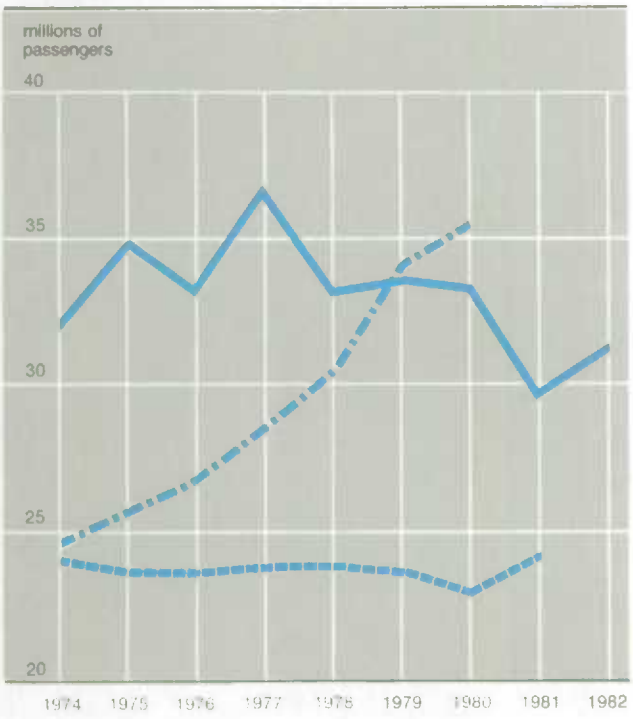
Chart 6.4.2
**Railroad and Aircraft Passenger Kilometres, 1940 to 1981**




**Footnotes:**
[1] A semi-logarithmic scale is employed to allow comparison of rates of growth.
[2] Includes all foreign and domestic services by Canadian carriers and that part of service by foreign carriers taking place over Canadian territory. Includes only unit toll operations. Unit toll is defined as the public transportation of persons and/or goods between designated points or from a designated base to a defined area at a fixed rate per unit.

**Sources:**
Statistics Canada, *Railway Transport*, Part IV, *Operating and Traffic Statistics*, Catalogue 52-210.
Statistics Canada, *Air Carrier Operations in Canada*, Catalogue 51-002.
Statistics Canada, *Civil Aviation*, Catalogue 51-202.
Statistics Canada, *Aviation in Canada (1971)*, Catalogue 51-501.

Chart 6.4.3
**Passengers Carried by Transportation Mode, 1974 to 1982**




[1] Includes all foreign and domestic services by Canadian carriers and that part of the foreign carriers' service taking place over Canadian territory.
[2] In 1974 includes only operations earning more than $500,000 in gross revenue per year. Starting in 1975, includes operations earning more than $100,000 in gross revenue per year.

**Sources:**
Statistics Canada, *Air Carrier Operations in Canada*, Catalogue 51-002.
Statistics Canada, *Passenger Bus and Urban Transit Statistics*, Catalogue 53-215.
Statistics Canada, *Railway Transport, Part 1, Comparative Summary Statistics*, Catalogue 52-207.

Table 6.4.4
## Airport Activity: Aircraft Movements[1] by Weight Class, 1983

| Airport[2] | Weight Class[3] | | | | Total Movements |
|---|---|---|---|---|---|
| | Light | Medium | Heavy | Very Heavy | |
| Toronto International (Pearson) | 58 412 | 27 600 | 116 241 | 33 214 | 235 467 |
| Montréal International (Dorval) | 51 323 | 23 024 | 65 999 | 8 746 | 149 092 |
| Vancouver International | 136 104 | 12 501 | 62 035 | 11 886 | 222 526 |
| Calgary International | 66 350 | 17 637 | 56 009 | 7 764 | 147 760 |
| Winnipeg International | 44 601 | 14 263 | 33 764 | 3 590 | 96 218 |
| Edmonton International | 21 612 | 3 861 | 32 848 | 4 094 | 62 415 |
| Ottawa International | 50 955 | 28 123 | 27 670 | 2 267 | 109 015 |
| Halifax International | 15 217 | 11 175 | 18 813 | 2 039 | 47 244 |
| Mirabel International | 9 485 | 5 118 | 3 247 | 16 453 | 34 303 |
| Edmonton Municipal | 105 329 | 9 890 | 12 698 | 13 | 127 930 |
| Québec | 53 786 | 8 142 | 12 228 | 274 | 74 430 |
| Regina | 41 043 | 3 172 | 9 968 | 363 | 54 546 |
| Gander International | 7 705 | 4 973 | 6 060 | 3 298 | 22 036 |
| Saskatoon | 39 393 | 5 045 | 9 053 | 216 | 53 707 |
| Victoria International | 81 840 | 3 522 | 8 722 | 117 | 94 251 |
| St. John's | 15 277 | 4 675 | 7 562 | 807 | 28 321 |

[1] A landing or a take-off by an aircraft. Includes only itinerant movement, one in which the aircraft enters or leaves the airport tower control zone.
[2] Airports are listed in descending order of volume of heavy and very heavy aircraft movements. (A crude indicator of airport noise disturbance, although this should be considered in context of location (see Table 6.4.5)).
[3] The following are examples of aircraft for each weight class:
Light (less than 5 670 kgs.) ..... Beechcraft Baron (2 322 kgs), Piper Navajo (3 538 kgs), DeHavilland of Canada DHC6 Twin Otter (5 760 kgs).
Medium (5 671 - 35 000 kgs) ..... McDonnell Douglas DC3/Dakota C47 (11 431 kgs), DeHavilland of Canada DHC7 Dash-7 (19 505 kgs), British Aerospace 748 (21 092 kgs).
Heavy (35 001 - 136 000 kgs) ..... Boeing 737 Passenger (50 350 kgs), McDonnell Douglas DC9-30 (54 885 kgs), Boeing 727-200 (86 638 kgs).
Very Heavy (more than 136 000 kgs) ..... Boeing 767 (141 523 kgs), McDonnell Douglas DC8 (142 884 kgs), Aerospatiale-British Aerospace Concorde (181 440 kgs), Lockheed L1011 (195 048 kgs), McDonnell Douglas DC10 (206 388 kgs), Boeing 747 Passenger (377 849 kgs).

**Source:**
Transport Canada, *Aircraft Movement Statistics, Annual Report*, TP-577, 1984.

Table 6.4.5
## Estimated Population Affected by Aircraft Noise[1] Around Selected Airports, 1976

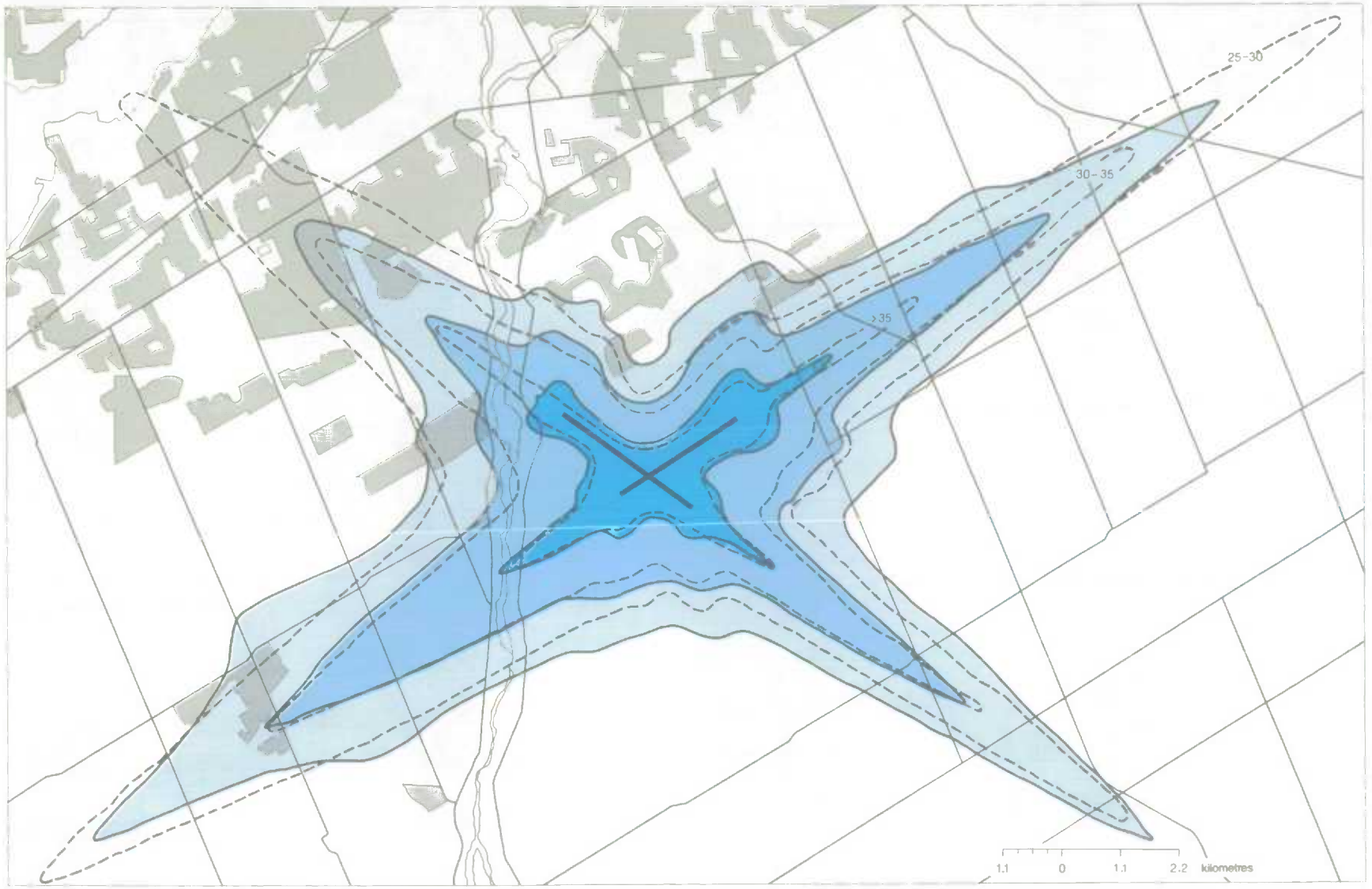
| Noise Zone | Montreal (Dorval) International | Toronto (Pearson) International | Ottawa International | Edmonton Industrial |
|---|---|---|---|---|
| Lower Noise Zone[2] | 206 189 | 64 712 | 30 241 | 20 241 |
| Intermediate Noise Zone[3] | 68 586 | 48 947 | 6 803 | 8 063 |
| Upper Noise Zone[4] | 18 798 | 41 367 | 4 312 | 3 232 |
| **Total** | **293 573** | **155 026** | **41 356** | **31 549** |

[1] Noise contours are expressed in Noise Exposure Forecast (N.E.F.) units. This unit depends on the frequency of aircraft movements at a specific location and of each individual noise expressed in Effective Perceived Noise decibel (EPNdB) units, on a typical summer day. The EPNdB unit provides a frequency weighting system which approximates the subjective reaction of the human ear to noise stimulus weighted according to the disturbance elements of noise. In the N.E.F. calculations one movement during nighttime (between 22:00 and 07:00 hours) is equivalent to the annoyance level of 16 movements during daytime. It should be noted that there is not a one-to-one correspondence between the frequency of movements and N.E.F. units; for example, a 100 percent growth in traffic will result in an increase of just 3 N.E.F. units.
[2] In the "lower" noise zone, values range between N.E.F. 25 and 30.
[3] In the "intermediate" noise zone, values fall between N.E.F. 30 and 35.
[4] In the "upper" noise zone, values are greater than N.E.F. 35.

**Sources:**
Statistics Canada, *1976 Census of Canada, Census Tracts*, Catalogue 95-811, 95-813, 95-803 and 95-826.
Transport Canada, Canadian Air Transportation Administration, Airport noise contour maps prepared for Canada Mortgage and Housing Corporation.

Map 6.4.6

## Noise Exposure Forecasts for Ottawa International Airport, 1976 and 1988




**Source:**
1976 and 1988 Airport Noise Contours were prepared in map form for Canada Mortgage and Housing Corporation by Transport Canada, Canadian Air Transportation Administration.

1988 Noise Exposure Forecast Zones

- 25-30
- 30-35
- > 35

1976 Noise Exposure Forecast contours

Residential areas

Table 6.4.7
## Cargo Movements Through Canadian Ports, 1935 to 1983

| | Cargo Loaded and Unloaded | | | Vessel Arrivals and Departures | | |
|---|---|---|---|---|---|---|
| | International Shipping[1] | Coastwise Shipping[2] | Total | International Shipping[1] | Coastwise Shipping[2] | Total |
| | thousands of tonnes | | | | | |
| 1935 | 16 803 | .. | .. | 70 132 | 136 986 | 207 118 |
| 1940 | 25 195 | .. | .. | 93 653 | 156 278 | 249 931 |
| 1950[3] | 52 137 | .. | .. | 64 923 | 166 289 | 231 212 |
| 1960 | 81 209 | 73 815 | 155 024 | 68 419 | 233 861 | 302 280 |
| 1965 | 123 299 | 96 458 | 219 757 | 57 912 | 195 211 | 253 123 |
| 1970 | 148 969 | 113 232 | 262 201 | 50 604 | 156 379 | 206 983 |
| 1975 | 166 221 | 108 745 | 274 966 | 40 522 | 93 742 | 134 264 |
| 1980 | 211 821 | 165 523 | 377 344 | 57 786 | 75 600 | 133 386 |
| 1982 | 174 011 | 131 763 | 305 744 | 49 206 | 57 376 | 106 582 |
| 1983 | 178 405 | .. | .. | 50 539 | .. | .. |

[1] International shipping includes trips that have one terminal point in Canada and the other in a foreign port.
[2] Domestic shipping includes trips that originate and terminate in Canadian ports.
[3] Data for Newfoundland were included from April 1, 1949. Data for non-customs ports were included for the first time in 1957.

**Sources:**
Statistics Canada, *Shipping Report: Part II, International Seaborne Shipping*, Catalogue 54-203.
Statistics Canada, *Shipping Report: Part III, Coastwise Shipping*, Catalogue 54-204.
Statistics Canada, *International Seaborne Shipping, Port Statistics*, Catalogue 54-211.
Statistics Canada, *Coastwise Shipping Statistics*, Catalogue 54-210.

Table 6.4.8
## Total Cargo and Petroleum Products Handled in Canadian Ports, 1981[1]

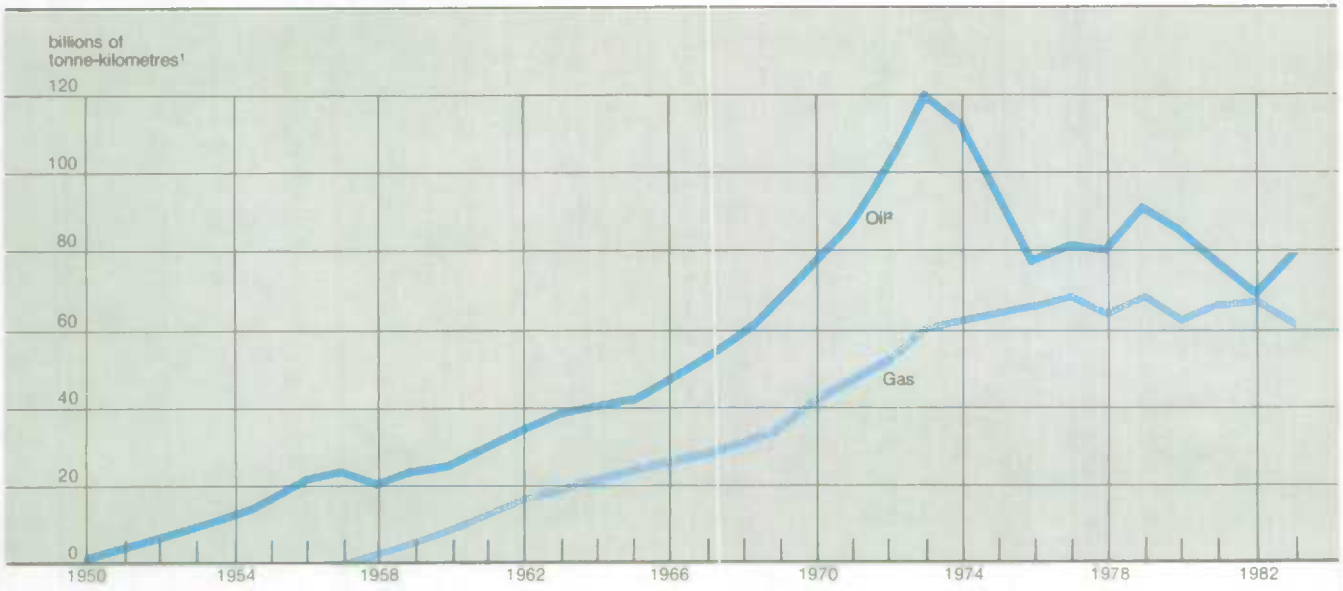
| Ports[2] | Total Cargo[3] | Petroleum Products[4] | Petroleum Products as a Percentage of Total Cargo |
|---|---|---|---|
| | thousands of tonnes | | percent |
| **Atlantic Region** | | | |
| Sept-Iles[5] | 28 636 | 783 | 2.7 |
| Port Cartier | 28 131 | 302 | 1.1 |
| Montréal | 21 107 | 6 650 | 31.5 |
| Québec/Lévis | 17 417 | 6 198 | 35.6 |
| Saint John | 14 201 | 11 112 | 78.3 |
| Halifax | 11 911 | 6 639 | 55.7 |
| Baie-Comeau | 8 129 | 321 | 4.0 |
| Sorel | 6 217 | 0 | 0.0 |
| Contrecoeur | 4 174 | 454 | 10.9 |
| Port-Alfred | 4 048 | 631 | 15.6 |
| Port Hawkesbury | 3 623 | 2 672 | 73.8 |
| Trois-Rivières | 2 526 | 357 | 14.1 |
| Havre-St-Pierre | 2 079 | 8 | 0.4 |
| Sydney | 1 833 | 383 | 20.9 |
| Sub-total | 154 032 | 36 511 | 23.7 |
| Other ports | 16 096 | 5 324 | 33.0 |
| **Total** | **170 128** | **41 835** | **24.6** |
| **Great Lakes Region** | | | |
| Thunder Bay | 19 623 | 477 | 2.4 |
| Hamilton | 10 445 | 299 | 2.9 |
| Nanticoke | 7 160 | 269 | 3.8 |
| Sault Ste. Marie | 6 230 | 519 | 8.3 |
| Sarnia | 6 065 | 3 520 | 58.0 |
| Windsor | 3 529 | 397 | 11.3 |
| Toronto | 1 948 | 239 | 12.3 |
| Port Colborne | 1 680 | 67 | 4.0 |
| Sub-total | 56 679 | 5 786 | 10.2 |
| Other ports | 17 948 | 1 600 | 8.9 |
| **Total** | **74 627** | **7 386** | **9.9** |
| **Pacific Region** | | | |
| Vancouver[6] | 52 945 | 2 471 | 4.7 |
| North Arm, Fraser River | 6 021 | 1 | -- |
| Howe Sound | 5 401 | 8 | 0.2 |
| New Westminster | 5 170 | 36 | 0.7 |
| Prince Rupert | 2 873 | 168 | 5.9 |
| Nanaimo | 2 864 | 430 | 15.0 |
| Jervis Inlet | 2 565 | 8 | 0.3 |
| Fraser River | 2 117 | 1 | 0.1 |
| Campbell River | 1 991 | 103 | 5.2 |
| Victoria | 1 842 | 467 | 25.4 |
| Kitimat | 1 516 | 239 | 15.8 |
| Port Alberni | 1 135 | 59 | 5.2 |
| Sub-total | 84 893 | 3 991 | 4.7 |
| Other ports | 26 527 | 765 | 2.9 |
| **Total** | **111 420** | **4 775** | **4.3** |
| **Canada Total** | **356 175** | **53 976** | **15.2** |

[1] Ports listed are those with more than one million metric tonnes of cargo loaded and unloaded by domestic and international shipping.
[2] Ports are listed in descending order of total cargo handled in each region.
[3] Total cargo handled includes crude petroleum and refined products.
[4] Includes crude petroleum and refined products (gasoline, fuel oil, etc.).
[5] Including Pointe-Noire.
[6] Including Roberts Bank.

**Sources:**
Statistics Canada, *Coastwise Shipping Statistics*, Catalogue 54-210.
Statistics Canada, *International Vessel Traffic Statistics*, Catalogue 54-209.

**Note:**
Individual items may not add to totals due to rounding.

Chart 6.4.9
**Oil and Gas Movements by Pipelines, 1950 to 1983**




[1] A tonne-kilometre is a unit which measures the movement of one tonne of a good one kilometre.
[2] Trunk lines only.

**Sources:**
Statistics Canada, *Gas Utilities: Transport and Distribution Systems*, Catalogue 57-205.
Statistics Canada, *Oil Pipeline Transport*, Catalogue 55-201.
Statistics Canada, *Historical Statistics of Canada*, second edition.

Table 6.4.10
**Energy Consumed by Transportation Mode, 1958 to 1983**

| | Road | Rail | Air | Marine | Total |
|---|---|---|---|---|---|
| | terajoules | | | | |
| 1958 | 523 405 | 134 042 | 42 396 | 75 932 | 775 775 |
| 1960 | 570 758 | 82 365 | 47 247 | 85 951 | 786 321 |
| 1965 | 723 641 | 90 591 | 58 426 | 107 993 | 989 651 |
| 1970 | 970 773 | 89 642 | 102 720 | 111 473 | 1 274 608 |
| 1975 | 1 286 208 | 99 028 | 145 959 | 93 123 | 1 624 318 |
| 1980 | 1 461 438 | 94 209 | 138 660 | 150 662 | 1 844 969 |
| 1982 | 1 180 333 | 83 992 | 118 924 | 116 639 | 1 494 888 |
| 1983 | 1 152 174 | 79 334 | 116 382 | 89 171 | 1 437 061 |

**Sources:**
Statistics Canada, *Quarterly Report on Energy Supply-Demand in Canada*, Catalogue 57-003, for years 1980, 1982 and 1983.
Statistics Canada, *Detailed Energy Supply and Demand in Canada*, Catalogue 57-207, for years 1970 and 1975.
Statistics Canada, *Detailed Energy Supply and Demand in Canada, 1958-1969*, Catalogue 57-505.

Table 6.4.11
## Gasoline Production and Lead Use, 1975 to 1983[1]

| Year | Gasoline Production | | | Lead Added to Gasoline | Lead Concentration[2] in Leaded Gasoline |
|---|---|---|---|---|---|
| | Leaded | Lead-free | Total | | |
| | percent | | | millions of cubic metres[3] | millions of kilograms | grams per litre |
| 1975 | 94.3 | 5.7 | 100.0 | 35.39 | 15.8 | 0.47 |
| 1976 | 87.4 | 12.6 | 100.0 | 36.25 | 14.6 | 0.46 |
| 1977 | 81.8 | 18.2 | 100.0 | 36.55 | 13.1 | 0.44 |
| 1978 | 76.4 | 23.6 | 100.0 | 35.98 | 12.2 | 0.44 |
| 1979 | 67.8 | 32.2 | 100.0 | 37.30 | 11.9 | 0.47 |
| 1980 | 63.4 | 36.6 | 100.0 | 38.19 | 11.0 | 0.45 |
| 1981 | 61.5 | 38.5 | 100.0 | 37.04 | 10.5 | 0.46 |
| 1982 | 60.9 | 39.1 | 100.0 | 33.16 | 9.3 | 0.46 |
| 1983 | 58.3 | 41.7 | 100.0 | 33.49 | 8.7 | 0.44 |

[1] Lead-free and leaded gasoline regulations were introduced under the authority of the Clean Air Act in 1973 and 1974 in response to health concerns regarding the effects of lead. In order to monitor lead use in gasoline, the regulations specify that each refinery must report the quantity of gasoline produced and the amount of lead added to it to Environment Canada.

[2] Recent medical research indicates that lead contamination continues to be a cause for concern, that children are particularly at risk and that lead additives in gasoline contribute substantially to the risks involved. Therefore a new measure to reduce lead content of gasoline was announced by Environment Canada in 1984. It will become effective on January 1st, 1987 and will reduce the lead content from 0.77 grams per litre to 0.29 grams per litre. This will bring about an 80 percent reduction in automobile lead emissions from the 1972 level.

[3] One cubic metre is 1,000 litres.

**Sources:**
Environment Canada, Environmental Protection Service, unpublished information.
Environment Canada, Environmental Protection Service, *Lead-Free and Leaded Gasoline Enforcement Programs, 1974-80*, Report EPS 3-AP-82-3, 1982.
House of Commons Canada, Sub-Committee on Acid Rain, *Time Lost, A Demand for Action on Acid Rain*, 1984.
Environment Canada, Environmental Protection Service, *The Phase-down of Lead in Gasoline*, Report EPS 2/CC/1, August 1984.

# 6.5
# Household Consumption and Municipal Wastes

Table 6.5.1

## Population Served by Municipal Wastewater Treatment Systems, by Major Drainage Area[1]

| Major Drainage Area | Municipal Population Served by Wastewater Treatment Systems | | | | | Municipal Population | Percent of Municipal Population Served |
|---|---|---|---|---|---|---|---|
| | Primary[2] | Secondary[3] | Lagoons[4] | Other[5] | Total | | |
| **Atlantic Ocean Basin** | **1 236 822** | **5 545 619** | **472 106** | **71 898** | **7 326 445** | **15 507 772** | **47.2** |
| Atlantic Ocean Coastal | 1 200 | 66 696 | 1 200 | 4 856 | 73 952 | 644 404 | 11.5 |
| Gulf of St. Lawrence Coastal | 37 474 | 133 727 | 71 836 | 19 637 | 262 674 | 819 537 | 32.1 |
| Bay of Fundy Coastal and Saint John River | 0 | 134 866 | 72 823 | 6 564 | 214 253 | 435 335 | 49.2 |
| St. Lawrence River | 199 178 | 187 621 | 46 590 | 13 579 | 446 968 | 5 810 222 | 7.7 |
| Ottawa River | 433 835 | 82 826 | 48 338 | 10 442 | 575 441 | 1 117 713 | 51.5 |
| Lake Ontario Shore | 153 741 | 3 650 836 | 69 938 | 922 | 3 875 437 | 4 253 909 | 91.1 |
| Lake Erie and Lake St. Clair Shore | 228 677 | 949 935 | 82 797 | 13 012 | 1 274 421 | 1 553 872 | 82.0 |
| Lake Huron Shore | 123 423 | 339 112 | 74 164 | 1 320 | 538 019 | 740 623 | 72.6 |
| Lake Superior Shore | 59 294 | 0 | 4 420 | 1 566 | 65 280 | 132 157 | 49.4 |
| **Hudson Bay and Ungava Bay Basin** | **331 346** | **1 744 826** | **789 347** | **8 931** | **2 874 450** | **3 203 121** | **89.7** |
| Hudson Bay and Ungava Bay Coastal | 28 204 | 37 699 | 29 041 | 3 694 | 98 638 | 225 784 | 43.7 |
| Nelson River | 14 000 | 2 675 | 7 508 | 1 300 | 25 483 | 25 924 | 98.3 |
| Lake Winnipeg Shore | 9 000 | 612 202 | 87 701 | 0 | 708 903 | 745 449 | 95.1 |
| Assiniboine River | 0 | 68 159 | 297 121 | 0 | 365 280 | 374 302 | 97.6 |
| Saskatchewan River | 280 142 | 1 024 091 | 367 976 | 3 937 | 1 676 146 | 1 831 662 | 91.5 |
| **Arctic Ocean Basin** | **0** | **4 256** | **155 694** | **5 115** | **165 065** | **179 464** | **92.0** |
| Mackenzie River | 0 | 4 256 | 154 338 | 5 115 | 163 709 | 173 963 | 94.1 |
| Arctic Ocean Coastal | 0 | 0 | 1 356 | 0 | 1 356 | 5 501 | 24.7 |
| **Pacific Ocean Basin** | **206 585** | **332 943** | **151 096** | **218 709** | **909 333** | **1 989 529** | **45.7** |
| Columbia River | 29 435 | 91 873 | 45 650 | 0 | 166 958 | 223 475 | 74.7 |
| Fraser River | 1 550 | 178 277 | 30 050 | 15 573 | 225 450 | 1 181 516 | 19.1 |
| Yukon River | 0 | 160 | 17 150 | 800 | 18 110 | 20 629 | 87.8 |
| Pacific Ocean, North Coastal | 10 000 | 8 030 | 15 950 | 0 | 33 980 | 56 280 | 60.4 |
| Pacific Ocean, South Coastal | 165 600 | 54 603 | 42 296 | 202 336 | 464 835 | 507 629 | 91.6 |
| **Gulf of Mexico Basin** | **0** | **0** | **3 216** | **0** | **3 216** | **3 280** | **98.0** |
| Missouri River | 0 | 0 | 3 216 | 0 | 3 216 | 3 280 | 98.0 |
| **Canada** | **1 774 753** | **7 627 644** | **1 571 459** | **304 653** | **11 278 509** | **20 883 166** | **54.0** |

[1] Data obtained from MUNDAT (a national inventory of waterworks and wastewater systems in Canada). The updating of the information occurs on a continuous basis, as received from participating agencies. Frequency of updating and completeness of replies varies among the respondants. The data presented here are current as of May 1984.

[2] Primary systems include systems that depend on physical or mechanical unit operations (e.g. bar screen, grit removal, sedimentation tank) as the sole component for removing settleable and floating solids.

[3] Secondary systems include mechanical plants having aerobic biological treatment processes (use of naturally occuring bacteria in sewage) and secondary clarifiers.

[4] Lagoons are man-made pools where natural waste decomposition occurs through contact with the air and naturally occuring micro-organisms, and through the settling of solids.

[5] Other types of treatment systems which are not specified (e.g. comminution only, grit removal only).

[6] Current municipal population as reported to MUNDAT. This represents about eighty-six percent of the total population of Canada (1981 Census). Much of the remaining population lives in rural areas and for the most part is serviced by private waste treatment and disposal systems such as septic tanks and tile fields. Population figures shown for certain drainage basins may be inconsistent with 1981 Census figures. These discrepancies may be the result of the following types of errors: non-inclusion or double counting of populated areas, variations in respondents interpretation of the survey questions, variations in the completeness and reliability of information available to respondents, processing of data.

**Source:**
Environment Canada, Environmental Protection Service, special tabulation from the MUNDAT database.

Table 6.5.2
## Estimated Daily Waste Discharged from Municipalities by Major Drainage Area[1]

| Major Drainage Area | Waste Generated[2] | | | Waste Removed[3] | | | Waste Discharged | | |
|---|---|---|---|---|---|---|---|---|---|
| | $BOD_5$ | Suspended Solids | Phosphorus | $BOD_5$ | Suspended Solids | Phosphorus | $BOD_5$ | Suspended Solids | Phosphorus |
| | kilograms per day | | | percentage | | | kilograms per day | | |
| **Atlantic Ocean Basin** | **2 199 680** | **1 977 705** | **70 366** | **32.4** | **40.9** | **40.6** | **1 487 478** | **1 169 786** | **41 793** |
| Atlantic Ocean Coastal | 92 966 | 83 668 | 2 972 | 8.7 | 11.7 | 4.0 | 84 876 | 73 911 | 2 853 |
| Gulf of St. Lawrence Coastal | 101 975 | 91 777 | 3 257 | 16.4 | 18.7 | 7.7 | 92 757 | 74 599 | 3 006 |
| Bay of Fundy Coastal and Saint John River | 49 735 | 44 761 | 1 589 | 29.1 | 31.0 | 13.7 | 35 260 | 30 874 | 1 371 |
| St. Lawrence River | 817 471 | 735 721 | 26 155 | 4.6 | 6.6 | 8.2 | 779 848 | 686 996 | 24 002 |
| Ottawa River | 168 540 | 151 685 | 5 392 | 21.8 | 54.4 | 51.2 | 131 865 | 69 148 | 2 633 |
| Lake Ontario Shore | 600 922 | 540 831 | 19 227 | 68.0 | 77.6 | 77.1 | 192 529 | 120 915 | 4 394 |
| Lake Erie and Lake St. Clair Shore | 246 698 | 222 028 | 7 892 | 56.9 | 68.2 | 71.3 | 106 208 | 70 686 | 2 267 |
| Lake Huron Shore | 107 947 | 97 151 | 3 453 | 49.1 | 59.9 | 66.5 | 54 942 | 39 001 | 1 157 |
| Lake Superior Shore | 13 426 | 10 083 | 429 | 31.5 | 63.7 | 74.4 | 9 193 | 3 656 | 110 |
| **Hudson Bay and Ungava Bay Basin** | **389 447** | **350 498** | **12 450** | **65.9** | **75.8** | **27.7** | **132 722** | **84 897** | **8 997** |
| Hudson Bay and Ungava Bay Coastal | 29 929 | 26 935 | 953 | 26.0 | 31.7 | 10.7 | 22 147 | 18 402 | 851 |
| Nelson River | 2 374 | 2 137 | 75 | 47.6 | 63.8 | 18.7 | 1 244 | 774 | 61 |
| Lake Winnipeg Shore | 90 872 | 81 783 | 2 905 | 75.0 | 83.8 | 33.1 | 22 754 | 13 279 | 1 943 |
| Assiniboine River | 30 284 | 27 255 | 968 | 83.5 | 74.9 | 31.7 | 4 994 | 6 828 | 661 |
| Saskatchewan River | 235 988 | 212 388 | 7 549 | 65.4 | 78.5 | 27.4 | 81 583 | 45 614 | 5 481 |
| **Arctic Ocean Basin** | **14 984** | **13 464** | **472** | **72.8** | **60.8** | **27.8** | **4 083** | **5 272** | **341** |
| Mackenzie River | 14 196 | 12 775 | 450 | 76.3 | 63.9 | 28.9 | 3 370 | 4 618 | 320 |
| Arctic Ocean Coastal | 788 | 709 | 22 | 9.5 | 7.8 | 4.5 | 713 | 654 | 21 |
| **Pacific Ocean Basin** | **161 134** | **145 018** | **5 149** | **25.6** | **30.7** | **13.9** | **119 943** | **100 484** | **4 433** |
| Columbia River | 22 243 | 20 018 | 710 | 47.3 | 52.8 | 31.3 | 11 713 | 9 450 | 488 |
| Fraser River | 46 834 | 42 151 | 1 497 | 25.7 | 28.3 | 19.4 | 34 806 | 30 219 | 1 207 |
| Yukon River | 4 802 | 4 322 | 153 | 81.0 | 67.5 | 28.1 | 913 | 1 403 | 110 |
| Pacific Ocean, North Coastal | 8 006 | 7 204 | 254 | 45.3 | 45.1 | 16.1 | 4 382 | 3 954 | 213 |
| Pacific Ocean, South Coastal | 79 249 | 71 323 | 2 535 | 14.0 | 22.2 | 4.7 | 68 129 | 55 456 | 2 415 |
| **Gulf of Mexico Basin** | **206** | **185** | **6** | **86.9** | **72.4** | **33.3** | **27** | **51** | **4** |
| Missouri River | 206 | 185 | 6 | 86.9 | 72.4 | 33.3 | 27 | 51 | 4 |
| **Canada** | **2 765 451** | **2 486 870** | **88 443** | **37.2** | **45.3** | **37.2** | **1 744 253** | **1 360 488** | **55 568** |

[1] Data obtained from MUNDAT (a national inventory of waterworks and wastewater systems in Canada). The updating of the information occurs on a continuous basis, as received from participating agencies. The data presented here are current as of May 1984.

[2] Discharged coefficients were applied to the average daily wastewater received by sewage collection systems. These were 0.25 kilograms per cubic metre for Biochemical Oxygen Demand ($BOD_5$), 0.225 kilograms per cubic metre for suspended solids and 0.008 kilograms per cubic metre for phosphorus. This assumes the composition of wastewater is identical across Canada. For residential, commercial and institutional sectors this may be valid, however this may not be the case for industrial wastewater.

[3] "Waste removed", shown here is from the wastewater undergoing primary, secondary and lagoon treatment. In calculating the amount of waste removed by treatment, standard waste removal efficiencies coefficients were used, i.e. primary treatment: 25 percent $BOD_5$ removal, 60 percent suspended solids removal and 5 percent phosphorus removal; secondary treatment: 80 percent $BOD_5$ removal, 90 percent suspended solids removal and 35 percent phosphorus removal; lagoon treatment: 90 percent $BOD_5$ removal, 75 percent suspended solids removal and 30 percent phosphorus removal. The untreated proportion of wastewater has also been considered in this calculation.

**Source:**
Environment Canada, Environmental Protection Service, MUNDAT database, special tabulation.

Table 6.5.3
## Private Occupied Dwellings by Principal House Heating Fuel, by Ecozone, 1981[1]

| Ecozone | Oil | Gas[2] | Electricity | Wood | Other[3] | Total Private Occupied Dwellings |
|---|---|---|---|---|---|---|
| | percent of private occupied dwellings | | | | | |
| **Atlantic Maritime** | **63.9** | **0.7** | **22.1** | **12.5** | **0.8** | **629 235** |
| Prince Edward Island | 79.0 | 0.3 | 2.8 | 17.7 | 0.2 | 37 655 |
| Nova Scotia | 75.2 | 1.1 | 11.2 | 10.8 | 1.7 | 273 190 |
| New Brunswick | 59.9 | 0.4 | 24.3 | 15.2 | 0.2 | 214 795 |
| Québec | 36.7 | 0.4 | 53.4 | 9.5 | 0.1 | 103 585 |
| **Mixed-Wood Plain** | **38.0** | **32.7** | **27.2** | **1.9** | **0.2** | **4 482 340** |
| Québec | 47.8 | 8.0 | 42.1 | 2.0 | 0.1 | 1 809 630 |
| Ontario | 31.3 | 49.4 | 17.2 | 1.9 | 0.2 | 2 672 700 |
| **Boreal Shield** | **40.3** | **13.9** | **35.8** | **9.9** | **0.2** | **709 575** |
| Newfoundland | 50.7 | 0.1 | 34.4 | 14.4 | 0.5 | 141 110 |
| New Brunswick | 56.0 | 0.0 | 36.0 | 8.0 | 0.0 | 125 |
| Québec | 40.0 | 2.0 | 51.3 | 6.6 | 0.1 | 255 200 |
| Ontario | 35.9 | 30.9 | 23.0 | 10.1 | 0.2 | 295 940 |
| Manitoba | 31.4 | 11.5 | 40.2 | 16.5 | 0.5 | 14 415 |
| Saskatchewan | 45.8 | 6.9 | 19.0 | 27.3 | 1.1 | 2 770 |
| **Prairie** | **8.1** | **79.4** | **11.1** | **0.8** | **0.5** | **1 249 330** |
| Manitoba | 13.6 | 60.6 | 23.7 | 1.7 | 0.4 | 313 330 |
| Saskatchewan | 17.2 | 74.2 | 7.0 | 1.2 | 0.5 | 286 280 |
| Alberta | 1.5 | 90.8 | 6.9 | 0.2 | 0.6 | 649 735 |
| **Boreal Plain** | **19.9** | **59.7** | **10.8** | **8.5** | **1.2** | **188 670** |
| Manitoba | 32.8 | 12.1 | 37.3 | 17.1 | 0.7 | 29 455 |
| Saskatchewan | 29.7 | 50.6 | 7.4 | 11.3 | 1.0 | 42 865 |
| Alberta | 12.5 | 76.7 | 4.4 | 4.8 | 1.6 | 99 280 |
| British Columbia | 14.9 | 66.8 | 10.4 | 7.5 | 0.5 | 16 680 |
| Yukon | 67.1 | 3.8 | 5.1 | 22.8 | 1.3 | 395 |
| **Montane Cordillera** | **21.9** | **43.5** | **23.8** | **10.5** | **0.3** | **239 935** |
| Alberta | 2.7 | 89.7 | 6.3 | 1.0 | 0.2 | 9 070 |
| British Columbia | 22.7 | 41.7 | 24.5 | 10.9 | 0.3 | 230 865 |
| **Pacific Maritime** | **26.6** | **47.2** | **22.7** | **3.2** | **0.3** | **747 655** |
| British Columbia | 26.6 | 47.2 | 22.7 | 3.2 | 0.3 | 747 655 |
| **Boreal Cordillera** | **61.1** | **3.9** | **15.9** | **18.4** | **0.7** | **8 245** |
| British Columbia | 46.2 | 17.0 | 4.7 | 30.8 | 1.2 | 1 265 |
| Yukon | 63.8 | 1.5 | 17.9 | 16.1 | 0.6 | 6 975 |
| **Tundra Cordillera** | **55.7** | **4.9** | **4.9** | **34.4** | **0.0** | **305** |
| Yukon | 51.1 | 4.4 | 4.4 | 40.0 | 0.0 | 225 |
| Northwest Territories | 68.8 | 18.8 | 0.0 | 12.5 | 0.0 | 80 |
| **Taiga Plain** | **64.1** | **9.5** | **5.0** | **20.1** | **1.4** | **3 910** |
| Alberta | 22.6 | 22.6 | 3.2 | 51.6 | 0.0 | 155 |
| British Columbia | 14.3 | 48.6 | 5.7 | 31.4 | 0.0 | 175 |
| Northwest Territories | 68.4 | 7.0 | 5.0 | 18.2 | 1.4 | 3 580 |
| **Taiga Shield** | **64.5** | **1.5** | **26.2** | **7.1** | **0.7** | **14 890** |
| Newfoundland | 65.6 | 0.0 | 23.1 | 10.5 | 0.9 | 6 875 |
| Québec | 44.6 | 0.7 | 54.6 | 0.1 | 0.0 | 3 680 |
| Manitoba | 2.6 | 0.0 | 2.6 | 94.9 | 0.0 | 195 |
| Saskatchewan | 90.1 | 1.9 | 5.6 | 0.0 | 2.5 | 805 |
| Northwest Territories | 81.5 | 5.7 | 7.9 | 4.3 | 0.6 | 3 345 |
| **Hudson Bay Plain** | **44.0** | **15.1** | **12.8** | **27.9** | **0.2** | **2 115** |
| Québec | 57.9 | 0.0 | 36.8 | 5.3 | 0.0 | 190 |
| Ontario | 46.3 | 2.2 | 6.2 | 44.9 | 0.4 | 1 135 |
| Manitoba | 17.6 | 48.7 | 21.8 | 11.8 | 0.0 | 595 |
| Northwest Territories | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 195 |
| **Southern Arctic** | **88.4** | **0.5** | **5.5** | **5.0** | **0.6** | **3 110** |
| Newfoundland | 65.2 | 0.0 | 2.2 | 32.6 | 0.0 | 445 |
| Québec | 95.8 | 0.0 | 4.2 | 0.0 | 0.0 | 355 |
| Northwest Territories | 92.0 | 0.4 | 6.3 | 0.7 | 0.7 | 2 305 |
| **Northern Arctic** | **93.7** | **0.0** | **4.4** | **0.2** | **1.7** | **2 060** |
| Québec | 86.0 | 0.0 | 14.0 | 0.0 | 0.0 | 215 |
| Northwest Territories | 94.1 | 0.3 | 3.2 | 0.3 | 2.2 | 1 855 |
| **Arctic Cordillera** | **91.4** | **0.0** | **0.0** | **0.0** | **8.6** | **175** |
| Northwest Territories | 91.4 | 0.0 | 0.0 | 0.0 | 8.6 | 175 |
| **Canada** | **33.8** | **37.8** | **24.2** | **3.8** | **0.3** | **8 281 530** |

[1] The 1981 Census figures have been random rounded. Since they have been rounded independently, individual items may not add exactly to totals.

[2] Bottled gas (e.g. propane) and piped gas (e.g. natural gas).

[3] Coal or coke and other fuel.

**Source:**
Special tabulation by the Census Operations Division, Statistics Canada, 1981 Census of Population.

Technical Box 6.5.4

## Major Air Contaminant Emissions from Residential Heating[1], 1980

| Contaminant | Tonnes | Residential Emissions as a Percentage of Emissions from All Sources |
|---|---|---|
| Particulates | 93 858 | 0.2 |
| Sulphur Oxides | 70 023 | 1.5 |
| Nitrogen Oxides | 50 066 | 2.6 |
| Hydrocarbons | 9 488 | 0.3 |
| Carbon Monoxide | 412 710 | 2.2 |

[1] Includes fuelwood combustion

**Source:**
Environment Canada, Environment Protection Service, *Emissions and Trends of Common Air Contaminants in Canada (1970-1980)*, unpublished.

**Note:**
Despite the relatively small volume of emissions from domestic heating sources, they impose a degree of stress on the human environment that is not proportional to their contribution to air pollution. First, the emissions are concentrated largely in winter months. Secondly, approximately eighty percent of domestic heating is located in densely populated urban areas. Thirdly, emissions are from low elevation chimneys, operating on natural draft with low exit velocities. This results in stack downwash and accumulation of pollutants in building cavities made worse by the weak dispersal action of wind at ground level. (Environment Canada, *Air Pollution Emissions and Control Technique: Residential Heating Units*, Report EPS 3-AP-79-3.)

Table 6.5.5

## High Energy Consuming Household and Recreational Goods, 1960 to 1984

| Year | Household Goods | | | | | Recreational Goods | | | Number of Households |
|---|---|---|---|---|---|---|---|---|---|
| | Clothes Dryers | | Air Conditioners | | Dishwashers | Outboard Motor Boats | Snowmobiles | | |
| | Electric | Gas | Window | Central | | | One | Two or More | |
| | percent of households owning | | | | | | | | thousands |
| 1960 | 11.4 | 0.7 | .. | .. | .. | .. | .. | .. | 4 404 |
| 1961 | 13.7 | 0.9 | .. | .. | 1.5 | .. | .. | .. | 4 489 |
| 1962 | 17.3 | 1.2 | 1.7 | .. | 1.7 | .. | .. | .. | 4 592 |
| 1963 | 20.0 | 1.6 | 1.9 | .. | 2.1 | .. | .. | .. | 4 671 |
| 1964 | 22.2 | 1.7 | 2.1 | .. | 2.2 | .. | .. | .. | 4 872 |
| 1965 | 25.2 | 2.2 | 2.2 | .. | 2.7 | .. | .. | .. | 5 000 |
| 1966 | 27.4 | 2.6 | 2.6 | .. | 3.2 | .. | .. | .. | 5 126 |
| 1967 | 31.7 | 2.7 | 3.2 | .. | 4.4 | .. | .. | .. | 5 293 |
| 1968 | 33.9 | 2.9 | 3.2 | .. | 5.1 | .. | .. | .. | 5 458 |
| 1969 | 37.3 | 3.2 | 3.9 | .. | 6.5 | .. | .. | .. | 5 616 |
| 1970 | 40.8 | 3.5 | 4.3 | .. | 7.5 | .. | .. | .. | 5 784 |
| 1971 | 40.7 | 3.4 | 5.3 | .. | 8.6 | .. | .. | 1.1 | 5 933 |
| 1972 | 39.4 | 3.5 | 5.8 | .. | 9.2 | .. | 6.7 | 1.6 | 6 111 |
| 1973 | 41.7 | 3.4 | 6.6 | .. | 10.7 | .. | 7.3 | 1.8 | 6 301 |
| 1974 | 44.6 | 3.7 | 7.6 | 2.5 | 12.9 | 8.6 | 7.1 | 2.1 | 6 513 |
| 1975 | 48.1 | 3.6 | 9.2 | 3.2 | 15.2 | .. | 7.4 | 2.6 | 6 721 |
| 1976 | 51.3 | 3.4 | 9.6 | 3.7 | 18.7 | 8.0 | 7.1 | 2.7 | 6 949 |
| 1977 | 53.2 | 3.7 | 10.9 | 4.4 | 21.8 | .. | 7.5 | 2.6 | 7 157 |
| 1978 | 56.0 | 3.4 | 10.7 | 4.5 | 23.9 | 7.9 | 7.1 | 2.6 | 7 357 |
| 1979 | 56.8 | 3.2 | 11.5 | 5.0 | 26.3 | .. | .. | .. | 7 572 |
| 1980 | 59.9 | 3.2 | 11.4 | 5.3 | 28.6 | 7.8 | 7.2 | 2.5 | 7 787 |
| 1981 | 60.4 | 3.5 | 11.1 | 5.7 | 31.3 | .. | .. | .. | 8 026 |
| 1982 | 62.5 | 3.7 | 9.9 | 6.1 | 33.3 | 7.6 | 6.3 | 2.2 | 8 254 |
| 1983 | 62.4 | 3.4 | 10.0 | 7.0 | 34.1 | .. | .. | .. | 8 460 |
| 1984 | 64.2 | 3.1 | 9.1 | 7.5 | 35.2 | .. | .. | .. | 8 857 |

**Source:**
Statistics Canada, *Household Facilities and Equipment*, Catalogue 64-202.

# 6.6
# Multiple Source Stress

Technical Box 6.6.1

## Energy Intensity of Industrial Processes: an Indicator of Environmental Stress

Energy intensity is a measure of the ratio of energy input to some other constant in the production process, such as energy per unit of output. The data in Table A depict the joule equivalent of purchased fuel and electricity by industrial group and per establishment (i.e., scale of production), per employee (i.e., energy/labour ratio) and per value added (i.e., energy/output ratio). These data are shown at a high level of aggregation and provide a rough indicator of the relative magnitude of energy throughput in industrial processes. Moreover, purchased energy accounts for a part of the energy consumption. In some high stressor industries energy needs are supplemented (or in some cases wholly supplied) through "self-produced" sources. Table B provides estimates of "self-produced energy" and compares this to purchased energy. Certain industrial activities are tied to cheap energy sources (e.g., aluminum production) whereas others generate (combustible) wastes from which they can obtain heat/steam (e.g., chemical and chemical products). Table C provides a further breakdown of "self-produced energy" into electricity and other energy sources. In 1981 the high stressor type manufacturing produced about forty-three percent of their own energy needs compared to three percent for all the remaining manufacturing industries.

From an environmental perspective all industrial processes can be reduced to a few basic physical and chemical transformations (i.e., concentration, mixing, synthesizing, shaping, assembling, and packaging). Energy consumption is an important element of all these transformations and therefore is perhaps the most integrative parameter to assess the overall environmental impact of human actions. Nonetheless, one must take care in assigning a one-to-one correspondence between the level of energy intensity and the level of environmental impact. In the first instance the source of energy is of critical importance, for example, whether it is obtained from a renewable or non-renewable source. Secondly, the pathway of energy flow can have varying impacts on the environment beginning with its extraction/generation, its means of transport, its efficiency of consumption, and its final diffusion in the environment.[1] A further extension of the flow concept is to look at the "embodied energy" in the commodities produced. In Canada, the predominant exports tend to be of high energy content particularly when compared to imported goods, suggesting a net-outflow of energy. Thirdly, we may consider the complex question of energy conservation not only in the direct sense of more efficient use of energy in production but also in its indirect manifestations. Here we might consider the effect of a product's design (e.g., introduction of lighter materials in transport equipment) or built-in potential for recyclability (e.g., aluminum cans).

[1] Energy wastes are generally associated with diffusion in the atmosphere of waste residuals from combustion (e.g., particulates $SO_2$, $CO_2$, $NO_2$). However, also included here are waste heat generated from plant cooling and noise which is also a waste product.

Table A:

### Energy Intensities in the Mineral and Manufacturing Industries, 1976 and 1981

| Industrial Group | Energy Consumption of Fuel and Electricity[1] | | Energy Consumed per Establishment[2] | | Energy Consumed per Employee[3] | | Energy Consumed per Millions of Dollars of Value Added in Constant 1971 Dollars[4] | |
|---|---|---|---|---|---|---|---|---|
| | 1976 | 1981 | 1976 | 1981 | 1976 | 1981 | 1976 | 1981 |
| | petajoules | | terajoules | | terajoules | | terajoules | |
| **Mineral Industries** | **183.2** | **177.5** | **147** | **130** | **1.6** | **1.4** | **56** | **55** |
| Iron Mines | 73.1 | 50.8 | 4 063 | 3 625 | 4.4 | 4.1 | 263 | 349 |
| Other Metal Mines | 45.0 | 51.6 | 455 | 453 | 0.9 | 0.9 | 45 | 58 |
| Asbestos Mines | 12.6 | 9.9 | 1 053 | 1 105 | 1.6 | 1.5 | 106 | 136 |
| Coal Mines | 8.9 | 13.5 | 328 | 501 | 1.0 | 1.2 | 77 | 82 |
| Other | 43.5 | 51.7 | 40 | 43 | 1.4 | 1.1 | 25 | 27 |
| **Manufacturing Industries** | **1 434.4** | **1 504.1** | **49** | **42** | **0.8** | **0.8** | **61** | **58** |
| Pulp and Paper | 352.5 | 329.9 | 2 398 | 2 291 | 4.1 | 3.8 | 289 | 237 |
| Iron and Steel[5] | 300.0 | 298.1 | 6 522 | 5 625 | 5.8 | 5.3 | 344 | 312 |
| Smelting and Refining | 92.9 | 99.8 | 3 318 | 3 023 | 2.7 | 2.6 | 211 | 176 |
| Cement | 62.3 | 52.1 | 2 306 | 1 930 | 13.8 | 11.0 | 462 | 416 |
| Petroleum Refineries | 40.2 | 58.1 | 1 032 | 1 453 | 2.7 | 2.7 | 135 | 229 |
| Industrial Chemicals | 140.0 | 189.2 | 979 | 1 261 | 6.4 | 7.1 | 370 | 409 |
| Other | 446.5 | 476.9 | 16 | 13 | 0.3 | 0.3 | 22 | 21 |

[1] Data include purchased fuel and electricity and exclude any self-produced fuel and electricity, fuel used for non-fuel purposes (production processes) and other energy sources such as steam or wood. Note that the coverage is incomplete. Figures apply only to larger establishments reporting detail in their operations.

[2] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.

[3] Includes production and related workers in mining or manufacturing operations and administrative, office and other employees.

[4] The value added is the contribution of each industrial group to the gross domestic product.

[5] Includes coal used as materials and supplies.

Technical Box 6.6.1

## Energy Intensity of Industrial Processes: an Indicator of Environmental Stress

Table A (concluded)

**Sources:**
Energy, Mines and Resources Canada, Annual Census of Metal Mines, Non-Metal Mines and Sand Pits and Quarries, 1976 and 1981.
Statistics Canada, Annual Census of Coal Mines and Annual Census of Manufactures, 1976 and 1981.
Statistics Canada, *General Review of Mineral Industries, Mines, Quarries and Oil Wells*, Catalogue 26-201.
Statistics Canada, *Manufacturing Industries of Canada: National and Provincial*, Catalogue 31-203.
Statistics Canada, *Gross Domestic Product by Industry*, Catalogue 61-213.
Statistics Canada, special tabulations by the Office of the Senior Adviser on Integration.

Table B

## Comparison of Self-Produced Energy and Purchased Energy, Manufacturing Industries, 1981

| Manufacturing Industry | Self-Produced Energy[1] | Purchased Energy | Total Energy | Self Produced Energy as a Percentage of Total Energy Used | Total Energy per Establishment |
|---|---|---|---|---|---|
| | petajoules | | | percent | terajoules |
| Pulp and Paper | 275 | 330 | 605 | 45.5 | 4 201 |
| Iron and Steel | 2 | 298[2] | 300 | 0.7 | 5 660 |
| Smelting and Refining | 109 | 100 | 209 | 52.2 | 6 333 |
| Cement | 0 | 52 | 52 | 0.0 | 1 930 |
| Petroleum Refineries | 261 | 58 | 319 | 81.8 | 7 975 |
| Industrial Chemicals | 124 | 189 | 313 | 39.6 | 2 087 |
| All Other Manufacturing Industries | 15 | 477 | 492 | 3.0 | 14 |
| **Total All Manufacturing Industries** | **786** | **1 504** | **2 290** | **34.4** | **64** |

[1] Includes self-produced electricity generated from woodwastes, liquors and other combustible by-products.
[2] Includes coal used as materials and supplies.

**Sources:**
Environment Canada, *Energy Supply and Use in the Canadian Domestic Market, 1971-1981*, by T.L. de Fayer and D. Piekarz, unpublished document, 1983.
Statistics Canada, Annual Census of Manufactures, 1981, special tabulation by the Office of the Senior Adviser on Integration.

Table C

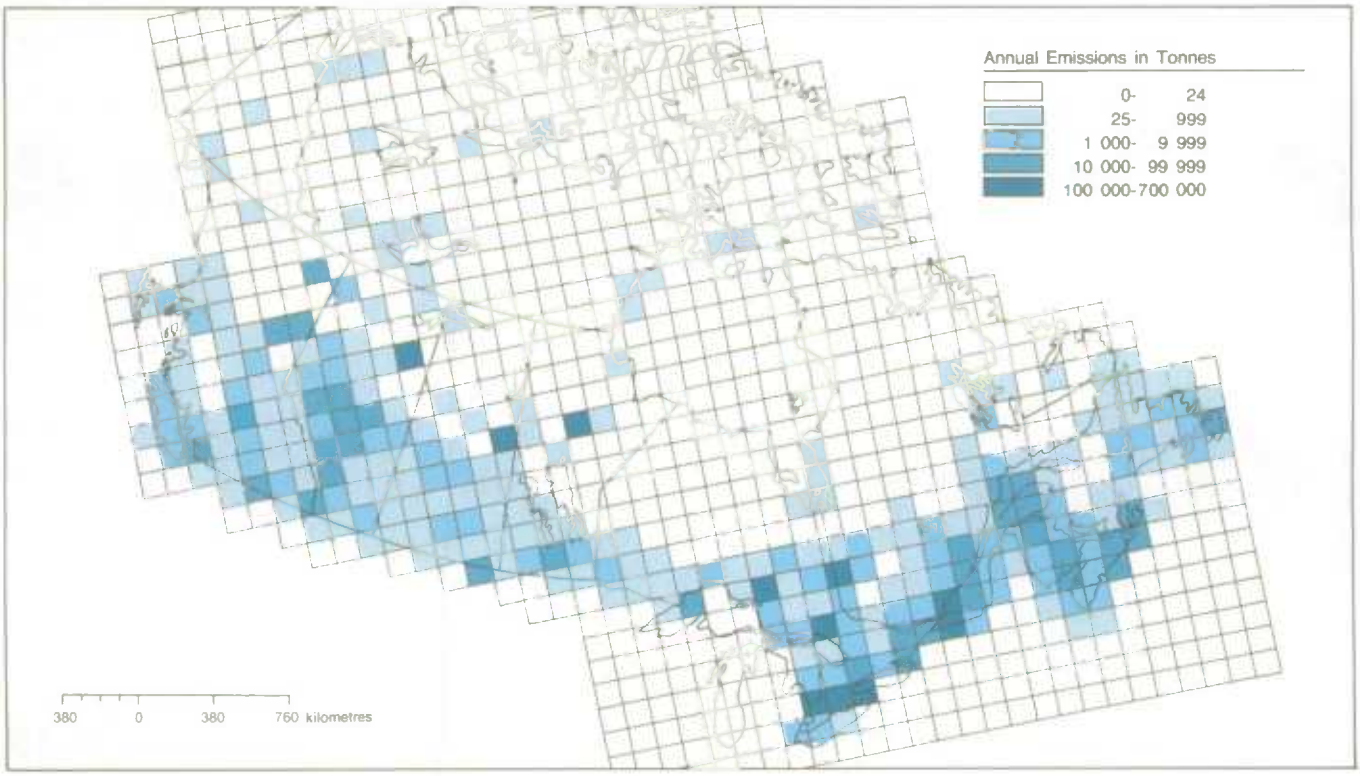
## Self-Produced Energy, 1980

| Industrial Group | Self Generated Electricity | Refinery[1] By-products | Black Liquor | Wood Waste | Purchased Steam | Other[2] | Total |
|---|---|---|---|---|---|---|---|
| | | | petajoules | | | | |
| **Manufacturing Industries** | **139** | **281** | **279** | **89** | **77** | **211** | **1 077** |
| Pulp and Paper | 37 | 0 | 279 | 85 | 5 | 0 | 406 |
| Iron and Steel | 1 | 0 | 0 | 0 | 0 | 189 | 190 |
| Smelting and Refining | 89 | 0 | 0 | 0 | 0 | 22 | 111 |
| Petroleum Refineries | -- | 238 | 0 | 0 | 2 | 0 | 241 |
| Industrial Chemicals | 7 | 42 | 0 | 0 | 69 | 0 | 119 |
| Other | 5 | 0 | 0 | 4 | 1 | -- | 10 |
| **Other Industries[3]** | **3** | **0** | **0** | **0** | **0** | **0** | **3** |
| **Total Industries** | **143** | **281** | **279** | **89** | **77** | **211** | **1 080** |

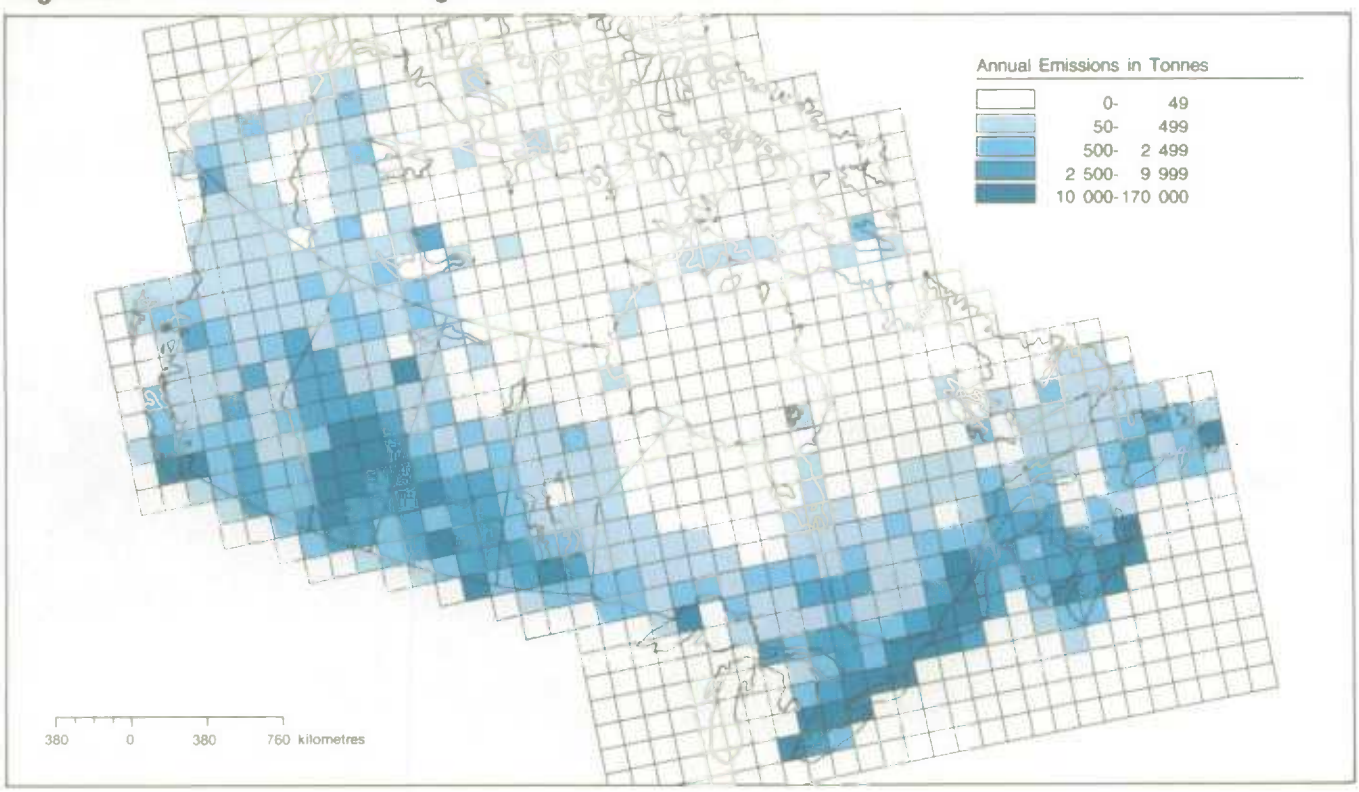
[1] Includes own manufactured by-products, petroleum coke and still gas.
[2] Includes carbon electrodes and coal for coke and coke oven gas.
[3] Includes logging and mining.

**Source:**
Energy, Mines and Resources Canada, Energy Conservation and Oil Substitution Branch, *Energy Cascading Potential in Canadian Industry, Data Base for 1980*, Industry Series, Publication Number 3b, February 1984.

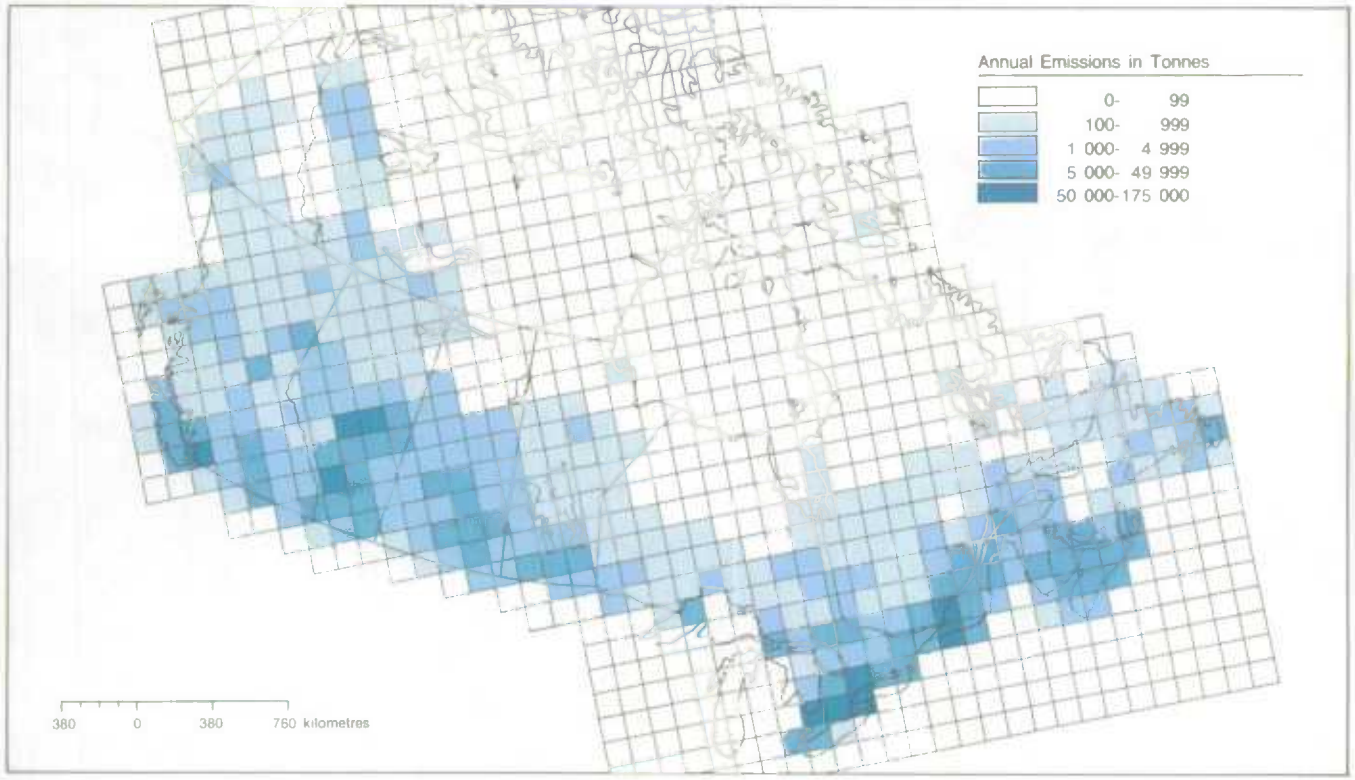
Map 6.6.2
**Magnitude and Distribution of Sulphur Dioxide Emissions, 1978**



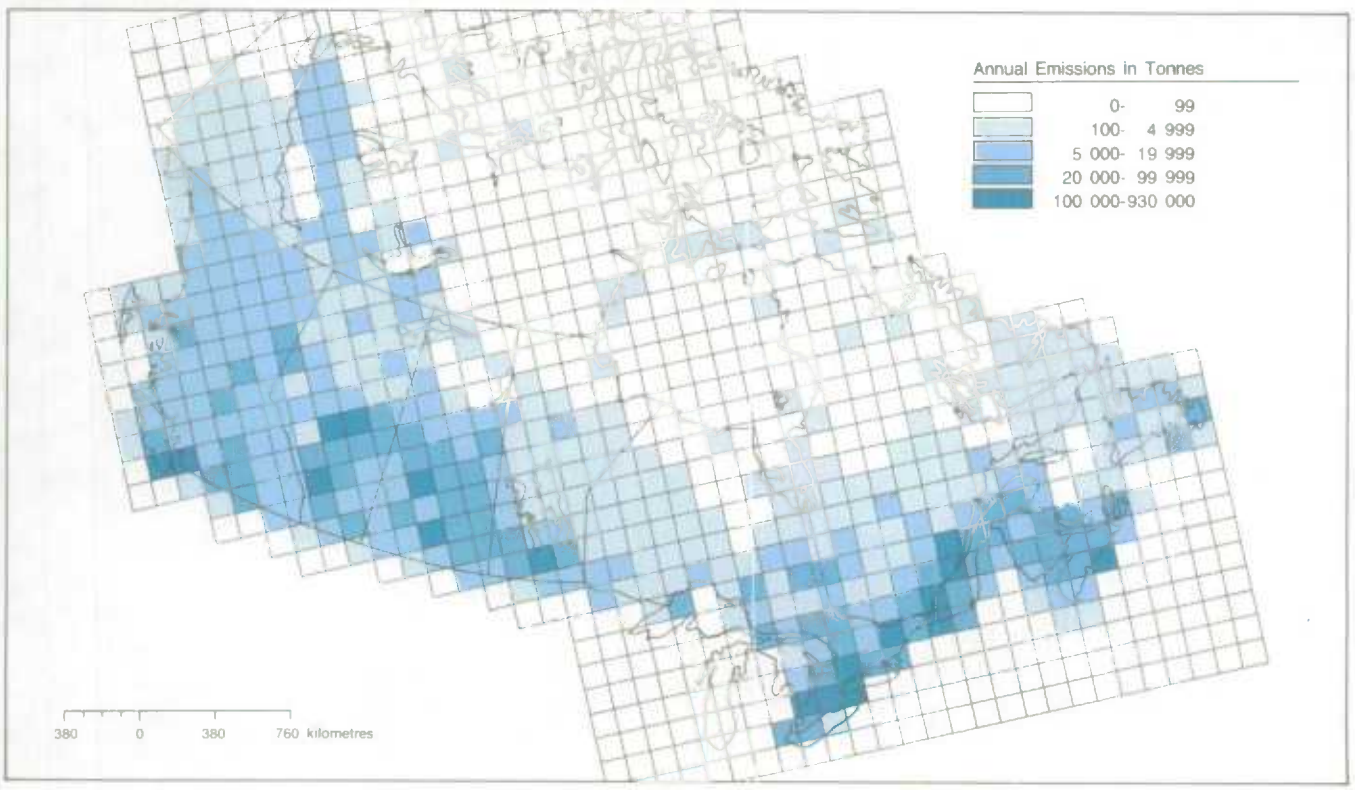

Map 6.6.3
**Magnitude and Distribution of Nitrogen Oxides Emissions, 1978**



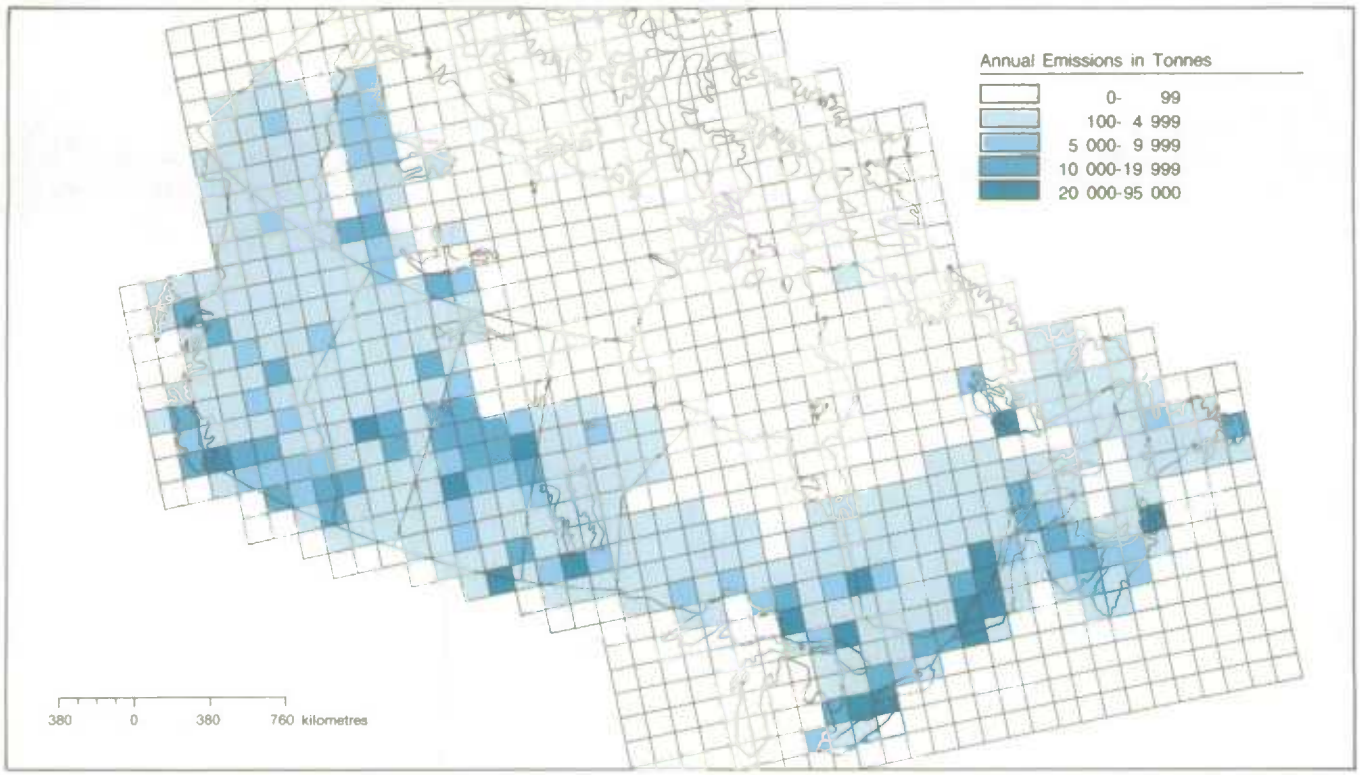
Map 6.6.4
**Magnitude and Distribution of Hydrocarbon Emissions, 1978**




Map 6.6.5
**Magnitude and Distribution of Carbon Monoxide Emissions, 1978**



Map 6.6.6
**Magnitude and Distribution of Particulate Matter Emissions, 1978**




**Source:**
Environment Canada, *A Nationwide Inventory of Emissions of Air Contaminants, (1978)*, Report EPS 3-EP-83-10, December 1983.

**Note:**
Grid cells on the map are 127 kilometres by 127 kilometres in size. Point source emissions, i.e. major industrial sources, power plants and municipal incinerators, are allocated directly to the appropriate grid cell. Area source emissions, i.e. small industrial sources (e.g. sawmills), residential fuel combustion and transportation sources, are estimated for each grid cell by prorating the provincial emission estimate. Emissions for each grid cell are the sum of both point and area sources.

Estimates of the overall precision of the inventory have been calculated for $SO_2$ and $NO_x$ only, as part of the *United States-Canada Memorandum of Intent on Transboundary Air Pollution* report. The precision of the $SO_2$ inventory was approximately $\pm 6\%$ and that of the $NO_x$ inventory about $\pm 10\%$. Further work is being performed to establish standard methodologies for calculating uncertainty in the emission inventory.

Table 6.6.7
## Trends in Emissions[1] of Sulphur Dioxide ($SO_2$)

| Sector | 1955 | 1965 | 1976 | 1980 |
|---|---|---|---|---|
| | kilotonnes per year | | | |
| **Non-Ferrous Smelting[2]** | **2 865** | **3 835** | **2 595** | **2 085** |
| Eastern[3] | 2 865 | 3 830 | 2 565 | 2 050 |
| Western | 0 | 5 | 30 | 35 |
| **Power Plants** | **55** | **260** | **610** | **770** |
| Eastern[3] | 50 | 255 | 550 | 670 |
| Western | 5 | 5 | 60 | 100 |
| **Non-Utility-Fuel Combustion[4]** | **1 000** | **1 130** | **880** | **610** |
| Eastern[3] | 965 | 990 | 790 | 575 |
| Western | 35 | 140 | 90 | 35 |
| **Transportation** | **80** | **50** | **115** | **135** |
| Eastern[3] | 50 | 35 | 85 | 105 |
| Western | 30 | 15 | 30 | 30 |
| **Iron Ore Processing** | **110** | **155** | **165** | **160** |
| Eastern[3] | 110 | 155 | 165 | 160 |
| Western | 0 | 0 | 0 | 0 |
| **Other[5]** | **425** | **1 160** | **950** | **870** |
| Eastern[3] | 215 | 230 | 200 | 250 |
| Western | 210 | 930 | 750 | 620 |
| **Total** | **4 535** | **6 590** | **5 315** | **4 635** |
| Eastern[3] | 4 255 | 5 495 | 4 355 | 3 810 |
| Western | 280 | 1 095 | 960 | 825 |

[1] Emission coefficients were applied to basic data (e.g. production, quantity of fuel burned) except for major stationary sources such as non-ferrous smelters and some power plants, for which actual emission data were used.
[2] Includes copper, nickel, lead and zinc production and pyrrotite roasting (a process that removes sulphur to make iron more suitable for steel making).
[3] Manitoba is included in eastern Canada.
[4] Includes fuel combustion from residential, industrial and commercial sources.
[5] Includes sources such as natural gas processing, tar sands operations, sulphite pulping, primary aluminium production and primary lead and zinc production.

**Source:**
Environment Canada, Environmental Protection Service, unpublished data.

**Note:**
In February 1985, the Environment Ministers of seven eastern provinces (Manitoba to Newfoundland) and the Federal Minister of the Environment reached an agreement concerning specific reductions in annual $SO_2$ emissions in order to meet the 1994 target of 2.3 million tonnes (representing 50 percent of the 1980 level).

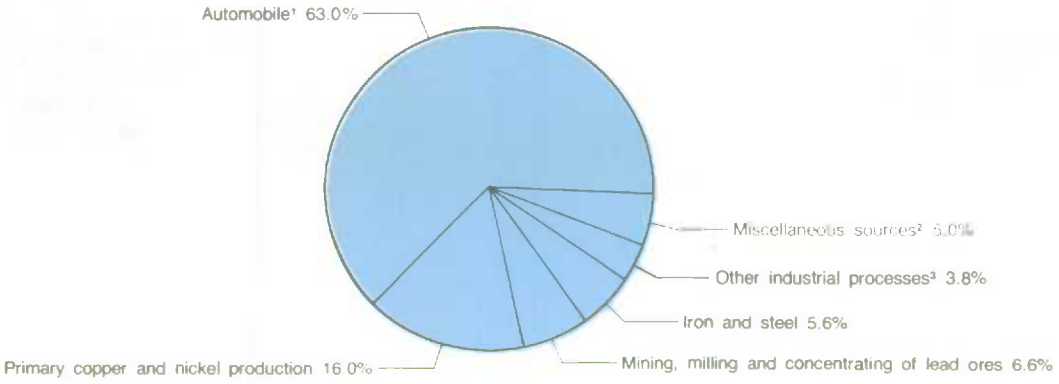
Table 6.6.8
## Trends in Emissions[1] of Nitrogen Oxides ($NO_2$)

| Sector | 1955 | 1965 | 1976 | 1980 |
|---|---|---|---|---|
| | kilotonnes per year | | | |
| **Transportation** | **330** | **510** | **980** | **1 075** |
| Eastern[2] | 210 | 335 | 615 | 680 |
| Western | 120 | 175 | 365 | 395 |
| **Non-Utility Fuel Combustion[3]** | **230** | **250** | **350** | **335** |
| Eastern[2] | 185 | 160 | 195 | 175 |
| Western | 45 | 90 | 155 | 160 |
| **Power plants** | **10** | **55** | **215** | **260** |
| Eastern[2] | 5 | 45 | 150 | 165 |
| Western | 5 | 10 | 65 | 95 |
| **Other[4]** | **70** | **35** | **55** | **80** |
| Eastern[2] | 50 | 15 | 25 | 30 |
| Western | 20 | 20 | 30 | 50 |
| **Total** | **640** | **850** | **1 600** | **1 750** |
| Eastern[2] | 450 | 555 | 985 | 1 050 |
| Western | 190 | 295 | 615 | 700 |

[1] Emission coefficients were applied to basic data (e.g. production, quantity of fuel burned) except for major stationary sources such as non-ferrous smelters and some power plants, for which actual emission data were used.
[2] Manitoba is included in eastern Canada.
[3] Includes fuel combustion from residential, industrial, commercial and fuelwood sources.
[4] Includes sources such as sulphate (kraft) pulping and tar sands operations but does not include forest fires.

**Source:**
Environment Canada, Environmental Protection Service, unpublished data.

Chart 6.6.9
**Sources and Emissions of Lead to the Atmosphere, 1978**
Total Emissions: 14 534 tonnes




¹ The introduction of lead-free gasoline has contributed to a reduction of lead emissions from automotive exhausts of approximately twenty-eight percent between 1970 and 1978.
² Includes sources such as aircraft and solid waste incineration.
³ Includes sources such as ferrous foundries, primary lead production, lead alkyl manufacture and metal fabricating industries.

**Source:**
Environment Canada, *National Inventory of Sources and Emissions of Lead (1978)*, Report EPS 3-EP-83-6.

Table 6.6.10
**Annual Air Quality Index for Selected Locations¹ in Canadian Cities, 1974 to 1983**

| City | Station Location² | 1974³ | 1975³ | 1976³ | 1977³ | 1978³ | 1979³ | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Halifax | Barrington and Duke (C) | .. | 33 | 23 | 22 | 22 | 26 | 26 | 27 | 14 | 21 |
| Québec City | 155 Dorchester South (C) | .. | 36 | 36 | 58 | 47 | 47 | 44 | 37 | 27 | 36 |
| Montréal | Botanical Gardens (R) | 45 | 45 | 40 | 39 | 37 | 34 | 35 | 26 | 26 | 22 |
| | Duncan and Decarie (C) | 48 | 50 | 45 | 43 | 49 | 51 | 50 | 47 | 45 | 46 |
| Ottawa | 88 Slater Street (C) | 41 | 41 | 39 | 42 | 38 | 38 | 35 | 24 | 40 | 33 |
| Toronto | 67 College Street (C) | 40 | 39 | 39 | 40 | 43 | 44 | 42 | 41 | .. | .. |
| | Bathurst and Wilson (R) | .. | .. | 38 | 44 | 42 | 45 | 38 | 39 | 40 | 29 |
| | Evans and Arnold (I) | 41 | 38 | 41 | 40 | 40 | 40 | 40 | 40 | 38 | 40 |
| Hamilton | Barton and Sanford (C) | 48 | 52 | 56 | 51 | 51 | 48 | 40 | 43 | 46 | 45 |
| Winnipeg | Jefferson and Scotia (R) | .. | .. | 39 | 34 | 28 | 44 | 41 | 35 | 27 | 28 |
| Regina | 1620 Albert Street (C) | .. | .. | .. | .. | .. | 40 | 41 | 52 | 35 | 33 |
| Edmonton | 10255-104th Street (C) | .. | .. | .. | 48 | 48 | 53 | 48 | 43 | 49 | 34 |
| | 127th St. and 133rd Ave. (R) | .. | 36 | 40 | 39 | 41 | 45 | 39 | 39 | 39 | 38 |
| | 17th Street and 105th Ave. (I) | 30 | 26 | 26 | 30 | 25 | 30 | 30 | 26 | 27 | 25 |
| Calgary | 39th St and 29th Ave N.W. (R) | .. | 34 | 29 | 36 | 35 | 37 | 46 | 36 | 38 | 35 |
| Vancouver | Robson and Hornby (C) | .. | 35 | 33 | 36 | 32 | 37 | 31 | 42 | 21 | 18 |
| | Rocky Point Park (I) | .. | .. | .. | .. | 26 | 32 | 40 | 43 | 26 | 25 |

¹ The measurements taken at a monitoring station can be considered representative of the air quality in an area surrounding the site which has a radius ranging between 0.5 and 4 kilometres (See note below for further explanation).
² Location is identified by street address and dominant activity: commercial (C), residential (R) and industrial (I).
³ Due to instrument and calibration difficulties, ozone data prior to 1979 and nitrogen dioxide data are not considered valid on a national scale. Thus in order to calculate sub-indices for these pollutants in determining the Index of Air Quality, it was necessary to use estimated sub-indices.

**Sources:**
Environment Canada, *National Urban Air Quality Trends, 1974-1981*, by Tom Furmanczyk, Report EPS 7/AP/14.
Environment Canada, Environmental Protection Service, unpublished data from National Air Pollution Surveillance data base.

## Note:
### Annual Air Quality Index

The "Annual Air Quality Index" was designed by the Federal-Provincial Committee on Air Pollution. This index reduces the values of individual air pollution related parameters to a single number that represents both the measured and publicly perceived quality of the ambient air at a given time and location. It is an indicator of *air quality trends* and can be used to make rough comparisons of the air quality between different urban areas. However, it does not necessarily represent city-wide air quality conditions. In

Table 6.6.10
**Annual Air Quality Index for Selected Locations[1] in Canadian Cities, 1974 to 1983 (concluded)**

general, air pollution levels within a city may vary and such factors as topography, meteorological conditions and distance from pollutant sources actually influence air quality of particular communities. The index is based on the average of three different pollutants that have the most significant effect on the environment during a given year. The pollutants include: sulphur dioxide, nitrogen dioxide, suspended particulate matter, carbon monoxide and ozone. In determining the index, the value which is only exceeded by 2 percent of the readings (98th percentile) is used. The remaining 2 percent of the readings usually reflect anomalies such as weather conditions or short term increases of industrial emissions and are not used.

The following scale is used to describe air quality:

| Numerical Values | Categories |
|---|---|
| 0-25 | Good |
| 26-50 | Fair |
| 51-100 | Poor |
| 100 and more | Very Poor |

During the 1974 to 1982 period the annual mean concentrations of various pollutants in the air have shown a general decrease nationally. ($SO_2$, 30 percent decrease; $NO_2$ 25 percent decrease; suspended particulates, 24 percent decrease; lead, 60 percent decrease)

Technical Box 6.6.11
## National Air Quality Objectives

| Contaminant | Maximum Desirable | Maximum Acceptable | Maximum Tolerable |
|---|---|---|---|
| Sulphur Dioxide | | parts per billion | |
| Annual Arithmetic Mean | 10 | 20 | -[1] |
| Average Concentration Over a Twenty-four Hour Period | 60 | 110 | 310 |
| Average Concentration Over a One Hour Period | 170 | 340 | -[1] |
| Suspended Particulate Matter | | micrograms per cubic metre | |
| Annual Geometric Mean | 60 | 70 | -[1] |
| Average Concentration Over a Twenty-four Hour Period | -[1] | 120 | 400 |

[1] No objectives are set.

**Source:**
Environment Canada, Environmental Protection Service, *National Air Pollution Surveillance, Annual Summary, 1983*, Report EPS 7/AP/13, September 1984

### Note:
EPS has defined ambient air quality standards for the purpose of achieving objectives with respect to the protection of the environment and human health. Concentrations of air pollutants vary greatly over relatively short periods of time. Rapid changes often occur due to meteorological conditions, thus extreme levels of pollutants can result from air temperature inversions, sometimes referred to as episodic events. Exposure can be treated in terms of short duration (hourly), medium (daily) and long term (annual). (See table above). The standards are set to take into account the various factors related to exposure. EPS has defined three levels of quality as follows:

The maximum desirable level defines the long-term goal for air quality and provides a basis for an anti-degradation policy for the unpolluted parts of the country and for the continuing development of control technology.

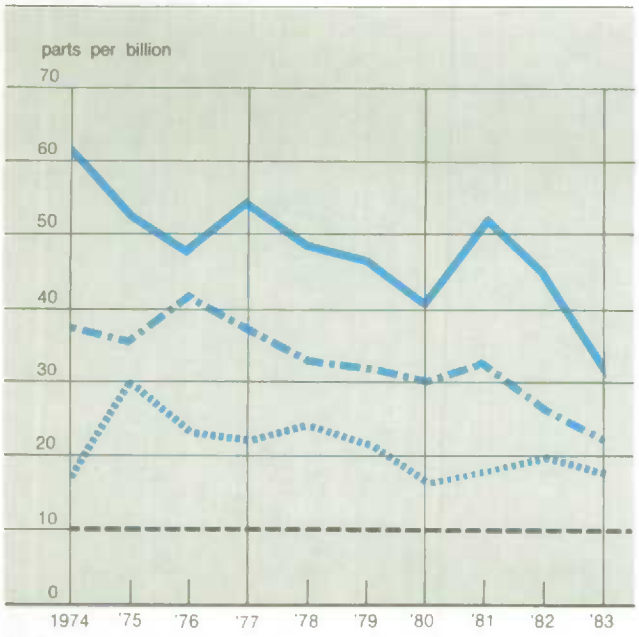
The maximum acceptable level is intended to provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort and well-being.

The maximum tolerable level denotes concentrations of air contaminants beyond which, due to a diminishing margin of safety, appropriate action is required to protect the health of the general population.

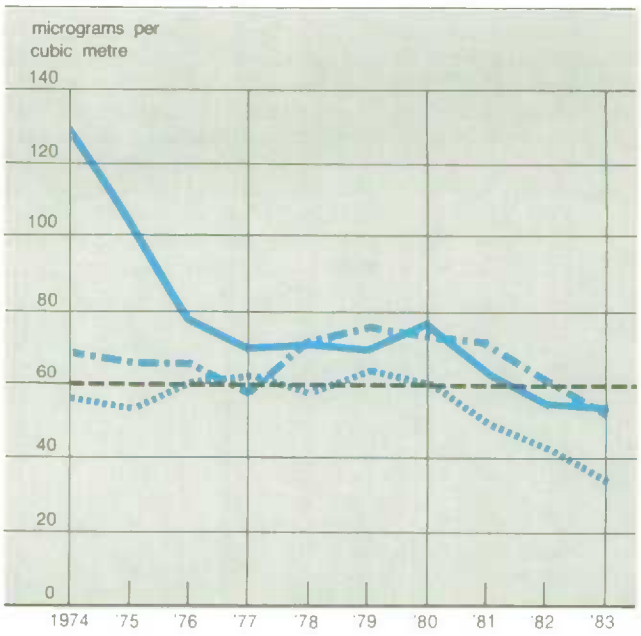
Chart 6.6.12

## Trends in Selected Air Pollutants in Toronto, Montréal and Vancouver[1]

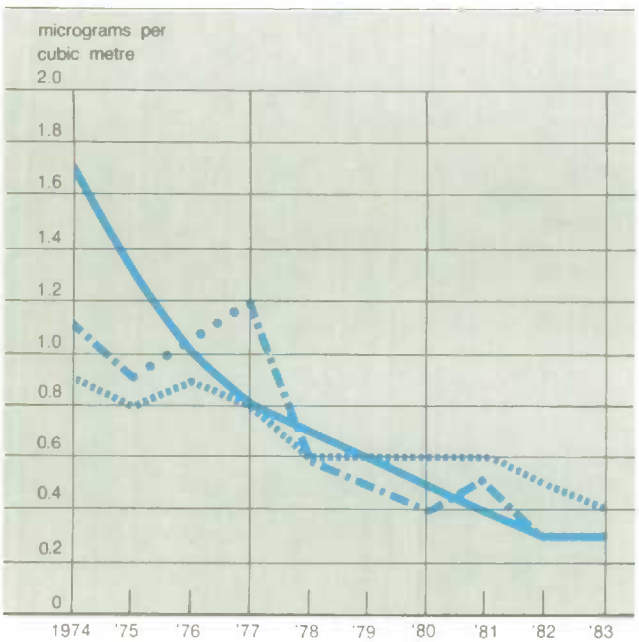
**Sulphur Dioxide[2]**




**Suspended Particulates[3]**




**Particulate Lead[3]**





[1] Annual data for each city were calculated by averaging the annual means or the 98th percentile concentrations for all selected stations.
[2] To show the trend in $SO_2$ concentrations, the second highest annual value (98th percentile) is used.
[3] Monitoring for suspended particulates and particulate lead is intermittent. A twenty-four hour sample is taken every six days. The annual geometric mean is used.
[4] This line represents the annual mean objective.

**Source:**
Environment Canada, *National Air Pollution Surveillance*, annual summaries for years 1974 to 1983.

Technical Box 6.6.13

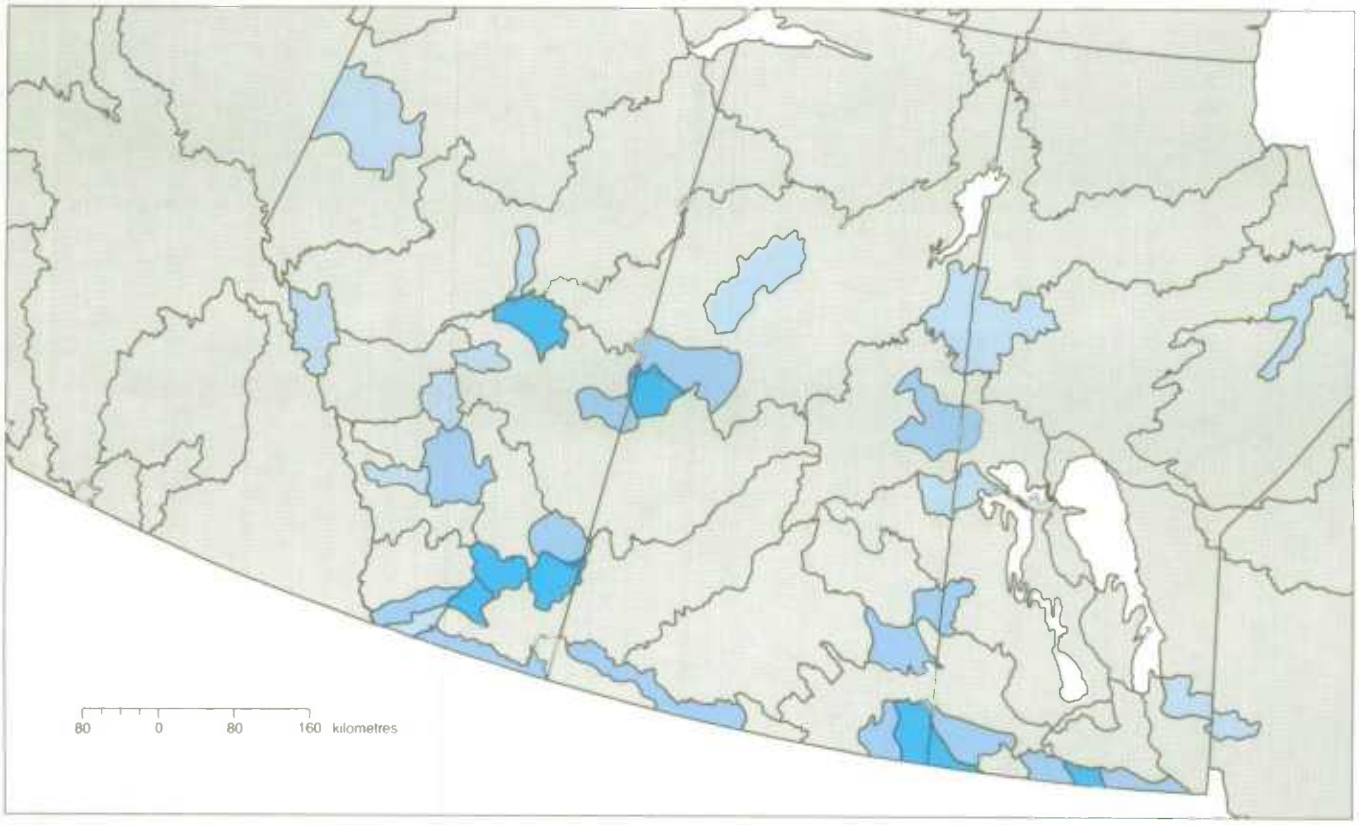
## Water Quality and the National Water Quality Data Bank

The data on water quality parameters which are presented in Maps 6.6.14 through 6.6.16 have been obtained from NAQUADAT, the National Water Quality Data Bank of Environment Canada. NAQUADAT contains records from the National Monitoring Program as well as from other national and regional projects. Data are collected for the purpose of checking the quality of water passing between Canada and the United States, for determining ambient water quality, and for other specific purposes (e.g., industrial and municipal intake). Some parts of the system predate water quality concerns[1]. Further, the sampling frequency has been irregular at many stations, and some measuring sites have only been used for short periods. As a result, it is often difficult to incorporate the details of the data base into a comprehensive picture of water quality characteristics in Canada. The maps presented here are based on a geographic aggregation of sampling points to the level of Environment Canada sub-sub-basins[2] which establishes a criterion for providing a broader picture of water quality. Data gaps for much of the country remain a major problem. Basin percentages shown on the maps reflect the situation at specific stations and may not be truly representative of conditions throughout the basin. Nevertheless, other observations and studies do confirm the main features emerging from the selection of NAQUADAT data presented here.

[1] Currently, Environment Canada is reviewing locations of sampling sites and the parameters monitored.
[2] These are either subdivisions of, or equivalent to, the Drainage Basins portrayed throughout this publication.

Map 6.6.14

## Detection of the Herbicide 2,4-D[1] in Prairie Rivers (from NAQUADAT Monitoring Stations[2]), 1980 to 1982




[1] 2,4-D is a herbicide used for weed control in the growing of cereal crops, and for brush control in the maintenance of pastureland.

[2] Data from monitoring stations were aggregated to the Environment Canada sub-sub river basin level.

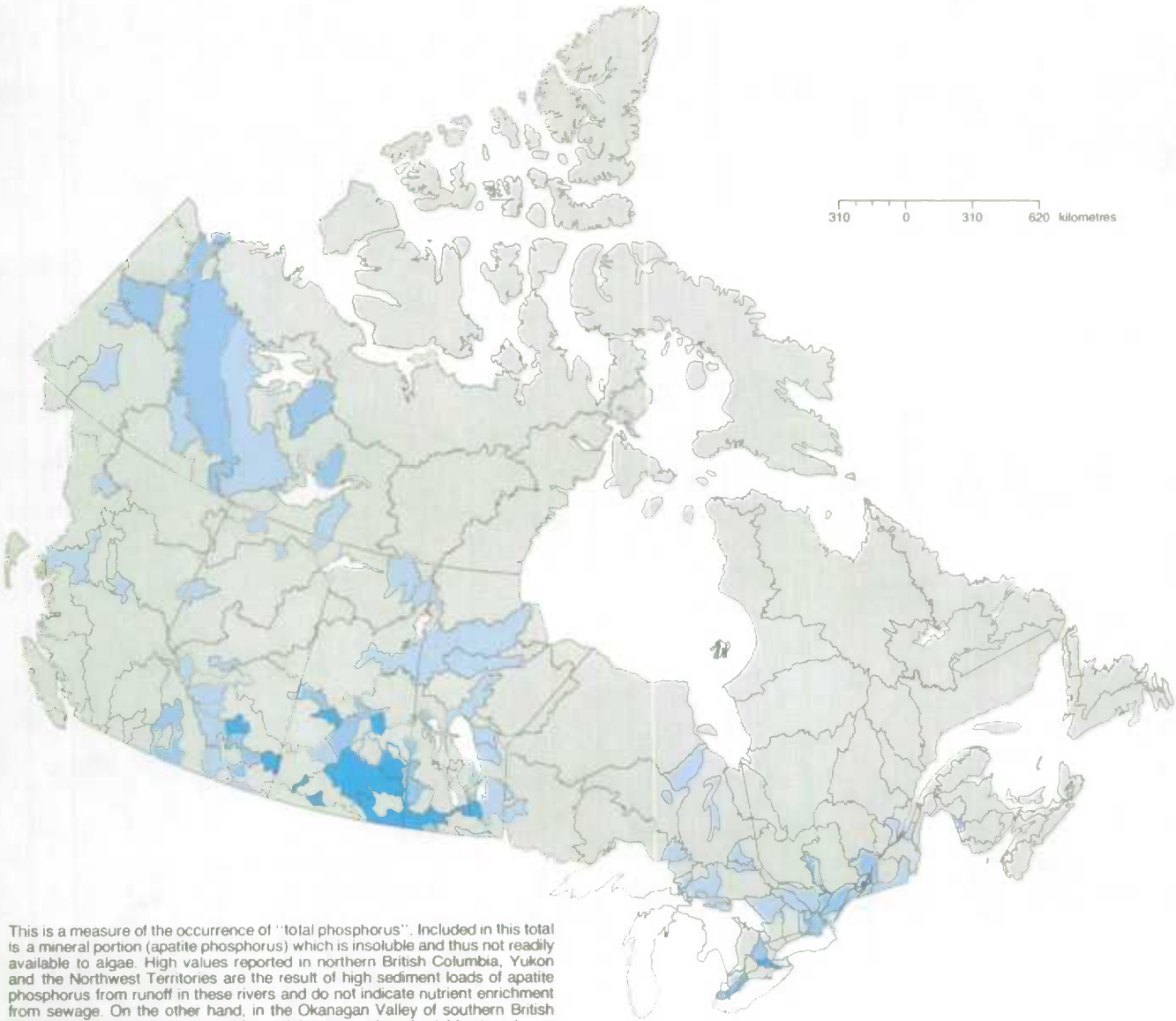
[3] The analytical procedure used to test water quality enables scientists to detect quantities of this chemical in water samples as low as 0.004 micrograms per litre or 4 parts per trillion. The objective level designated by Health and Welfare Canada for drinking water is 1 microgram per litre of this chemical; there were no occurences above this concentration.

**Source:**
Environment Canada, Inland Waters Directorate, NAQUADAT data base, special tabulations.

**Note:**
Although pesticides accumulate in the sediment of lakes and rivers or become bioconcentrated in animals and plants, monitoring of the surface waters can still indicate abundance, distribution and movement of these chemicals in the aquatic environment. Factors determining the concentrations in water include the intensity of agricultural application, proximity of industrial activity (related to manufacture or packaging), river flow rates, stream-bed characteristics and solubility of the chemical itself.

Map 6.6.15

## Phosphorus[1] in Canadian Rivers (from NAQUADAT Monitoring Stations[2]), 1971 to 1973




[1] This is a measure of the occurrence of "total phosphorus". Included in this total is a mineral portion (apatite phosphorus) which is insoluble and thus not readily available to algae. High values reported in northern British Columbia, Yukon and the Northwest Territories are the result of high sediment loads of apatite phosphorus from runoff in these rivers and do not indicate nutrient enrichment from sewage. On the other hand, in the Okanagan Valley of southern British Columbia, total phosphorus contains a higher proportion of soluble phosphorus and is linked to high algae growth. (See Table 6.6.23).

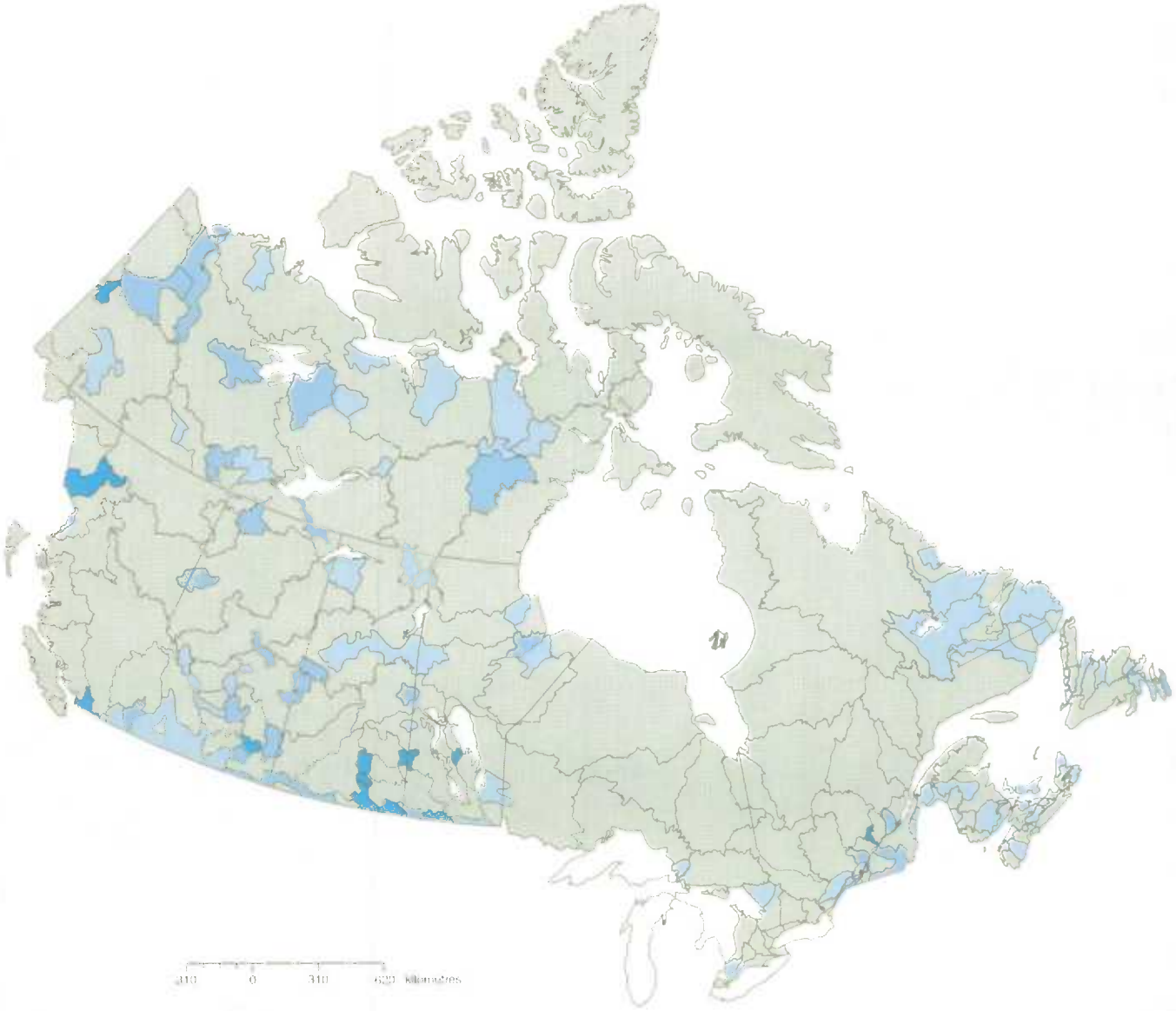
[2] Data from monitoring stations were aggregated to the Environment Canada sub-sub river basin level. Only those units with at least 5 samples were recorded on this map. Since the network of stations changes from year to year, each map shows a unique set of monitored rivers. Care should therefore be taken in comparing years.

[3] Due to the heterogeneous nature of drainage basins, no standard exists for phosphorus concentrations. However, concentrations above 0.1 milligrams per litre of total phosphorus in flowing waters increase the probability of the accelerated growth of algae.

**Source:**
Environment Canada, Inland Waters Directorate, NAQUADAT data base, special tabulations.

**Note:**
The uncontrolled growth of algae contributes to the problem known as eutrophication. Data detailing concentrations of phosphorous in water which can be used as an indicator of this must be viewed in the context of the physical and chemical characteristics of the drainage basin, the location and seasonality of sources of loadings and the placement of monitoring stations.

Map 6.6.16
**Phosphorus[1] in Canadian Rivers (from NAQUADAT Monitoring Stations[2]), 1980 to 1982**

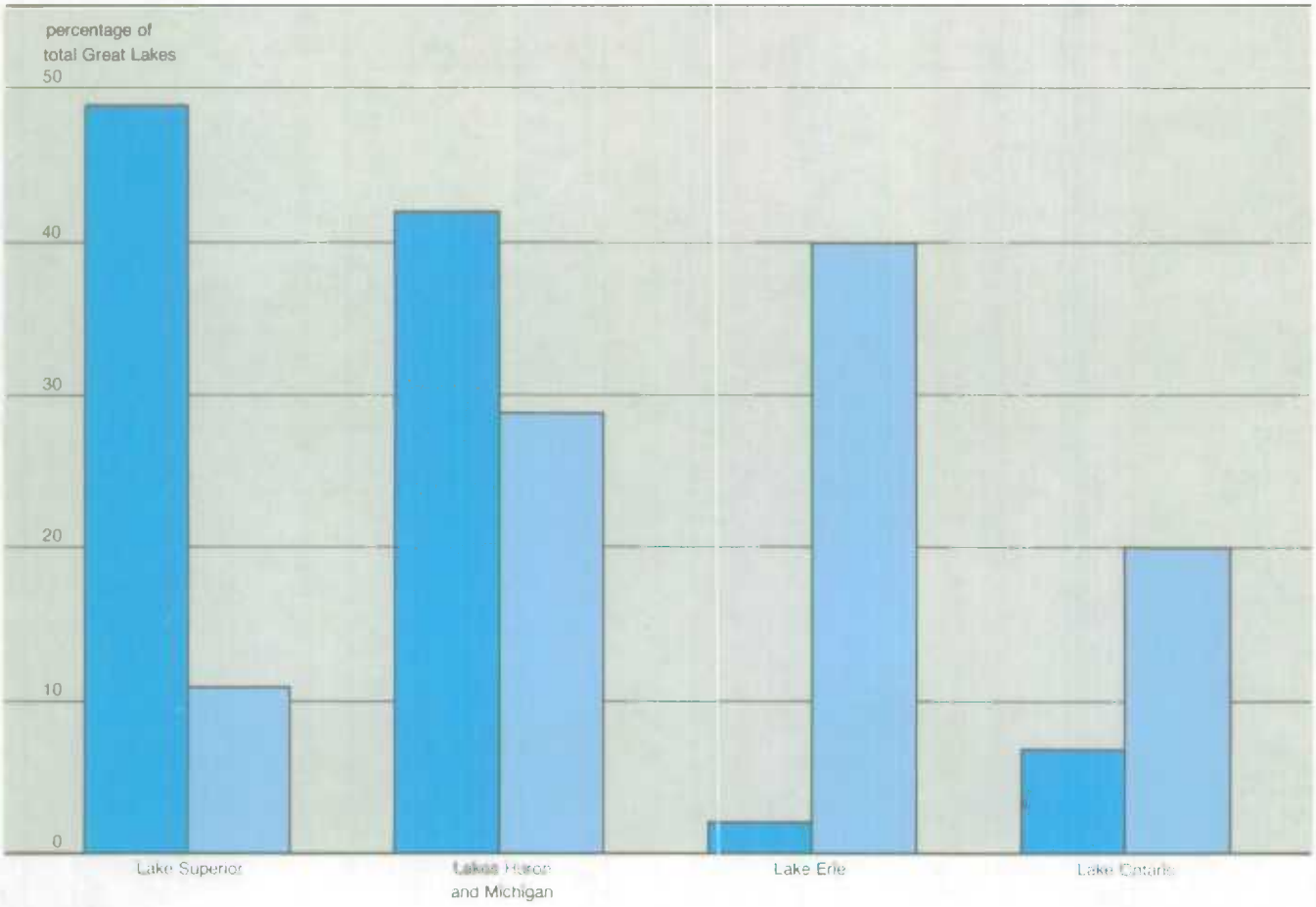



**Source:**
Environment Canada, Inland Waters Directorate, NAQUADAT data base, special tabulations.

Percentage of Samples with a Concentration of Phosphorus Greater Than 0.1 Milligrams per Litre[3]

- 0- 10
- 11- 50
- 51-100
- Insufficient data

Chart 6.6.17
**Distribution of Phosphorus Loadings Relative to Great Lakes Volume[1], 1982**




[1] This chart illustrates the relative stress of phosphorus loadings on the Great Lakes by comparing loading with the volume of water. For example, Lake Superior contains 49 percent of the water of the Great Lakes and receives about 11 percent of the phosphorus loading, whereas Lake Erie contains 2 percent of the volume and receives 40 percent of the load.

**Source:**
Great Lakes Water Quality Board, Report to the International Joint Commission, *1983 Report on Great Lakes Water Quality, Appendix, Great Lakes Surveillance.*

Table 6.6.18
## Phosphorus Loadings to the Great Lakes, 1976 to 1982

| Lake Erie: | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent |
| Point Sources[1] | 6 006 | 39 | 5 832 | 40 | 4 631 | 24 | 2 890 | 24 | 2 452 | 17 | 1 898 | 18 | 1 455 | 12 |
| Non-Point Sources | | | | | | | | | | | | | | |
| Tributary Interbasin | 7 211 | 47 | 6 545 | 45 | 12 874 | 66 | 6 421 | 54 | 9 773 | 66 | 6 745 | 65 | 9 154 | 74 |
| Transfer | 1 080 | 7 | 1 080 | 7 | 1 080 | 6 | 1 080 | 9 | 1 080 | 7 | 1 080 | 10 | 1 080 | 9 |
| Atmospheric | 1 119 | 7 | 1 119 | 8 | 879 | 4 | 1 550 | 13 | 1 550 | 10 | 729 | 7 | 660 | 5 |
| **Total** | **15 416** | **100** | **14 576** | **100** | **19 464** | **100** | **11 941** | **100** | **14 855** | **100** | **10 452** | **100** | **12 349** | **100** |
| Percent from Canadian Sources[2] | | 14 | | 24 | | 12 | | 22 | | 22 | | 16 | | 23 |
| **Target Load[3]** | **14 606** | | **14 606** | | **11 000** | | **11 000** | | **11 000** | | **11 000** | | **11 000** | |

| Lake Ontario: | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent |
| Point Sources[1] | 2 119 | 17 | 2 594 | 29 | 2 030 | 19 | 2 419 | 27 | 2 122 | 25 | 1 818 | 25 | 1 643 | 18 |
| Non-Point Sources | | | | | | | | | | | | | | |
| Tributary Interbasin | 4 490 | 35 | 2 970 | 33 | 2 899 | 26 | 3 200 | 36 | 3 059 | 36 | 2 435 | 33 | 3 318 | 37 |
| Transfer | 5 613 | 44 | 2 748 | 31 | 5 250 | 48 | 3 058 | 35 | 3 087 | 36 | 2 856 | 38 | 3 330 | 38 |
| Atmospheric | 473 | 4 | 623 | 7 | 764 | 7 | 311 | 3 | 311 | 3 | 328 | 4 | 600 | 7 |
| **Total** | **12 695** | **100** | **8 935** | **100** | **10 943** | **100** | **8 988** | **100** | **8 579** | **100** | **7 437** | **100** | **8 891** | **100** |
| Percent from Canadian Sources[2] | | 39 | | 38 | | 48 | | 51 | | 51 | | 51 | | 50 |
| **Target Load[3]** | **9 072** | | **9 072** | | **7 000** | | **7 000** | | **7 000** | | **7 000** | | **7 000** | |

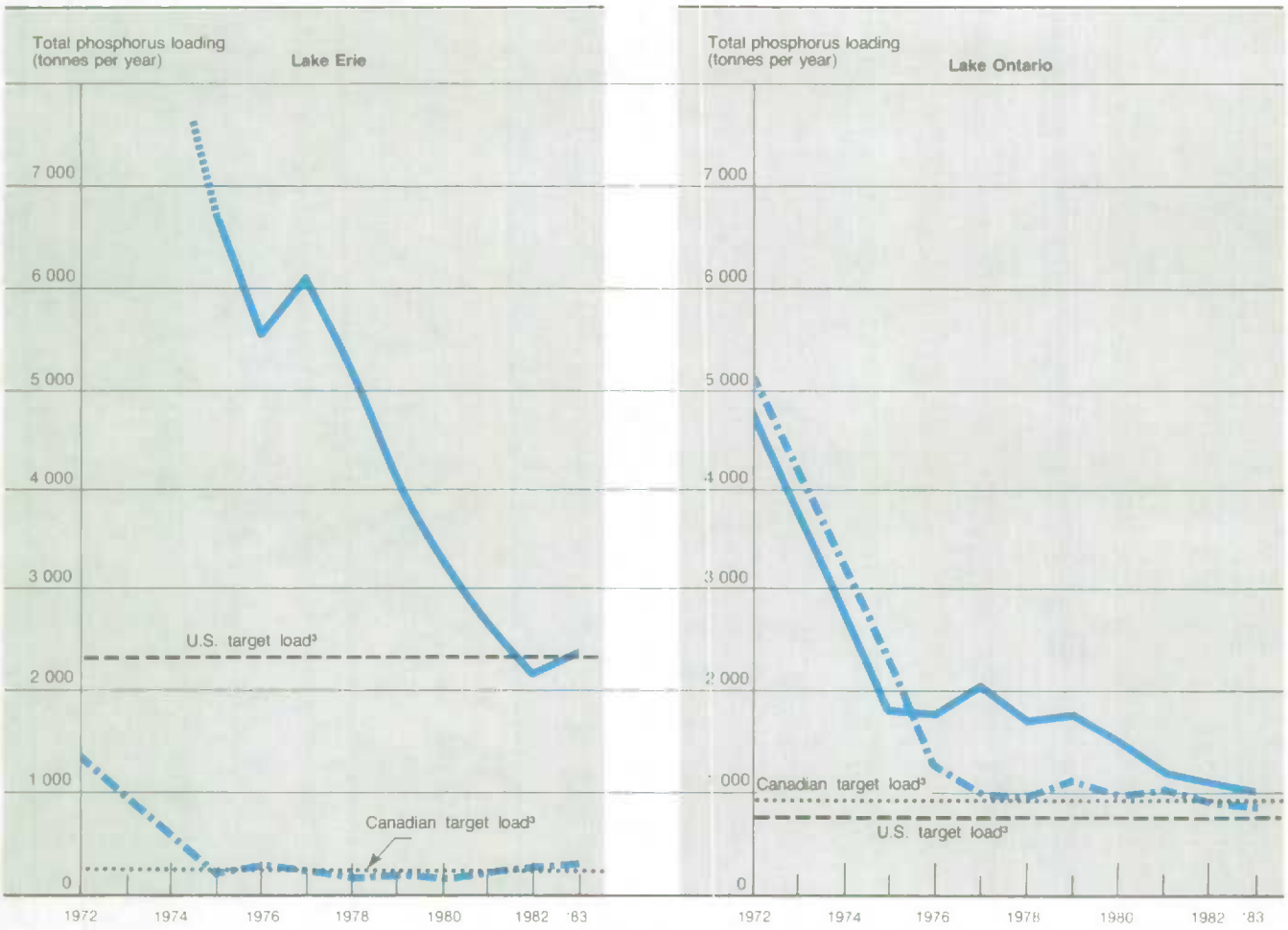
| All Lakes[4] | 1976 | | 1977 | | 1978 | | 1979 | | 1980 | | 1981 | | 1982 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent | tonnes | percent |
| Point Sources[1] | 9 595 | 26 | 9 802 | 31 | 7 739 | 20 | 6 252 | 17 | 5 568 | 15 | 4 536 | 18 | 3 893 | 14 |
| Non-Point Sources | | | | | | | | | | | | | | |
| Tributary | 21 248 | 59 | 16 017 | 51 | 24 517 | 62 | 18 432 | 51 | 20 631 | 55 | 17 750 | 72 | 21 500 | 75 |
| Atmospheric | 5 433 | 15 | 5 583 | 19 | 7 284 | 18 | 11 157 | 32 | 11 157 | 30 | 2 481 | 10 | 3 393 | 11 |
| **Total** | **36 276** | **100** | **31 402** | **100** | **39 540** | **100** | **35 841** | **100** | **37 356** | **100** | **24 767** | **100** | **28 786** | **100** |
| Percent from Canadian Sources[2] | | 24 | | 29 | | 22 | | 29 | | 30 | | 26 | | 30 |
| **Total Target Loads of All Lakes[3]** | **32 562** | | **32 562** | | **31 360** | | **31 360** | | **31 360** | | **31 360** | | **31 360** | |

[1] Includes direct municipal and industrial discharge.
[2] Excludes interbasin transfer and atmospheric sources.
[3] Sum of the target phosphorus loads established by the Great Lakes Water Quality Agreement for each lake.
[4] Includes St. Lawrence River.

**Source:**
Great Lakes Water Quality Board, Report to the International Joint Commission, *Report on Great Lakes Water Quality, Appendix, Great Lakes Surveillance*, 1976, 1977, 1978, 1981 and 1983 reports.

**Note:**
Target loads for the individual lakes are derived by using modelling estimates of the capacity of each lake to assimilate phosphorus loads and through bipartisan negotiation. An agreement to reduce tributary loadings (run-off from phosphorus containing fertilizer) was signed in 1983 between Canada and the United States. Further reductions are planned.

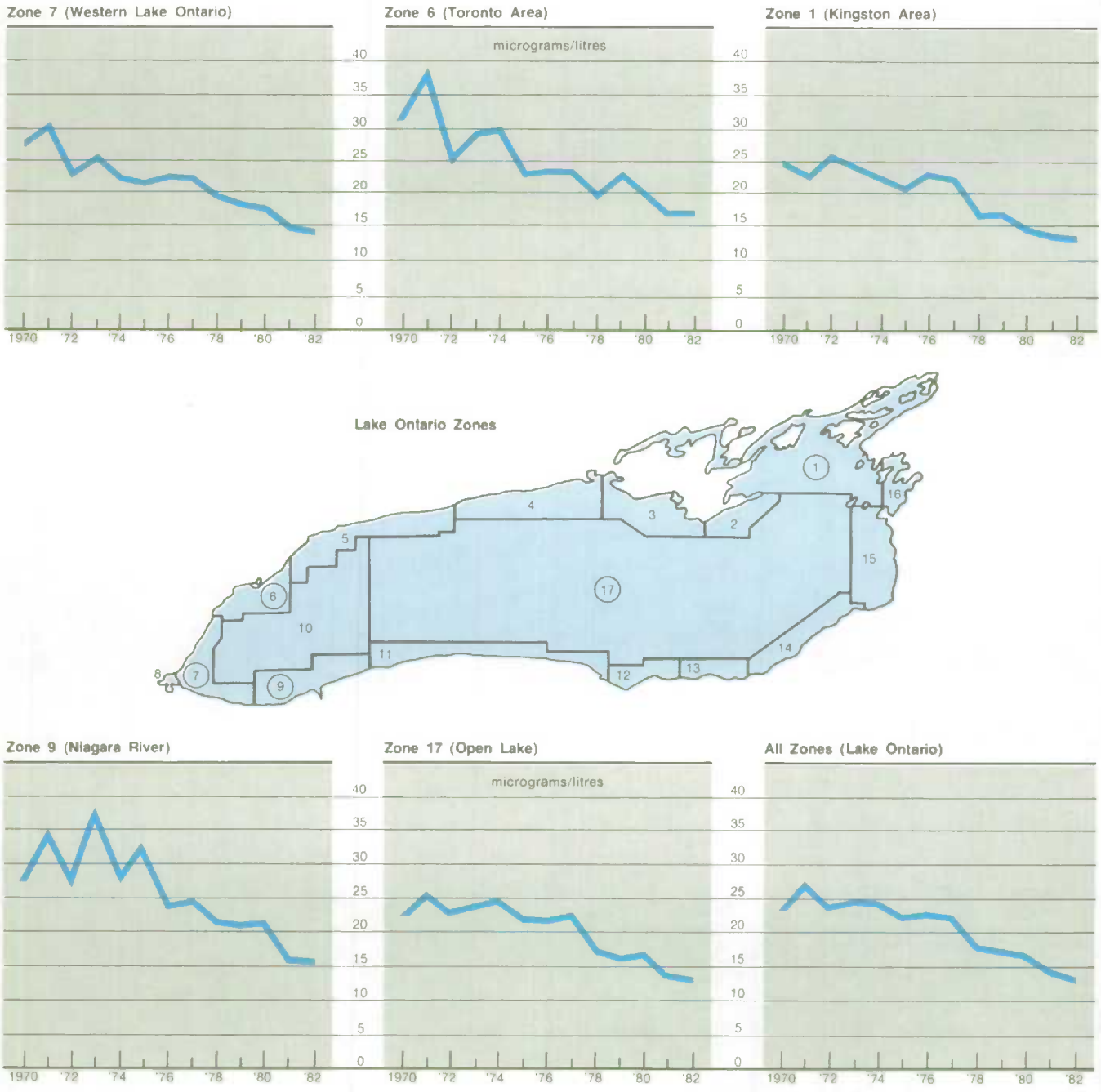
Chart 6.6.19
**Lower Great Lakes Municipal Phosphorus Loads[1], 1972 to 1983**




[1] The municipal phosphorus loads are based on sewage treatment plants discharging directly to the lakes and indirect discharges (i.e. tributary loadings) of major municipal sources.
[2] In 1972 the phosphorus load in the American portions of the lakes was estimated at 13 870 tonnes.
[3] Target loads based on the 1972 Great Lakes Water Quality Agreement between the United States and Canada which contained the provision for a 1 mg/L total phosphorus concentration limit on all major municipal point sources. The difference between target loads of the U.S.A. and Canada is related to the volume discharged in the respective countries in the reference year (1972). More stringent regulations regarding phosphorus came into effect in the late 1970s.

**Source:**
Great Lakes Water Quality Board, Report to the International Joint Commission, *1985 Report on Great Lakes Water Quality*.

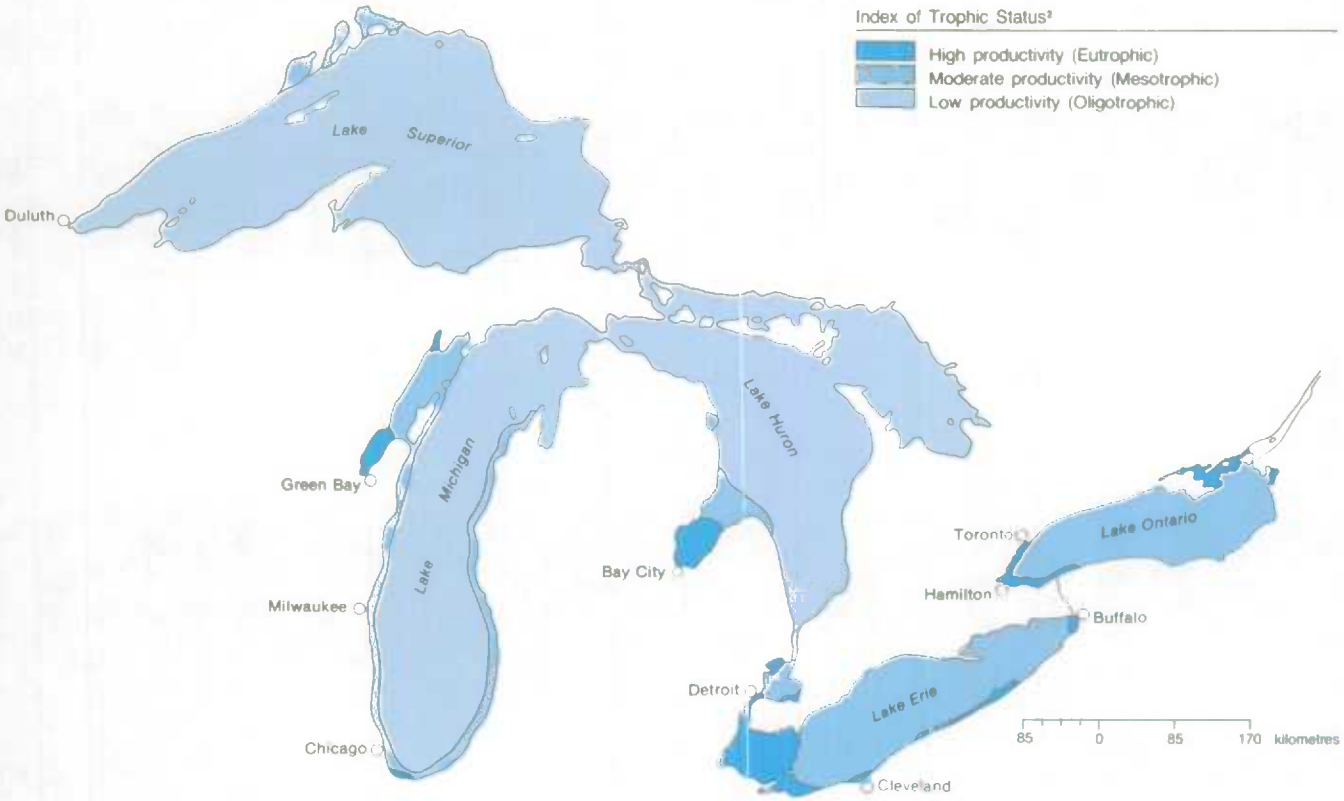
Chart 6.6.20
**Phosphorus Concentrations in Lake Ontario[1], 1970 to 1982**




[1] These data are obtained from spatial sampling techniques during the "spring turnover" for individual zones.

**Source:**
Environment Canada, Inland Waters Directorate, Ontario Region, *Report on Status of the Open Waters of Lake Ontario*, by M. Neilson, April 1983.

Map 6.6.21
## Nutrient Enrichment of the Great Lakes[1]




[1] This map illustrates trophic conditions in the Great Lakes and identifies regions showing signs of eutrophication induced by human activity. Historically, the Upper Lakes were highly oligotrophic and the Lower Lakes were likely mesotrophic due to inputs of nutrients from natural sources. Excess inputs, mainly from sewage and agriculture (see Table 6.6.18) have led to the increased and sporadic production of algae and rooted plants in the map areas indicated as eutrophic. In some instances, the taste and odour of drinking water supplies have become affected and nuisances to navigation and recreation have occurred. Ecologically, the lakes have experienced deep water oxygen depletion and changes in the physical nearshore environment affecting the life-cycle and habitat of some fish species. Eutrophication is regarded as one of the factors contributing to the breakdown of stable fish communities. (see also Technical Box 3.3.18)

[2] Defined by levels of phosphorus, Chlorophyll A (green pigment in algae), and water clarity.

**Source:**
International Joint Commission, *1981 Report on Great Lakes Water Quality, Appendix, Great Lakes Surveillance*, Windsor, 1981. Since the original publication of this map, changes in the trophic status of the lakes have occurred. The present map incorporates more recent information.

Map 6.6.22
## Lakes in the Okanagan Drainage Basin

Table 6.6.23
## Phosphorus Loadings[1] to Okanagan Drainage Basin Lakes, 1970 and 1980

| Source[1] | Osoyoos | | Skaha | | Okanagan | | Kalmalka | | Wood | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1970 | 1980 | 1970 | 1980 | 1970 | 1980 | 1970 | 1980 | 1970 | 1980 |
| | kilograms | | | | | | | | | |
| **Point Source** | | | | | | | | | | |
| Municipal | 2 700 | 900 | 13 100 | 2 400 | 37 500 | 17 000 | 0 | 0 | 0 | 0 |
| Storm Water | 0 | 0 | 30 | 35 | 280 | 475 | 0 | 0 | 0 | 0 |
| Industrial | 90 | 0 | 60 | 0 | 720 | 1 050 | 0 | 0 | 0 | 0 |
| Sub-Total | 2 790 | 900 | 13 190 | 2 435 | 38 500 | 18 525 | 0 | 0 | 0 | 0 |
| **Non-Point Source[2]** | | | | | | | | | | |
| Agriculture: | | | | | | | | | | |
| Animals | 300 | 520 | 480 | 430 | 2 180 | 8 800 | 300 | 670 | 410 | 520 |
| Fertilizers | 370 | 510 | .. | .. | 280 | 370 | .. | .. | 70 | 70 |
| Logging[3] | .. | 870 | .. | 870 | .. | 6 000 | .. | 100 | .. | 450 |
| Septic Tanks and Other Domestic Sources | 2 880 | 2 140 | 630 | 1 820 | 4 010 | 7 850 | 390 | 340 | 490 | 870 |
| Atmospheric[4] | 450 | 450 | 750 | 750 | 8 900 | 8 900 | 300 | 300 | 100 | 100 |
| Watershed Sources[5] | 7 100 | 6 200 | 4 200 | 3 300 | 24 500 | 18 500 | 2 200 | 2 100 | 1 650 | 1 200 |
| Interbasin Transfer[6] | 8 900 | 8 900 | 3 100 | 3 100 | 140 | 140 | 340 | 340 | ... | ... |
| Sub-Total | 20 000 | 19 590 | 9 160 | 10 270 | 40 010 | 50 560 | 3 530 | 3 850 | 2 720 | 3 210 |
| **Total** | **22 790** | **20 490** | **22 350** | **12 705** | **78 510** | **69 085** | **3 530** | **3 850** | **2 720** | **3 210** |

[1] These loading estimates are based on "bioavailable phosphorus", i.e. phosphorus that is readily utilized by algae. Total phosphorus loadings calculated in Table 6.6.18 and Chart 6.6.19, include a proportion of the phosphorus which is not readily taken up by algae and other plant life.
[2] Non-point source loadings were aggregated to each lake basin from calculations based on the nutrient production from septic tanks and animals, and estimates of fertilizer used. An attenuation factor was applied to these loads due to soil texture and depth of ground water.
[3] Monitoring results of two logged areas were extrapolated to others in the basin.
[4] Assumes phosphorus in dustfall and precipitation are biologically available.
[5] Watershed sources include natural run-off, for both years, and logging estimates, 1970 only. For Okanagan Lake in 1970, cattle grazing was also included.
[6] Loadings from upstream lakes were obtained at their outlets.

**Source:**
Okanagan Basin Implementation Board and British Columbia Ministry of Environment, *Report on the Okanagan Basin Implementation Agreement*, 1982.

Table 6.6.24
## Phosphorus Concentrations in Okanagan Drainage Basin Lakes, 1970 to 1980

| Lake | Total Phosphorus Concentrations[1] | | | | | | | Comments on Status |
|---|---|---|---|---|---|---|---|---|
| | 1970 | 1971 | 1976 | 1977 | 1978 | 1979 | 1980 | |
| | micrograms per litre | | | | | | | |
| Wood | .. | .. | 70.0 | 68.5 | 91.0 | 54.7 | 84.0 | this lake is naturally nutrient rich |
| Kalamalka | .. | .. | 6.0 | 5.0 | 6.5 | 7.0 | 9.8 | occasional algal blooms |
| Okanagan | | | | | | | | |
| north | .. | 8.7 | .. | 9.5 | 8.5 | 9.0 | 10.8 | nearshore deterioration |
| central | 7.6 | 10.8 | .. | 8.5 | 4.5 | 9.5 | 7.0 | |
| south | .. | 9.8 | .. | 7.5 | 6.0 | 5.8 | 7.8 | |
| Skaha | 31.0 | 20.7 | .. | 11.0 | 18.0 | 22.8 | 24.5 | variability of concentration not correlated with changes in known loadings |
| Osoyoos | 26.9 | 22.8 | .. | 21.0 | 23.5 | 17.3 | 21.3 | nuisance algae and anoxia (seasonal) |

[1] Concentration measures are obtained at four different depths at the time of the spring turnover (i.e. mixing of water of different temperatures). This is the period when phosphorus is most uniformly distributed throughout the lake.

**Source:**
Okanagan Basin Implementation Board and British Columbia Ministry of Environment, *Report on the Okanagan Basin Implementation Agreement*, 1982.

Map 6.6.25
## Acidity of Precipitation in the United States and Canada, 1981

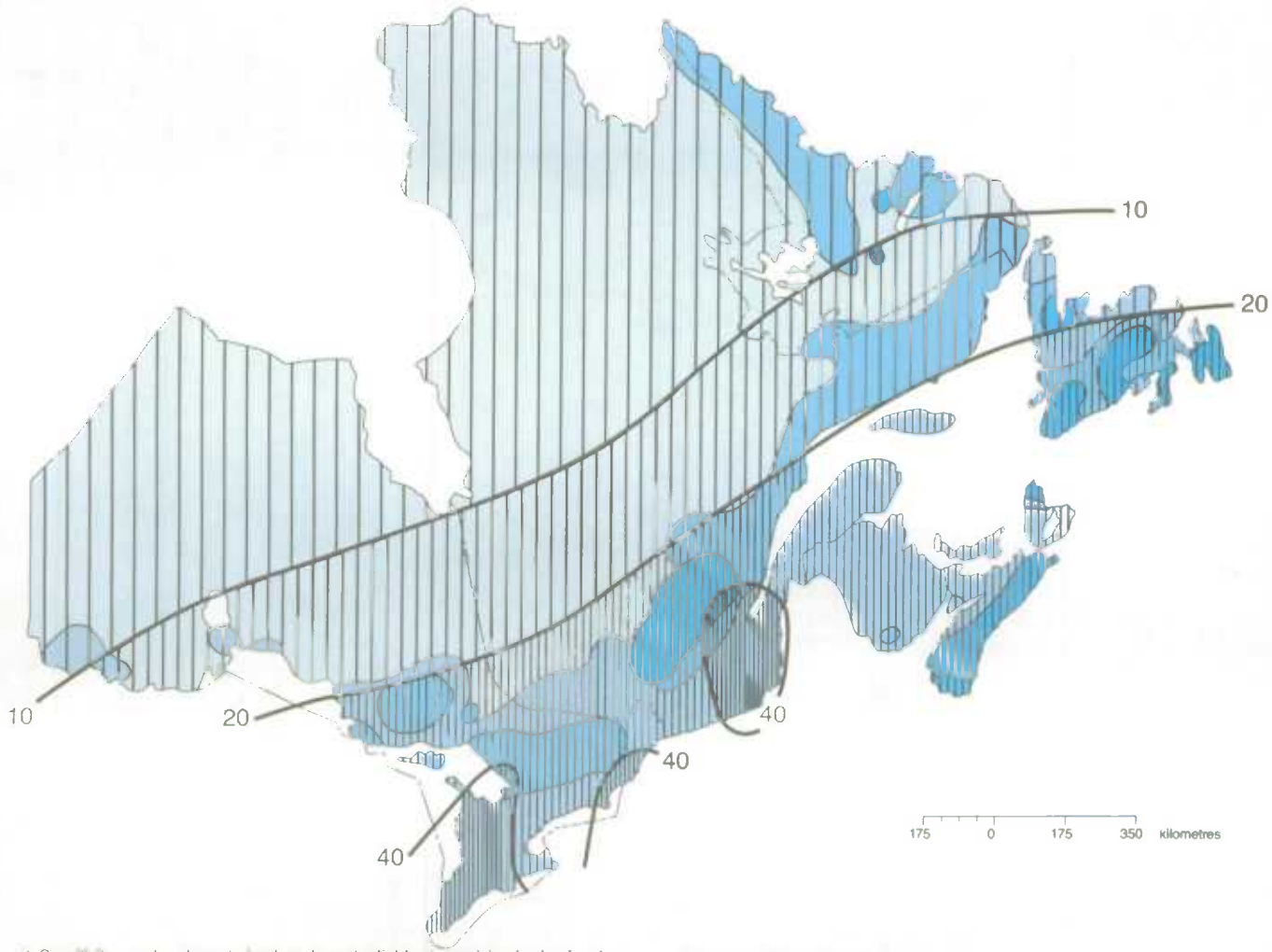

**Source:**
U.S. Geological Survey, *National Water Summary 1983 — Hydrological Events and Issues*, Washington, 1984.

**Note:**
The pH scale ranges from 0 to 14 and measures whether a liquid is acidic or alkaline (basic). A value of 7 is neutral, while values below 7 indicate acidity and values above 7 indicate alkalinity. Because the scale is logarithmic, there is a 10-fold difference between one number and the next. An excess of acidic material over alkaline in the atmosphere produces acid precipitation. Factors such as windblown dust in the Prairies may neutralize acidic material and raise the pH of rainfall. (In the absence of contaminants, precipitation is slightly acidic with a pH of approximately 5.6). Sources of acid in the atmosphere are fossil fuel combustion for power generation, motor vehicles, metal smelting and other industrial processes. Natural sources such as volcanoes and forest fires contribute both acidic gases and alkali ash; their net effect on the acidity of precipitation is uncertain.

• 5.4 Average pH at sample site
—5.0— Line joining equal pH values

Map 6.6.26

## Sulphate Deposition and Sensitivity[1] of Waters to Acid Precipitation in Eastern Canada




[1] Sensitivity can be characterized as the potential for a receiving body of water to be stressed by acid deposition and can be quantified using the calcite saturation index.

[2] Wet sulphate deposition is the weight of sulphate in rainfall and snow. Currently this measure is considered to be the best indicator of acidification. Data are from the Canadian Network for Sampling Precipitation (CANSAP) and are for 1980.

[3] The calcite saturation index is a composite indicator of the ability of surface water to neutralize acid deposited in it.

**Sources:**

National Research Council, *Acidification in the Canadian Aquatic Environment*, Ottawa, 1981.

Impact Assessment Work Group, *United States-Canada Memorandum of Intent on Transboundary Air Pollution*, Final Report, January 1983.

**Note:**

Both terrestrial and aquatic ecosystems are affected by the excess of acidity and the presence of oxides of sulphur and nitrogen ($SO_2$,$NO_x$) in precipitation. Although the surrounding soil and bedrock buffering capacity (ability to resist changes in acidity) and other aspects of soil chemistry are used as factors in assessing susceptibility of aquatic ecosystems to acid rain, the chemical and hydrological characteristics of water bodies themselves must also be determined. In terrestrial systems, the proximity to point sources of emissions, run-off and snow-melt characteristics, and the type of forest cover are significant factors.

To reduce emissions, the Federal and Provincial Ministers of Environment have agreed to a maximum wet sulphate deposition level of 20 kilograms per hectare per year as the environmental objective for the acid rain control program. This is the level of deposition that would allow water bodies to assimilate acid precipitation without the pH dropping below 5.3 and would afford protection for all but the most sensitive aquatic systems. Objectives have not been established for other acidifying substances (dry sulphate and nitrates) or for terrestrial systems. It is now believed that dry sulphate deposition is a more appropriate indicator for Western Canada.

Wet Sulphate Deposition[2]

kilograms per hectare-year

- less than 10
- 10-20
- 20-40
- greater than 40

Environment Canada has designated a target of 20 kilograms per hectare-year for sulphate deposition as part of an emissions reducing program.

Calcite Saturation Index[3]

- No data available
- 0.0-3.0
- 3.1-5.0
- 5.1-7.0

Values greater than 3.0 reflect areas sensitive to acidification.

Table 6.6.27
## Surface Water Area[1] by Potential to Reduce Acidity and Sulphate Deposition in Eastern Canada

| Potential to Reduce Acidity[2] | Wet Sulphate Deposition | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 10 to 20 kg/ha.yr. | | 20 to 40 kg/ha.yr. | | Greater than 40 kg/ha.yr. | | Total | |
| | km² | percent study area | km² | percent study area | km² | percent study area | km² | percent study area |
| High | 4 644 | 5 | 6 608 | 7 | 660 | <1 | 11 912 | 12 |
| Moderate | 6 674 | 7 | 16 067 | 17 | 554 | <1 | 23 295 | 24 |
| Low | 31 728 | 34 | 27 308 | 29 | 400 | <1 | 59 444 | 64 |
| Total | 43 046 | 46 | 49 983 | 53 | 1 622 | 1 | 94 651 | 100 |

[1] Includes only surface water area receiving more than 10 kilograms per hectare year sulphate deposition as shown in the shaded area of Map 6.6.28.
[2] This inventory is based on the ecological land survey developed by the Lands Directorate of Environment Canada. Using areas of land showing distinctive geology, soil and hydrology (ecodistricts), data for the potential of bedrock and soil to reduce acidity were overlaid with the deposition regime of wet sulphate (shown on Map 6.6.26). The areas shown in the table are the aggregate based on the ratio of land to water. Note that the calcite index was employed in determining areas of sensitivity in Map 6.6.26, whereas the areas of potential to reduce acidity in this table are determined by soil and bedrock characteristics.

**Source:**
Impact Assessment Work Group I, *United States-Canada Memorandum of Intent on Transboundary Air Pollution*, Final Report, January 1983.

Map 6.6.28
## Eastern Canada Sulphate Deposition Study Area[1]


[1] Area covered in Table 6.6.27 is shown in colour.
**Source:**
Impact Assessment Work Group, *United States-Canada Memorandum of Intent on Transboundary Air Pollution*, Final Report, January 1983.

Table 6.6.29
## Spills of Hazardous Materials by Source, 1974 to 1979[1]

| Source | 1974 | 1975 | 1976 | 1977 | 1978 | 1979[2] |
|---|---|---|---|---|---|---|
| | tonnes | | | | | |
| Tankers | 362 | 81 | 1 574 | 826 | 78 | 8 080 |
| Bulk Carriers | 33 | 652 | 24 | 105 | 979 | 1 135 |
| Other Watercraft | 3 525 | 427 | 950 | 548 | 360 | 18 |
| Tank Trucks | 529 | 559 | 965 | 1 446 | 1 003 | 3 804 |
| Other Motor Vehicles | 869 | 1 640 | 348 | 484 | 658 | 526 |
| Trains | 2 288 | 6 534 | 4 026 | 6 611 | 58 417 | 4 886 |
| Pipelines | 10 396 | 2 838 | 4 618 | 3 358 | 5 577 | 15 181 |
| Aviation | 6 | 39 | 30 | 75 | 28 | 21 |
| Mines and Wells | 10 237 | 759 614 | 14 775 | 11 636 | 37 232 | 31 469 |
| Refineries and Marine Terminals | 1 049 | 160 | 368 | 1 232 | 1 529 | 572 |
| Storage Depots | 713 | 3 705 | 1 620 | 2 933 | 67 082 | 2 099 |
| Service Stations | 9 | 928 | 71 | 103 | 197 | 130 |
| Industrial Plants | 51 364 | 5 933 | 2 220 | 13 343 | 31 540 | 889 |
| Other Sources | 5 216 | 439 879 | 234 054 | 30 069 | 488 | 36 591 |
| **Total** | **86 596** | **1 222 989** | **265 643** | **72 769** | **205 168** | **105 401** |

[1] Includes oil spills and non-oil spills of substances such as acids, bases, pesticides, fertilizers, paint and dyes, minerals, metal, industrial chemicals, industrial waste, radioactive material and salt water. These data are obtained from NATES (National Analysis of Trends in Emergencies System) data base. Spill information is provided voluntarily by several federal and provincial regulatory agencies. Therefore, the data base is not necessarily complete.

[2] 1979 is the last date for which data have been compiled.

**Source:**
Environment Canada, Environmental Protection Service, NATES data base.

# 7

# Biotic State

# Contents

# 7.1
# Wildlife

Table 7.1.1
## Terrestrial Mammal Species[1] by Ecozone

| Scientific Name / Order[2] / Family[3] | Common Name | Number of Species in Canada | Ecozone[4] A.M. | M.P. | B.S. | Pr. | B.P. | M.C. | P.M. | B.C. | T.C. | T.P. | T.S. | H.B.P. | S.A. | N.A. | A.C. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Marsupialia*** | **Marsupials** | **1** | **0** | **1** | **0** | **0** | **0** | **0** | **1** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| *Didelphidae* | Opossum | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Insectivora*** | **Insectivores** | **18** | **7** | **9** | **9** | **4** | **5** | **5** | **9** | **4** | **4** | **5** | **4** | **5** | **0** | **0** | **0** |
| *Soricidae* | Shrews | 6 | 6 | 6 | 7 | 4 | 5 | 5 | 6 | 4 | 4 | 5 | 3 | 4 | 0 | 0 | 0 |
| *Talpidae* | Moles | 12 | 1 | 3 | 2 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| ***Chiroptera*** | **Bats** | **17** | **5** | **9** | **5** | **8** | **5** | **11** | **10** | **1** | **1** | **1** | **1** | **1** | **0** | **0** | **0** |
| *Vespertilionidae* | Smooth-faced Bats | 16 | 5 | 9 | 5 | 8 | 5 | 11 | 9 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| *Molossidae* | Free-tailed Bats | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Lagomorpha*** | **Pikas, Hares and Rabbits** | **7** | **1** | **3** | **1** | **4** | **1** | **2** | **3** | **2** | **2** | **1** | **2** | **1** | **1** | **1** | **1** |
| *Ochotonidae* | Pikas | 6 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Leporidae* | Rabbits and Hares | 1 | 1 | 3 | 1 | 4 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 |
| ***Rodentia*** | **Rodents** | **68** | **18** | **21** | **19** | **26** | **17** | **29** | **22** | **22** | **20** | **17** | **15** | **15** | **8** | **2** | **2** |
| *Aplodontidae* | Mountain Beaver | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sciuridae* | Squirrels | 22 | 5 | 7 | 5 | 9 | 5 | 10 | 5 | 6 | 5 | 5 | 3 | 4 | 1 | 0 | 0 |
| *Geomyidae* | Pocket Gophers | 2 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Heteromyidae* | Pocket Mice and Kangaroo Rats | 3 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Castoridae* | Beavers | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| *Muridae* | Rats, Mice, and Voles | 33 | 9 | 9 | 10 | 11 | 8 | 13 | 13 | 12 | 13 | 9 | 9 | 7 | 7 | 2 | 2 |
| *Dipodidae* | Jumping Mice and Jerboas | 4 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 0 | 1 | 1 | 2 | 0 | 0 | 0 |
| *Erethizontidae* | Porcupines | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| *Capromyidae* | Hutias and Coypus | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***Carnivora*** | **Carnivores** | **24** | **9** | **10** | **14** | **14** | **16** | **18** | **14** | **13** | **12** | **14** | **11** | **14** | **8** | **6** | **6** |
| *Canidae* | Dogs | 5 | 1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 |
| *Ursidae* | Bears | 3 | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| *Procyonidae* | Raccoons and their Allies | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Mustelidae* | Weasels and their Allies | 12 | 4 | 5 | 7 | 6 | 9 | 10 | 8 | 7 | 6 | 8 | 6 | 8 | 3 | 2 | 2 |
| *Felidae* | Cats | 3 | 2 | 1 | 2 | 3 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| ***Artiodactyla*** | **Cloven-Hoofed Mammals** | **12** | **2** | **1** | **3** | **5** | **6** | **7** | **4** | **4** | **4** | **4** | **2** | **2** | **3** | **2** | **1** |
| *Cervidae* | Deer | 6 | 2 | 1 | 3 | 3 | 5 | 5 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 1 |
| *Antilocapridae* | Pronghorns | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Bovidae* | Antelopes, Cattle, Sheep and Goats | 5 | 0 | 0 | 0 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 0 | 0 | 1 | 1 | 0 |
| **Total Number of Species:** | | **147** | **42** | **54** | **51** | **61** | **50** | **72** | **63** | **46** | **43** | **42** | **35** | **38** | **18** | **11** | **10** |

[1] Species: A taxonomic group of similar individuals that interbreed freely among themselves (or are biologically capable of doing so) but do not normally breed with individuals of other such groups; popularly thought of as a kind of plant or animal.

[2] Order: A taxonomic group composed of related families.

[3] Family: A taxonomic group composed of related species.

[4] Ecozone Abbreviations:
A.M. — Atlantic Maritime
M.P. — Mixed-Wood Plain
B.S. — Boreal Shield
Pr. — Prairie
B.P. — Boreal Plain
M.C. — Montane Cordillera
P.M. — Pacific Maritime
B.C. — Boreal Cordillera
T.C. — Tundra Cordillera
T.P. — Taiga Plain
T.S. — Taiga Shield
H.B.P. — Hudson Bay Plain
S.A. — Southern Arctic
N.A. — Northern Arctic
A.C. — Arctic Cordillera

**Source:**
The National Museums of Canada, *The Mammals of Canada*, by A.W.F. Banfield, 1977. Special tabulations by the Office of the Senior Adviser on Integration, Statistics Canada.

**Note:**
Species distribution data can serve as crude indicators of species diversity and ecosystem resilience. Ecological systems that maintain a large variety of species are generally complex and usually provide varied opportunities for alternate survival strategies for individual species when under human or natural stress.
The data in this Table and Tables 7.1.2, 7.1.3, 7.1.6 and Maps 7.1.4, 7.1.5 and 7.1.7 were derived by a map overlay technique. To be included in a particular ecozone, a species had to meet one of two criteria: 1.) The species' range area had to cover at least one-quarter of the ecozone, or 2.) for species with very restricted ranges, at least one-quarter of the species' range area had to be within the ecozone.

Table 7.1.2
## Marine Mammal Species by Ocean[1]

| Scientific Name<br>**Order**<br>Family | Common Name | All Canadian Marine Waters | Atlantic Ocean | Arctic Ocean | Pacific Ocean |
|---|---|---|---|---|---|
| | | number of species | | | |
| **Cetacea** | **Whales** | **33** | **22** | **14** | **22** |
| Ziphiidae | Beaked Whales | 8 | 4 | 1 | 4 |
| Physeteridae | Sperm Whale | 1 | 1 | 1 | 1 |
| Kogiidae | Pigmy Sperm Whales | 1 | 1 | 0 | 1 |
| Monodontidae | White Whale and Narwhal | 2 | 1 | 2 | 0 |
| Delphinidae | Dolphins and Porpoises | 13 | 8 | 4 | 9 |
| Eschrichtidae | Greywhale | 1 | 0 | 0 | 1 |
| Balaenopteridae | Rorquals | 5 | 5 | 4 | 5 |
| Balaenidae | Bowhead Whales | 2 | 2 | 2 | 1 |
| **Pinnipedia** | **Seals, Sea Lions and Walrus** | **12** | **7** | **8** | **5** |
| Otariidae | Eared Seals | 4 | 0 | 2 | 3 |
| Odobenidae | Walrus | 1 | 1 | 1 | 0 |
| Phocidae | True Seals | 7 | 6 | 5 | 2 |
| **Carnivora** | **Carnivores** | **1** | **0** | **0** | **1** |
| Mustelidae | Sea Otter[2] | 1 | 0 | 0 | 1 |
| **Total Number of Species** | | 46 | 29 | 32 | 28 |

[1] Canadian waters (ie. within 200 nautical mile limit).
[2] The sea otter is a species of the family Mustelidae (weasels). This species is the only marine aquatic member of this family found in Canada.

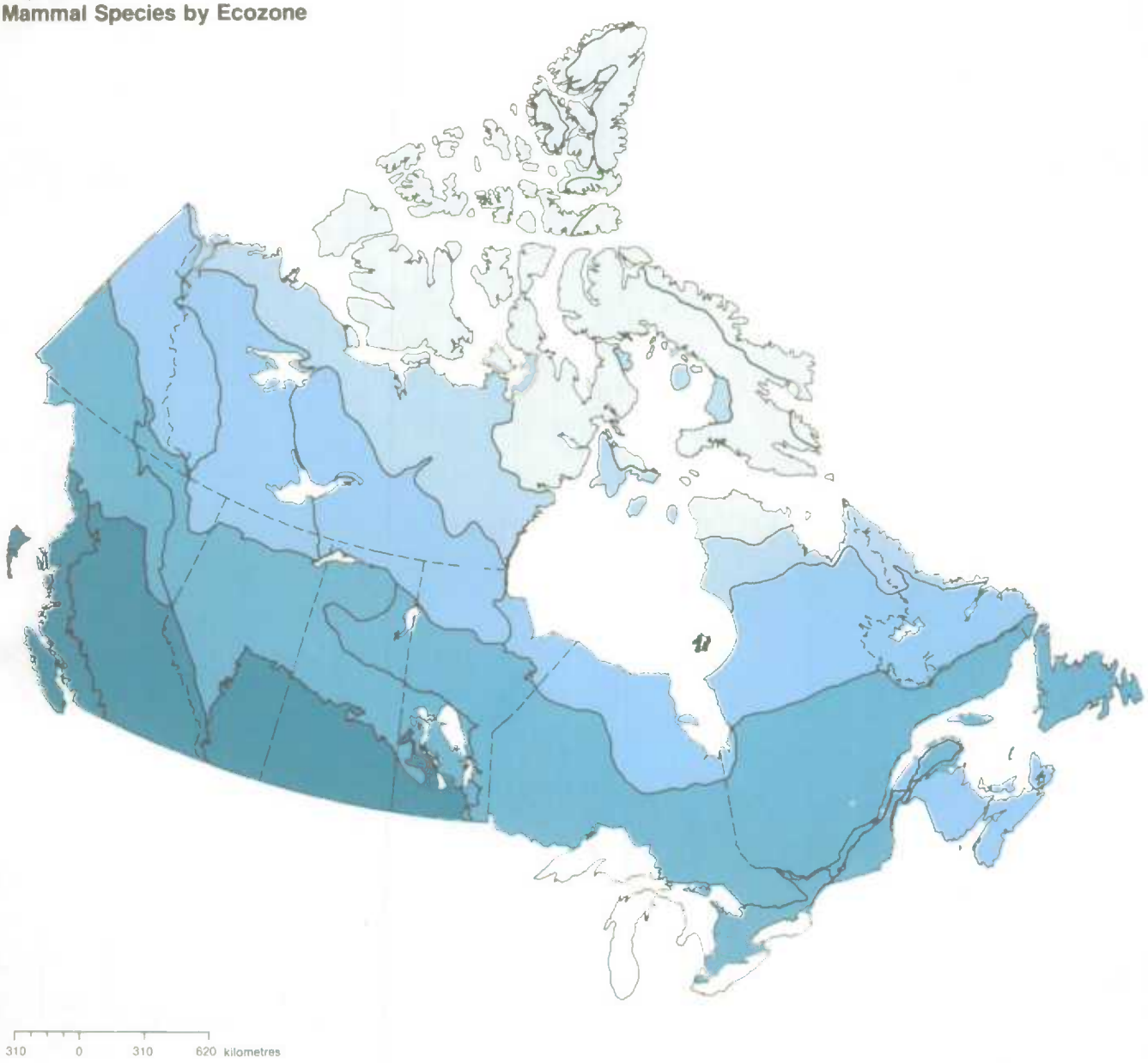
**Source:**
The National Museums of Canada, *The Mammals of Canada*, by A.W.F. Banfield, 1977.
Special tabulations by the Office of the Senior Adviser on Integration, Statistics Canada.

Table 7.1.3
## Large Mammal Species by Ecozone

| Species<br>Common Name | Atlantic Maritime | Mixed-Wood Plain | Boreal Shield | Prairie | Boreal Plain | Montane Cordillera | Pacific Maritime | Boreal Cordillera | Tundra Cordillera | Taiga Plain | Taiga Shield | Hudson Bay Plain | Southern Arctic | Northern Arctic | Arctic Cordillera |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coyote | X | X | X | X | X | X | | X | X | X | | | | | |
| Wolf | | | X | | X | X | X | X | X | X | X | X | X | X | X |
| Arctic Fox | | | | | | | | | X | | | X | X | X | X |
| Red Fox | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Grey Fox | | X | | X | | | | | | | | | | | |
| Black Bear | X | | X | X | X | X | X | X | X | X | X | X | | | |
| Grizzly Bear | | | | | | X | X | X | X | | | | X | | |
| Polar Bear | | | | | | | | | | | | X | X | X | X |
| Cougar | | | | X | X | X | X | | | | | | | | |
| Lynx | X | | X | X | X | X | | X | X | X | X | X | | | |
| Bobcat | X | X | X | X | | X | | | | | | | | | |
| Caribou | | | X | | X | X | | X | X | X | X | X | X | X | X |
| Mule Deer | | | | X | X | X | X | | | X | | | | | |
| White-tailed Deer | X | X | X | X | X | X | | | | | | | | | |
| Moose | X | | X | | X | X | | X | X | X | X | X | X | | |
| Fallow Deer | | | | | | | X | | | | | | | | |
| Elk | | | | X | X | X | X | | | | | | | | |
| Bison | | | | X | X | | | | | X | | | | | |
| Mountain Goat | | | | | | X | X | X | X | | | | X | X | |
| Bighorn Sheep | | | | | | X | | | | | | | | | |
| Dall's Sheep | | | | | | | | X | X | | | | | | |
| Muskox | | | | | | | | | | | | | | X | |
| Pronghorn | | | | X | | | | | | | | | | | |

**Sources:**
National Museums of Canada, *The Mammals of Canada*, by A.W.F. Banfield, 1977
Special tabulation by the Office of the Senior Adviser on Integration, Statistics Canada.

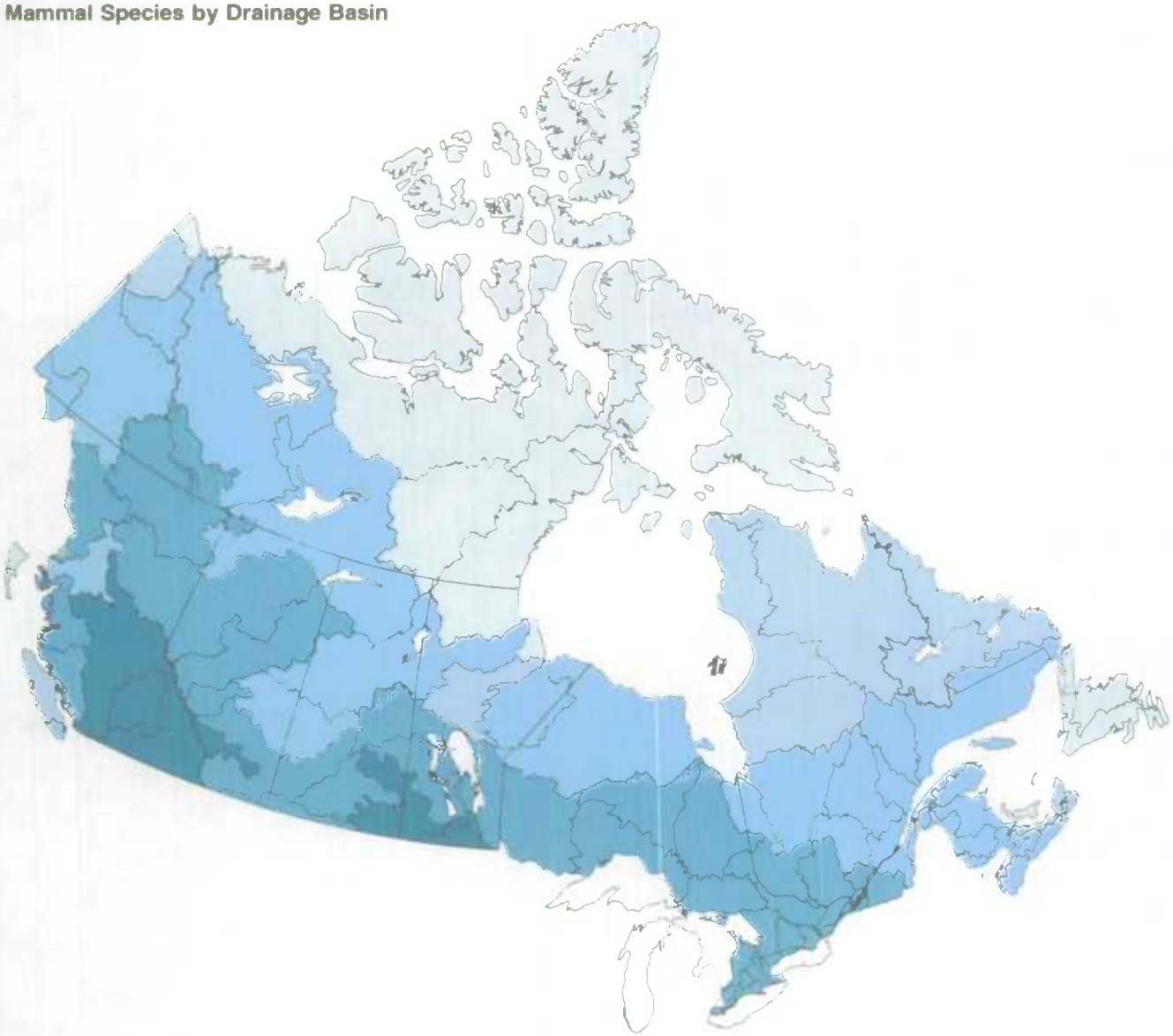
Map 7.1.4
**Mammal Species by Ecozone**




**Sources:**
The National Museums of Canada, *The Mammals of Canada*, by A.W.F. Banfield, 1977.
Special tabulations by the Office of the Senior Adviser on Integration, Statistics Canada.

**Note:**
Refer to Table 7.1.1 for methodology details.

Map 7.1.5
**Mammal Species by Drainage Basin**




**Sources:**
The National Museums of Canada, *The Mammals of Canada*, by A.W.F. Banfield, 1977.
Special tabulations by the Office of the Senior Adviser on Integration, Statistics Canada.

**Note:**
Species information by drainage basin was compiled in the same manner as species statistics for ecozones. For details, see note on Table 7.1.1.

Table 7.1.6
## Breeding Bird Species by Ecozone

| Scientific Name / Order / Family | Common Name | Number of Species in Canada | Ecozone[1] A.M. | M.P. | B.S. | Pr. | B.P. | M.C. | P.M. | B.C. | T.C. | T.P. | T.S. | H.B.P. | S.A. | N.A. | A.C. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **_Gaviiformes_** | **Loons** | **4** | **1** | **1** | **1** | **0** | **1** | **1** | **1** | **1** | **2** | **3** | **3** | **2** | **3** | **4** | **1** |
| **_Podicipediformes_** | **Grebes** | **5** | **1** | **2** | **3** | **5** | **5** | **5** | **2** | **2** | **2** | **2** | **2** | **2** | **0** | **0** | **0** |
| **_Procellariiformes_** | **Petrels and Allies** | **3** | **1** | **0** | **1** | **0** | **0** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **1** |
| **_Pelecaniformes_** | **Pelicans, Cormorants, and Allies** | **5** | **3** | **1** | **3** | **2** | **2** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **_Ciconiiformes_** | **Herons, Storks and Allies** | **6** | **5** | **6** | **2** | **5** | **3** | **1** | **1** | **0** | **0** | **1** | **1** | **1** | **0** | **0** | **0** |
| **_Anseriformes_** | **Swans, Geese and Ducks** | **35** | **12** | **13** | **17** | **17** | **21** | **20** | **11** | **18** | **15** | **16** | **11** | **17** | **10** | **8** | **5** |
| **_Falconiformes_** | **Diurnal Birds of Prey** | **19** | **10** | **10** | **11** | **10** | **10** | **14** | **11** | **12** | **10** | **8** | **4** | **9** | **5** | **3** | **1** |
| *Cathartidae* | American Vultures | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Accipitridae* | Kites, Hawks, Eagles, Harriers | 12 | 7 | 7 | 8 | 6 | 7 | 8 | 6 | 7 | 5 | 5 | 3 | 6 | 3 | 1 | 1 |
| *Pandionidae* | Ospreys | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| *Falconidae* | Falcons | 5 | 2 | 1 | 2 | 3 | 2 | 4 | 3 | 4 | 4 | 2 | 1 | 2 | 2 | 2 | 0 |
| **_Galliformes_** | **Pheasant, Grouse and Allies** | **15** | **4** | **5** | **5** | **6** | **6** | **10** | **8** | **6** | **7** | **6** | **3** | **4** | **2** | **2** | **1** |
| **_Gruiformes_** | **Cranes, Rails, and Allies** | **7** | **4** | **5** | **4** | **2** | **5** | **2** | **3** | **0** | **0** | **2** | **2** | **3** | **1** | **1** | **0** |
| **_Charadriiformes_** | **Shorebirds, Gulls, and Allies** | **71** | **13** | **12** | **20** | **16** | **19** | **10** | **12** | **15** | **13** | **15** | **17** | **20** | **26** | **27** | **16** |
| *Haematopodidae* | Oystercatchers | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Charadriidae* | Plovers, Surfbirds, Turnstones | 7 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 1 | 2 | 2 | 4 | 3 |
| *Scolopacidae* | Woodcock, Snipe, Sandpipers | 26 | 4 | 4 | 6 | 6 | 8 | 5 | 2 | 9 | 7 | 6 | 8 | 11 | 13 | 9 | 3 |
| *Recurvirostridae* | Avocets and Stilts | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Phalaropodidae* | Phalaropes | 3 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 2 | 2 | 2 |
| *Stercorariidae* | Jaegers and Skuas | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 3 | 2 |
| *Laridae* | Gulls and Terns | 19 | 4 | 5 | 7 | 6 | 8 | 3 | 2 | 4 | 4 | 6 | 5 | 5 | 4 | 8 | 4 |
| *Alcidae* | Auks, Murres and Puffins | 11 | 2 | 0 | 5 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 2 |
| **_Columbiformes_** | **Pigeons and Doves** | **3** | **2** | **2** | **1** | **2** | **2** | **2** | **3** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **_Cuculiformes_** | **Cuckoos** | **2** | **1** | **2** | **1** | **1** | **0** | **0** | **1** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **_Strigiformes_** | **Owls** | **14** | **5** | **7** | **8** | **6** | **8** | **11** | **9** | **5** | **5** | **6** | **4** | **5** | **2** | **1** | **1** |
| **_Caprimulgiformes_** | **Goatsuckers** | **3** | **2** | **2** | **2** | **2** | **2** | **2** | **1** | **1** | **1** | **1** | **1** | **1** | **0** | **0** | **0** |
| **_Apodiformes_** | **Swifts and Hummingbirds** | **7** | **2** | **2** | **2** | **2** | **2** | **5** | **3** | **2** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **_Corsciiformes_** | **Kingfisher** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **1** | **0** | **0** | **0** |
| **_Paciformes_** | **Woodpecker and Allies** | **11** | **8** | **6** | **7** | **5** | **7** | **9** | **7** | **7** | **4** | **7** | **3** | **6** | **0** | **0** | **0** |
| **_Passeriformes_** | **Perching Birds** | **183** | **86** | **101** | **89** | **84** | **97** | **105** | **85** | **73** | **49** | **68** | **39** | **56** | **14** | **8** | **8** |
| *Tyrannidae* | Flycatchers | 15 | 8 | 8 | 8 | 8 | 9 | 10 | 8 | 4 | 6 | 8 | 3 | 5 | 0 | 0 | 0 |
| *Alaudidae* | Larks | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| *Hirundinidae* | Swallows | 7 | 5 | 6 | 1 | 6 | 5 | 6 | 6 | 5 | 5 | 4 | 2 | 3 | 0 | 0 | 0 |
| *Corvidae* | Jays, Magpies and Crows | 8 | 4 | 3 | 4 | 3 | 5 | 6 | 4 | 4 | 2 | 3 | 2 | 3 | 1 | 1 | 1 |
| *Paridae* | Titmice, Verdins, Bushtits | 6 | 2 | 1 | 4 | 1 | 2 | 4 | 3 | 3 | 2 | 2 | 1 | 2 | 0 | 0 | 0 |
| *Sittidae* | Nuthatches | 3 | 2 | 2 | 2 | 1 | 2 | 3 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Certhiidae* | Creepers | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Cinclidae* | Dippers | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Troglodytidae* | Wrens | 7 | 2 | 6 | 0 | 4 | 4 | 4 | 4 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Mimidae* | Mockingbirds and Thrashers | 4 | 1 | 3 | 2 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Turndidae* | Thrushes, Solitaires and Bluebirds | 12 | 5 | 6 | 2 | 5 | 5 | 8 | 7 | 8 | 7 | 4 | 3 | 2 | 3 | 1 | 1 |
| *Sylviidae* | Warblers, Gnatcatchers and Kinglets | 3 | 2 | 2 | 5 | 0 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| *Motacillidae* | Wagtails and Pipits | 2 | 0 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| *Bombycillidae* | Waxwings | 2 | 1 | 1 | 0 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| *Laniidae* | Shrikes | 2 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| *Sturnidae* | Starlings | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Vireonidae* | Vireos | 6 | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 3 | 0 | 3 | 0 | 1 | 0 | 0 | 0 |
| *Parulidae* | Wood Warblers | 36 | 22 | 24 | 25 | 9 | 21 | 14 | 10 | 13 | 7 | 14 | 7 | 14 | 0 | 0 | 0 |
| *Ploceidae* | Weaver Finches | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| *Icteridae* | Meadowlarks, Blackbirds and Orioles | 12 | 6 | 8 | 5 | 10 | 8 | 8 | 5 | 2 | 2 | 4 | 1 | 1 | 0 | 0 | 0 |
| *Thraupidae* | Tanagers | 2 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Fringillidae* | Grosbeaks, Finches, Sparrows and Buntings | 49 | 18 | 21 | 19 | 24 | 20 | 26 | 20 | 19 | 13 | 20 | 15 | 17 | 8 | 4 | 4 |
| **Total Number of Species** | | **394** | **161** | **178** | **178** | **166** | **191** | **198** | **163** | **143** | **109** | **136** | **91** | **127** | **63** | **54** | **34** |

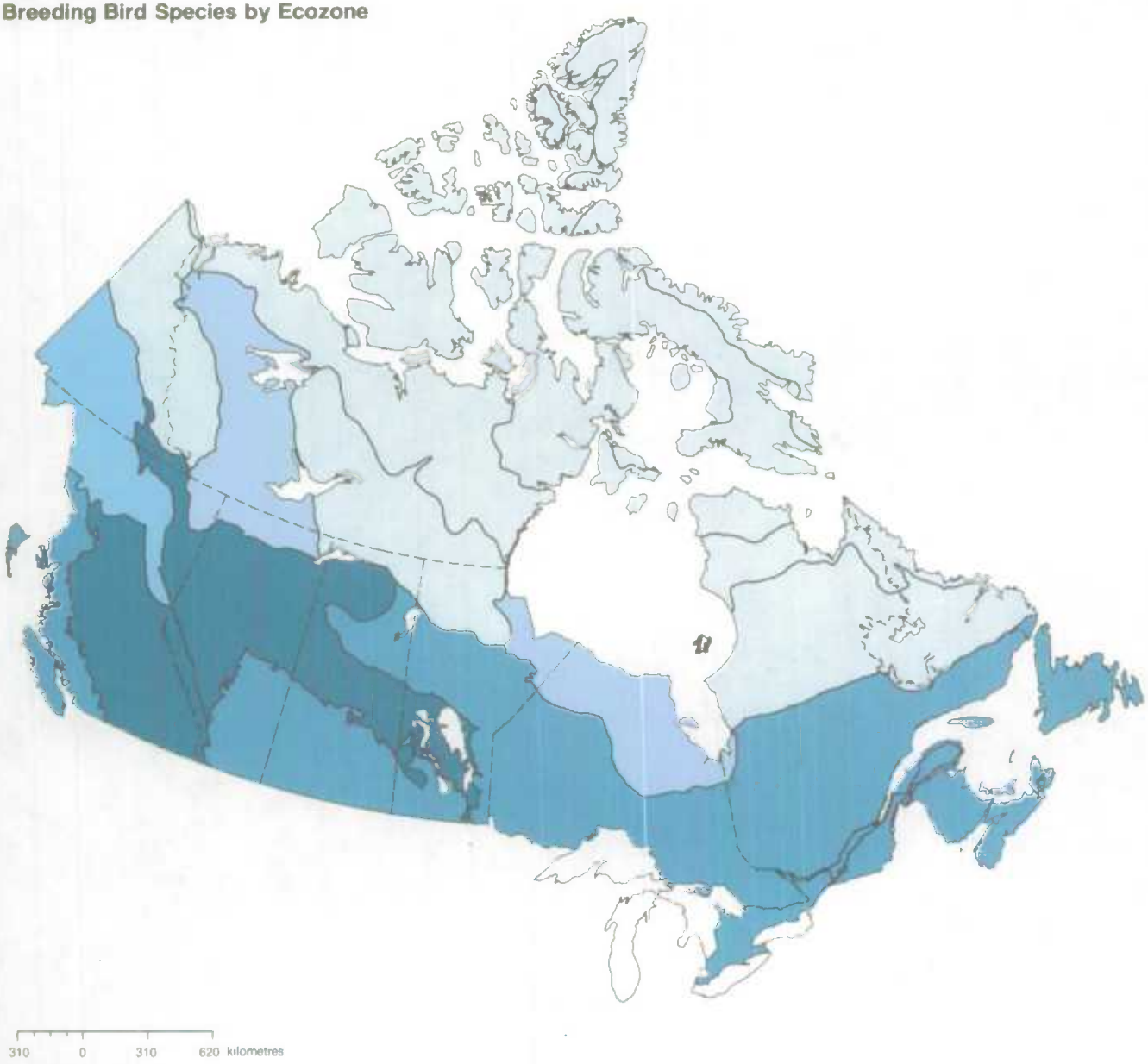
[1] Ecozone Abbreviations:

A.M. — Atlantic Maritime
M.P. — Mixed-Wood Plain
B.S. — Boreal Shield
Pr. — Prairie
B.P. — Boreal Plain
M.C. — Montane Cordillera
P.M. — Pacific Maritime
B.C. — Boreal Cordillera
T.C. — Tundra Cordillera
T.P. — Taiga Plain
T.S. — Taiga Shield
H.B.P. — Hudson Bay Plain
S.A. — Southern Arctic
N.A. — Northern Arctic
A.C. — Arctic Cordillera

**Sources:**
The National Museums of Canada, *The Birds of Canada*, by W. Earl Godfrey, 1979.
Special tabulation by the Office of the Senior Adviser on Integration, Statistics Canada.

**Note:**
This table presents number of bird species by Order with a further breakdown to the Family level for birds of prey, shorebirds and perching birds. A complete breakdown is also available. Refer to the note accompanying Table 7.1.1 for methodology details.

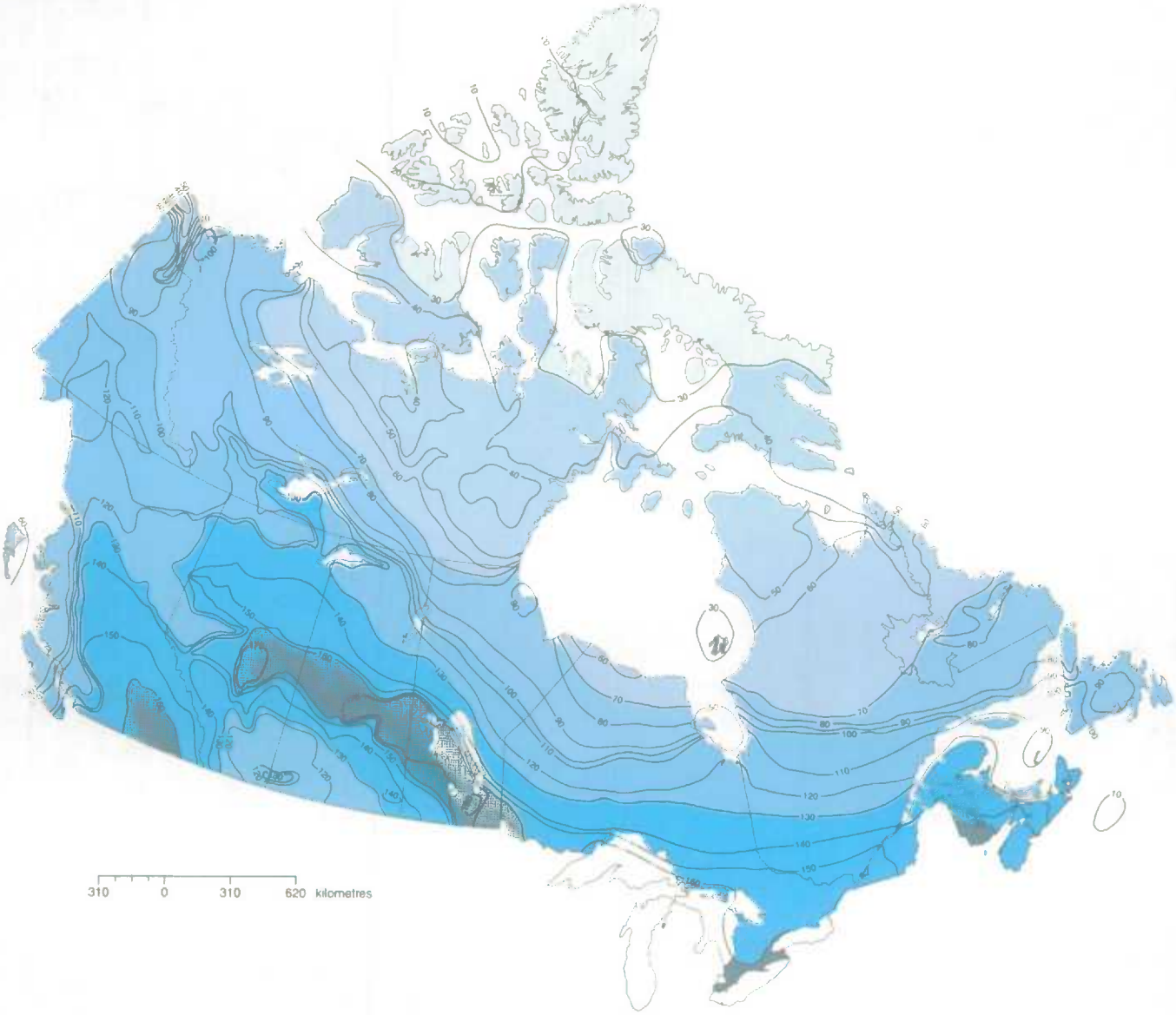
Map 7.1.7
**Breeding Bird Species by Ecozone**




**Sources:**
The National Museums of Canada, *The Birds of Canada*, W. Earl Godfrey, 1979.
Special tabulations by the Office of the Senior Adviser on Integration, Statistics Canada.

**Note:**
Refer to Table 7.1.1 for methodology details.

Map 7.1.8
## Breeding Bird Species




**Source:**
Environment Canada, Canadian Wildlife Service, Edmonton, map by A.R. Smith, based on National Museums of Canada, *The Birds of Canada*, by W. Earl Godfrey, 1979.

**Note:**
This map presents information complementary to Birds by Ecozone, Table 7.1.6 and Map 7.1.7. In both instances Godfrey's species range maps provided the base information. In this case, however, species were counted by grid cells and the resulting patterns were generalized by plotting species isolines.

Number of Bird Species

| | |
|---|---|
| | < 29 |
| | 30- 69 |
| | 70- 99 |
| | 100-129 |
| | 130-159 |
| | 160 + |

There are 394 bird species breeding in Canada.

Map 7.1.9
**Distribution of Caribou and Population of Major Herds**


[1] Major herds are defined as those having an estimated population of more than 35 000 adult caribou. Data are based on transect aerial photograph counts of animals at caribou calving areas.
[2] Kill statistics include licensed resident, non-resident and native kill combined.
[3] The Porcupine kill is Canadian kill only. Including Alaska kill the total was 2 281.
[4] More recent estimates indicate that the population of this herd may have increased significantly (possibly to as many as 600 000 animals).

**Sources:**
Environment Canada, Canadian Wildlife Service, unpublished information.
Indian and Northern Affairs Canada, Northern Environment Directorate.
Government of Québec, Ministry of Recreation, Hunting and Fishing.
Government of the Northwest Territories, Department of Renewable Resources, Wildlife Service.
Government of Yukon, Department of Renewable Resources.

**Major Caribou Herds**

| Herd | Population Estimate[1] | Survey Year | Kill Statistics 1982-83[2] |
|---|---|---|---|
| | thousands | | |
| 1. Porcupine | 110 | 1981 | 1 641[3] |
| 2. Bluenose | 40 | 1982 | 1 545 |
| 3. Bathurst | 180 | 1982 | 10 350 |
| 4. Beverly | 190 | 1982 | 6 030 |
| 5. Kaminuriak | 230 | 1983 | 6 339 |
| 6. Wager Bay | 120 | 1983 | 4 000 |
| 7. Baffin Island | 45 | 1978 | 9 000 |
| 8. George River | 300 | 1983[4] | 10 437 |

Map 7.1.10
**Distribution and Population of Polar Bear**


[1] Estimates are based on mark and recapture in 1981.
[2] Incidental kill includes: problem kill, handling death, illegal kill, unknown source of kill and natural deaths.
[3] Total for sub populations $A^a$ and $A^b$.

**Note:**
Kill and Quota statistics are for the 1982/1983 season.

**Source:**
Environment Canada, Canadian Wildlife Service, Edmonton, unpublished data.

**Polar Bear Population Statistics**

| Management Zone | Population Estimate 1981[1] | Hunting Kill | Incidental Kill[2] | Hunting Quota |
|---|---|---|---|---|
| $A^a$ | | 54 | 11 | 95 |
| $A^b$ | 1 500-1 800[3] | 15 | 0 | 25 |
| $A^c$ | 250 | 35 | 0 | 30 |
| B | 75 | 15 | 0 | 5 |
| C | .. | 141 | 6 | 137 |
| D | 700 | 98 | 11 | 99 |
| E | 1 100 | 89 | 11 | 81 |
| F | 1 800-2 000 | 99 | 6 | 104 |
| G | .. | 8 | 0 | 12 |
| H | 1 800 | 92 | 4 | 97 |
| **Canada Total:** | .. | **646** | **49** | **685** |

Table 7.1.11
## Animal Pelts Taken, 1982-83[1]

| Species | Newfound-land | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatch-ewan | Alberta | British Columbia | Northwest Territories | Yukon | Canada |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Badger | ... | ... | ... | ... | ... | 7 | 458 | 2 288 | 1 580 | ... | ... | ... | 4 333 |
| Black Bear | 0 | ... | 30 | 0 | 572 | 120 | 784 | 312 | 218 | 382 | 35 | 11 | 2 464 |
| Grizzly Bear | ... | ... | ... | ... | ... | ... | ... | ... | 0 | 12 | ... | ... | 12 |
| Polar Bear | ... | ... | ... | ... | 27 | 4 | ... | ... | 0 | ... | 196 | 0 | 227 |
| Beaver | 2 777 | 289 | 2 663 | 4 598 | 54 518 | 141 648 | 24 532 | 35 402 | 54 054 | 11 815 | 2 714 | 701 | 335 711 |
| Cougar | ... | ... | ... | ... | ... | ... | 0 | 0 | 0 | 15 | ... | 0 | 15 |
| Coyote | ... | ... | 72 | 797 | ... | 2 347 | 9 992 | 19 059 | 37 447 | 3 506 | 29 | 345 | 73 594 |
| Ermine | 1 874 | 10 | 1 215 | 932 | 7 134 | 3 941 | 5 991 | 6 650 | 10 827 | 3 840 | 357 | 154 | 42 925 |
| Fisher | ... | ... | 25 | 124 | 1 267 | 4 413 | 4 585 | 4 537 | 5 055 | 941 | 57 | 1 | 21 005 |
| Blue Fox | ... | ... | ... | ... | 12 | 106 | 10 | ... | 0 | ... | 59 | ... | 187 |
| Cross or Red Fox | 2 431 | 1 114 | 2 291 | 4 867 | 19 161 | 21 928 | 13 861 | 15 000 | 3 313 | 831 | 2 211 | 813 | 87 821 |
| Silver Fox | 193 | 49 | 29 | ... | 124 | ... | 194 | 123 | 151 | ... | 115 | 0 | 978 |
| Arctic Fox | 25 | ... | ... | ... | 285 | 0 | 1 288 | 75 | 20 | ... | 12 652 | 0 | 14 345 |
| Other Foxes | ... | ... | ... | ... | ... | 6 | 0 | ... | 0 | ... | ... | 0 | 6 |
| Lynx | 582 | ... | 3 | ... | 3 289 | 2 888 | 2 059 | 1 613 | 8 315 | 6 264 | 2 200 | 2 320 | 29 533 |
| Marten | 1 338 | ... | ... | 0 | 18 453 | 58 522 | 3 233 | 2 275 | 10 640 | 23 434 | 17 506 | 4 237 | 139 638 |
| Mink (wild) | 4 841 | 635 | 3 622 | 1 654 | 10 033 | 21 575 | 9 910 | 10 581 | 9 585 | 4 110 | 2 768 | 391 | 79 705 |
| Muskrat | 4 837 | 8 527 | 42 929 | 39 136 | 201 252 | 617 459 | 168 047 | 106 835 | 81 985 | 21 580 | 131 109 | 19 339 | 1 443 035 |
| Otter | 818 | ... | 450 | 277 | 3 320 | 10 189 | 1 627 | 976 | 272 | 429 | 42 | 50 | 18 450 |
| Rabbit | ... | ... | 0 | ... | ... | ... | 243 | 0 | 0 | ... | ... | ... | 243 |
| Raccoon | ... | 1 336 | 8 511 | 3 555 | 10 669 | 126 636 | 4 090 | 2 856 | 49 | 667 | ... | ... | 158 369 |
| Seal[2] | X | X | X | X | X | ... | ... | ... | ... | ... | 14 837 | ... | X |
| Skunk | ... | 0 | 19 | 69 | 223 | 536 | 69 | 4 | 62 | 22 | ... | ... | 1 004 |
| Squirrel | 1 498 | 63 | 8 554 | 771 | 5 427 | 7 652 | 39 482 | 52 243 | 144 877 | 79 348 | 2 746 | 6 024 | 348 685 |
| Bobcat | ... | ... | 1 164 | 653 | 176 | 47 | 0 | 26 | 50 | 184 | ... | ... | 2 300 |
| Wolf | 26 | ... | ... | ... | 3 605 | 1 154 | 424 | 288 | 611 | 184 | 523 | 168 | 6 983 |
| Wolverine | ... | ... | ... | ... | 0 | 26 | 141 | 22 | 103 | 265 | 137 | 336 | 1 030 |
| **Total** | **21 240** | **12 023** | **71 577** | **57 433** | **339 547** | **1 021 204** | **291 020** | **261 165** | **369 214** | **157 829** | **190 293** | **34 890** | **2 812 598** |

[1] Trapping season in most cases is the winter.
[2] Data on seal pelts taken in the Eastern Provinces are confidential as there are only two buyers; an X identifies data confidentiality.

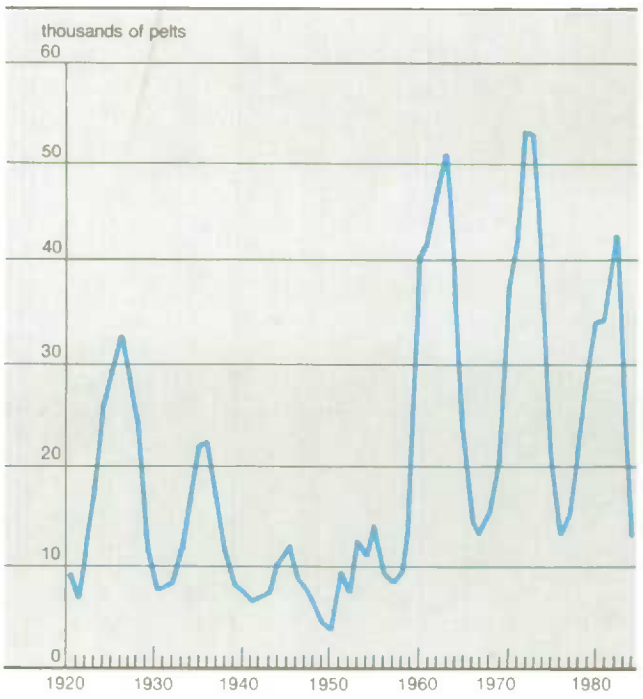
**Source:**
Statistics Canada, *Fur Production*, 1982-1983, Catalogue 23-207.

**Note:**
... indicates that species does not occur within the particular province or territory.

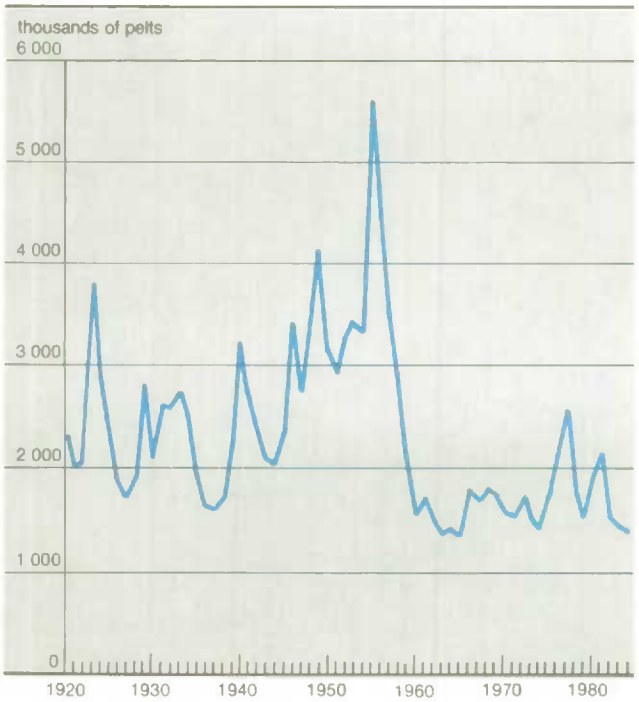
Chart 7.1.12
**Beaver, Lynx and Muskrat Pelts Taken, 1920 to 1984**

**Beaver**


**Lynx**




**Muskrat**




**Source:**
Statistics Canada, *Fur Production*, Catalogue 23-207, seasons 1919-20 to 1983-1984.

**Note:**
In Canada, fur harvest has been a traditional means of livelihood since the early settlement days. These data (time series since the 1920's) show great variation from year to year and apparent cycles from one decade to the next. In part this can be explained by trends in fur fashion (reflected in relative price change) and in part by the underlying population trends. Some species, like lynx, show frequent population variations due to natural factors such as availability of food source (i.e., snowshoe hare), perhaps combined with pressures from hunting. Other trends may reflect "over-harvesting" and subsequent recovery (beaver pelts taken since 1930 parallels, to some extent, the steady recovery of the underlying population). Price change (related to fashion) may be a major factor in the variation in muskrat pelts taken, although some time lags seem to exist.

Table 7.1.13
## Sport and Native Hunting Kills of Large Mammals, by Province, 1983

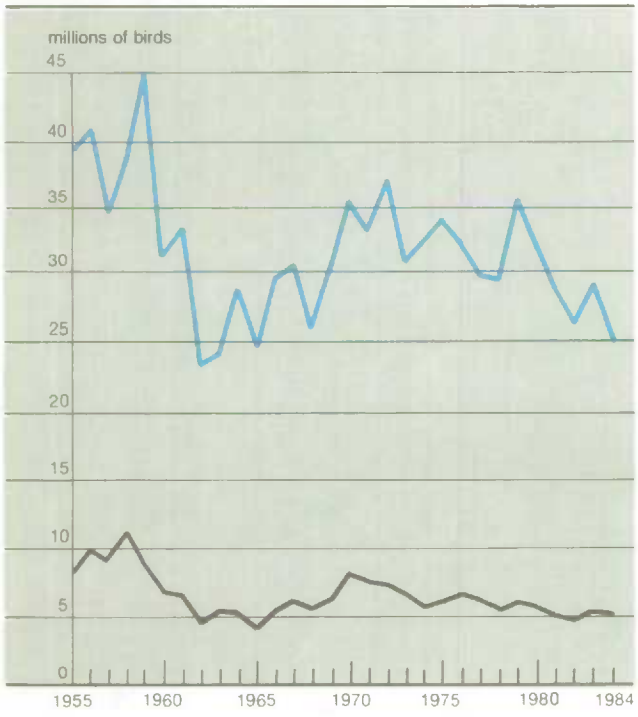
| Province | Moose | Deer | Caribou | Wapiti | Antelope | Mountain Sheep[1] | Mountain Goat | Bison[2] | Bear[3] | Mountain Lion | Wolf | Muskox |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Newfoundland | 7 444 | ... | 4 340 | ... | ... | ... | ... | 0 | 272 | ... | 50 | ... |
| Prince Edward Island | ... | ... | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... |
| Nova Scotia | 0 | 44 513 | ... | ... | ... | .. | ... | ... | 422 | ... | ... | ... |
| New Brunswick | 1 287 | 27 165 | ... | ... | ... | .. | ... | ... | 801 | ... | ... | ... |
| Québec | 11 799[4] | 3 849[4] | 7 052[4] | ... | ... | .. | ... | ... | 1 432[4] | ... | 0 | 0 |
| Ontario | 10 700[4] | 11 955[4] | ... | ... | ... | .. | ... | ... | 4 500[4] | ... | 0 | ... |
| Manitoba | 4 510 | 35 450 | 185 | 680 | ... | .. | ... | 0 | 1 570 | 0 | 450 | ... |
| Saskatchewan | 2 113 | 39 805 | 27 | 471 | 2 010 | .. | ... | 0 | 1 071 | 0 | 0 | ... |
| Alberta | 18 000 | 12 000 | ... | 18 000 | 1 000 | 255 | 26 | 0 | 5 050 | 33 | 0 | ... |
| British Columbia | 9 613 | 29 804 | 308 | 3 321 | ... | 426 | 924 | 0 | 4 375 | 159 | 333[4] | ... |
| Yukon | 1 081 | 0 | 1 222 | 0 | ... | 239 | 5 | ... | 215 | 0 | 45 | 0 |
| Northwest Territories | 691[4] | ... | 24 740[4] | ... | ... | 221[4] | 7[4] | 60[4] | 803[4] | ... | 0 | 207[4] |

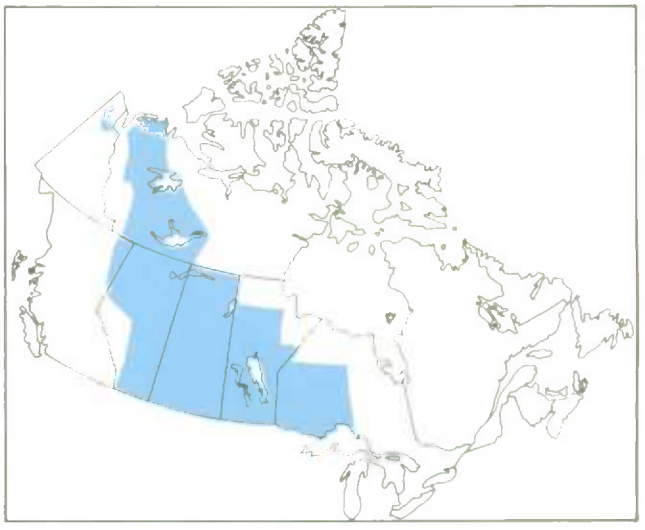
[1] Mountain sheep includes California bighorn, Dall's sheep, Rocky Mountain bighorn, and Stone's sheep.
[2] Bison hunting is only permitted in the Northwest Territories.
[3] Bear includes black, grizzly, and polar bear.
[4] 1982 data.

**Source:**
Environment Canada, Canadian Wildlife Service, and Government agencies in the Provinces and Territories responsible for wildlife.

**Note:**
These data are obtained from a number of different agencies and are largely estimates. Due to methodological differences some caution should be used in interpreting the figures. The data in all cases include sport hunting kills. In many cases they also include native kills. The figures for bear also include kills for the fur industry. For cougar and wolf, sport kills only are shown; additional cougar and wolves may have been killed for bounties and pelts. Québec and Yukon caribou kill data include both native and sports hunting. In Ontario and Alberta, only caribou hunting by natives is permitted and these figures are not reported. In both Manitoba and Saskatchewan only the kill of woodland caribou is reported. The kill of barren-ground animals is not available.

Chart 7.1.14
**Ducks on the Western Plains, 1955 to 1984**



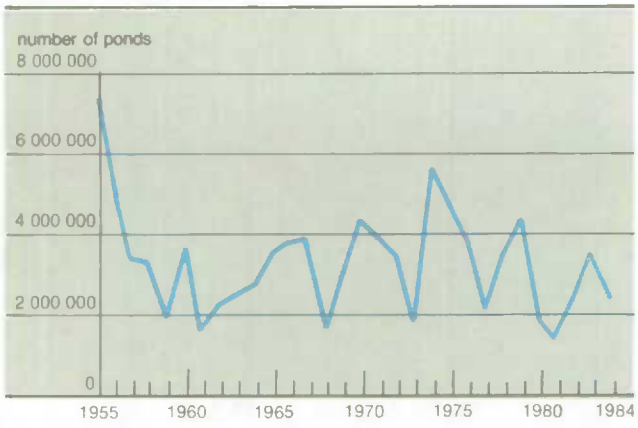
**Area of Waterfowl Breeding Population Surveys**

All ducks
Mallards

**Source:**
Environment Canada, Canadian Wildlife Service and United States Fish and Wildlife Service, Annual Waterfowl Breeding Population Survey.

**Note:**
Duck population estimates are derived from the Annual Waterfowl Breeding Population Survey which is taken annually by the United States Fish and Wildlife Service in cooperation with the Canadian Wildlife Service. The insert map outlines the survey area in Canada. The pond count shown in Graph 7.1.15 is also taken by this survey but restricted to the Prairies. The graphs illustrate the variability of the duck population and the number of ponds. Ponds are critical habitat for breeding ducks and duck populations correlate closely with the number of ponds.
The survey monitors populations of nineteen species. Dabbling ducks in the survey are: mallard, black duck, gadwall, wigeon, green-winged and blue-winged teal, shoveler and pintail. Diving ducks included in the survey are redhead, canvasback, scaup, ring-necked, golden-eye and bufflehead. Miscellaneous ducks counted are old squaw, eider, scoter, ruddy duck and merganser. Coot are also counted although they are not ducks.

Chart 7.1.15
**Prairie Ponds, 1955 to 1984**




**Source:**
Environment Canada, Canadian Wildlife Service and United States Fish and Wildlife Service, Annual Waterfowl Breeding Population Survey.

Table 7.1.16
## Migratory Birds Killed[1], by Province, 1983

| | Woodcock | Common Snipe | American Coot | Sandhill Crane | Mourning Dove | Band-tailed Pigeon | Ducks | Geese | Total |
|---|---|---|---|---|---|---|---|---|---|
| | thousands | | | | | | | | |
| Newfoundland | ... | 15.2 | ... | .. | ... | ... | 119.5 | 13.7 | 148.4 |
| Prince Edward Island | 0.7 | 0.2 | ... | .. | ... | ... | 36.1 | 15.7 | 52.8 |
| Nova Scotia | 3.4 | 2.1 | ... | .. | ... | ... | 117.3 | 9.7 | 132.5 |
| New Brunswick | 7.3 | 1.5 | ... | .. | ... | ... | 72.9 | 7.5 | 89.2 |
| Québec | 36.9 | 25.4 | 9.1 | .. | ... | ... | 454.0 | 83.8 | 609.1 |
| Ontario | 55.7 | 8.0 | 3.8 | ... | ... | ... | 888.4 | 72.7 | 1 028.5 |
| Manitoba | ... | 1.5 | 1.3 | 0.4 | ... | ... | 284.4 | 158.6 | 446.1 |
| Saskatchewan | ... | 1.1 | 2.0 | 2.7 | ... | ... | 381.7 | 210.1 | 597.7 |
| Alberta | ... | 8.4 | 3.9 | ... | ... | ... | 515.7 | 122.8 | 650.9 |
| British Columbia | ... | 3.5 | 0.3 | ... | 1.0 | 3.8 | 193.5 | 15.6 | 217.7 |
| Yukon | ... | ... | ... | ... | ... | ... | 13.0 | 2.7 | 15.8 |
| Northwest Territories | ... | ... | ... | ... | ... | ... | 3.0 | 0.4 | 3.3 |
| **Canada** | **103.9** | **66.9** | **20.4** | **3.1** | **1.0** | **3.8** | **3 079.5** | **713.3** | **3 991.9** |

[1] Estimates are based on the results of the National Harvest Survey (NHS). Questionnaires are mailed to purchasers of Canada migratory game bird hunting permits; thus other kills such as native hunting, illegal kills and subsequent deaths of injured birds are not included in these figures.

**Source:**
Environment Canada, Canadian Wildlife Service, 1984.

**Note:**
Individual items may not add to totals due to rounding.

Table 7.1.17
## Waterfowl[1] Killed[2], by Province, 1967 to 1983[3]

| Year | Newfound-land | Prince Edward Island | Nova Scotia | New Brunswick | Québec | Ontario | Manitoba | Saskatch-ewan | Alberta | British Columbia | Yukon | Northwest Territories | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | thousands | | | | | | | | | | | | |
| 1967 | 73.9 | 27.2 | 74.7 | 50.0 | 356.0 | 1 091.2 | 394.3 | 555.6 | 780.2 | 394.6 | .. | .. | 3 797.8 |
| 1968 | 87.2 | 27.6 | 81.4 | 66.7 | 361.2 | 828.9 | 316.4 | 365.9 | 518.6 | 387.7 | .. | .. | 3 021.6 |
| 1969 | 99.0 | 32.7 | 71.2 | 69.2 | 538.6 | 995.0 | 505.3 | 623.5 | 861.9 | 293.1 | .. | .. | 4 089.4 |
| 1970 | 105.6 | 39.4 | 84.3 | 66.9 | 553.3 | 930.5 | 565.9 | 1 062.3 | 1 005.1 | 304.8 | .. | .. | 4 717.9 |
| 1971 | 79.5 | 42.5 | 106.8 | 64.2 | 560.3 | 803.4 | 389.3 | 781.3 | 926.7 | 242.6 | .. | .. | 3 996.5 |
| 1972 | 97.4 | 30.8 | 83.7 | 60.0 | 466.5 | 858.2 | 421.0 | 706.5 | 894.7 | 273.3 | .. | .. | 3 892.1 |
| 1973 | 119.2 | 25.1 | 123.7 | 55.1 | 547.0 | 793.8 | 341.3 | 588.8 | 933.6 | 267.4 | .. | .. | 3 795.1 |
| 1974 | 112.1 | 42.7 | 110.6 | 61.8 | 623.3 | 859.1 | 338.1 | 790.7 | 1 107.5 | 225.5 | .. | .. | 4 268.4 |
| 1975 | 109.8 | 34.8 | 127.4 | 62.0 | 520.1 | 989.1 | 451.6 | 964.4 | 971.2 | 249.0 | 5.4 | 11.2 | 4 496.2 |
| 1976 | 106.9 | 55.6 | 128.8 | 75.1 | 656.1 | 1 026.8 | 450.8 | 955.8 | 999.2 | 242.7 | 4.1 | 30.9 | 4 733.0 |
| 1977 | 145.4 | 48.8 | 143.4 | 56.3 | 703.2 | 980.1 | 335.5 | 630.3 | 894.6 | 270.6 | 3.2 | 21.3 | 4 233.0 |
| 1978 | 155.7 | 41.9 | 116.4 | 69.1 | 637.6 | 1 007.7 | 485.4 | 665.8 | 689.6 | 223.1 | 3.4 | 20.4 | 4 116.2 |
| 1979 | 135.8 | 31.5 | 94.5 | 51.7 | 540.0 | 921.5 | 579.1 | 735.1 | 784.1 | 221.5 | 3.5 | 10.5 | 4 108.8 |
| 1980 | 116.9 | 50.8 | 133.2 | 63.0 | 623.3 | 998.1 | 505.3 | 614.9 | 822.0 | 205.0 | 3.6 | 12.5 | 4 148.5 |
| 1981 | 124.4 | 40.6 | 121.2 | 63.3 | 563.8 | 902.9 | 441.7 | 414.6 | 651.1 | 208.1 | 1.8 | 5.0 | 3 538.6 |
| 1982 | 131.8 | 53.1 | 93.0 | 63.3 | 586.1 | 934.3 | 437.6 | 475.1 | 578.1 | 180.7 | 1.1 | 3.1 | 3 537.4 |
| 1983 | 133.2 | 51.8 | 127.1 | 80.4 | 537.8 | 961.1 | 443.0 | 591.9 | 638.6 | 209.0 | 3.3 | 15.7 | 3 792.9 |

[1] Waterfowl refers to ducks and geese only.
[2] Estimates are based on the results of the National Harvest Survey (NHS). Questionnaires are mailed to purchasers of Canada migratory game bird hunting permits; thus other kills such as native hunting, illegal kills and subsequent deaths of injured birds are not included in these figures.
[3] The Survey was first taken in 1966 and was expanded to include Yukon and the Northwest Territories after 1974.

**Source:**
Environment Canada, Canadian Wildlife Service, 1984.

**Note:**
Individual items may not add to total due to rounding.

Table 7.1.18
## Mammal Species in Jeopardy

| Species | Status | Critical Habitat | Comments | Probable Stress/Limiting Factors |
|---|---|---|---|---|
| Vancouver Island Marmot | endangered | alpine and subalpine areas, steep slopes, talus debris, open meadows | total population between 50 and 100 animals,<br>long-term population decline | loss of habitat |
| St. Lawrence Beluga | endangered | St. Lawrence Estuary | long-term declining population, reduced range | hunting,<br>human disturbance — movement of ships, commercial fishing,<br>loss of habitat — dredging, port and marine development, dam construction, dumping, resource exploration,<br>pollutants and contaminants — chemical and thermal |
| Humpback Whale | threatened | waters of Canada's east and west coast | officially protected from commercial whaling since 1955 | hunting — although protected, native kill unknown,<br>loss of food source — availability of primary food, capelin, affected by fisheries |
| Bowhead Whale | endangered | winter: southern edge of pack-ice | long-term population decline, only 2,300 animals remain | hunting — commercially overharvested |
| Right Whale | endangered | coastal waters of both coasts of North America, from tropics to the subarctic | long-term population decline, only 100-200 animals remain | hunting — commercially overharvested |
| Swift Fox | extirpated | native prairie | extirpated since the 1930's,<br>serious decrease in North American range,<br>re-introduction programs underway | hunting — overharvested as a furbearer,<br>pest control program — secondary poisoning from wolf control,<br>loss of habitat |
| Long-tailed Weasel (*M.f.longicauda*) | threatened | aspen parkland of prairies | population decline over the past 50 years | loss of habitat — agricultural activities,<br>loss of food source — decreased numbers and diversity of prey species |
| Black-footed Ferret | extirpated | native prairie | very dependent on its major prey, the prairie dog | loss of food source |
| Sea Otter | endangered | Pacific Coast | wiped out in Canada by the 1930's, re-introduced to coastal waters of Vancouver Island,<br>stable population at present | hunting — commercially overharvested |
| Eastern Cougar (Mountain Lion) (*F.c.couguar*) | endangered | mixed and coniferous forests | long-term population decline | hunting,<br>loss of food source — limited deer populations,<br>human disturbance |
| Peary Caribou | threatened | Arctic Islands (except Baffin)<br>summer: forage slopes of river valleys and upland plains<br>winter: beach ridges | extreme variability in population | hunting,<br>climatic vulnerability |
| Woodland Caribou | | | | |
| (Dawson) | extinct | Queen Charlotte Islands | | hunting |
| (Maritime) | threatened | Gaspé region, upland forest | now protected in a provincial park | loss of habitat — unsuitable habitat threatens herd viability and amplifies effects of other stresses<br>hunting,<br>disease — parasite infections |
| Wood Bison | endangered | summer: upland prairies, open forests and sand ridges<br>winter: near lakes | long-term population decline has been reversed,<br>re-introduction programs are providing protected ranges | hunting,<br>disease |

**Sources:**
Environment Canada, Canadian Wildlife Service, Committee on the Status of Endangered Wildlife in Canada, various status reports.
N. Novakowski, Environment Canada, Canadian Wildlife Service, unpublished information.
C.G. von Zyll de Jong, National Museums of Canada, unpublished information.

**Note:**
Species status refers to the degree to which a species is in jeopardy. COSEWIC recognizes a number of degrees of danger to species. Definitions for the ones presented in this table and Tables 7.1.19, 7.1.20 and 7.1.21 are as follows:

THREATENED SPECIES: Any indigenous species of fauna or flora that is likely to become endangered in Canada if the factors affecting its vulnerability do not become reversed.
ENDANGERED SPECIES: Any indigenous species of fauna or flora whose existence in Canada is threatened with immediate extinction through all or a significant portion of its range, owing to the action of man.
EXTIRPATED SPECIES: Any indigenous species of fauna or flora no longer existing in the wild in Canada but existing elsewhere.
EXTINCT SPECIES: Any species of fauna or flora formerly indigenous to Canada but no longer existing anywhere.
The complete COSEWIC list is presented as Appendix Table 7.1.

Table 7.1.19
**Bird Species in Jeopardy**

| Species | Status | Critical Habitat | Comments | Probable Stress/Limiting Factors |
|---|---|---|---|---|
| White Pelican | threatened | breeding: remote, inaccessible islands | long-term population decline | human disturbance |
| Peregrine Falcon (*tundrius*) | threatened | breeding: tundra region, nesting: cliffs | long-term population decline | pollution and contaminants — DDE residues leading to reproductive failure (egg shell thinning) |
| (*anatum*) | endangered | breeding: taiga region, nesting: cliffs | almost extirpated | human disturbance — egg collectors, taking of young for falconry, hunting, loss of habitat |
| Ferruginous Hawk | threatened | open grasslands | greatly reduced breeding distribution | loss of habitat, loss of food source — decrease in prey |
| Greater Prairie Chicken | endangered | open, undisturbed native grasslands | almost extirpated | loss of habitat |
| Whooping Crane | endangered | breeding: generally Wood Buffalo National Park | long-term population decline, now stable but small population | hunting — accidental shooting, loss of habitat |
| Piping Plover | endangered | breeding: on ocean beaches or along inland lakes and sloughs | generally uncommon, periodic population declines | hunting, human disturbance |
| Eskimo Curlew | endangered | breeding: tundra and lichen woodland | almost disappeared between 1880 and 1895 | human disturbance, hunting, habitat loss |
| Burrowing Owl | threatened | heavily grazed pastures | long-term population decline | human disturbance, pollution and contaminants — insecticides, pesticides, loss of habitat — land development |
| Kirtland's Warbler | endangered | dense jack-pine stands | long-term population decline, now seems to be stabilized | loss of habitat, introductions — nest parasitism (brown-headed cowbird) |
| Henslow's Sparrow | threatened | open fields and meadows, breeds in southern Ontario | population decline during the past 30 years | loss of habitat — land development |

**Sources:**
Environment Canada, Canadian Wildlife Service, Committee on the Status of Endangered Wildlife in Canada, various status reports.
National Museums of Canada, unpublished information.

**Note:**
Refer to note accompanying Table 7.1.18 for an explanation of species status.

Table 7.1.20
**Fish and Reptile Species in Jeopardy**

| Species | Status | Critical Habitat | Comments | Probable Stress/Limiting Factors |
|---|---|---|---|---|
| Acadian Whitefish (fish) | endangered | Tusket and Petit rivers in southern Nova Scotia | less than 500 specimens in the Petit River | fishing — were commercially exploited, human disturbance — development (ie. hydro-electric dam, fish ladders) led to easier capture, pollution and contaminants — acidification of habitat due to acid rain |
| Shorthead Sculpin (fish) | threatened | found only in the Flathead River in southeastern British Columbia | very small population | pollution and contaminants — run off from coal mines contributes to stream turbidity and acidity which affect reproductive success |
| Longjaw Cisco (fish) | extinct | formerly abundant in Lakes Michigan and Huron, small population was also found in Lake Erie | none have been caught since 1968 | fishing — intensive fishing pressure and sea lamprey predation |
| Blue Walleye (fish) | extinct | formerly occured in Lake Erie, lower Niagara River and western Lake Ontario | none have been caught since the 1960s, historically, this species was of great importance in commercial and sport fishery | fishing — intensive fishing pressure, competition — interspecies competition and predation on young fish, loss of habitat — eutrophication of the bottom waters forced fish into deeper waters of eastern basin of Lake Erie, species were highly dependent on sight for prey capture and this became impeded as water clarity declined. |
| Gravel Chub (fish) | endangered | Thames River drainage basin, prefers clear to moderately turbid streams with consistent flow | none have been caught since 1958, peripheral species in Canada | loss of habitat — due to siltation of gravel-bottomed rivers and streams, possibly due to human development. |
| Leatherback Turtle (reptile) | endangered | marine beaches which serve as nesting areas | designated endangered in Canada because of similar international status | predation |

**Sources:**
Environment Canada, Canadian Wildlife Service, Committee on the Status of Endangered Wildlife in Canada.
National Museums of Canada, unpublished information.

**Note:**
Refer to note accompanying Table 7.1.18 for an explanation of species status.

Table 7.1.21
**Plant Species in Jeopardy**

| Species | Status | Distribution | Comments | Probable Stress/Limiting Factors |
|---|---|---|---|---|
| Furbish's Lousewort (*Pedicularis furbishiae*) | endangered | banks of the upper Saint John River, New Brunswick | herb, about 600 plants remain in Canada | loss of habitat — destruction of riverside areas by farming, forestry, industrial operations, flooding, and hydro-electric projects |
| Small White Lady's Slipper (*Cypripedium candidum*) | endangered | tall grass prairie, fens, swampy meadows, remnant prairies, edge of thickets | orchid, long-term decline throughout its range | loss of habitat — agricultural and urban development |
| Tyrell's Willow (*Salix planifolia ssp. tyrellii*) | threatened | beach dunes and active sand dunes, only found on the south shore of Lake Athabasca, Saskatchewan | herb, very limited distribution, species unique to Canada | loss of habitat — threatened by proposed road development between Lake Athabasca and Cluff Lake uranium mines; pollution and contaminants — acid rain from tar sands operations in Alberta (plants grow in calcium-poor sand dunes) |
| Athabasca Thrift (*Armeria maritima ssp. interior*) | threatened | three localities in Canada (on the south shore of Lake Athabasca, Saskatchewan), restricted to relatively stable ridges and plains comprised of glacial till covered by a veneer of gravel (also grows in moist depressions between active sand dunes) | herb, very limited distribution, species unique to Canada | loss of habitat — threatened by proposed road development between Lake Athabasca and Cluff Lake uranium mines; pollution and contaminants — acid rain from tar sands operations in Alberta |
| Small Whorled Pogonia (*Isotria medeoloides*) | endangered | one site in Elgin County, Ontario | the rarest orchid in northeastern U.S. and Canada, only 2 plants in Ontario (1980) | human disturbance — rarity attracts attention, loss of habitat |
| Kentucky Coffee Tree (*Gymnocladus dioica*) | threatened | in Canada exists only in southern-most Ontario | used as an ornamental | loss of habitat |
| Blue Ash (*Fraxinus quadrangulata*) | threatened | southern Ontario | largest population is 200 trees on Pelee Island | loss of habitat — land clearing, especially flood plain forests; human disturbance — grazing in seedling areas has affected reproduction |
| Southern Maidenhair Fern (*Adiantum capillus-veneris*) | endangered | Fairmont Hot Springs, B.C. | plant size, number of plants and sites are decreasing | loss of habitat — reduced hot water flow and increased competion from herbacious species |
| Plymouth Gentian (*Sabatia kennedyana*) | threatened | gravelly, peaty margins of lakes in the lowest portions of the Tusket River valley, Yarmouth County, Nova Scotia | herb, apparently intolerant of competition | human disturbance — reservoir construction has changed water levels; cottage development |
| Pink Coreopsis (*Coreopsis rosea*) | endangered | found only in Tusket River Valley, Nova Scotia, restricted to gravelly margins of lakes | herb, range has decreased significally since the 1930's | human disturbance — increased cottage development and use of off-road vehicles |

Table 7.1.21
**Plant Species in Jeopardy (concluded)**

| Species | Status | Distribution | Comments | Probable Stres/Limiting Factors |
|---|---|---|---|---|
| American Water-Willow (*Justicia americana*) | threatened | occupies the flood plains of streams in Ontario and Quebec | aquatic plant (herb) | climatic vulnerability — at northern limits of its range; pollutants and contaminants — industrial pollutants; loss of habitat — land development; natural competition — alligator grass |
| Giant Helleborine (*Epipactis gigantea*) | threatened | four localities in southern British Columbia, Fairmont Hot Springs has the largest population | orchid | human disturbance — reduction of run-off from hot springs |
| Pink Milkwort (*Polygala incarnata*) | endangered | prairies and meadows, found at only two sites in Lambton County, Ontario | herb, only about 100 plants left, previously common at one of the sites | loss of habitat — expansion of agricultural land use |
| Mosquito Fern (*Azolla mexicana*) | threatened | four localities in Canada, all within a thirty five square kilometre area on the south side of Sushwap Lake, British Columbia | requires fluctuating water levels and thrives within a relatively narrow range of water chemistry, under suitable conditions reproduces rapidly to form millions of plants within weeks | pollutants and contaminants — potential chemical and oil spills, road salt effects |
| Cucumber Tree (*Magnolia acuminata*) | endangered | limited distribution in southwestern Ontario, nine sites | rapid decline in populations has occurred, only a few seed bearing trees remain | human disturbance — decline due mainly to lumbering and forest clearing |
| Heart-Leaved Plantain (*Plantago cordata*) | endangered | moist depressions in undisturbed, shaded, deciduous woodland, one site remains extant in Canada on the eastern shore of Lake Huron | plantain, approximately 300 plants remain on Canadian site, reduced population throughout North American range | loss of habitat — development; human disturbance — collecting by natives for medicinal purposes |
| Eastern Prickly Pear Cactus (*Opuntia humifusa*) | endangered | restricted to four confirmed locations in southeastern Ontario | cactus | loss of habitat — changes in vegetation cover, agricultural expansion; human disturbance — collecting |
| Bluehearts (*Buchnera americana*) | threatened | found only on a narrow stretch of Lake Huron's shoreline in Lambton County, Ontario | herb, approximately 2200 plants (1981) | loss of habitat — cottage development |
| Water Pennywort (*Hydrocotyle umbellata*) | endangered | found in only two localities in southeastern Nova Scotia - Wilson's Lake and in Kejimkujik Lake | small creeping aquatic plant of tropical origin, reaches northern limit of its range in Canada | loss of habitat — cottage development aquatic recreation activities |

**Sources:**
Environment Canada, Canadian Wildlife Service, The Committee on the Status of Endangered Wildlife in Canada, *Status Reports*.
Dr. E. Haber, National Museums of Canada, Botany Division, unpublished information.

**Note:**
Refer to Table 7.1.18 for a discussion of status.

Table 7.1.22
**Non-Native[1] Mammal Introductions**

| Species | Introduction Where/When | Origin | Status | Intentional or Accidental Release |
|---|---|---|---|---|
| European Hare | nine animals escaped from captivity at Brantford, Ontario in 1912, intentional introductions at Fort William, Ontario in the 1940's | Germany | well established in Southern Ontario, unsuccessful in more northern areas | accidental and intentional |
| Snowshoe Hare | Newfoundland in 1864, Anticosti Island, Québec, 1902-03 | Canadian mainland | established on both islands | intentional |
| Masked Shrew | Newfoundland in 1958 for larch sawfly control | Canadian mainland | spread over much of the island | intentional |
| Eastern Fox Squirrel | Pelee Island, Ontario, about 1890 | Ohio | firmly established and common in areas of suitable habitat | intentional |
| Black Rat | coastal B.C., arrived with early settlement | southern Asia | well established in settled areas, seaports | accidental |
| Alexandrian Rat | Queen Charlotte Islands, and lower B.C. mainland, arrived with settlers from the orient | Asia | well established | accidental |
| Norway Rat | around 1775 | Europe, Asia | found in most settled areas of Canada | accidental |
| House Mouse | arrived with first Europeans | Europe, Asia | found in most settled areas of Canada | accidental |
| Nutria (Coypu) | Fraser River delta, B.C.,<br>Ottawa River drainage of west Québec and eastern Ontario | South America | introduced to North America as a ranch fur-bearer, escaped animals established feral populations, cold climate restricts their range in Canada | intentional and accidental |
| Sea Otter | Burnaby Island, B.C., 1969 (native to B.C. Coast but extripated around 1900) | Alaska | status is uncertain | intentional |
| Reindeer | Newfoundland, 1907, (mainland in 1918)<br>Rocky Bay, Québec, 1918, later to Anticosti Island<br>Great Slave Lake area, NWT, 1911<br>Mackenzie River delta, 1935 | Norway, Alaska | unsuccessful on Anticosti Island, and in Great Slave Lake area, Mackenzie delta herd remains strong | intentional |
| Moose | Newfoundland in 1878 and 1904, Cape Breton Island, Nova Scotia in 1947 and 1948, Anticosti Island, Québec, early 1900's, Southern Labrador in 1953 | Canadian range | flourishing in Newfoundland | intentional |
| Red Deer | British Columbia, 1913 | New Zealand | unsuccessful, population decline began in 1940's | intentional |
| Fallow Deer | James Island, B.C., about 1895 (other releases on different islands, early 1900's) | Mediterranean Region and Asia | successful, flourishing on James, Saltspring, and Sidney Islands, B.C. | intentional |
| White-tailed Deer | Anticosti Island in 1896, Prince Edward Island in 1949 | Canadian mainland | flourishing on Anticosti Island, surviving on Prince Edward Island | intentional |

[1] Non-native species are those introduced into an area outside their natural range. This includes from one location to another within the same country. Only the major introductions of this latter type are listed here.

**Sources:**
Environment Canada, *Exotic Mammals and Birds in Canada — An Historical Review*, by N. Novakowski, G. Moore, P. Reilly, 1975 (unpublished).
National Museums of Canada *The Mammals of Canada*, by A.W.F. Banfield, 1977.

Table 7.1.23
**Non-Native Bird Introductions**

| Species | Introduction Where/When | Origin | Status | Intentional or Accidental Release |
|---|---|---|---|---|
| Northern Japanese Green Pheasant | Prince Edward Island | Japan | unsuccessful release | intentional |
| Ring-Necked Pheasant | Newfoundland, near St. John's, 1950's (escaped from commercial poultry establishment), New Brunswick, Prince Edward Island and Ontario, 1900, Manitoba, 1950's, Saskatchewan, 1940's, British Columbia, many releases between 1882 and 1960, Yukon, 1950's | Asia | established in St. John's area, Maritime introductions surviving, successfully established in Ontario, some surviving in Manitoba, successfully established in southern British Columbia and the Queen Charlotte Islands, unsuccessful in Yukon | Newfoundland release accidental, others intentional |
| Coturnix Quail | Québec, 1875 and 1932, Ontario, 1875 and recently | Italy | last sighted in Québec in 1947, present status unknown | intentional |
| California Quail | near Victoria, B.C., 1860 and 1870's, Vancouver Island and mainland B.C., 1890's, other areas of B.C., early 1900's | western U.S.A. | well established on Vancouver Island but populations are relatively low | intentional, natural migration |
| Mountain Quail | Victoria, B.C., 1860-61, other releases in Fraser Valley, Vancouver Island 1870-1880's | western U.S.A. | small populations established on Vancouver Island | intentional |
| Gray Partridge | Prince Edward Island, 1930, Nova Scotia, 1926, New Brunswick, 1926, southwestern Québec and Ontario, late 1930's, Manitoba, Saskatchewan and Alberta, 1908, southern interior of B.C., 1904 | Czechoslovakia, Hungary | generally successful except in New Brunswick | intentional |
| Chukar Partridge | Prince Edward Island and New Brunswick, southern B.C., 1950-55 southern Saskatchewan and Manitoba, 1938 | U.S.A. | Maritime introduction unsuccessful, British Columbia population established, few birds surviving in the Prairies | intentional |
| Wild Turkey | Maritimes, Prairies, West Coast, and southern Ontario | U.S.A. (Canadian species extirpated by 1902 due to habitat loss) | reintroduction attempts have been made in its former Canadian range | intentional |
| Rock Dove (Pigeon) | 1906 | Europe | very common across southern Canada, mainly around human settlements | intentional |
| English Skylark | near Victoria, B.C., 1903 and 1913 | Europe | well established | intentional |
| Common Starling | introduced to North America at New York in 1890, spread to Canada by 1914 | Europe | established across Canada by 1950 | intentional |
| Crested Mynah | Vancouver, B.C. in 1897 | Orient | established in the Vancouver area | accidental |
| House Sparrow | New York in 1850, first Canadian releases in Québec and Halifax | England | established across Canada by 1890 | intentional |

**Sources:**
Environment Canada, *Exotic Mammals and Birds in Canada — An Historical Review* by N. Novakowski, G. Moore, P. Reilly, 1975 (unpublished).
National Museums of Canada, *The Birds of Canada* by W. Earl Godfrey, 1979.

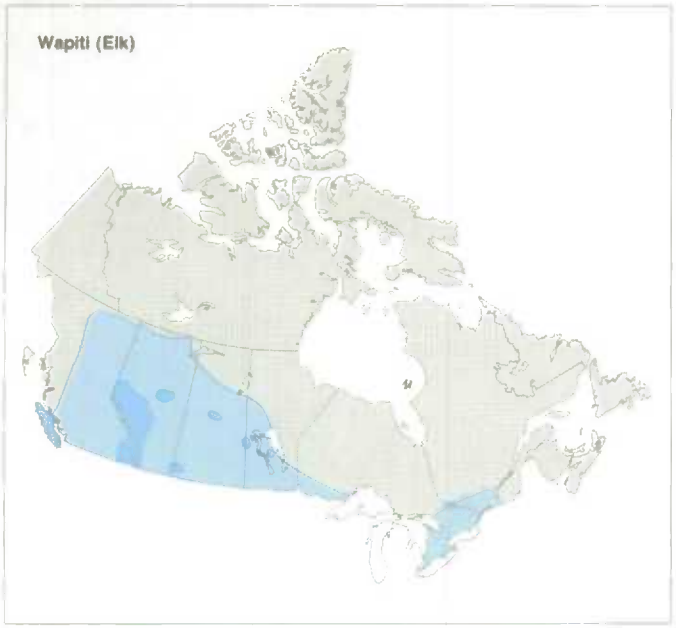
Table 7.1.24
## Exotic[1] Fish Introductions[2]

| Species | Introduction Where/When | Natural Distribution | Status | Intentional or Accidental Release |
|---|---|---|---|---|
| Danube Salmon (*Hucho hucho*) | Québec in 1969 | Czechoslovakia (Danube River) | unsuccessful introduction | intentional for sport fishing |
| Cherry Salmon (*Oncorhynchus masou*) | Algonquin Park, Ontario in 1965 | Japan (Shirbetsu River) | unsuccessful introduction | intentional for sport fishing |
| Golden Trout (*Salmo aquabonita*) | British Columbia in 1959, also in Alberta | Wyoming | established | intentional for sport fishing |
| Brown Trout (*Salmo trutta*) | Newfoundland in 1884-1886, 1892, 1905, Nova Scotia in 1925, New Brunswick in 1921, Québec in 1890, 1951, Ontario in 1913-1918 and other years, Manitoba various years since 1943, Saskatchewan and Alberta in 1924, B.C. beginning in 1932 ending in 1961. | Europe | established, in some cases they have dispiaced native trout as dominant species | intentional for sport fishing |
| Alaska Blackfish (*Dallia pectoralis*) | southern Ontario in 1956 | Alaska | unsuccessful introduction | intentional |
| Goldfish (*Carassius auratus*) | throughout Canada | eastern Asia | surviving, in some cases common, hybridization with carp | deliberate illegal introductions and accidental releases |
| Common Carp (*Cyprinus carpio*) | Ontario in 1880 and 1891, Manitoba in 1885, 1886, 1889, B.C. in 1970's | Asia and Europe | established and abundant, competes with native species | intentional and accidental releases |
| Mosquito fish (*Gambusia affinis*) | Manitoba in 1958, B.C. in 1928, Alberta (Banff) in 1924 | U.S.A. | established in Alberta, unsuccessful elsewhere | intentional, mosquito control experiment |
| European Flounder (*Platichys flesus*) | Lake Erie, Lake Superior | Europe | unknown | accidentally released from ballast water of European ships |

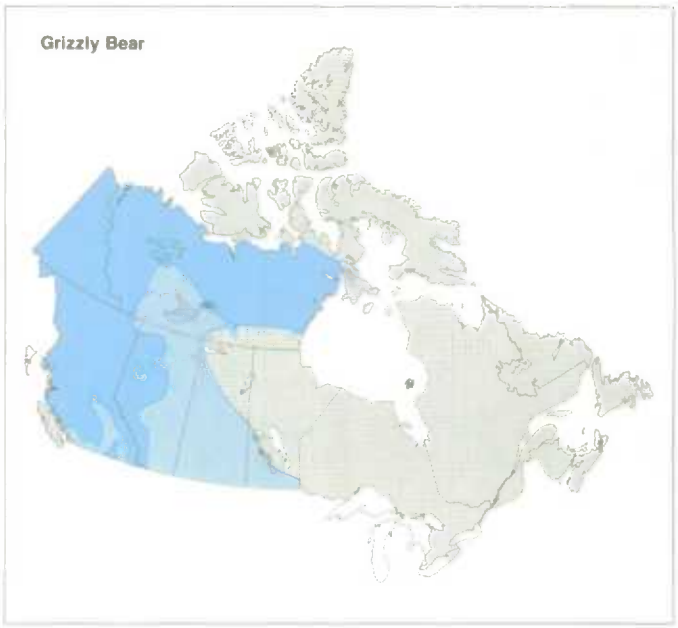
[1] Exotic species are any introduced by man from another country.
[2] This table details introductions of fish from outside Canada. A number of species, however, have been introduced to new ranges within Canada by man's action. The population of the upper Great Lakes by the Lamprey as a result of the construction of the Welland Canal is perhaps the best known example of this. Another is the introduction of West Coast salmon species to the Great Lakes. In addition to the introductions listed here there have been very localized releases of exotics. The hot springs of Banff National Park in Alberta, for example, have been the habitat at various times to a host of tropical species including Guppies, Swordtails, Jewelfish and Cichlids released by aquarists.

**Source:**
E.J. Crossman, "Introduction of Exotic Fishes to Canada" Chapter 5 in *Distribution, Biology and Management of Exotic Fishes*, edited by W. Courtenay and J. Stauffer, Jr., The John Hopkins University Press, Baltimore, 1984.

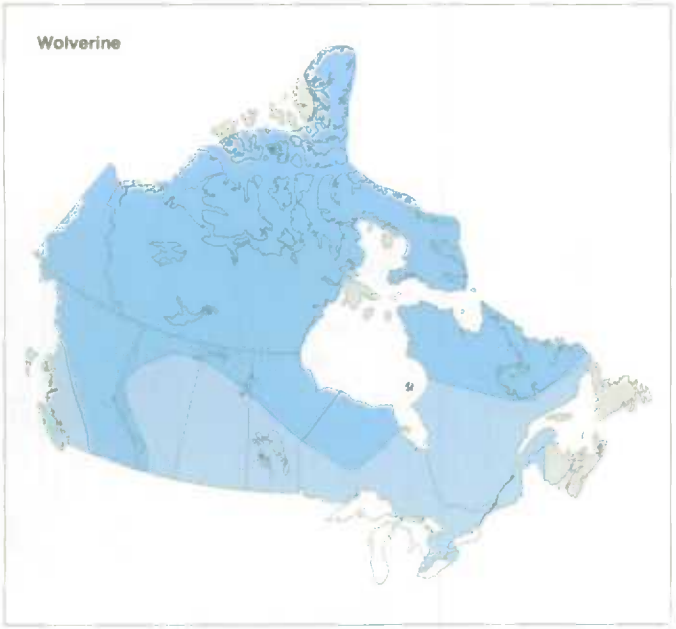
Map 7.1.25
## Range Change of Selected Species



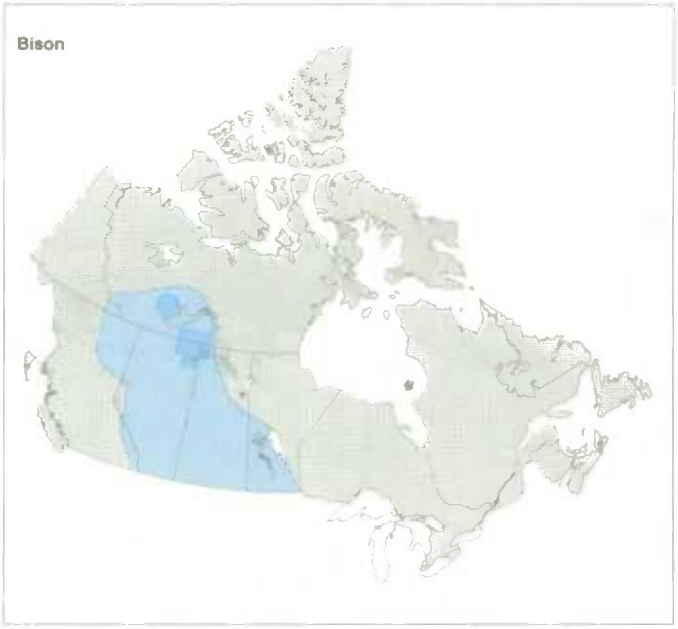

**Source:**
The National Museums of Canada, *The Mammals of Canada*, by W.F. Banfield, 1977.




**Source:**
Environment Canada, Committee on the Status of Endangered Wildlife in Canada, *Grizzly Bear Status Report*, 1984.



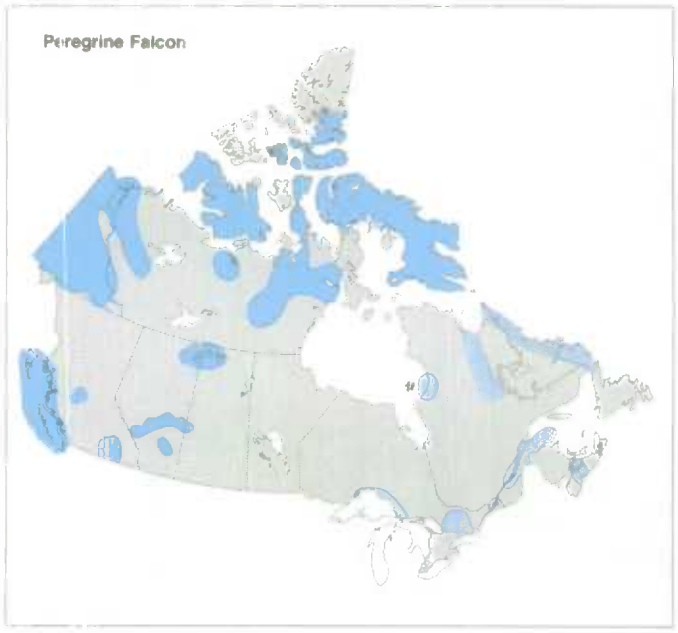

**Source:**
Environment Canada, Committee on the Status of Endangered Wildlife in Canada, *Wolverine Status Report*, 1984.



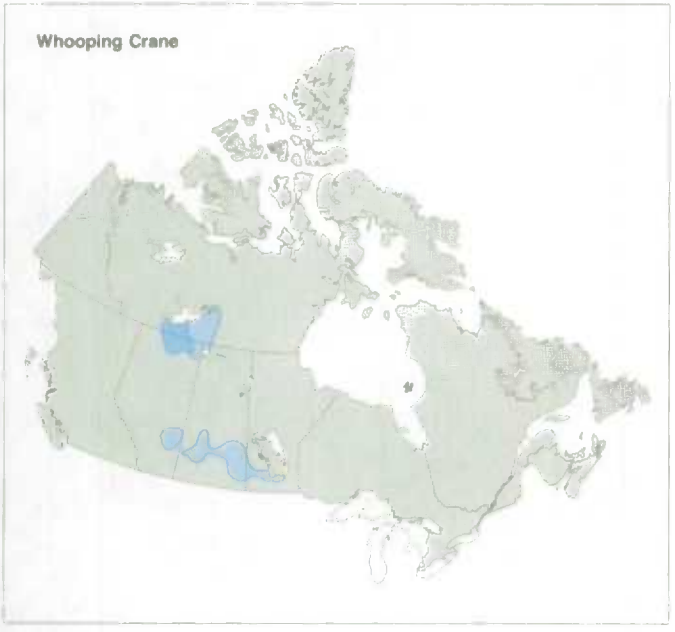

**Source:**
The National Museums of Canada, *The Mammals of Canada*, by W.F. Banfield, 1977.

Map 7.1.25
## Range Change of Selected Species


**Source:**
The National Museums of Canada, *The Mammals of Canada*, by W.F. Banfield, 1977.




**Sources:**
Environment Canada, Lands Directorate, *Canada's Special Resource Lands*, by Wendy Simpson-Lewis, *et al.*, 1979.




**Source:**
Environment Canada, Lands Directorate, *Canada's Special Resource Lands*, by Wendy Simpson-Lewis, *et al.*, 1979.

# 7.2
# Contaminants and Biotic Response

## Introduction

The data in this section are selected examples of a growing body of quantitative evidence collected by scientists about the impact of pollutants. These data differ from those found in other sections of the publication since they constitute direct measures of *environmental response* to stress from human activity. Three concerns are examined. There is a section on contaminants in biota in the Great Lakes watershed, a presentation of mercury levels in Canadian fish and an example of the biotic response to acid rain in Nova Scotia rivers. (The reproductive failure of Atlantic Salmon).

These data do not necessarily reflect national conditions, being largely obtained from monitoring programs in areas where there is a high exposure to pollutants (eg. the Great Lakes). The high cost of measuring (due to the complex laboratory tests required) precludes a sampling approach based on large sample sizes. In cases where the variation in a population has been determined, the necessary sample size can be calculated and may be quite small. Monitoring programs are now able to identify trends of some known contaminants and identify previously unrecognized ones (see Technical Box 7.2.1). Other chemicals are completely metabolized (transformed into new compounds) by organisms and escape detection in tissue; however, the presence of tumours and other abnormalities may provide an early warning mechanism to identify exposure (see Appendix 7, Map 3).

Scientists and environmental managers view these data as indicators of change in the environment and consider them to be of sufficient significance to undertake political actions to restrict the use, transport and disposal of specific chemicals. These types of data also play a critical role in the setting of public health guidelines aimed at reducing the risk of toxicity to humans, for example the restrictions on the consumption of contaminated fish.

Technical Box 7.2.1

## Contaminants in Biota: an Indicator of Environmental Response

Since the 1960s there has been a growing awareness that the global ecosystem has become increasingly contaminated with persistent organochlorine chemicals such as DDT, 2,4-D, and PCBs, from agricultural, forestry and industrial sources. Many of these chemicals are difficult to monitor in air or water since they become very dilute after disposal. However, these substances accumulate in the bodies of fish and other wildlife and thus can be more easily detected. Compounds such as DDT, DDE, dieldrin, mirex and PCBs have been monitored for some time. Now coming to the attention of scientists is the presence of dioxins, furans, PAHs in the tissues of fish and birds.

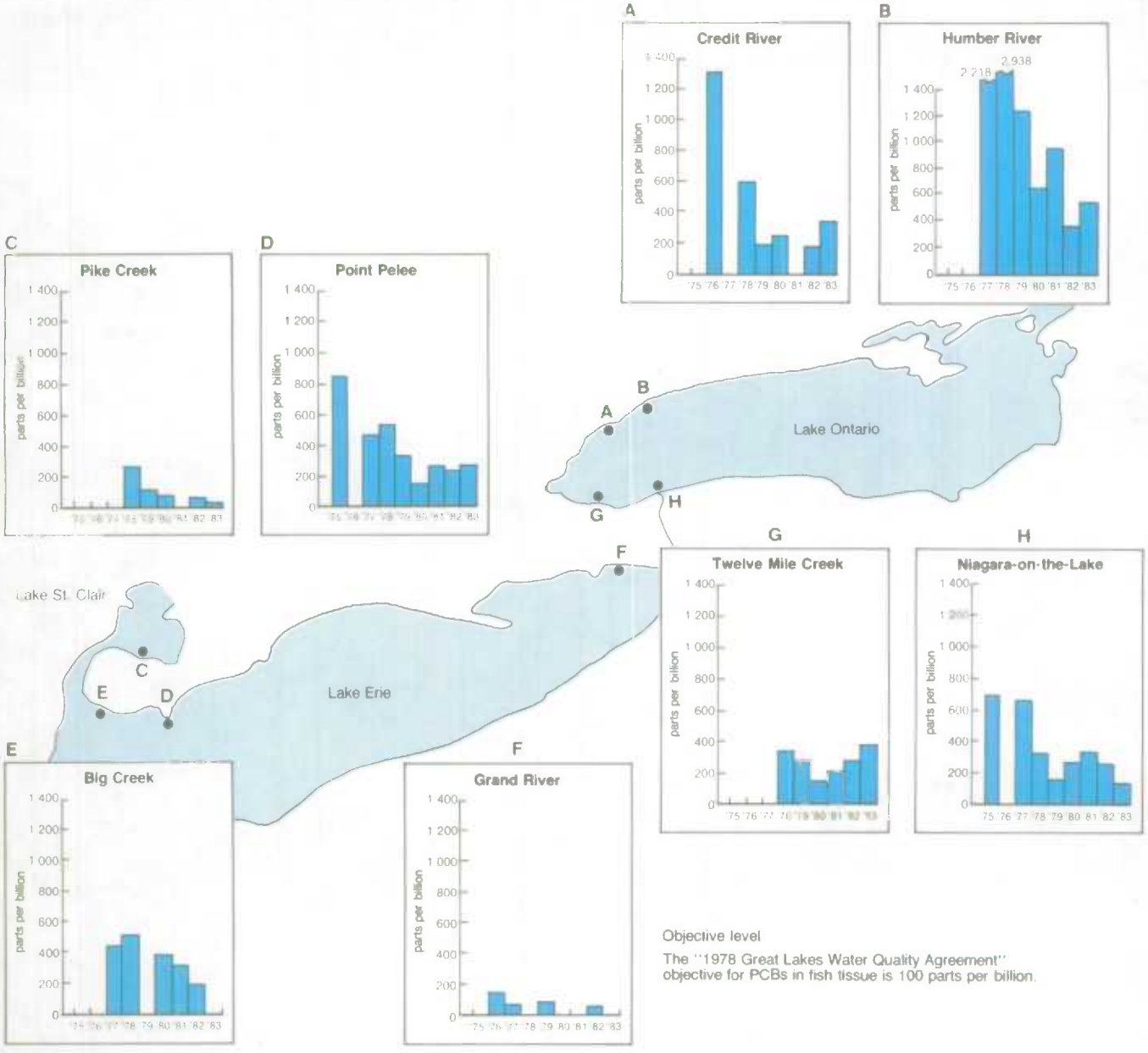
Three types of indicators of contaminants in aquatic systems are presented with example species. The first type, fish less than one year old with a limited swimming range, serve as locators of pollution sources (for example, spottail shiners). Second, eggs of bird species (for example, herring gulls) provide an instantaneous measure of contaminant levels since the concentration found in the eggs reflect what was eaten recently. The herring gull monitoring program has provided a long continuous record of contaminant trends in the Great Lakes basin. Third, top predators in the food chain are long-lived and forage in a large area. Their tissue burden represents the cumulative effect of contaminants in an ecosystem (for example, trout and walleye, see Appendix 7, Map 2). Since whole fish samples are used, the levels of contaminants will be higher than in the edible (muscle) portion of the fish. These species serve as early warning indicators of possible threats to human health.

It should be noted that the significance of year to year changes in the level of contaminants may not always be understood by scientists; however absolute changes are more important than percentage ones. Long-term trend data permit the reader to evaluate the remedial actions established between government and industry. In Canada and the United States, a number of pesticides were restricted after 1969, and a ban on the use of PCBs in new non-electrical equipment began in 1977. Declining contaminant levels suggest that these policies are effective although disturbances in the sediments may retard the rate of decline for years to come.

| Units: | Equivalent to: | Multiplying Factor: |
|---|---|---|
| parts per million (ppm) | milligrams per kilogram | $10^{-6}$ |
| parts per billion (ppb) | micrograms per kilogram | $10^{-9}$ |
| parts per trillion (ppt) | nanograms per kilogram | $10^{-12}$ |

Map 7.2.2

## PCB[1] Residues[2] in Spottail Shiners from Selected Great Lakes Sites[3]




Objective level

The "1978 Great Lakes Water Quality Agreement" objective for PCBs in fish tissue is 100 parts per billion.

[1] PCBs (Polychlorinated Biphenyls) are a group of chemical compounds used in power transformers, electrical insulators, hydraulic fluids and many other products. PCBs have been found in the tissue of many animal species. There are concerns about the potential human health effect from exposure to these chemicals. Under the Environmental Contaminants Act, PCB use in new non-electrical equipment was banned in 1977. In 1980 the ban was extended to new electrical equipment.

[2] Composites of ten fish (constituting a single sample) were used for contaminant analyses of young-of-the-year fish. Since analyses of young fish show lower variations than analysis of older fish, small sample sizes can be used.

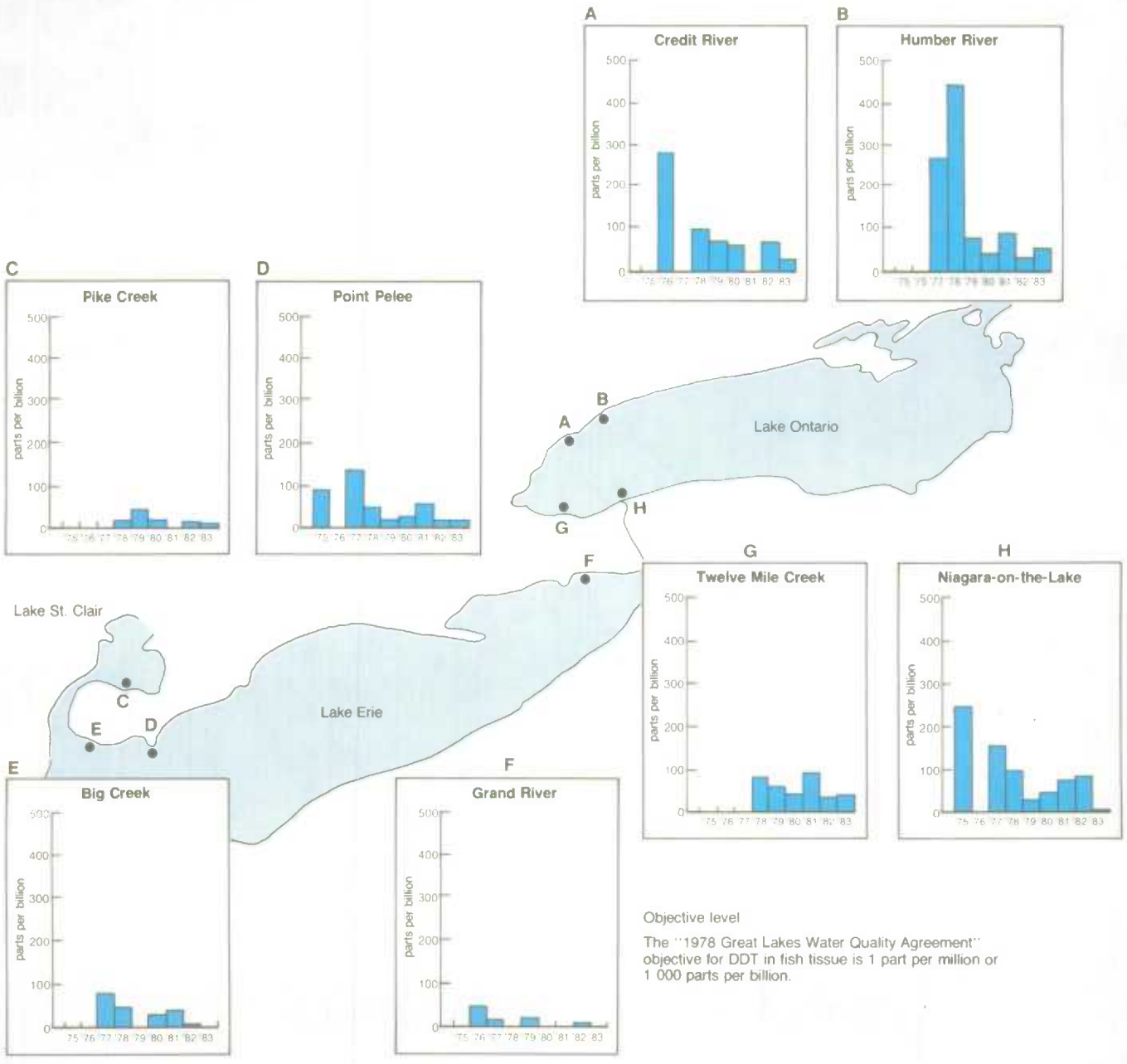
[3] Data for the Upper Great Lakes were not included because the data base does not contain sufficient information for trend assessment.

**Sources:**
Ontario Ministry of the Environment, *Organochlorine Contaminant Declines and their Present Geographical Distribution in Great Lakes Spottail Shiners*, by K. Suns et al., 1981.
Ontario Ministry of the Environment, Water Resources Branch, unpublished data.

**Note:**
Young-of-the-year spottail shiners are indicators of current contaminant uptake conditions. Since they have a limited geographic range, they also serve as locators of sources of loadings of organochlorines.

Map 7.2.3

## DDT[1] Residues in Spottail Shiners from Selected Great Lakes Sites




Objective level

The "1978 Great Lakes Water Quality Agreement" objective for DDT in fish tissue is 1 part per million or 1 000 parts per billion.

[1] Refers to the total weight of DDT pesticide and all of its metabolic forms found in animal tissue. This insecticide was once widely used for agricultural purposes. In 1969, its use was restricted when the effect of this chemical on the reproduction of many bird species became a major concern. At present, DDT is not manufactured in Canada and has limited registration and use.

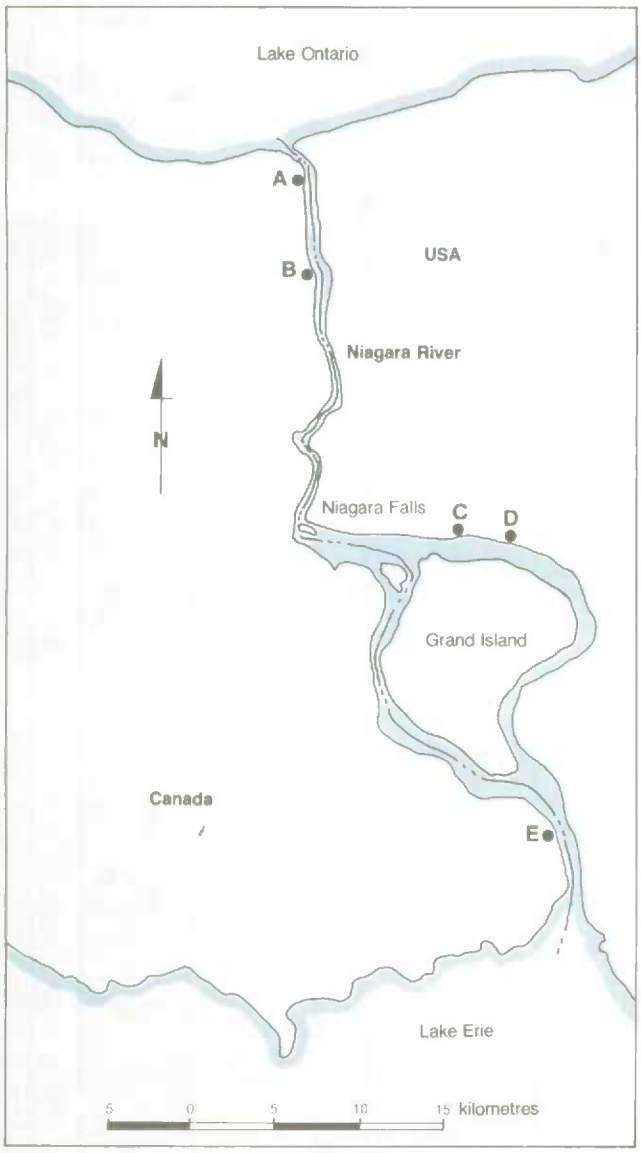
**Sources:**

Ontario Ministry of the Environment, *Organochlorine Contaminant Declines and their Present Geographical Distribution in Great Lakes Spottail Shiners*, by K. Suns et al., 1981.

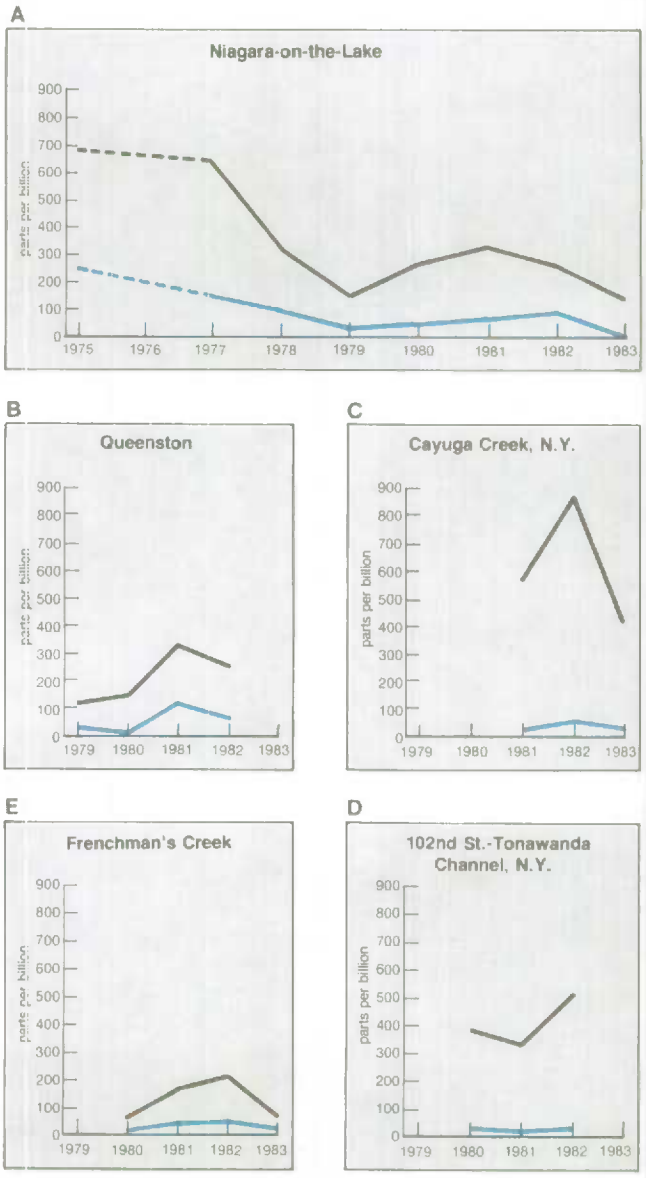
Ontario Ministry of the Environment, Water Resources Branch, unpublished data.

Chart 7.2.4

## DDT[1] and PCB Residues in Spottail Shiners from Selected Niagara River Sites




The Niagara River




[1] Refers to the total weight of DDT pesticide and all of its metabolic forms found in animal tissue.

**Sources:**
Ontario Ministry of the Environment, Water Resources Branch, unpublished data.
K. Suns *et al*, "Organochlorine Contaminant Residues in Spottail Shiners *(Notropis Hudsonius)* from the Niagara River." *Journal of Great Lakes Research* Volume 9, Number 2, pages 335-340, 1983.

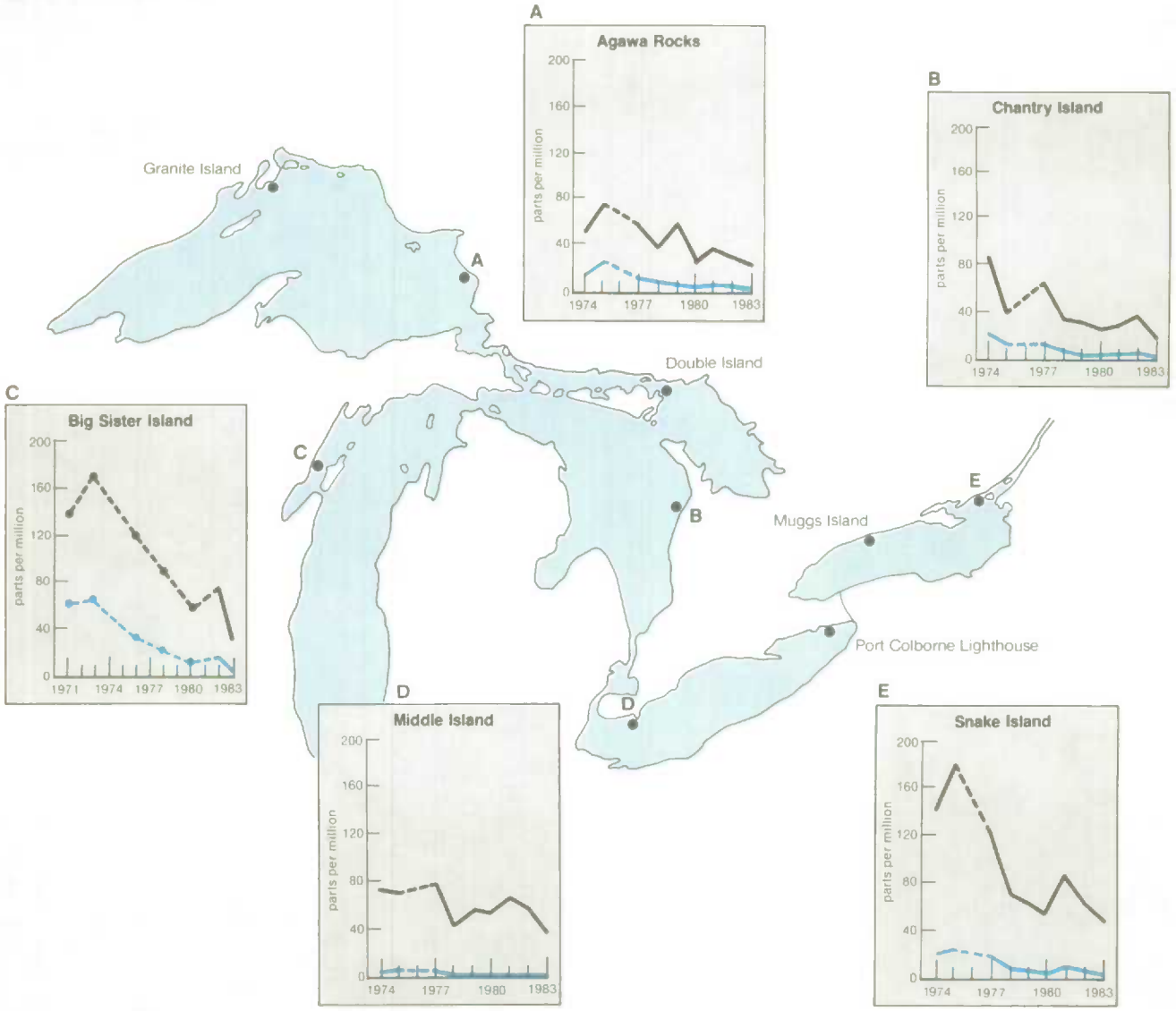
**Note:**
Elevated levels of industrial wastes have been found in the sediments, ambient water, ground water, and local fish of the Niagara River basin. These have now been linked to the seepage of chemicals from liquid waste disposal sites in the area.

Objective level

The "1978 Great Lakes Water Quality Agreement" objectives for PCBs in fish tissue is 100 parts per billion. For total DDT (DDT plus metabolites), it is 1000 parts per billion.
(not shown on graphs)

Map 7.2.5

## DDT and PCB Residues in Herring Gull Eggs[1] from Selected Great Lakes Nesting Colonies[2]




[1] Due to the nature of the metabolism of herring gulls, the concentration of contaminants in eggs reflects the concentration of these substances in the diet of the birds two to three weeks prior to egg laying. Since the time of exposure can be pinpointed in this manner, gulls provide an instantaneous measure of pollutants in the ecosystem.

[2] The map also indicates other colonies for which herring gull monitoring data are available from Environment Canada.

[3] DDE, the main metabolized form of DDT, was measured. Virtually all DDT introduced to the environment is now in metabolized form.

**Source:**
Environment Canada, Canadian Wildlife Service, Burlington, Ontario.

**Note:**
The herring gull is a fish-eating bird that remains within the Great Lakes Basin during its adult life. Gull populations suffering from severe reproductive problems in the early 1970s now have normal reproductive rates. This improvement may be linked to regulations introduced to control the use of PCBs and pesticides.

**Note:**
Dotted lines refer to years when data were not collected.

Table 7.2.6
## DDT and PCB Residues in Atlantic Seabird Eggs[1]

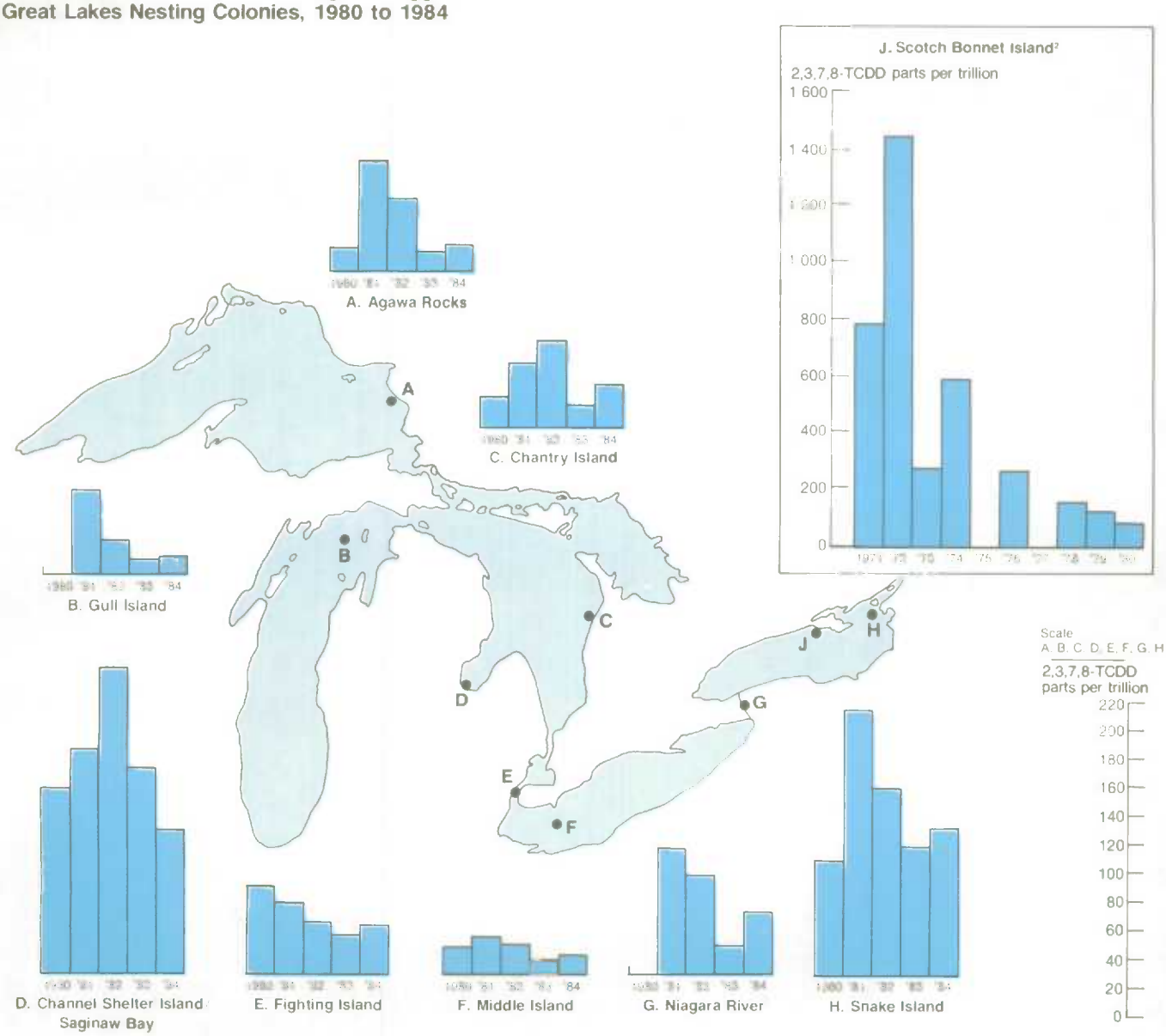
| Species | Year | Sampling Location[2] | | | |
|---|---|---|---|---|---|
| | | Bay of Fundy | | Open Ocean | |
| | | DDT[3] | PCBs | DDT[3] | PCBs |
| | | parts per million | | parts per million | |
| Leach's Petrel[4] | 1968 | .. | .. | 1.46 | 2.38 |
| | 1972 | 6.81 | 11.10 | 2.48 | 2.68 |
| | 1976 | 1.75 | 3.45 | 0.75 | 1.92 |
| | 1980 | 1.13 | 4.37 | 0.46 | 1.55 |
| | 1984 | 1.05 | 3.44 | 0.40 | 1.16 |
| Atlantic Puffin[5] | 1968 | .. | .. | 0.89 | 2.33 |
| | 1972 | 2.57 | 7.20 | 0.76 | 1.67 |
| | 1976 | 1.27 | 6.10 | 0.59 | 1.86 |
| | 1980 | 1.03 | 5.53 | 0.55 | 2.50 |
| | 1984 | 0.74 | 3.23 | 0.30 | 0.99 |
| Double-Crested Cormorant[6] | 1972 | 6.51 | 14.60 | 2.85 | 11.50 |
| | 1976 | 1.49 | 6.31 | 2.18 | 14.30 |
| | 1980 | 1.91 | 12.40 | 1.34 | 10.10 |
| | 1984 | 1.07 | 3.60 | 1.88 | 11.50 |

[1] Only species and locations where time-series were available are presented here. In all, twenty-six colonies and seven species have been sampled for six contaminants. Values shown are geometric means.
[2] Colonies have been grouped into Bay of Fundy or open ocean to compare levels of stress. The cormorant data listed in the open ocean column come from Ile-aux-Pommes in the Gulf of St. Lawrence.
[3] DDE, the main metabolite of DDT, was measured.
[4] Colonies of Leach's petrel are located at Kent Island in the Bay of Fundy and Great Island, Newfoundland. Petrels feed on micro-organisms at the water surface.
[5] Colonies of Atlantic puffin are located at Machias Seal Island in the Bay of Fundy, and Great Island, Newfoundland. Puffins feed on fish.
[6] Colonies of double-crested cormorant are located at Manawagonish in the Bay of Fundy and Ile-aux-Pommes, Québec. Cormorants feed largely on fish.

**Source:**
Environment Canada, Canadian Wildlife Service, Wildlife Toxicology and Pathology Division, D.B. Peakall, unpublished data.

Map 7.2.7

## Dioxin Concentrations[1] in Herring Gull Eggs from Selected Great Lakes Nesting Colonies, 1980 to 1984




[1] Dioxins are a group of 75 chemicals, of which the most toxic is 2,3,7,8-TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin). They are by-products formed during production of organic chemicals or during the combustion of organic materials. Chemicals containing dioxin impurities are wood preservatives (PCP), herbicides (2,4,5-T and 2,4-D), electrical insulator and hydraulic fluids (PCBs).

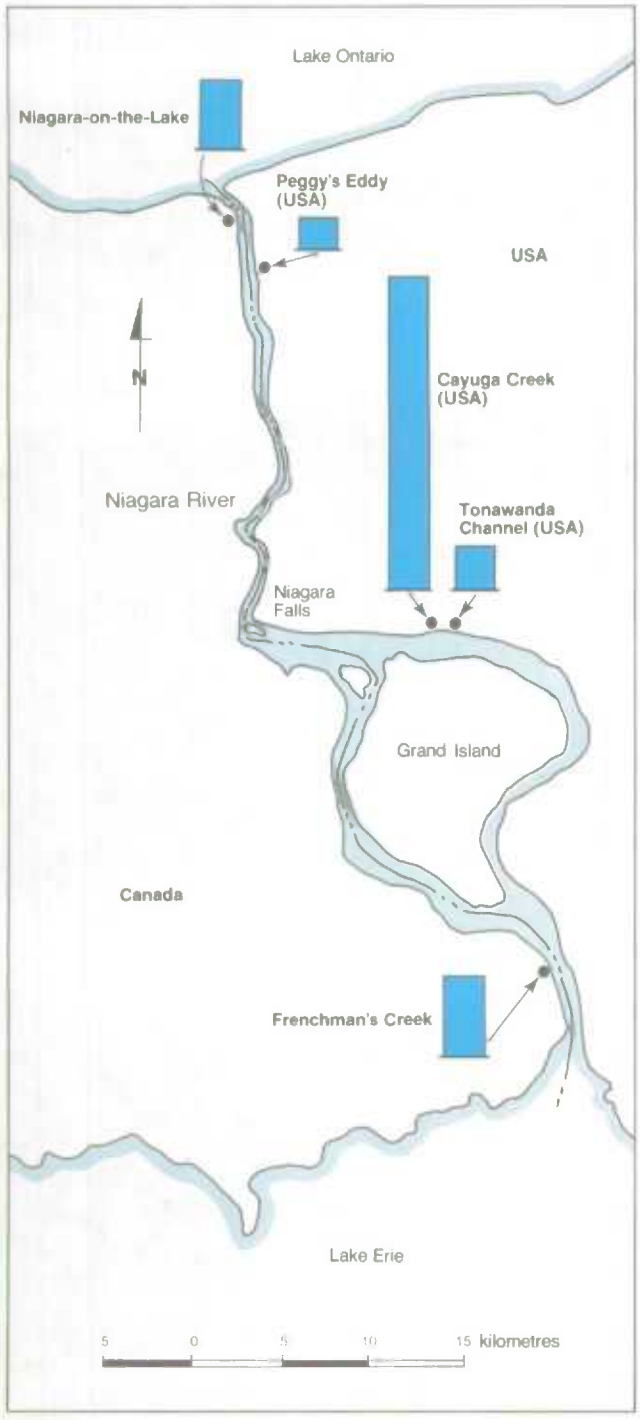
The methodology for detecting the 2,3,7,8-TCDD has been modified since original analyses were done. Data for 1980 and before have been corrected and are now consistent with data after 1981. The trend in dioxin concentration has followed that of other organochlorines in the Great Lakes.

[2] The availability of herring gull eggs from stored samples dating back to 1971 enabled scientists to obtain time trends of dioxin levels in eggs from the Scotch Bonnet Island colony, although this site is not part of the regular program.

**Source:**
Environment Canada, Canadian Wildlife Service, R.J. Norstrom.

**Note:**
The discovery of high TCDD levels in herring gull eggs in 1980 led to bilateral action. Health and Welfare Canada and the New York State Department of Health issued warnings regarding the consumption of fish. Intense efforts have also been made to find and control sources of this chemical.

Map 7.2.8
## Dioxin Residue[1] in Spottail Shiners from Selected Niagara River Sites, 1981




The Niagara River

2,3,7,8-TCDD
parts per trillion


[1] 2,3,7,8 - tetrachlorodibenzo-p-dioxin.

**Source:**
K. Suns, *et al*, "Organochlorine Contaminant Residues in Spottail Shiners (*Notropis Hudsonius*)from the Niagara River" *Journal of Great Lakes Research*, Volume 9, Number 2, pages 335-340, 1983.

**Note:**
Dioxin contamination has been found in sportsfish at a number of locations in the Great Lakes Basin. Peggy's Eddy (map location 2) has been closed to sportsfishing because of high levels of 2,3,7,8-TCDD. The Health Protection Branch of Health and Welfare Canada advises that fish containing more than 20 parts per trillion of dioxin should not be consumed on a regular basis.

Technical Box 7.2.9

## Mercury Contamination in Biota: an Indicator of Environmental Response

One of the early indicators of environmental contamination from heavy metals was the level of mercury in fish. Until regulations were introduced in the early 1970s, industrial effluents containing inorganic mercury entered the aquatic environment. These were associated with the use of mercury cells in chlor-alkali plants (chlorine production) and mercury in pulp mills (slimicides). Mercury is deposited in the sediments of lakes and streams and becomes bioavailable through the activity of bacteria (methylation). Although the major sources of mercury to lakes and streams have been restricted, disturbances to the sediments (through natural hydrological activity and through dredging of harbours and channels) make it necessary to continue the surveillance of mercury.

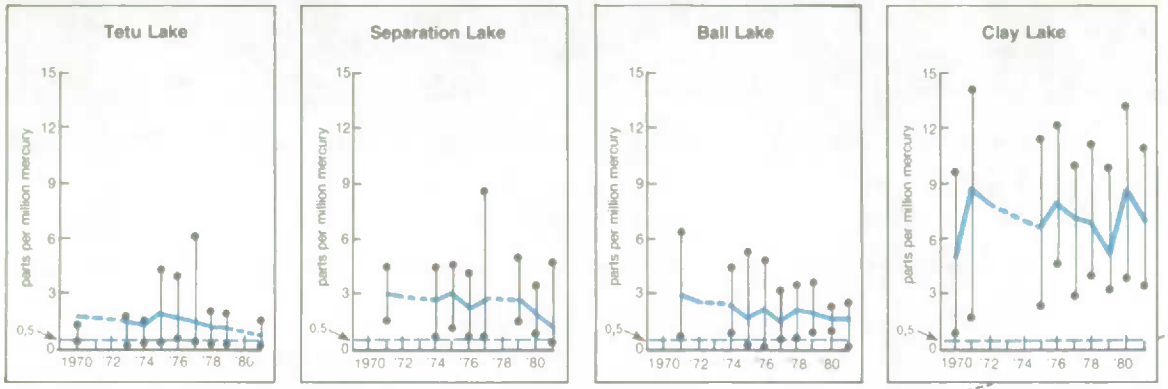
In 1969, high concentrations of mercury in fish were found in the vicinity of chlor-alkali plants, pulp mills, and mines (associated with sulphide ore deposits). These levels were sufficiently high to impose a health risk to human consumption; as a result, a number of commercial fisheries (e.g. Lake St. Clair, Lake Winnipeg, English-Wabigoon) were closed and anglers warned.

In the tables that follow, top predators in the food chain are selected. These fish have bioconcentrated mercury in their tissues and can be used as indicators of changes in the mercury levels in aquatic ecosystems in which concerns have been noted. Specifically, walleye are more affected by mercury transported from upstream while pike and other bottom-dwelling fish are more affected by mercury in the sediments.

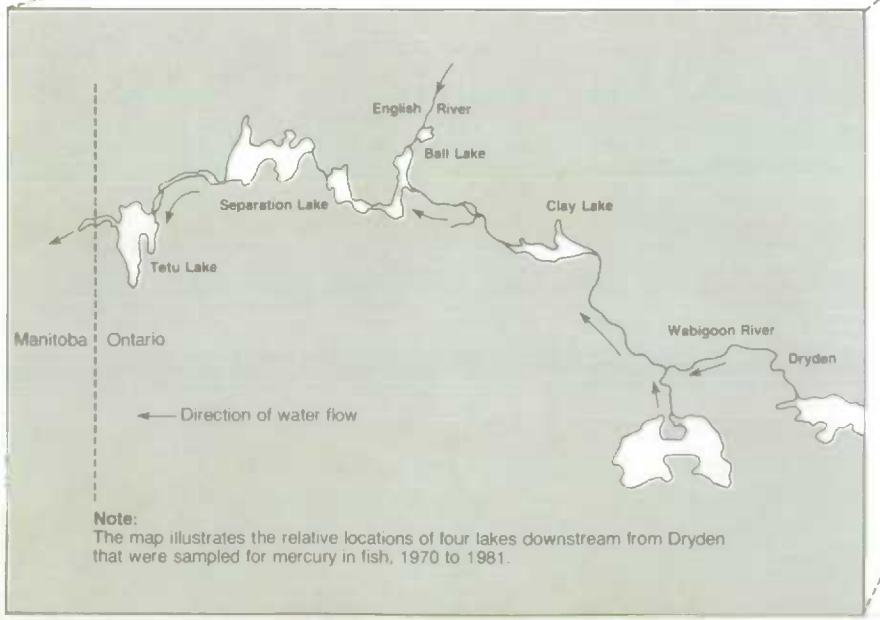
Cross reference: Chart 6.2.16

Chart 7.2.10

## Mercury Concentration in Walleye in the English-Wabigoon River System, 1970 to 1981








**Note:**
The map illustrates the relative locations of four lakes downstream from Dryden that were sampled for mercury in fish, 1970 to 1981.

Mean value

Range of values

Health and Welfare Canada Guideline[1]

[1] The maximum mercury level in fish muscle, set by Health and Welfare Canada for commercially marketed fish, is 0.5 parts per million. For information on the recommended frequency of consumption of sportsfish in Ontario, the reader may consult the *Guide to Eating Ontario Sport Fish* published by the Ontario Ministry of the Environment.

**Source:**
Ontario Ministry of Natural Resources, Fisheries Branch, Contaminants Data System.

**Note:**
The control of mercury in the English-Wabigoon system is an example of the relationship between industrial activity, government regulation and biotic response. In this case, the chlor-alkali paper plant complex restricted its discharge of mercury effluent in response to Fisheries and Environment Canada regulation of the entire chlor-alkali industry in the early 1970s. Accumulations of mercury in the fish have declined. However, due to large quantities of mercury in the sediment of lake and river bottoms, levels in fish will remain too high to allow consumption by humans for years to come.

Table 7.2.11
## Mercury Concentration in Walleye in Lake St. Clair and Lake Simcoe, 1970 to 1983[1]

| Year | Lake St. Clair[2] (Whole Lake) | | | | Lake St. Clair (Tremblay Creek) | | | | Lake Simcoe | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Observations | Mercury Concentration | | Percentage of Samples Containing Over 0.5 ppm Mercury | Number of Observations | Mercury Concentration | | | Number of Observations | Mercury Concentration | |
| | | Mean | Range | | | Mean | Range | | | Mean | Range |
| | | parts per million | | | | parts per million | | | | parts per million | |
| 1970 | 615 | 2.10 | 0.23-14.00 | 99 | 20 | 0.81 | 0.36-1.70 | | 22 | 0.26 | 0.07-0.96 |
| 1971 | 350 | 1.80 | 0.13-13.10 | 96 | .. | .. | .. | | 12 | 0.55 | 0.18-2.04 |
| 1972 | 436 | 1.30 | 0.13- 7.10 | 83 | .. | .. | .. | | .. | .. | .. |
| 1973 | 291 | 1.10 | 0.13- 5.00 | 80 | .. | .. | .. | | .. | .. | .. |
| 1974 | 590 | 0.98 | 0.10- 3.20 | 78 | 357 | 0.90 | 0.26-3.07 | | .. | .. | .. |
| 1975 | 69 | 0.81 | 0.16- 1.90 | 73 | .. | .. | .. | | 15 | 0.73 | 0.15-1.28 |
| 1976 | 246 | 0.93 | 0.11- 3.00 | 66 | .. | .. | .. | | 50 | 0.98 | 0.18-1.70 |
| 1977 | .. | .. | .. | .. | 35 | 0.81 | 0.37-1.60 | | 27 | 0.60 | 0.10-1.60 |
| 1978 | .. | .. | .. | .. | 25 | 0.65 | 0.14-1.80 | | .. | .. | .. |
| 1979 | .. | .. | .. | .. | 30 | 0.81 | 0.11-1.51 | | 36 | 0.53 | 0.11-1.45 |
| 1980 | .. | .. | .. | .. | 8 | 0.95 | 0.33-0.95 | | .. | .. | .. |
| 1983 | .. | .. | .. | .. | .. | .. | .. | | 15 | 0.55 | 0.13-1.90 |

[1] Although data were collected in most years, data presented here are only those where inter-calibration between laboratories had been achieved.
[2] Calculations of the mean of the whole of the lake were made from an Ontario Ministry of Environment Report that covered 1970 to 1976. Monitoring is now less extensive; however, Tremblay Creek has been taken as representative.

**Source:**
Ontario Ministry of Natural Resources, Contaminants Data System.

**Note:**
Discovery of mercury contamination resulted in the closure of the commercial fishery in Lake St. Clair from 1970 to 1980. It has now re-opened.

Table 7.2.12
## Mercury Concentration in Walleye in Lakes of the Prairie Provinces, 1971 to 1983[1]

| Year | Cumberland Lake | | | Cedar Lake | | | Lake Winnipeg (North Basin) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mercury Concentration | | Percentage of Samples Containing Over 0.5 ppm[2] Mercury | Mercury Concentration | | Percentage of Samples Containing Over 0.5 ppm[2] Mercury | Mercury Concentration | | Percentage of Samples Containing Over 0.5 ppm[2] Mercury |
| | Mean | Range | | Mean | Range | | Mean | Range | |
| | parts per million | | percent | parts per million | | percent | parts per million | | percent |
| 1971 | .. | .. | .. | 0.53 | 0.11-1.83 | 40 | 0.44 | 0.09-1.24 | 22 |
| 1972 | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| 1973 | .. | .. | .. | 0.48 | 0.10-1.32 | 30 | 0.41 | 0.10-1.21 | 16 |
| 1974 | 0.78 | 0.16-2.19 | 69 | .. | .. | .. | .. | .. | .. |
| 1975 | 0.67 | 0.23-1.68 | 59 | 0.48 | 0.23-0.71 | 17 | 0.27 | 0.14-1.00 | 6 |
| 1976 | 0.63 | 0.13-2.06 | 35 | 0.54 | 0.29-1.06 | 33 | 0.29 | 0.11-0.89 | 7 |
| 1977 | 0.68 | 0.20-1.63 | 64 | .. | .. | .. | .. | .. | .. |
| 1978 | 0.54 | 0.22-1.08 | 60 | 0.31 | 0.13-0.77 | 12 | 0.26 | 0.07-0.68 | 7 |
| 1979 | 0.81 | 0.14-2.93 | 58 | .. | .. | .. | .. | .. | .. |
| 1980 | 0.31 | 0.14-0.70 | 9 | .. | .. | .. | .. | .. | .. |
| 1981 | 0.71 | 0.20-1.26 | 60 | .. | .. | .. | .. | .. | .. |
| 1982 | 0.46 | 0.26-0.70 | 40 | .. | .. | .. | .. | .. | .. |
| 1983 | 0.34 | 0.19-0.72 | 20 | .. | .. | .. | .. | .. | .. |

[1] Based on samples taken from commercially landed fish.
[2] The maximum allowable mercury level in fish muscle, set by Health and Welfare Canada for commercially marketed fish, is 0.5 parts per million.

**Source:**
Fisheries and Oceans Canada, Freshwater Institute, Winnipeg, unpublished data.

**Note:**
Mercury contamination of these lakes (and subsequent bio-accumulation in walleye) is believed to have occurred as a result of discharge from chlo-alkali plants.

Table 7.2.13
## Mercury Concentration in Walleye and Pike in Québec Drainage Basins, 1979

| Drainage Basins[1] | Walleye[2] | | | | Pike[2] | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of Lakes | Number of Observations | Mercury Concentration | | Number of Lakes | Number of Observations | Mercury Concentration | |
| | | | Mean | Range | | | Mean | Range |
| | | | parts per million | | | | parts per million | |
| Eastern Townships Rivers (144) | 5 | 20 | 0.56 | 0.31-1.00 | 4 | 7 | 0.34 | 0.25-0.40 |
| Ottawa River (150,151) | 29 | 145 | 0.56 | 0.04-1.33 | 29 | 95 | 0.56 | 0.18-1.15 |
| St. Lawrence River, St. Maurice River, Montreal Area Rivers (141,143,145) | 15 | 70 | 0.54 | 0.17-1.14 | 13 | 35 | 0.54 | 0.12-1.35 |
| Saguenay River (110.3,140) | 4 | 19 | 0.23 | 0.21-0.24 | 3 | 13 | 0.94 | .. |
| Gulf of St. Lawrence, North Coast Mainland (110.1,110.2) | .. | .. | .. | .. | 6 | 27 | 0.66 | 0.27-2.41 |
| South and West Hudson Bay (210.1,210.2,210.3) | 2 | 3 | 0.52 | .. | 4 | 5 | 0.52 | 0.26-0.98 |

[1] The basins shown here are groupings of our drainage basins. The basin codes indicate the constituent basins. Refer to Map 1.1.4 for their locations.
[2] Walleye and Pike are "top predators" in the aquatic ecosystem. By eating fish that contain mercury, they accumulate it in their own flesh.

**Source:**
Environnement Québec, Bureau d'étude sur les substances toxiques, *Contamination mercurielle du poisson gibier du Québec*, 1980.

Table 7.2.14
## Mercury Concentration in Fish from the Fraser River[1], 1980

| | White Sturgeon[2] | | | Large-Scale Sucker[2] | | | Northern Squawfish[2] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number of Observations | Mercury Concentration | | Number of Observations | Mercury Concentration | | Number of Observations | Mercury Concentration | |
| | | Mean | Range | | Mean | Range | | Mean | Range |
| | | parts per million | | | parts per million | | | parts per million | |
| Lower Fraser (Estuary to Chilliwack) | 21 | 0.17 | 0.05-0.39 | 41 | 0.22 | 0.05-0.50 | 30 | 0.52 | 0.19-1.23 |
| Upper Fraser (Chilliwack to Alberta Border) | 10 | 0.17 | 0.05-0.37 | 40 | 0.23 | 0.05-0.26 | 25 | 0.23 | 0.11-0.49 |

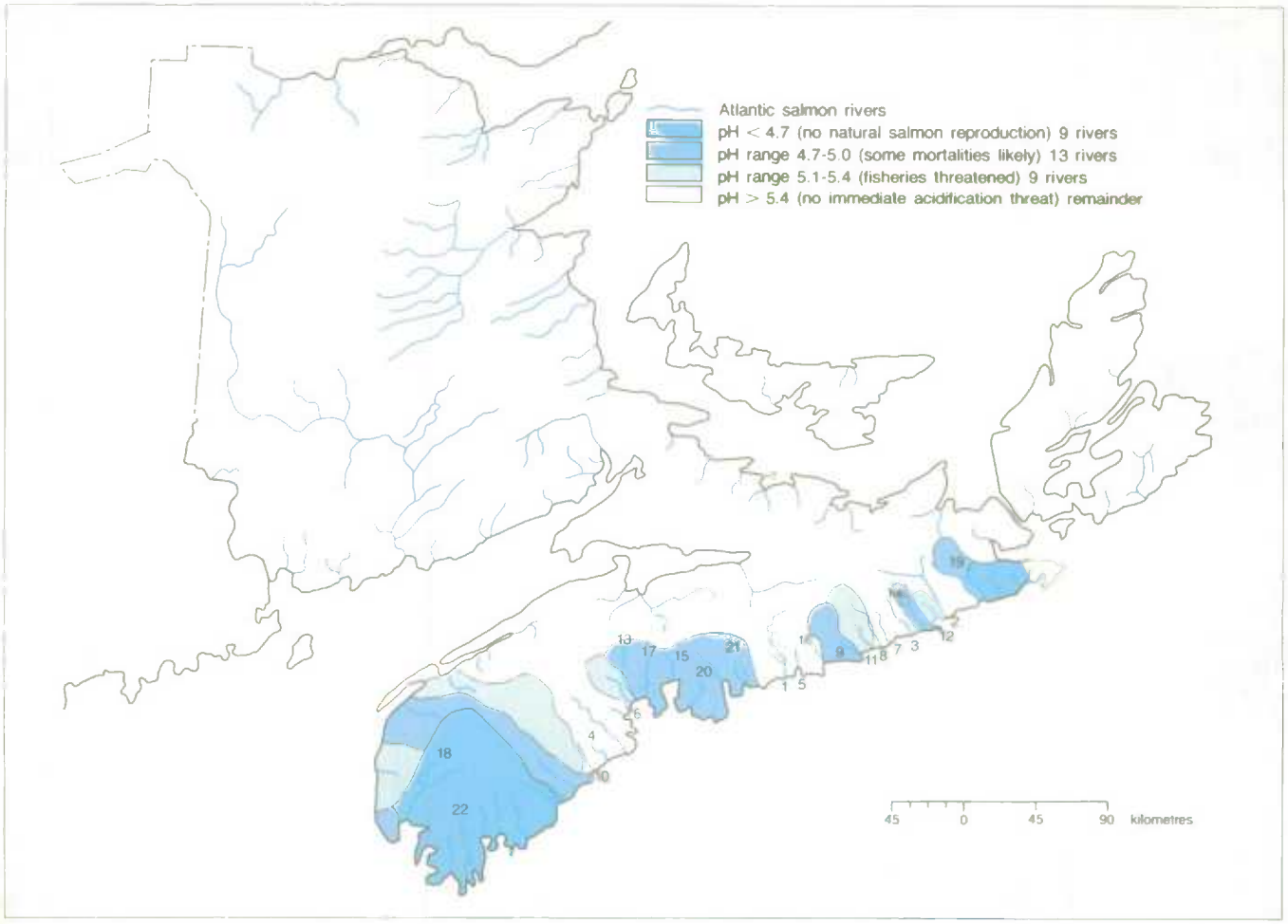
[1] Pollution concerns include untreated wastes, discharge from upstream activity and the build-up of toxic wastes in the estuary. There are over 100 industrial outfalls to the Lower Fraser River; municipal sewage systems may contain industrial discharges as well.
[2] Since walleye are not found west of the Rocky Mountains, three other predators were chosen as indicators of mercury levels in aquatic ecosystems. Each has different exposures to mercury. Adult northern squawfish are primarily fish-eating (piscivorous), white sturgeon are anadromous (adult life at sea returning to spawn in coastal inland waters) and has a varied diet, while the adult large-scale sucker feeds on bottom dwelling invertebrates.

**Source:**
British Columbia Ministry of the Environment, *Trace Metals and Selected Organic Contaminants in Fraser River Fish*, 1983.

**Note:**
Eleven locations on the Fraser River were sampled in 1980. Although comparisons with samples from an earlier date (1972-73) show that the 1980 levels are consistently lower than in the earlier period, elevated levels at two sites in the lower Fraser may be cause for concern given the toxic effects of this metal.

Map 7.2.15

## Acidity[1] of Atlantic Salmon Rivers in the Maritime Provinces




[1] pH is a logarithmic measure of the acidity of water. Values below 7.0 are increasingly acidic. *Cross reference:* see Map 6.6.26 for a more detailed explanation of pH and sensitive areas of Eastern Canada.

**Source:**
W.D. Watt, *Present and Potential Effects of Acid Precipitation on the Atlantic Salmon in Eastern Canada*. International Atlantic Salmon Foundation, Special Publication Series, No. 10, March 1981, St. Andrews, New Brunswick.

**Note:**
River systems where pH values are low enough to interfere with the reproduction of Atlantic salmon occur only in Nova Scotia. Salmon runs in 9 rivers with annual mean pH values below 4.7 are now considered extinct. Rivers within the pH 4.7 to 5.0 range still have self-sustaining runs but are subject to high mortality of juveniles related to water acidity. Those rivers in the range of pH 5.1 to 5.4 have thriving salmon runs, yet may be subject to the sub-lethal effects of acidity. The remaining rivers in the Maritimes are adequately buffered and are not under any immediate threat from acid rain.

### Twenty-two Nova Scotia Salmon[1] Rivers Used to Compare the Effects of Acidification[2] 1979-1980

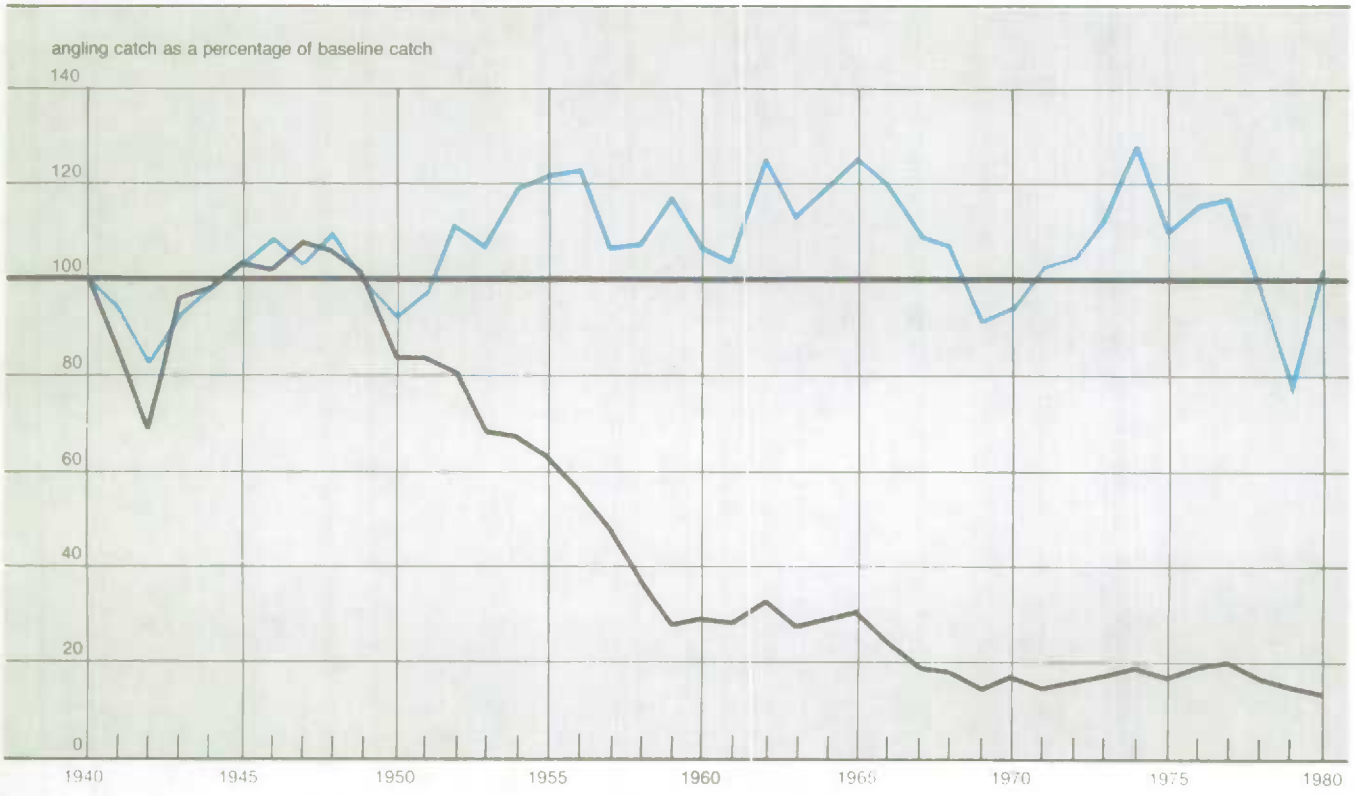
The list of rivers and the notes here refer to Chart 7.2.16. The rivers themselves can be located on Map 7.2.15 by number.

| Rivers with pH>5.0 | Mean pH 1980-81 | Rivers with pH≤ 5.0 | Mean pH 1980-81 |
|---|---|---|---|
| 1 Musquodoboit | 6.7 | 13 Middle | 5.0 |
| 2 St. Mary's | 6.1 | 14 Liscomb | 5.0 |
| 3 Ecum Secum | 5.7 | 15 Ingram | 5.0 |
| 4 Petit | 5.6 | 16 Tangier | 4.9 |
| 5 Ship Harbour | 5.6 | 17 East | 4.8 |
| 6 Gold | 5.5 | 18 Tusket | 4.8 |
| 7 Moser | 5.4 | 19 Isaacs Harbour | 4.8 |
| 8 Quoddy | 5.4 | 20 Nine Mile | 4.8 |
| 9 Kirby | 5.4 | 21 Salmon (Lawrencetown) | 4.7 |
| 10 Medway | 5.4 | 22 Clyde | 4.6 |
| 11 Salmon (Port Dufferin) | 5.3 | | |
| 12 Gaspereaux | 5.2 | | |

[1] See map for locations.
[2] In geologically sensitive areas, river pH levels have fallen significantly since 1954.

**Note:**
When comparing Map 7.2.15 and Chart 7.2.16 note that rivers with no natural salmon reproduction (shaded area) presently do have angling catch reported. However, once the last surviving year class of fish returns to spawn for its last time, the natural stocks of those rivers will be extinct.

Chart 7.2.16
**Angling Catch[1] of Atlantic Salmon in Twenty-two Nova Scotia Rivers[2] by Levels of Acid Stress, 1940 to 1980**




[1] Angling catch for each river was expressed as a percentage of a baseline catch from the mean of the years 1936-1940. The rivers were grouped according to their 1980-81 mean pH (above 5.0 or 5.0 and below) and the percentages were averaged. Since extreme year-to-year fluctuations occurred, (partly from angler preference shifting from river to river), five year running means of the annual values were calculated and then plotted.

[2] Rivers with substantial hatchery stocking or major restructuring (dam construction or removal) have been excluded.

**Source:**
D.C. Watt, *et al.* "Evidence of Acidification of Some Nova Scotia Rivers and Its Impact on Atlantic Salmon, *Salmo salar*." *Canadian Journal of Fisheries and Aquatic Sciences*, Volume 40, pages 462-473, 1983.

# 8

# Collective and Individual Human Responses

# Contents

**Tables**



**Map**

Table 8.1.1
## Selected Government Expenditures on the Environment, 1970 to 1980[1]

| Year | Water Purification and Supply | Sewage Collection and Treatment | Solid Waste Collection and Disposal | Pollution Control | Environmental Administration and Other | Total |
|---|---|---|---|---|---|---|
| | millions of current dollars | | | | | |
| 1970 | 210 | 229 | 99 | 7 | 12 | 557 |
| 1971 | 297 | 271 | 108 | 21 | 17 | 714 |
| 1972 | 417 | 325 | 118 | 43 | 88 | 992 |
| 1973 | 456 | 428 | 122 | 68 | 219 | 1 293 |
| 1974 | 628 | 490 | 170 | 77 | 249 | 1 614 |
| 1975 | 764 | 569 | 230 | 65 | 283 | 1 912 |
| 1976 | 880 | 763 | 245 | 90 | 280 | 2 259 |
| 1977 | 981 | 792 | 283 | 117 | 319 | 2 491 |
| 1978 | 1 190 | 711 | 316 | 139 | 334 | 2 690 |
| 1979 | 1 113 | 773 | 329 | 108 | 418 | 2 741 |
| 1980[2] | 1 302 | 890 | 391 | 131 | 505 | 3 219 |

[1] All levels of government.
[2] Preliminary estimates. No more current estimates are available.

**Source:**
Statistics Canada, *Consolidated Government Finance*, Catalogue 68-202.

**Note:**
*Water Purification and Supply* — Covers outlays for the construction, operation and maintenance of water acquisition, treatment and distribution facilities. It also includes grants and subsidies in aid of research in this field.
*Sewage Collection and Treatment* — Provides for expenditures on the construction, operation and maintenance of sewage removal and treatment facilities including expenditures on sanitary sewers and combined sanitary-storm sewers (separate storm sewers are classified under "transportation and communications — roads"), booster stations, reclamation of sludge areas, and on inspection, cleaning and flushing of sewers. It also covers grants and subsidies in aid of research to cope with sewage problems.
*Solid Waste Collection and Disposal* — Includes outlays for these services as well as expenditures on incinerators, nuisance grounds or dumps for waste disposal purposes. Services contracted out are included.
*Pollution Control* — Provides for expenditure on the prevention of pollution and on reducing pollution's detrimental effects on the environment, but only where such expenditures cannot be allocated to a more specific sub-function, e.g., "solid waste collection and disposal". This category also covers outlays on general research and control activities; it includes grants and subsidies toward the development and use of anti-pollution devices and toward undertakings designed to restore or maintain a healthy environment.
*Other* — Covers miscellaneous expenditures which cannot be linked with any specific sub-function or which applies to several sub-functions; (e.g., the administrative expenditure of a department of the environment).

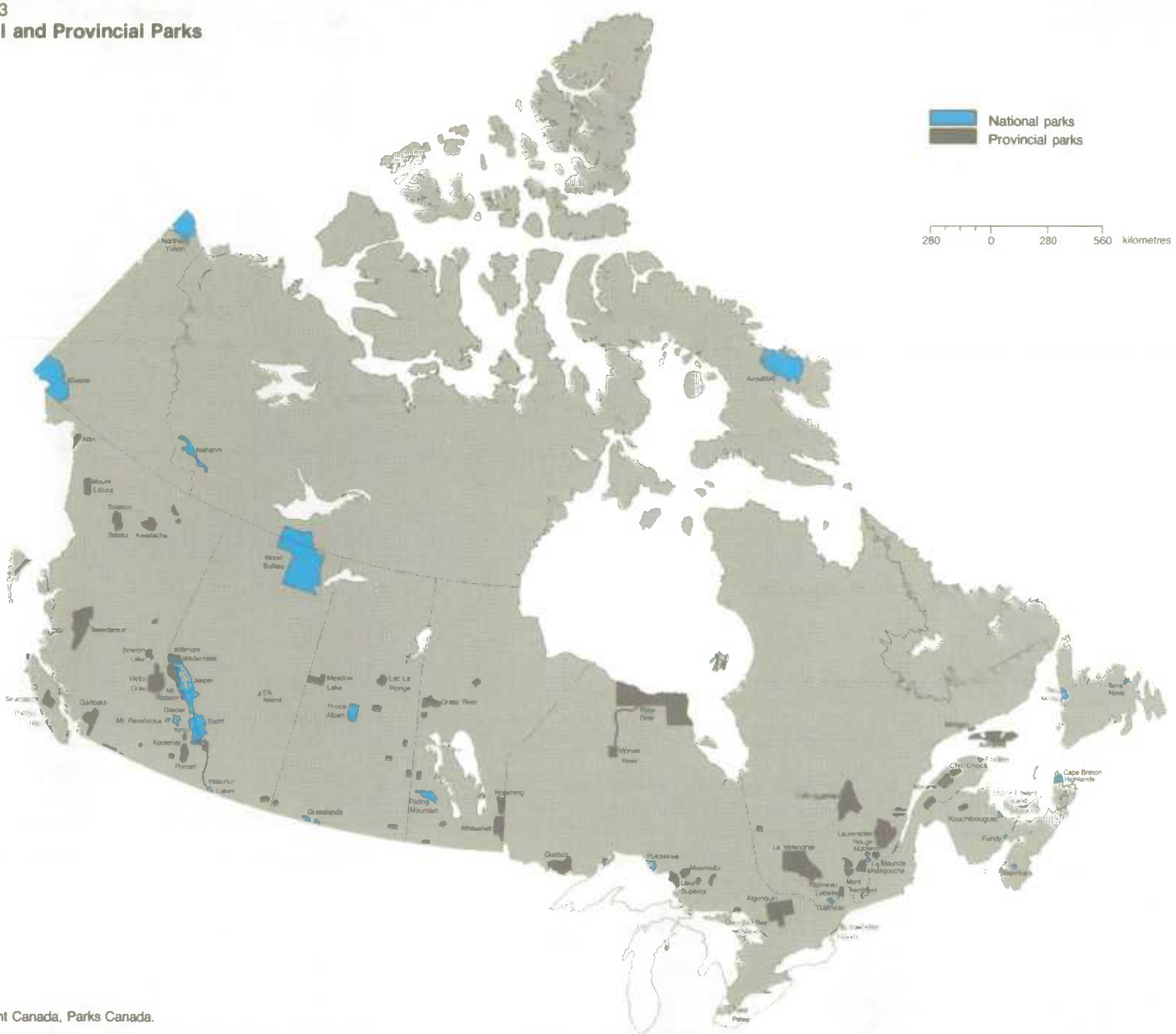
Table 8.1.2
## Accelerated Capital Cost Allowances for Pollution Control Equipment by Industry

| Industry | Allowance — Water 1969 to 1981 | | Allowance — Air 1971 to 1981 | |
|---|---|---|---|---|
| | millions of dollars | percent | millions of dollars | percent |
| Mining | 69.5 | 9.1 | 57.8 | 9.2 |
| Manufacturing | 647.7 | 84.5 | 419.9 | 66.7 |
| Food and Beverages | 32.6 | 4.3 | 24.7 | 3.9 |
| Paper and Allied Industries | 277.7 | 36.2 | 74.8 | 11.8 |
| Primary Metals | 136.8 | 17.8 | 152.1 | 24.2 |
| Petroleum and Coal Products | 62.6 | 8.2 | 43.9 | 7.0 |
| Chemicals and Chemical Products | 71.0 | 9.3 | 26.4 | 4.2 |
| All Other Manufacturing | 66.9 | 8.7 | 98.0 | 15.6 |
| Transportation, Communication and Utilities | 36.4 | 4.7 | 123.9 | 19.6 |
| All Other Industries | 13.3 | 1.7 | 28.0 | 4.5 |
| **Total** | **766.9** | **100.0** | **629.6** | **100.0** |

**Source:**
Statistics Canada, *Corporation Taxation Statistics*, Catalogue 61-208, various years.

**Note:**
Fifty percent of the capital costs of water pollution control assets acquired after April 26, 1965, may be deducted under the Income Tax Act. Air pollution control assets acquired after March 12, 1970 are also deductable at the same rate. The table above presents the aggregate of these allowances for the periods indicated. It should be noted, however, that the full allowance may not have been taken for a particular purchase as of 1981 as it is possible to spread the allowance across a number of years. These data provide an indication of total expenditures on pollution abatement equipment. Actual expenditure figures for the years 1970 to 1975 are available in an uncatalogued publication produced by Business Finance Division titled *Water and Air Pollution Abatement Expenditures*.

Map 8.1.3
**National and Provincial Parks**




**Source:**
Environment Canada, Parks Canada.

**Note:**
Only provincial parks over 1 000 square kilometres are named; and only those over 100 square kilometres are shown.

Table 8.1.4
**National Park Profiles**

| Ecozone/Park (Province) | Year Established | Area | Visits 1983-1984 | Biophysical and Cultural Features |
|---|---|---|---|---|
| | | square kilometres | | |
| **Atlantic Maritime** | | | | |
| Prince Edward Island (PEI) | 1937 | 32 | 1 606 920 | Widely varied coastal environment, beaches, dunes, spits, Acadian forests, fresh and saltwater marshes; Green Gables and Dalvay House. |
| Cape Breton Highlands (NS) | 1936 | 951 | 821 279 | Igneous and metamorphic highlands, rugged coastlines, cliffs, beaches, and barrens. |
| Kejimkujik (NS) | 1968 | 382 | 203 162 | Coastal uplands, numerous lakes and rivers, peat deposits; historic Micmac Indian petroglyphs. |
| Forillon, (Qué) | 1970 | 240 | 614 712 | Coastal environment with rugged limestone cliffs; northern Appalachian mountain terrain with vegetation varying from mixed forests, to boreal to alpine-tundra; an abundance of bird life and a variety of sea mammals are present. |
| Kouchibouguac (NB) | 1969 | 244 | 354 252 | Acadian forested plains and coastal environments, barrier islands, lagoons, tidal rivers, salt-marshes, bogs, unique cedar groves. |
| Fundy (NB) | 1948 | 207 | 869 901 | Forested uplands, irregular coastline cut by deep valleys, varied flora and fauna including several species of large mammals. |
| **Mixed-Wood Plain** | | | | |
| Point Pelee (Ont) | 1918 | 16 | 483 679 | Carolinian forest, marshes, beaches, staging ground for a variety of migratory bird species. |
| Georgian Bay Islands (Ont) | 1929 | 24 | 124 216 | Seventy-seven islands portray a transition between deciduous forest and the mixed forest of the southern shield; a heavily glaciated and flooded area with sheltered coves, sand and cobble beaches, drumlins and glacier-scraped rock; unusual geological formations on Flowerpot Island. Geology varies from Precambrian material to deposits similar to those of the Niagara escarpment; archeological evidence of a 1 000 year old Ojibway Indian settlement. |
| St. Lawrence Islands (Ont) | 1904 | 8 | 219 389 | Mainland area and a number of islands representing features of the Canadian Shield's Frontenac Axis; a variety of rare flora and fauna. |
| **Boreal Shield** | | | | |
| Gros Morne (Nfld) | 1970 | 1 943 | 245 097 | Coastal and highland environments, fjords, lakes, variety of wildlife. |
| Terra Nova (Nfld) | 1957 | 397 | 396 598 | Coastal environments and boreal forest, rocky headlands, post-glacial features, bogs and inland ponds. |
| La Mauricie (Qué) | 1970 | 544 | 252 008 | Margin of the Canadian Shield; forest is transitional between mixed wood and boreal, many lakes, post-glacial relief. |
| Gatineau[1] (Qué) | 1937 | 356 | 975 000 | Canadian Shield, forested hills, lakes, varied flora and fauna; Mackenzie King Estate. |
| Mingan Archipelago (Qué) | 1984 | 85 | ... | Canadian Shield — Maritime margin; variety of bird species. |
| Pukaskwa (Ont) | 1978 | 1 878 | .. | Representative of boreal uplands and the rugged coast of Lake Superior; turbulent rivers and streams, many lakes; a variety of boreal flora and fauna species; sixty kilometre coastal trail and white water canoe routes. |
| **Prairie** | | | | |
| Grasslands (Sask) | 1981 | 56 | .. | Remnants of natural prairies are preserved. |
| Elk Island (Alta) | 1913 | 194 | 372 494 | Forested plains, lakes; fenced preserve with large population of buffalo, deer, elk and moose. |
| **Boreal Plain** | | | | |
| Prince Albert (Sask) | 1927 | 3 875 | 282 171 | Boreal forest, aspen groves and grasslands (park is in a transition area), glacial topography including eskers, drumlins, glacial lakes, spillways, pelican nesting colony, woodland caribou and bison. |
| Riding Mountain (Man) | 1929 | 2 978 | 937 487 | Post-glacial landforms and the blending of mixed-wood forests with grasslands and lakes; major features include the Manitoba escarpment and populations of large mammals. |

Table 8.1.4
## National Park Profiles (concluded)

| Ecozone/Park (Province) | Year Established | Area | Visits 1983-1984 | Biophysical and Cultural Features |
|---|---|---|---|---|
| | | square kilometres | | |
| **Montane Cordillera** | | | | |
| Jasper (Alta) | 1907 | 10 878 | 1 896 263 | Mountain ranges of limestones, quartzites, and argillites, glaciated valleys, Columbia Icefields; Maligne Valley contains underground river system; Large relatively undisturbed areas are critical for the maintenance of large mammal species such as grizzly bear, mountain goat, caribou, elk, sheep and wolves. |
| Banff (Alta) | 1885 | 6 641 | 3 128 160 | Mountain ranges composed of limestones and other deformed sediments, glaciated valleys, mineral hot springs, alpine meadows, glaciers, and other valley and mountain habitat supports quantity of wildlife including sizeable populations of large mammals; Banff townsite has 4,200 permanent residents. |
| Waterton Lakes (Alta) | 1895 | 526 | 674 421 | Mountain area with valley lakes; widely varied fauna and flora because the park is located near the boundary of the prairie and mountain ecosystems; archeological remains related to both the plains and mountains native cultures. |
| Kootenay (BC) | 1920 | 1 406 | 2 289 968 | Mountain ranges of limestone, quartzites and argillites, glaciated valleys, river canyons, geothermal features, significant populations of large mammals. |
| Glacier (BC) | 1886 | 1 349 | 997 192 | Extensively glaciated region of the Selkirk Mountains; variety of montane flora and fauna; Rodgers Pass is a major transportation corridor. |
| Yoho (BC) | 1886 | 1 313 | 1 193 241 | Mountain peaks of limestone, quartzites, argillites, glaciated valleys, mountain lakes, glaciers, Burgess Shales World Heritage Site, Canada's highest waterfall, a variety of montane flora and fauna including populations of large mammals. |
| Mount Revelstoke (BC) | 1914 | 263 | 983 124 | Heavily forested mountainous area, alpine meadows, glaciers. |
| **Pacific Maritime** | | | | |
| Pacific Rim (BC) | 1970 | 389 | 508 869 | The park has three areas with distinct environments, Long Beach, the Broken Group Islands and the West Coast Trail; Rain forests are of particular significance; Park is especially noted for the abundance and diversity of marine mammals. |
| **Boreal Cordillera** | | | | |
| Kluane (BC) | 1972 | 22 015 | 50 213 | St. Elias Mountains and glaciers are part of the world's largest non-polar icefields; Mount Logan, Canada's highest peak, rare bird and plant species, a variety of large mammal species including grizzly bear and Dall's sheep. |
| **Tundra Cordillera** | | | | |
| North Yukon[2] (YK) | 1984 | 11 265 | 0 | Variety of Arctic highland and coastal environments, important caribou range. |
| Nahanni (NWT) | 1972 | 4 766 | 770 | Mackenzie Mountains, canyons, Virginia Falls, Rabbit Kettle Hot Springs; world heritage site. |
| **Taiga Plain** | | | | |
| Wood Buffalo[3] (Alta and NWT) | 1922 | 44 807 | 1 404 | Aspen-pine-spruce forests and open plains; largest herds of plains bison and wood bison in North America; unique salt flats with salt-tolerant plant species; gypsum karst formations; hunting and trapping by descendants of the original inhabitants. |
| **Arctic Cordillera**[4] | | | | |
| Auyuittuq (NWT) | 1972 | 21 471 | 459 | A variety of Arctic environments, fjords, mountains, glaciers, Penny Ice Cap, arctic marine mammals; glacial and periglacial landforms, prehistoric archeological sites and contemporary Inuit culture. |

[1] This park is located in the National Capital Region and is administered by the National Capital Commission rather than Parks Canada. The number of visits is for the calendar year 1983.
[2] A relatively small part of the North Yukon park extends into the Southern Arctic ecozone.
[3] The largest part of Wood Buffalo Park lies in the Taiga Plain ecozone (30 738 square kilometres, 22 090 in Alberta and 8 648 in the Northwest Territories); A smaller part is located in the Boreal Plain ecozone of northern Alberta (14 069 square kilometres).
[4] Parks Canada has recently announced the establishment of a new park on Ellesmere Island. Much of the park will be in this ecozone.

**Source:**
Environment Canada, Parks Canada, 1985.

Table 8.1.5
## Provincial Parks by Ecozone[1]

| Ecozone/Park | | Area in square kilometres |
|---|---|---|
| **Atlantic Maritime** | | |
| Mount Carleton | (NB) | 174 |
| Port Daniel | (Qué) | 64 |
| West Dover | (NS) | 9 |
| Blomidon | (NS) | 7 |
| Brudenell River | (PEI) | 6 |
| Dollar Lake | (NS) | 6 |
| North River | (NS) | 6 |
| Mactaquac | (NB) | 5 |
| Wolastook | (NB) | 5 |
| **Mixed-Wood Plain** | | |
| Fathom Five | (Ont) | 100 |
| Mont-Orford | (Qué) | 58 |
| Rondeau | (Ont) | 48 |
| The Pinery | (Ont) | 25 |
| Paul-Sauvé | (Qué) | 19 |
| Awenda | (Ont) | 16 |
| Wasaga Beach | (Ont) | 16 |
| Carillon | (Ont) | 14 |
| Yamaska | (Qué) | 13 |
| Macgregor Point | (Ont) | 10 |
| Tidewater | (Ont) | 10 |
| Mont-Saint-Bruno | (Qué) | 9 |
| Presqu'ile | (Ont) | 9 |
| Charleston Lake | (Ont) | 9 |
| Iles-de-Boucherville | (Qué) | 7 |
| Sandbanks | (Ont) | 7 |
| Cyprus Lake | (Ont) | 7 |
| Bronte Creek | (Ont) | 6 |
| **Boreal Shield** | | |
| La Vérendrye | (Qué) | 13 610 |
| Chibougamau | (Qué) | 11 025 |
| Laurentides | (Qué) | 7 961 |
| Algonquin | (Ont) | 7 653 |
| Anticosti | (Qué) | 6 747 |
| Quetico | (Ont) | 4 758 |
| Whiteshell | (Man) | 2 734 |
| Grass River | (Man) | 2 290 |
| Papineau-Labelle | (Qué) | 1 667 |
| Rouge-Matawin | (Qué) | 1 635 |
| Mastigouche | (Qué) | 1 617 |
| Lake Superior | (Ont) | 1 557 |
| Lac La Ronge | (Sask) | 1 544 |
| Nopiming | (Man) | 1 437 |
| Matane | (Qué) | 1 284 |
| Mont-Tremblant | (Qué) | 1 248 |
| Chic-Chocs | (Qué) | 1 126 |
| Gaspésie | (Qué) | 802 |
| Rimouski | (Qué) | 797 |
| St. Maurice | (Qué) | 782 |
| Portneuf | (Qué) | 774 |
| Jacques Cartier | (Qué) | 670 |
| Missinaibi Lake | (Ont) | 441 |
| Saguenay | (Qué) | 350 |
| Killarney | (Ont) | 341 |
| Grand-Jardins | (Qué) | 310 |
| Sibley | (Ont) | 244 |
| Aiguebelle | (Qué) | 238 |
| Paint Lake | (Man) | 226 |
| Mississagi River | (Ont) | 198 |
| The Shoals | (Ont) | 112 |
| Obatanga | (Ont) | 94 |
| Wakami Lake | (Ont) | 88 |
| Chapleau-Nemegosenda River | (Ont) | 82 |
| Nagagamisis | (Ont) | 81 |
| Bon Echo | (Ont) | 66 |
| Pistolet Bay | (Nfld) | 58 |
| Greenwater | (Ont) | 54 |
| Fushimi Lake | (Ont) | 53 |
| Halfway Lake | (Ont) | 47 |
| Barachois Pond | (Nfld) | 35 |
| Neys | (Ont) | 34 |
| Mattawa River | (Ont) | 33 |
| Esker Lakes | (Ont) | 32 |
| Sandbar Lake | (Ont) | 32 |
| Remi Lake | (Ont) | 30 |
| Mississagi | (Ont) | 29 |
| Ojibway | (Ont) | 26 |
| Grundy Lake | (Ont) | 26 |
| Lady Evelyn River | (Ont) | 25 |
| Samuel de Champlain | (Ont) | 24 |
| Chance Cove | (Nfld) | 21 |
| Killbear | (Ont) | 18 |
| Butter Pot | (Nfld) | 18 |
| White Lake | (Ont) | 17 |
| Squires Memorial | (Nfld) | 16 |
| Ivanhoe Lake | (Ont) | 16 |
| Petroglyphs | (Ont) | 16 |
| Lake Nipigon | (Ont) | 15 |
| La Manche Valley | (Nfld) | 14 |
| Kettle Lakes | (Ont) | 13 |
| Stag Lake | (Nfld) | 13 |
| Murphy's Point | (Ont) | 12 |
| Lake of the Woods | (Ont) | 11 |
| Arrowhead | (Ont) | 10 |
| Freshwater Pond | (Nfld) | 9 |
| Duley Lake | (Nfld) | 9 |
| Jipujijkuei Kuespen | (Nfld) | 9 |
| Fitzgerald's Pond | (Nfld) | 8 |
| Marine Drive | (Nfld) | 8 |
| Silent Lake | (Ont) | 8 |
| Ouimet Canyon | (Ont) | 8 |
| Restoule | (Ont) | 7 |
| Backside Pond | (Nfld) | 6 |
| Jack's Pond | (Nfld) | 6 |
| Pakwash | (Ont) | 6 |
| Rainbow Falls | (Ont) | 6 |
| **Prairie** | | |
| Moose Mountain | (Sask) | 400 |
| Spruce Woods | (Man) | 249 |
| Cypress Hills | (Alta) | 201 |
| Turtle Mountain | (Man) | 189 |
| Cypress Hills | (Sask) | 182 |
| Dinosaur | (Alta) | 60 |
| Saskatchewan Landing | (Sask) | 56 |
| Douglas | (Sask) | 44 |
| Bird Hill | (Man) | 35 |
| Danielson | (Sask) | 29 |
| Assessippi | (Man) | 25 |
| Goodspirit Lake | (Sask) | 20 |
| Buffalo Pound | (Sask) | 19 |
| Waskwei River | (Sask) | 10 |
| Dillberry Lake | (Alta) | 10 |
| Dry Island Buffalo Jump | (Alta) | 10 |
| Beaudry | (Man) | 9 |
| Vermillion | (Alta) | 8 |
| Anderson Island | (Sask) | 8 |
| Matador Grasslands | (Sask) | 8 |
| Echo Valley | (Sask) | 7 |
| Fish Creek | (Alta) | 7 |
| Midland | (Alta) | 6 |
| The Battlefords | (Sask) | 6 |
| Pike Lake | (Sask) | 5 |
| **Boreal Plain** | | |
| Meadow Lake | (Sask) | 1 570 |
| Hecla | (Man) | 863 |
| Nipawin | (Sask) | 653 |
| Clearwater Lake | (Man) | 596 |
| Duck Mountain | (Sask) | 262 |
| Greenwater | (Sask) | 187 |
| Wildcat Hill | (Sask) | 170 |
| Duck Mountain | (Man) | 127 |
| Nolikewin | (Alta) | 97 |
| Gwillim Lake | (BC) | 92 |
| Lesser Slave Lake | (Alta) | 73 |
| Crimson Lake | (Alta) | 34 |
| William A. Switzer | (Alta) | 27 |
| Grand Beach | (Man) | 25 |
| Hilliard's Bay | (Alta) | 23 |
| Cross Lake | (Alta) | 21 |
| Carson-Pegasus | (Alta) | 12 |
| Winagami Lake | (Alta) | 12 |
| Young's Point | (Alta) | 11 |
| Moonshine Lake | (Alta) | 9 |
| Bow Valley | (Alta) | 8 |
| Long Lake | (Alta) | 8 |
| Calling Lake | (Alta) | 7 |
| Moose Lake | (Alta) | 7 |
| Gregoire Lake | (Alta) | 7 |
| **Montane Cordillera** | | |
| Tweedsmuir | (BC) | 9 811 |
| Wells Gray | (BC) | 5 273 |
| Willmore Wilderness | (Alta) | 4 597 |
| Mount Robson | (BC) | 2 193 |
| Purcell | (BC) | 1 315 |
| Bowron Lake | (BC) | 1 231 |
| E.C. Manning[2] | (BC) | 714 |
| Kananaskis | (Alta) | 503 |
| Valhalla | (BC) | 496 |
| Mount Assiniboine | (BC) | 391 |
| Cathedral | (BC) | 333 |
| Kokanee Glacier | (BC) | 259 |
| Bugaboo Alpine | (BC) | 249 |
| Hamber | (BC) | 245 |
| Carp Lake | (BC) | 193 |
| Okanagan Mountain | (BC) | 105 |
| St. Mary's Alpine | (BC) | 92 |
| Top of the World | (BC) | 88 |
| Silver Star | (BC) | 87 |
| Nancy Greene | (BC) | 81 |
| Monashee | (BC) | 75 |
| Elk Lake | (BC) | 56 |
| Birkenhead Lake | (BC) | 36 |
| Whiteswan Lake | (BC) | 20 |
| Mount Terry Fox | (BC) | 19 |
| Darke Lake | (BC) | 15 |
| Champion Lakes | (BC) | 14 |
| White Pelican | (BC) | 13 |
| Stagleap | (BC) | 11 |
| Eneas Lakes | (BC) | 10 |
| Crooked River | (BC) | 10 |
| Haig Brown | (BC) | 10 |
| Kalamaika Lake | (BC) | 9 |
| Dahl Lake | (BC) | 8 |
| Premier Lake | (BC) | 7 |
| Beauvais Lake | (Alta) | 6 |
| Apex Mountain | (BC) | 6 |
| Conkle Lake | (BC) | 6 |
| Fry Creek Canyon | (BC) | 6 |
| **Pacific Maritime** | | |
| Strathcona | (BC) | 2 314 |
| Garibaldi | (BC) | 1 951 |
| Naikoon | (BC) | 726 |
| Golden Ears | (BC) | 556 |
| Skagit Valley | (BC) | 325 |
| Cape Scott | (BC) | 151 |
| Desolation Sound Marine | (BC) | 83 |
| Schoen Lake | (BC) | 82 |
| Mount Judge Howay | (BC) | 62 |
| Mount Seymour | (BC) | 31 |
| Cypress | (BC) | 29 |
| International Ridge | (BC) | 21 |
| Kitsumkalum Mountain | (BC) | 15 |
| Sasquatch | (BC) | 12 |
| Elk Falls | (BC) | 11 |
| Kikomun Creek | (BC) | 7 |
| Liard River Hotsprings | (BC) | 7 |
| Cultus Lake | (BC) | 7 |
| **Boreal Cordillera** | | |
| Spatsizi | (BC) | 6 597 |
| Atlin | (BC) | 2 711 |
| Mount Edziza | (BC) | 2 327 |
| Kwadacha Wilderness | (BC) | 1 675 |
| Tatalatui | (BC) | 1 058 |
| Muncho Lake | (BC) | 884 |
| Stone Mountain | (BC) | 257 |
| Boya Lake | (BC) | 46 |
| **Hudson Bay Plain** | | |
| Polar Bear | (Ont) | 24 087 |
| Winisk River | (Ont) | 1 740 |

[1] Only parks of five square kilometres and over are included in this table. The table includes wilderness areas and wildlife reserves in which human activities or land use is restricted by the province; a wide range of levels of protection are found in the parks and areas included above.

[2] A small part of this park is located in the Pacific Maritime Ecozone.

**Source:**
Provincial Government Departments with responsibility for parks.

Table 8.1.6
## Park Area by Ecozone

| Ecozone | National Parks | Provincial Parks[1] | Total Park Area | Park Area as a Percentage of Ecozone Area |
|---|---|---|---|---|
| | square kilometres | | | |
| **Atlantic Maritime** | **2 022** | **282** | **2 304** | **1.5** |
| Prince Edward Island | 18 | 6 | 24 | 0.4 |
| Nova Scotia | 1 333 | 28 | 1 361 | 2.5 |
| New Brunswick | 431 | 184 | 615 | 0.8 |
| Québec | 240 | 64 | 304 | 1.5 |
| **Mixed-Wood Plain** | **48** | **383** | **431** | **0.3** |
| Québec | 0 | 106 | 106 | 0.2 |
| Ontario | 48 | 277 | 325 | 0.4 |
| **Boreal Shield** | **5 203** | **77 427** | **82 630** | **4.6** |
| Newfoundland | 2 340 | 230 | 2 570 | 2.1 |
| Québec | 985 | 52 643 | 53 628 | 7.7 |
| Ontario | 1 878 | 16 323 | 18 201 | 3.0 |
| Manitoba | 0 | 6 687 | 6 687 | 2.7 |
| Saskatchewan | 0 | 1 544 | 1 544 | 1.5 |
| **Prairie** | **250** | **1 561** | **1 811** | **0.4** |
| Manitoba | 0 | 507 | 507 | 0.7 |
| Saskatchewan | 56 | 752 | 808 | 0.3 |
| Alberta | 194 | 302 | 496 | 0.3 |
| **Boreal Plain** | **14 069** | **4 901** | **18 970** | **2.1** |
| Manitoba | 0 | 1 611 | 1 611 | 1.2 |
| Saskatchewan | 0 | 2 842 | 2 842 | 1.1 |
| Alberta | 14 069 | 356 | 14 425 | 3.8 |
| British Columbia | 0 | 92 | 92 | 0.1 |
| **Montane Cordillera** | **22 376** | **28 593** | **50 969** | **11.0** |
| Alberta | 18 045 | 5 106 | 23 151 | 52.8 |
| British Columbia | 4 331 | 23 487 | 27 818 | 6.6 |
| **Pacific Maritime** | **389** | **6 390** | **6 779** | **3.4** |
| British Columbia | 389 | 6 390 | 6 779 | 3.4 |
| **Boreal Cordillera** | **22 015** | **15 555** | **37 570** | **8.8** |
| British Columbia | 0 | 15 555 | 15 555 | 7.5 |
| Yukon | 22 015 | 0 | 22 015 | 10.1 |
| **Tundra Cordillera** | **16 031** | **..[2]** | **16 031** | **4.3** |
| Yukon | 11 265 | ..[2] | 11 265 | 4.9 |
| Northwest Territories | 4 766 | ..[2] | 4 766 | 3.2 |
| **Taiga Plain** | **30 738** | **...[2]** | **30 738** | **5.5** |
| Alberta | 22 090 | 0 | 22 090 | 32.4 |
| Northwest Territories | 8 648 | ...[2] | 8 648 | 1.9 |
| **Hudson Bay Plain** | **0** | **25 827** | **25 827** | **7.0** |
| Ontario | 0 | 25 827 | 25 827 | 9.3 |
| **Arctic Cordillera** | **21 471** | **...[2]** | **21 471** | **7.1** |
| Northwest Territories | 21 471 | ...[2] | 21 471 | 7.1 |

[1] Only parks of five square kilometres and over are included in the provincial parks column. The numerous smaller parks were not assigned to an ecozone.
[2] Territorial parks have been excluded.

**Source:**
Environment Canada, Parks Canada, 1984.
Statistics Canada, special tabulations by the Office of the Senior Adviser on Integration from provincial source material.

Table 8.1.7
## Public Perception of the Most Important Environmental Problems at National and Provincial Levels, 1981[1]

| The Question: "What do you consider to be the most serious environmental problem today?" | Canada | Atlantic Canada | Québec | Ontario | Western Canada |
|---|---|---|---|---|---|
| "In Canada" | | | percent | | |
| Water Pollution | 22 | 13 | 26 | 23 | 22 |
| Acid Rain | 18 | 24 | 14 | 18 | 18 |
| Air Pollution | 9 | 9 | 10 | 12 | 5 |
| Industrial Pollution | 8 | 6 | 9 | 6 | 12 |
| Pollution (unspecified) | 7 | 7 | 8 | 8 | 4 |
| Air and Water Pollution | 6 | 7 | 5 | 5 | 6 |
| Dump Sites/Chemical Dumps | 3 | 3 | 1 | 4 | 3 |
| Destruction of Forests | 2 | 4 | 4 | 1 | 2 |
| Destruction of Animals | 1 | 0 | 2 | 1 | 1 |
| Urbanization/No Green Spaces | 1 | 1 | 1 | 1 | 1 |
| Land/Soil Pollution | 1 | 1 | 2 | 1 | 2 |
| Don't Know and Other | 22 | 25 | 18 | 20 | 24 |
| Total | 100 | 100 | 100 | 100 | 100 |
| "In Your Province" | | | percent | | |
| Water Pollution | 27 | 11 | 43 | 21 | 26 |
| Acid Rain | 15 | 12 | 10 | 27 | 6 |
| Air Pollution | 8 | 6 | 6 | 11 | 8 |
| Industrial Pollution | 9 | 5 | 8 | 9 | 10 |
| Pollution (unspecified) | 6 | 6 | 8 | 7 | 4 |
| Air and Water Pollution | 6 | 3 | 5 | 5 | 7 |
| Dump Sites/Chemical Dump | 4 | 2 | 2 | 5 | 4 |
| Destruction of Forests | 6 | 36 | 2 | 1 | 5 |
| Destruction of Animals | 2 | 2 | 2 | 1 | 2 |
| Urbanization/No Green Space | 1 | 0 | 1 | 1 | 3 |
| Land/Soil Pollution | 1 | 1 | 1 | 1 | 2 |
| Don't Know and Other | 15 | 16 | 12 | 11 | 23 |
| Total | 100 | 100 | 100 | 100 | 100 |

[1] The total sample size was 1,960.

Source:
Centre de recherches sur l'opinion publique. (CROP) survey, June, 1981.

Table 8.1.8
## Public Perception of Pollution Change in Canada[1]

| The Question: "Would you say that the level of pollution has increased, decreased or remained the same over the past two years?" | Canada | Atlantic Canada | Québec | Ontario | Western Canada |
|---|---|---|---|---|---|
| "In Your Neighbourhood?" | | | percent | | |
| Increased | 38 | 40 | 40 | 36 | 38 |
| Decreased | 7 | 6 | 9 | 8 | 4 |
| Same | 52 | 51 | 48 | 52 | 55 |
| Don't know | 3 | 3 | 3 | 4 | 3 |
| Total | 100 | 100 | 100 | 100 | 100 |
| "In Your Province?" | | | percent | | |
| Increased | 65 | 71 | 64 | 61 | 67 |
| Decreased | 8 | 4 | 12 | 10 | 3 |
| Same | 20 | 22 | 18 | 19 | 24 |
| Don't know | 7 | 3 | 6 | 10 | 6 |
| Total | 100 | 100 | 100 | 100 | 100 |

| The Question: "Would you say that the level of pollution has increased, decreased or remained the same over the past two years?" | Canada | Atlantic Canada | Québec | Ontario | Western Canada |
|---|---|---|---|---|---|
| "In Canada?" | | | percent | | |
| Increased | 70 | 86 | 66 | 61 | 76 |
| Decreased | 6 | 5 | 7 | 10 | 3 |
| Same | 15 | 6 | 19 | 16 | 15 |
| Don't know | 9 | 3 | 8 | 13 | 6 |
| Total | 100 | 100 | 100 | 100 | 100 |

[1] The sample size was 1,994. The question asked was asked in 1982 and thus refers to the period 1981-1982.

Source:
Centre de recherches sur l'opinion publique (CROP) survey, 1982.

Table 8.1.9
## Public Attitudes Concerning the Management of Forest Resources[1]

| The Question: "For each of the following statements about forest management please tell me whether you agree strongly, agree somewhat, disagree somewhat or disagree strongly based on your general impressions." | Canada | Atlantic Canada | Québec | Ontario | Western Canada |
|---|---|---|---|---|---|
| **"Companies should be free to harvest our forests without government regulation"** | | | percent | | |
| Agree strongly | 4 | 9 | 1 | 3 | 3 |
| Agree somewhat | 5 | 8 | 4 | 6 | 4 |
| Disagree somewhat | 17 | 15 | 21 | 16 | 14 |
| Disagree strongly | 73 | 68 | 72 | 73 | 78 |
| Don't know | 1 | 0 | 2 | 2 | 1 |
| Total | 100 | 100 | 100 | 100 | 100 |
| **"Chemicals, such as pesticides, are necessary for taking care of forests"** | | | percent | | |
| Agree strongly | 12 | 13 | 13 | 11 | 12 |
| Agree somewhat | 46 | 36 | 52 | 42 | 47 |
| Disagree somewhat | 24 | 28 | 24 | 23 | 23 |
| Disagree strongly | 15 | 21 | 8 | 19 | 15 |
| Don't know | 3 | 2 | 3 | 4 | 3 |
| Total | 100 | 100 | 100 | 100 | 100 |
| **"In recent years, more trees were cut down compared to the number of trees planted[2]"** | | | percent | | |
| Agree strongly | 35 | 55 | 37 | 35 | 27 |
| Agree somewhat | 31 | 28 | 34 | 31 | 30 |
| Disagree somewhat | 16 | 12 | 14 | 14 | 21 |
| Disagree strongly | 6 | 2 | 4 | 9 | 6 |
| Don't know | 12 | 3 | 11 | 11 | 16 |
| Total | 100 | 100 | 100 | 100 | 100 |
| **"The forests should not be exploited economically at all"** | | | percent | | |
| Agree strongly | 18 | 25 | 8 | 25 | 17 |
| Agree somewhat | 20 | 20 | 14 | 23 | 20 |
| Disagree somewhat | 39 | 37 | 53 | 30 | 37 |
| Disagree strongly | 20 | 17 | 22 | 19 | 23 |
| Don't know | 3 | 1 | 3 | 3 | 3 |
| Total | 100 | 100 | 100 | 100 | 100 |

[1] The sample size was 1,960.
[2] Information in Chapter 3.2 indicates that 22 percent of the cut was replanted or reseeded in the period 1976 to 1980.

**Source:**
Centre de recherches sur l'opinion publique (CROP) Survey, June 1981.

# Appendices

Appendix 1, Table 1
## Drainage Basin Reference Codes

| | | | Province |
|---|---|---|---|
| **1. ATLANTIC OCEAN BASIN** | | | |
| **Atlantic Ocean Coastal Drainage** | | | |
| 100.1 | - 10 | Labrador Coast Rivers | Newfoundland |
| 100.2 | - 10 | Churchill and Naskaupi Rivers | Newfoundland |
| 101 | - 10 | Newfoundland, North Coast Rivers | Newfoundland |
| 102 | - 10 | Trinity Bay Coast Rivers | Newfoundland |
| 103 | - 10 | St. John's area Rivers | Newfoundland |
| 104 | - 12 | Nova Scotia, Southeast Coast Rivers | Nova Scotia |
| **Gulf of St. Lawrence Coastal Drainage** | | | |
| 110.1 | | Gulf, Mainaland North Coast Rivers: | |
| 110.1 | - 10 | Labrador part | Newfoundland |
| 110.1 | - 24 | Québec part | Québec |
| 110.2 | - 24 | Manicouagan and Outardes Rivers | Québec |
| 110.3 | - 24 | Betsiamites River | Québec |
| 111 | - 10 | Gulf, Newfoundland West and South Coast Rivers | Newfoundland |
| 112 | - 24 | North Gaspé Peninsula Rivers | Québec |
| 113 | | Gulf, Mainland South and West Coast Rivers: | |
| 113 | - 12 | Nova Scotia part | Nova Scotia |
| 113 | - 13 | New Brunswick part | New Brunswick |
| 113 | - 24 | Québec part | Québec |
| 114 | - 11 | Prince Edward Island Rivers | Prince Edward Island |
| 115 | - 12 | Cape Breton Island Rivers | Nova Scotia |
| **Bay of Fundy Coastal - Saint John River Drainage** | | | |
| 120 | | Bay of Fundy Coast Rivers: | |
| 120 | - 12 | Nova Scotia part | Nova Scotia |
| 121 | - 13 | New Brunswick part | New Brunswick |
| 130 | | Saint John River: | |
| 130 | - 13 | New Brunswick part | New Brunswick |
| 130 | - 24 | Québec part | Québec |
| **St. Lawrence River Drainage** | | | |
| 140 | - 24 | Saguenay River | Québec |
| 141 | - 24 | Québec City area - Middle North Shore Rivers | Québec |
| 142 | - 24 | Chaudière River - Middle South Shore Rivers | Québec |
| 143 | - 24 | St. Maurice River | Québec |
| 144 | - 24 | Eastern Township Rivers - Richelieu River | Québec |
| 145 | - 24 | Eastern Laurentian Rivers | Québec |
| 146 | - 24 | Montréal area Rivers | Québec |
| 147 | | West St. Lawrence River: | |
| 147 | - 24 | Québec part | Québec |
| 147 | - 35 | Ontario part | Ontario |
| **Ottawa River Drainage** | | | |
| 150 | | Lower Ottawa River: | |
| 150 | - 24 | Québec part | Québec |
| 150 | - 35 | Ontario part | Ontario |
| 151 | | Upper Ottawa River: | |
| 151 | - 24 | Québec part | Québec |
| 151 | - 35 | Ontario part | Ontario |
| **Lake Ontario Shore Drainage** | | | |
| 160 | - 35 | Belleville - Napanee area Rivers | Ontario |
| 161 | - 35 | Trent River | Ontario |
| 162 | - 35 | Oshawa - Colborne area Rivers | Ontario |
| 163 | - 35 | Toronto area Rivers | Ontario |
| 164 | - 35 | Hamilton area Rivers | Ontario |
| 165 | - 35 | Niagara Peninsula Rivers | Ontario |
| **Lake Erie and Lake St. Clair Shore Drainage** | | | |
| 170 | - 35 | Grand River | Ontario |
| 171 | - 35 | Lake Erie Shore Rivers | Ontario |
| 172 | - 35 | Thames River | Ontario |
| 173 | - 35 | Sydenham River | Ontario |
| **Lake Huron Shore Drainage** | | | |
| 180 | - 35 | South Huron Shore Rivers | Ontario |
| 181 | - 35 | Georgian Bay Shore - Lake Simcoe Shore Rivers | Ontario |
| 182 | - 35 | North Huron Shore Rivers | Ontario |
| **Lake Superior Shore Drainage** | | | |
| 190 | - 35 | Lake Superior Shore Rivers | Ontario |
| **2. HUDSON BAY AND UNGAVA BAY BASIN** | | | |
| Hudson Bay and Ungava Bay Coastal Drainage | | | |
| 200.1 | - 24 | East Hudson Bay Coast Rivers | Québec |
| 200.2 | - 24 | Ungava Bay Coast Rivers | Québec |
| 200.3 | - 24 | Eastmain and LaGrande Rivers | Québec |
| 210.1 | - 24 | Rupert and Nottaway Rivers | Québec |
| 210.2 | | Harricanaw River: | |
| 210.2 | - 24 | Québec part | Québec |
| 210.2 | - 35 | Ontario part | Ontario |
| 210.3 | | Moose River: | |
| 210.3 | - 24 | Québec part | Québec |
| 210.3 | - 35 | Ontario part | Ontario |
| 210.4 | - 35 | Albany River | Ontario |
| 210.5 | | Southwest Hudson Bay Coast Rivers: | |
| 210.5 | - 35 | Ontario part | Ontario |
| 210.5 | - 46 | Manitoba part | Manitoba |
| 210.6 | | Hayes River: | |
| 210.6 | - 35 | Ontario part | Ontario |
| 210.6 | - 46 | Manitoba part | Manitoba |
| 211.1 | | West Hudson Bay Coast Rivers: | |
| 211.1 | - 46 | Manitoba part | Manitoba |
| 211.1 | - 47 | Saskatchewan part | Saskatchewan |
| 211.1 | - 61 | Northwest Territories part | Northwest Territories |
| 211.2 | | Thelon - Kazan Rivers: | |
| 211.2 | - 46 | Manitoba part | Manitoba |
| 211.2 | - 47 | Saskatchewan part | Saskatchewan |
| 211.2 | - 61 | Northwest Territories part | Northwest Territories |
| 211.3 | | Churchill River: | |
| 211.3 | - 46 | Manitoba part | Manitoba |
| 211.3 | - 47 | Saskatchewan part | Saskatchewan |
| 211.3 | - 48 | Alberta part | Alberta |
| **Nelson River Drainage** | | | |
| 220 | - 46 | Nelson River | Manitoba |
| **Lake Winnipeg Shore Drainage** | | | |
| 230 | | Lake Winnipeg Shore Rivers: | |
| 230 | - 35 | Ontario part | Ontario |
| 230 | - 46 | Manitoba part | Manitoba |
| 231 | - 46 | Red River | Manitoba |
| 232 | | Dauphin River: | |
| 232 | - 46 | Manitoba part | Manitoba |
| 232 | - 47 | Saskatchewan part | Saskatchewan |
| **Assiniboine River Drainage** | | | |
| 240 | | Assiniboine and Souris Rivers: | |
| 240 | - 46 | Manitoba part | Manitoba |
| 240 | - 47 | Saskatchewan part | Saskatchewan |
| 241 | | Qu'Appelle River - Old Wives Lake: | |
| 241 | - 46 | Manitoba part | Manitoba |
| 241 | - 47 | Saskatchewan part | Saskatchewan |
| **Saskatchewan River Drainage** | | | |
| 250 | | Saskatchewan River: | |
| 250 | - 46 | Manitoba part | Manitoba |
| 250 | - 47 | Saskatchewan part | Saskatchewan |
| 251 | - 48 | Upper North Saskatchewan River | Alberta |
| 252 | | Lower North Saskatchewan River: | |
| 252 | - 47 | Saskatchewan part | Saskatchewan |
| 252 | - 48 | Alberta part | Alberta |
| 253 | | South Saskatchewan River and Red Deer River: | |
| 253 | - 47 | Saskatchewan part | Saskatchewan |
| 253 | - 48 | Alberta part | Alberta |
| 254 | - 48 | Bow River | Alberta |
| **3. ARCTIC OCEAN BASIN** | | | |
| **Mackenzie River Drainage** | | | |
| 300.1 | | Mackenzie River: | |
| 300.1 | - 60 | Yukon part | Yukon |
| 300.1 | - 61 | Northwest Territories part | Northwest Territories |
| 300.2 | | Great Slave Lake Shore Rivers: | |
| 300.2 | - 47 | Saskatchewan part | Saskatchewan |
| 300.2 | - 48 | Alberta part | Alberta |
| 300.2 | - 59 | British Columbia part | British Columbia |
| 300.2 | - 61 | Northwest Territories part | Northwest Territories |
| 300.3 | | Liard River: | |
| 300.3 | - 48 | Alberta part | Alberta |
| 300.3 | - 59 | British Columbia part | British Columbia |
| 300.3 | - 60 | Yukon part | Yukon |
| 200.3 | - 61 | Northwest Territories part | Northwest Territories |
| 301 | | Athabasca River: | |
| 301 | - 47 | Saskatchewan part | Saskatchewan |
| 301 | - 48 | Alberta part | Alberta |
| 302 | | Peace River: | |
| 302 | - 48 | Alberta part | Alberta |
| 302 | - 59 | British Columbia part | British Columbia |
| **Arctic Ocean Coastal Drainage** | | | |
| 330.1 | | Mainland Arctic Coast Rivers: | |
| 330.1 | - 60 | Yukon Part | Yukon |
| 330.1 | - 61 | Northwest Territories part | Northwest Territories |
| 330.2 | - 61 | Arctic Islands Rivers | Northwest Territories |

Appendix 1, Table 1
## Drainage Basin Reference Codes (concluded)

| | | Province |
|---|---|---|
| **4. PACIFIC OCEAN BASIN** | | |
| **Columbia River Drainage** | | |
| 400 - 59 | Columbia River | British Columbia |
| 401 - 59 | Okanagan River | British Columbia |
| 402 - 59 | Similkameen River | British Columbia |
| Fraser River Drainage | | |
| 410 - 59 | Upper Fraser River | British Columbia |
| 411 - 59 | Thompson River | British Columbia |
| 412 - 59 | Lower Fraser River | British Columbia |
| **Yukon River Drainage** | | |
| 420.1 | Yukon River: | |
| 420.1 - 59 | British Columbia part | British Columbia |
| 420.1 - 60 | Yukon part | Yukon |
| 420.2 - 60 | Porcupine River | Yukon |
| **Pacific Ocean, North Coastal Drainage** | | |
| 430 | Alsek River: | |
| 430 - 59 | British Columbia part | British Columbia |
| 430 - 60 | Yukon part | Yukon |
| 431.1 - 59 | Pacific Ocean, North Coast Rivers | British Columbia |
| 431.2 - 59 | Skeena River | British Columbia |
| 431.3 - 59 | Queen Charlotte Islands Rivers | British Columbia |
| **Pacific Ocean, South Coastal Drainage** | | |
| 432.1 - 59 | Pacific Ocean, South Coast Rivers | British Columbia |
| 432.2 - 59 | Northern Vancouver Island Rivers | British Columbia |
| 433 - 59 | Southern Vancouver Island Rivers | British Columbia |
| 434 - 59 | Skagit River | British Columbia |
| **5. GULF OF MEXICO BASIN** | | |
| **Missouri River Drainage** | | |
| 500 | Milk - Missouri Tributary Rivers: | |
| 500 - 47 | Saskatchewan part | Saskatchewan |
| 500 - 48 | Alberta part | Alberta |

**Note:**
Basin reference codes are made up of two elements, a first number which is the actual basin code and a second number which is the Statistics Canada code for the province. The provincial codes are as follows: 10 - Newfoundland, 11 - Prince Edward Island, 12 - Nova Scotia, 13 - New Brunswick, 24 - Québec, 35 - Ontario, 46 - Manitoba, 47 - Saskatchewan, 48 - Alberta, 59 - British Columbia, 60 - Yukon, 61 - Northwest Territories.

Appendix 1 Technical Box 2

## Special Tabulations of Data for Ecozones and Drainage Basins

Many of the data presented here for ecozones and drainage basins were derived from Statistics Canada files through special tabulations of existing data. Several steps were involved in the preparation of these data series.

Ecozone and drainage basin boundaries were first transcribed to large scale maps. From these the boundaries of each unit were geocoded (i.e. assigned machine-readable x-y coordinates) by the Spatial Systems Section of the Geography Division, Statistics Canada. The resulting geographic file was matched to a file containing centroid coordinates of enumeration areas (EA'S), the basic data building block for Census of Population and Census of Agriculture information. A new file which contained a list of the constitutent enumeration areas of each ecozone and drainage basin was then created.

Statistical tapes containing EA level information for the desired variables were accessed and the results tabulated to the ecozone and the basin levels.

A similar process was used to access information from the Census of Manufactures except that for these data series the municipality replaced the enumeration area as the basic data building block.

The special tabulations which appear in this book are illustrative of the flexibility Statistics Canada data bases possess for meeting information requirements for statistics on user-specified geographic units and special themes. More information regarding these services can be obtained from User Advisory Services.

### Drainage Basin Comparability

In the first edition of *Human Activity and the Environment*, data were presented for a set of sixty-nine basins. In this publication statistics are presented for eighty-eight drainage basins, this increase resulting from the subdivision of some of the larger northern basins. These basins were split to reflect more accurately the geographic areas in which major resource projects were located.

To allow comparisons, the basin numbering system has remained consistent with that of the first edition. The basins which have been subdivided retained their original code number but now also carry an additional number which follows a decimal point.

**References:**

Environment Canada, Lands Directorate, *Terrestrial Ecozones of Canada*, by E. Wiken, unpublished working paper, August, 1983.
Statistics Canada, Office of the Senior Adviser on Integration, *Human Activity and the Environment*, Catalogue 11-509, 1978.
Statistics Canada, Office of the Senior Adviser on Integration, *Thematic Maps of Man's Activities in Canada's Watersheds*, by B.W. Mitchell, uncatalogued publication, 1980.

Appendix 2, Table 1

## Population and Population Density by Drainage Basin, 1971[1], 1976 and 1981

| Code | Drainage Basin | Area | Population | | | Population Density[2] | | | Percentage Change in Population | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1971 | 1976 | 1981 | 1971 | 1976 | 1981 | 1971-1976 | 1976-1981 |
| | | square kilometres | | | | persons/square kilometre | | | | |
| 1. | **Atlantic Ocean Basin** | | | | | | | | | |
| 100.1-10 | Labrador Coast Rivers | 150 230 | 4 525 | 4 830 | 5 109 | <1 | <1 | <1 | 6.7 | 5.8 |
| 100.2-10 | Churchill and Naskaupi Rivers | 110 715 | 21 670 | 25 908 | 23 750 | <1 | <1 | <1 | 19.6 | -8.3 |
| 101 -10 | Newfoundland North Coast Rivers | 48 510 | 125 840 | 132 766 | 133 798 | 3 | 3 | 3 | 5.5 | 0.8 |
| 102 -10 | Trinity Bay Coastal Rivers | 4 575 | 67 325 | 70 283 | 72 665 | 15 | 15 | 16 | 4.4 | 3.4 |
| 103 -10 | St.John's area Rivers | 2 935 | 144 960 | 156 645 | 165 843 | 49 | 53 | 57 | 8.1 | 5.9 |
| 104 -12 | Nova Scotia, Southeast Coast Rivers | 23 295 | 358 585 | 376 181 | 389 316 | 15 | 16 | 17 | 4.9 | 3.5 |
| 110.1 | Gulf, Mainland North Coast Rivers: | 184 640 | 73 700 | 88 931 | 90 590 | <1 | <1 | <1 | 20.7 | 1.9 |
| 110.1-10 | Labrador part | 32 475 | 1 975 | 2 314 | 2 459 | <1 | <1 | <1 | 17.2 | 6.3 |
| 110.1-24 | Québec part | 152 165 | 71 725 | 86 617 | 88 131 | <1 | 1 | 1 | 20.8 | 1.7 |
| 110.2-24 | Manicouagan and Outardes Rivers | 68 370 | 23 510 | 24 898 | 23 659 | <1 | <1 | <1 | 5.9 | -5.0 |
| 110.3-24 | Betsiamites River | 28 915 | 17 700 | 16 150 | 16 203 | 1 | 1 | 1 | -8.8 | 0.3 |
| 111 -10 | Gulf, Newfoundland West and South Coast Rivers | 56 280 | 155 810 | 164 979 | 164 057 | 3 | 3 | 3 | 5.9 | -0.6 |
| 112 -24 | North Gaspé Peninsula Rivers | 12 245 | 148 630 | 147 751 | 153 970 | 12 | 12 | 13 | -0.6 | 4.2 |
| 113 | Gulf, Mainland South and West Coast Rivers: | 62 860 | 386 700 | 401 060 | 410 365 | 6 | 6 | 7 | 3.7 | 2.3 |
| 113 -12 | Nova Scotia part | 7 015 | 75 310 | 79 133 | 81 073 | 11 | 11 | 12 | 5.1 | 2.5 |
| 113 -13 | New Brunswick part | 33 610 | 217 950 | 231 644 | 239 235 | 6 | 7 | 7 | 6.3 | 3.3 |
| 113 -24 | Québec part | 22 235 | 93 450 | 90 283 | 90 057 | 4 | 4 | 4 | -3.4 | -0.3 |
| 114 -11 | Prince Edward Island Rivers | 5 660 | 111 640 | 118 229 | 122 506 | 20 | 21 | 22 | 5.9 | 3.6 |
| 115 -12 | Cape Breton Island Rivers | 10 660 | 170 265 | 170 883 | 170 112 | 16 | 16 | 16 | 0.4 | -0.5 |
| 120 | Bay of Fundy Coast Rivers: | 25 140 | 312 205 | 345 771 | 355 413 | 12 | 14 | 14 | 10.8 | 2.8 |
| 120 -12 | Nova Scotia part | 14 520 | 184 800 | 202 374 | 206 941 | 13 | 14 | 14 | 9.5 | 2.3 |
| 121 -13 | New Brunswick part | 10 620 | 127 405 | 143 397 | 148 472 | 12 | 14 | 14 | 12.6 | 3.5 |
| 130 | Saint John River: | 37 450 | 341 780 | 350 905 | 356 935 | 9 | 9 | 10 | 2.7 | 1.7 |
| 130 -13 | New Brunswick part | 29 210 | 289 205 | 302 209 | 308 696 | 10 | 10 | 11 | 4.5 | 2.1 |
| 130 -24 | Québec part | 8 240 | 52 575 | 48 696 | 48 239 | 6 | 6 | 6 | -7.4 | -0.9 |
| 140 -24 | Saguenay River | 87 970 | 267 215 | 270 977 | 287 272 | 3 | 3 | 3 | 1.4 | 6.0 |
| 141 -24 | Québec City area - Middle North Shore Rivers | 20 025 | 406 490 | 442 365 | 465 470 | 20 | 22 | 23 | 8.8 | 5.2 |
| 142 -24 | Chaudière River - Middle South Shore Rivers | 17 685 | 523 080 | 528 257 | 559 767 | 30 | 30 | 32 | 1.0 | 6.0 |
| 143 -24 | St.Maurice River | 45 405 | 126 675 | 127 701 | 131 975 | 3 | 3 | 3 | 0.8 | 3.3 |
| 144 -24 | Eastern Township Rivers - Richelieu River | 20 590 | 861 230 | 910 737 | 985 785 | 42 | 44 | 48 | 5.7 | 8.2 |
| 145 -24 | Eastern Laurentian Rivers | 9 445 | 169 025 | 193 979 | 221 367 | 18 | 21 | 23 | 14.8 | 14.1 |
| 146 -24 | Montréal area Rivers | 4 670 | 2 679 280 | 2 721 833 | 2 716 086 | 574 | 583 | 582 | 1.6 | -0.2 |
| 147 | West St. Lawrence River: | 4 800 | 247 710 | 251 895 | 256 266 | 52 | 52 | 53 | 1.7 | 1.7 |
| 147 -24 | Québec part | 710 | 59 050 | 61 269 | 65 669 | 83 | 86 | 92 | 3.8 | 7.2 |
| 147 -35 | Ontario part | 4 090 | 188 665 | 190 626 | 190 597 | 46 | 47 | 47 | 1.0 | 0.0 |
| 150 | Lower Ottawa River: | 56 070 | 844 040 | 908 169 | 946 683 | 15 | 16 | 17 | 7.6 | 4.2 |
| 150 -24 | Québec part | 46 235 | 318 745 | 343 633 | 357 972 | 7 | 7 | 8 | 7.8 | 4.2 |
| 150 -35 | Ontario part | 9 835 | 525 290 | 564 536 | 588 711 | 53 | 57 | 60 | 7.5 | 4.3 |
| 151 | Upper Ottawa River: | 90 615 | 328 170 | 347 233 | 351 781 | 4 | 4 | 4 | 5.8 | 1.3 |
| 151 -24 | Québec part | 47 980 | 94 395 | 99 289 | 99 056 | 2 | 2 | 2 | 5.2 | -0.2 |
| 151 -35 | Ontario part | 42 635 | 233 780 | 247 944 | 252 725 | 5 | 6 | 6 | 6.1 | 1.9 |
| 160 -35 | Belleville-Napanee area Rivers | 7 055 | 158 095 | 175 381 | 178 316 | 22 | 25 | 25 | 10.9 | 1.7 |
| 161 -35 | Trent River | 12 815 | 188 320 | 209 390 | 217 513 | 15 | 16 | 17 | 11.2 | 3.9 |
| 162 -35 | Oshawa-Colborne area Rivers | 1 910 | 164 170 | 185 895 | 197 523 | 86 | 97 | 103 | 13.2 | 6.3 |
| 183 -35 | Toronto area Rivers | 3 050 | 2 381 840 | 2 509 641 | 2 642 678 | 781 | 823 | 866 | 5.4 | 5.3 |
| 184 -35 | Hamilton area Rivers | 2 300 | 531 170 | 623 210 | 704 713 | 231 | 271 | 306 | 17.3 | 13.1 |
| 165 -35 | Niagara Peninsula Rivers | 2 565 | 560 710 | 600 787 | 611 132 | 219 | 234 | 238 | 7.1 | 1.7 |
| 170 -35 | Grand River | 7 035 | 502 555 | 556 008 | 582 983 | 71 | 79 | 83 | 10.6 | 4.9 |
| 171 -35 | Lake Erie Shore Rivers | 7 315 | 477 180 | 486 560 | 490 110 | 65 | 67 | 67 | 2.0 | 0.7 |
| 172 -35 | Thames River | 5 800 | 424 045 | 451 505 | 464 752 | 73 | 78 | 80 | 6.5 | 2.9 |
| 173 -35 | Sydenham River | 3 440 | 78 130 | 83 509 | 83 261 | 23 | 24 | 24 | 6.9 | -0.3 |
| 180 -35 | South Huron Shore Rivers | 13 930 | 262 025 | 286 344 | 294 843 | 19 | 21 | 21 | 9.3 | 3.0 |
| 181 -35 | Georgian Bay Shore - Lake Simcoe Shore Rivers | 22 740 | 304 120 | 358 379 | 384 433 | 13 | 16 | 17 | 17.8 | 7.3 |
| 182 -35 | North Huron Shore Rivers | 55 850 | 367 040 | 368 152 | 371 843 | 7 | 7 | 7 | 0.3 | 1.0 |
| 190 -35 | Lake Superior Shore Rivers | 101 795 | 170 970 | 177 869 | 180 440 | 2 | 2 | 2 | 4.0 | 1.4 |
| 2. | **Hudson Bay and Ungava Bay Basin** | | | | | | | | | |
| 200.1-24 | East Hudson Bay Coast Rivers | 198 075 | 1 780 | 1 651 | 2 925 | <1 | <1 | <1 | -7.2 | 77.2 |
| 200.2-24 | Ungava Bay Coast Rivers | 384 035 | 6 440 | 6 423 | 5 431 | <1 | <1 | <1 | -0.3 | -15.4 |
| 200.3-24 | Eastmain and LaGrande Rivers | 163 430 | 2 080 | 4 130 | 5 738 | <1 | <1 | <1 | 98.6 | 38.9 |
| 210.1-24 | Rupert and Nottaway Rivers | 137 955 | 30 385 | 32 776 | 34 172 | <1 | <1 | <1 | 7.9 | 4.3 |
| 210.2 | Harricanaw River: | 42 615 | 50 870 | 52 894 | 57 446 | 1 | 1 | 1 | 4.0 | 8.6 |
| 210.2-24 | Québec part | 26 320 | 47 460 | 50 204 | 54 538 | 2 | 2 | 2 | 5.8 | 8.6 |
| 210.2-35 | Ontario part | 16 295 | 3 410 | 2 690 | 2 908 | <1 | <1 | <1 | -21.1 | 8.1 |
| 210.3 | Moose River: | 112 290 | 124 880 | 123 944 | 123 309 | 1 | 1 | 1 | -0.7 | -0.5 |
| 210.3-24 | Québec part | 3 650 | 26 835 | 24 826 | 24 921 | 7 | 7 | 7 | -7.5 | 0.4 |
| 210.3-35 | Ontario part | 108 640 | 98 050 | 99 118 | 98 388 | 1 | 1 | 1 | 1.1 | -0.7 |
| 210.4-35 | Albany River | 100 195 | 5 115 | 5 584 | 5 688 | <1 | <1 | <1 | 9.2 | 1.9 |
| 210.5 | Southwest Hudson Bay Coast Rivers | 325 920 | 4 660 | 5 589 | 7 266 | <1 | <1 | <1 | 19.9 | 30.0 |
| 210.5-35 | Ontario part | 304 585 | 4 660 | 5 589 | 7 266 | <1 | <1 | <1 | 19.9 | 30.0 |
| 210.5-46 | Manitoba part | 21 335 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |

Appendix 2 Table 1
**Population and Population Density by Drainage Basin, 1971[1], 1976 and 1981 (continued)**

| Code | Drainage Basin | Area | Population | | | Population Density[2] | | | Percentage Change in Population | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1971 | 1976 | 1981 | 1971 | 1976 | 1981 | 1971-1976 | 1976-1981 |
| | | square kilometres | | | | persons/square kilometre | | | | |
| 210.6 | Hayes River: | 107 935 | 4 580 | 5 709 | 5 142 | <1 | <1 | <1 | 24.7 | -9.9 |
| 210.6-35 | Ontario part | 15 880 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 210.6-46 | Manitoba part | 92 055 | 4 580 | 5 709 | 5 142 | <1 | <1 | <1 | 24.7 | -9.9 |
| 211.1 | West Hudson Bay Coast Rivers: | 427 165 | 4 745 | 4 482 | 5 060 | <1 | <1 | <1 | -5.5 | 12.9 |
| 211.1-46 | Manitoba part | 112 455 | 2 275 | 1 367 | 1 304 | <1 | <1 | <1 | -39.9 | -4.6 |
| 211.1-47 | Saskatchewan part | 300 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 211.1-61 | Northwest Territories part | 314 410 | 2 470 | 3 115 | 3 756 | <1 | <1 | <1 | 26.1 | 20.6 |
| 211.2 | Thelon - Kazan Rivers: | 243 935 | 755 | 882 | 954 | <1 | <1 | <1 | 16.8 | 8.2 |
| 211.2-46 | Manitoba part | 795 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 211.2-47 | Saskatchewan part | 5 220 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 211.2-61 | Northwest Territories part | 237 920 | 755 | 882 | 954 | <1 | <1 | <1 | 16.8 | 8.2 |
| 211.3 | Churchill River: | 282 520 | 60 775 | 64 199 | 70 096 | <1 | <1 | <1 | 5.6 | 9.2 |
| 211.3-46 | Manitoba part | 93 790 | 6 040 | 8 251 | 6 625 | <1 | <1 | <1 | 36.6 | -19.7 |
| 211.3-47 | Saskatchewan part | 172 780 | 27 590 | 29 018 | 32 784 | <1 | <1 | <1 | 5.2 | 13.0 |
| 211.3-48 | Alberta part | 15 950 | 27 145 | 26 930 | 30 687 | 2 | 2 | 2 | -0.8 | 14.0 |
| 220 -46 | Nelson River | 90 365 | 30 255 | 30 897 | 26 276 | <1 | <1 | <1 | 2.1 | -15.0 |
| 230 | Lake Winnipeg Shore Rivers: | 227 845 | 116 475 | 115 643 | 114 465 | 1 | 1 | 1 | -0.7 | -1.0 |
| 230 -35 | Ontario part | 130 560 | 73 775 | 75 748 | 74 284 | 1 | 1 | 1 | 2.7 | -1.9 |
| 230 -46 | Manitoba part | 97 285 | 42 695 | 39 895 | 40 181 | <1 | <1 | <1 | -6.6 | 0.7 |
| 231 -46 | Red River | 25 620 | 552 295 | 578 561 | 596 164 | 22 | 23 | 23 | 4.8 | 3.0 |
| 232 | Dauphin River: | 83 510 | 106 770 | 104 475 | 101 918 | 1 | 1 | 1 | -2.1 | -2.4 |
| 232 -46 | Manitoba part | 65 245 | 85 085 | 83 088 | 81 308 | 1 | 1 | 1 | -2.3 | -2.1 |
| 232 -47 | Saskatchewan part | 18 265 | 21 685 | 21 387 | 20 610 | 1 | 1 | 1 | -1.4 | -3.6 |
| 240 | Assiniboine and Souris Rivers: | 90 245 | 390 670 | 389 688 | 381 819 | 4 | 4 | 4 | -0.3 | -2.0 |
| 240 -46 | Manitoba part | 31 595 | 243 045 | 251 641 | 247 264 | 8 | 8 | 8 | 3.5 | -1.7 |
| 240 -47 | Saskatchewan part | 58 650 | 147 630 | 138 047 | 134 555 | 3 | 2 | 2 | -6.5 | -2.5 |
| 241 | Qu'Appelle River - Old Wives Lake: | 71 600 | 304 700 | 308 829 | 323 383 | 4 | 4 | 5 | 1.4 | 4.7 |
| 241 -46 | Manitoba part | 70 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 241 -47 | Saskatchewan part | 71 530 | 304 700 | 308 829 | 323 383 | 4 | 4 | 5 | 1.4 | 4.7 |
| 250 | Saskatchewan River: | 78 730 | 71 040 | 70 596 | 70 011 | 1 | 1 | 1 | -0.6 | -0.8 |
| 250 -46 | Manitoba part | 19 340 | 21 980 | 22 097 | 21 977 | 1 | 1 | 1 | 0.5 | -0.5 |
| 250 -47 | Saskatchewan part | 59 390 | 49 060 | 48 499 | 48 034 | 1 | 1 | 1 | -1.1 | -1.0 |
| 251 -48 | Upper North Saskatchewan River | 28 065 | 176 910 | 199 546 | 235 955 | 6 | 7 | 8 | 12.8 | 18.2 |
| 252 | Lower North Saskatchewan River: | 124 750 | 670 065 | 725 627 | 844 808 | 5 | 6 | 7 | 8.3 | 16.4 |
| 252 -47 | Saskatchewan part | 57 030 | 140 505 | 138 019 | 143 099 | 2 | 2 | 3 | -1.8 | 3.7 |
| 252 -48 | Alberta part | 67 720 | 529 565 | 587 608 | 701 709 | 8 | 9 | 10 | 11.0 | 19.4 |
| 253 | South Saskatchewan River and Red Deer River: | 152 575 | 500 685 | 534 742 | 614 247 | 3 | 4 | 4 | 6.8 | 14.9 |
| 253 -47 | Saskatchewan part | 56 970 | 220 150 | 224 049 | 251 133 | 4 | 4 | 4 | 1.8 | 12.1 |
| 253 -48 | Alberta part | 95 605 | 280 535 | 310 693 | 363 114 | 3 | 3 | 4 | 10.8 | 16.9 |
| 254 -48 | Bow River | 24 980 | 447 520 | 524 318 | 668 857 | 18 | 21 | 27 | 17.2 | 27.6 |
| **3.** | **Arctic Ocean Basin** | | | | | | | | | |
| 300.1 | Mackenzie River: | 544 765 | 6 900 | 8 543 | 8 517 | <1 | <1 | <1 | 23.8 | -0.3 |
| 300.1-60 | Yukon part | 68 530 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 300.1-61 | Northwest Territories part | 476 235 | 6 900 | 8 543 | 8 517 | <1 | <1 | <1 | 23.8 | -0.3 |
| 300.2 | Great Slave Lake Shore Rivers: | 496 915 | 21 065 | 25 278 | 27 089 | <1 | <1 | <1 | 20.0 | 7.2 |
| 300.2-47 | Saskatchewan part | 114 900 | 3 400 | 3 480 | 4 392 | <1 | <1 | <1 | 2.4 | 26.2 |
| 300.2-48 | Alberta part | 76 265 | 2 575 | 2 851 | 2 845 | <1 | <1 | <1 | 10.7 | -0.2 |
| 300.2-59 | British Columbia part | 8 065 | 495 | 488 | 473 | <1 | <1 | <1 | -1.4 | -3.1 |
| 300.2-61 | Northwest Territories part | 297 685 | 14 595 | 18 459 | 19 379 | <1 | <1 | <1 | 26.5 | 5.0 |
| 300.3 | Liard River: | 273 915 | 6 220 | 6 972 | 8 373 | <1 | <1 | <1 | 12.1 | 20.1 |
| 300.3-48 | Alberta part | 9 035 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 300.3-59 | British Columbia part | 142 545 | 4 485 | 4 959 | 6 316 | <1 | <1 | <1 | 10.6 | 27.4 |
| 300.3-60 | Yukon part | 60 670 | 1 120 | 1 394 | 1 247 | <1 | <1 | <1 | 24.5 | -10.5 |
| 300.3-61 | Northwest Territories part | 61 665 | 610 | 619 | 810 | <1 | <1 | <1 | 1.5 | 30.9 |
| 301 | Athabasca River: | 160 690 | 78 740 | 94 231 | 123 969 | <1 | 1 | 1 | 19.7 | 31.6 |
| 301 -47 | Saskatchewan part | 16 720 | 0 | 8 | 17 | 0 | <1 | <1 | ... | 112.5 |
| 301 -48 | Alberta part | 143 970 | 78 740 | 94 223 | 123 952 | 1 | 1 | 1 | 19.7 | 31.6 |
| 302 | Peace River: | 319 080 | 125 380 | 135 796 | 164 799 | <1 | <1 | 1 | 8.3 | 21.4 |
| 302 -48 | Alberta part | 194 040 | 81 750 | 89 011 | 107 816 | <1 | <1 | 1 | 8.9 | 21.1 |
| 302 -59 | British Columbia part | 125 040 | 43 630 | 46 785 | 56 983 | <1 | <1 | <1 | 7.2 | 21.8 |
| 330.1 | Mainland Arctic Coast Rivers: | 707 725 | 3 050 | 3 734 | 4 217 | <1 | <1 | <1 | 22.4 | 12.9 |
| 330.1-60 | Yukon part | 16 120 | 0 | 4 | 1 | 0 | <1 | <1 | ... | -75.0 |
| 330.1-61 | Northwest Territories part | 691 605 | 3 050 | 3 730 | 4 216 | <1 | <1 | <1 | 22.3 | 13.0 |
| 330.2-61 | Arctic Islands Rivers | 1 346 800 | 6 420 | 7 261 | 8 109 | <1 | <1 | <1 | 13.1 | 11.7 |
| **4.** | **Pacific Ocean Basin** | | | | | | | | | |
| 400 -59 | Columbia River | 88 960 | 132 155 | 142 607 | 155 306 | 1 | 2 | 2 | 7.9 | 8.9 |
| 401 -59 | Okanagan River | 7 820 | 113 425 | 153 334 | 178 079 | 15 | 20 | 23 | 35.2 | 16.1 |
| 402 -59 | Similkameen River | 7 155 | 6 800 | 8 262 | 8 730 | 1 | 1 | 1 | 21.5 | 5.7 |
| 410 -59 | Upper Fraser River | 172 820 | 154 290 | 188 164 | 211 080 | 1 | 1 | 1 | 22.0 | 12.2 |
| 411 -59 | Thompson River | 56 570 | 100 630 | 125 816 | 143 383 | 2 | 2 | 3 | 25.0 | 14.0 |
| 412 -59 | Lower Fraser River | 5 745 | 899 210 | 992 532 | 1 110 808 | 157 | 173 | 193 | 10.4 | 11.9 |

Appendix 2 Table 1
## Population and Population Density by Drainage Basin, 1971[1], 1976 and 1981 (concluded)

| Code | Drainage Basin | Area | Population | | | Population Density[2] | | | Percentage Change in Population | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1971 | 1976 | 1981 | 1971 | 1976 | 1981 | 1971-1976 | 1976-1981 |
| | | square kilometres | | | | persons/square kilometre | | | | |
| 420.1 | Yukon River: | 272 985 | 16 985 | 20 504 | 21 698 | <1 | <1 | <1 | 20.7 | 5.8 |
| 420.1-59 | British Columbia part | 24 075 | 310 | 558 | 402 | <1 | <1 | <1 | 80.0 | -28.0 |
| 420.1-60 | Yukon part | 248 910 | 16 680 | 19 946 | 21 296 | <1 | <1 | <1 | 19.6 | 6.8 |
| 420.2-60 | Porcupine River | 61 820 | 215 | 224 | 243 | <1 | <1 | <1 | 4.2 | 8.5 |
| 430 | Alsek River: | 38 605 | 375 | 268 | 366 | <1 | <1 | <1 | -28.5 | 36.6 |
| 430 -59 | British Columbia part | 11 205 | 0 | 0 | 0 | 0 | 0 | 0 | ... | ... |
| 430 -60 | Yukon part | 27 400 | 375 | 268 | 366 | <1 | <1 | <1 | -28.5 | 36.6 |
| 431.1-59 | Pacific Ocean, North Coast Rivers | 154 575 | 22 285 | 21 836 | 22 480 | <1 | <1 | <1 | -2.0 | 2.9 |
| 431.2-59 | Skeena River | 55 245 | 48 720 | 52 467 | 59 264 | 1 | 1 | 1 | 7.7 | 13.0 |
| 431.3-59 | Queen Charlotte Islands Rivers | 9 695 | 4 355 | 5 509 | 5 621 | <1 | 1 | 1 | 26.5 | 2.0 |
| 432.1-59 | Pacific Ocean, South Coast Rivers | 44 560 | 272 055 | 281 074 | 288 849 | 6 | 6 | 6 | 3.3 | 2.8 |
| 432.2-59 | Northern Vancouver Island Rivers | 27 925 | 144 020 | 170 904 | 201 728 | 5 | 6 | 7 | 18.7 | 18.0 |
| 433 -59 | Southern Vancouver Island Rivers | 4 850 | 237 755 | 271 313 | 294 964 | 49 | 56 | 61 | 14.1 | 8.7 |
| 434 -59 | Skagit River | 950 | 0 | 0 | 1 | 0 | 0 | <1 | ... | ... |
| 5. | **Gulf of Mexico Basin** | | | | | | | | | |
| 500 | Milk - Missouri Tributary Rivers: | 26 135 | 14 660 | 12 844 | 13 095 | 1 | <1 | 1 | -12.4 | 2.0 |
| 500 -47 | Saskatchewan part | 20 575 | 11 525 | 9 987 | 10 306 | 1 | <1 | 1 | -13.3 | 3.2 |
| 500 -48 | Alberta part | 5 560 | 3 135 | 2 857 | 2 789 | 1 | 1 | 1 | -8.9 | -2.4 |
| **Canada[3]** | | **9 848 015** | **21 568 310** | **22 992 604** | **24 343 181** | **2** | **2** | **2** | **6.6** | **5.9** |

[1] The 1971 Census figures have been random rounded. Since they have been rounded independently, individual items may not add exactly to totals.
[2] <1 indicates that the population density is less than 1 when rounded to the nearest whole number.
[3] The Canada area total in this table corresponds to the area total of all the drainage basins. However, there is a difference of 122 595 square kilometres between the Canada area total of this Table and the total shown in Table 2.1.4. This is because the drainage basins in this Table exclude the following water bodies:
Gulf of St. Lawrence - 28 000 square kilometres,
St. Lawrence River - 6 330 square kilometres,
Lake Ontario - Canadian Portion - 10 050 square kilometres,
Lake St. Clair - Canadian Portion - 695 square kilometres,
Lake Erie - Canadian Portion - 12 770 square kilometres,
Lake Huron - Canadian Portion - 36 000 square kilometres,
Lake Superior - Canadian Portion - 28 750 square kilometres.

**Source:**

Statistics Canada, Census of Population, 1971, 1976 and 1981, special tabulations by the Office of the Senior Adviser of Integration.

Appendix 3, Table 1

## Monoculture Farms by Drainage Basin 1971, 1976 and 1981

| | Drainage Basin | Wide-row | | | | Close-row | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | | number | | | percent | number | | | percent |
| 1. | **Atlantic Ocean Basin** | | | | | | | | |
| 100.1-10 | Labrador Coast Rivers | 0 | 0 | 1 | ... | 0 | 0 | 0 | ... |
| 100.2-10 | Churchill and Naskaupi Rivers | 0 | 0 | 2 | ... | 0 | 0 | 0 | ... |
| 101 -10 | Newfoundland, North Coast Rivers | 48 | 48 | 51 | 6.3 | 1 | 1 | 1 | 0 |
| 102 -10 | Trinity Bay Coast Rivers | 21 | 32 | 16 | -23.8 | 2 | 2 | 2 | 0 |
| 103 -10 | St. John's area Rivers | 21 | 24 | 21 | 0 | 1 | 0 | 1 | 0 |
| 104 -12 | Nova Scotia, Southeast Coast Rivers | 19 | 24 | 25 | 31.6 | 35 | 26 | 14 | -60.0 |
| 110.1 | Gulf, Mainland North Coast Rivers: | 4 | 19 | 12 | 200.0 | 4 | 9 | 8 | 100.0 |
| 100.1-10 | Labrador part | 0 | 0 | 1 | ... | 0 | 0 | 0 | ... |
| 110.1-24 | Québec part | 4 | 19 | 11 | 175.0 | 4 | 9 | 8 | 100.0 |
| 110.2-24 | Manicouagan and Outardes Rivers | 6 | 2 | 7 | ... | 3 | 2 | 0 | -100.0 |
| 110.3-24 | Betsiamites River | 0 | 1 | 4 | ... | 11 | 4 | 2 | -81.8 |
| 111 -10 | Gulf, Newfoundland West and South Coast Rivers | 29 | 26 | 26 | -10.3 | 1 | 5 | 1 | 0 |
| 112 -24 | North Gaspé Peninsula Rivers | 9 | 21 | 25 | 177.8 | 233 | 106 | 121 | -48.1 |
| 113 | Gulf, Mainland South and West Coast Rivers: | 114 | 99 | 73 | -36.0 | 388 | 230 | 169 | -56.4 |
| 113 -12 | Nova Scotia part | 14 | 11 | 9 | -35.7 | 82 | 74 | 46 | -43.9 |
| 113 -13 | New Brunswick part | 84 | 63 | 47 | -44.0 | 174 | 96 | 44 | -74.7 |
| 113 -24 | Québec part | 16 | 25 | 17 | 6.3 | 132 | 60 | 79 | -40.2 |
| 114 -11 | Prince Edward Island Rivers | 125 | 81 | 93 | -25.6 | 402 | 261 | 300 | -25.4 |
| 115 -12 | Cape Breton Island Rivers | 9 | 4 | 8 | -11.1 | 25 | 26 | 5 | -80.0 |
| 120 | Bay of Fundy Coast Rivers: | 90 | 80 | 85 | -5.6 | 161 | 101 | 87 | -46.0 |
| 120 -12 | Nova Scotia part | 80 | 70 | 74 | -7.5 | 124 | 80 | 71 | -42.7 |
| 121 -13 | New Brunswick part | 10 | 10 | 11 | 10.0 | 37 | 21 | 16 | -56.8 |
| 130 | Saint John River: | 328 | 241 | 180 | -45.1 | 374 | 214 | 161 | -57.0 |
| 130 -13 | New Brunswick part | 320 | 238 | 171 | -46.6 | 209 | 133 | 91 | -56.5 |
| 130 -24 | Québec part | 8 | 3 | 9 | 12.5 | 165 | 81 | 70 | -57.6 |
| 140 -24 | Saguenay River | 29 | 32 | 26 | -10.3 | 320 | 163 | 161 | -49.7 |
| 141 -24 | Québec City area - Middle North Shore Rivers | 76 | 78 | 104 | 36.8 | 312 | 167 | 181 | -42.0 |
| 142 -24 | Chaudière River - Middle South Shore Rivers | 55 | 50 | 111 | 101.8 | 1051 | 573 | 664 | -36.8 |
| 143 -24 | St. Maurice River | 18 | 13 | 20 | 11.1 | 21 | 14 | 11 | -47.6 |
| 144 -24 | Eastern Township Rivers - Richelieu River | 645 | 606 | 1 159 | 79.7 | 925 | 701 | 789 | -14.7 |
| 145 -24 | Eastern Laurentian Rivers | 201 | 226 | 267 | 32.8 | 319 | 248 | 276 | -13.5 |
| 146 -24 | Montreal area Rivers | 651 | 607 | 743 | 14.1 | 216 | 161 | 215 | -0.5 |
| 147 | West St. Lawrence River: | 94 | 122 | 220 | 134.0 | 119 | 87 | 106 | -10.9 |
| 147 -24 | Québec part | 40 | 46 | 103 | 157.5 | 23 | 26 | 37 | 60.9 |
| 147 -35 | Ontario part | 54 | 76 | 117 | 116.7 | 96 | 61 | 69 | -28.1 |
| 150 | Lower Ottawa River: | 324 | 262 | 358 | 10.5 | 454 | 338 | 357 | -21.4 |
| 150 -24 | Québec part | 64 | 49 | 58 | -9.4 | 204 | 126 | 146 | -28.4 |
| 150 -35 | Ontario part | 260 | 213 | 300 | 15.4 | 250 | 212 | 211 | -15.6 |
| 151 | Upper Ottawa River: | 77 | 108 | 105 | 36.4 | 344 | 239 | 249 | -27.6 |
| 151 -24 | Québec part | 31 | 33 | 26 | -16.1 | 119 | 75 | 64 | -46.2 |
| 151 -35 | Ontario part | 46 | 75 | 79 | 71.7 | 225 | 164 | 185 | -17.8 |
| 160 -35 | Belleville-Napanee area Rivers | 89 | 103 | 137 | 53.9 | 139 | 136 | 100 | -28.1 |
| 161 -35 | Trent River | 128 | 171 | 287 | 124.2 | 285 | 214 | 205 | -28.1 |
| 162 -35 | Oshawa-Colborne area Rivers | 147 | 139 | 204 | 38.8 | 80 | 83 | 77 | -3.8 |
| 163 -35 | Toronto area Rivers | 160 | 175 | 202 | 26.3 | 213 | 190 | 124 | -41.8 |
| 164 -35 | Hamilton area Rivers | 224 | 238 | 213 | -4.9 | 170 | 161 | 115 | -32.4 |
| 165 -35 | Niagara Peninsula Rivers | 166 | 189 | 254 | 53.0 | 235 | 204 | 210 | -10.6 |
| 170 -35 | Grand River | 717 | 844 | 997 | 39.1 | 723 | 677 | 626 | -13.4 |
| 171 -35 | Lake Erie Shore Rivers | 3 788 | 3 078 | 3 549 | -6.3 | 337 | 375 | 245 | -27.3 |
| 172 -35 | Thames River | 1 938 | 1 813 | 2 370 | 22.3 | 337 | 293 | 179 | -46.9 |
| 173 -35 | Sydenham River | 1 287 | 1 190 | 1 706 | 32.6 | 110 | 107 | 84 | -23.6 |
| 180 -35 | South Huron Shore Rivers | 641 | 823 | 1 194 | 86.3 | 737 | 584 | 597 | -19.0 |
| 181 -35 | Georgian Bay Shore - Lake Simcoe Shore Rivers | 537 | 536 | 589 | 9.7 | 407 | 313 | 264 | -35.1 |
| 182 -35 | North Huron Shore Rivers | 29 | 43 | 49 | 69.0 | 100 | 121 | 64 | -36.0 |
| 190 -35 | Lake Superior Shore Rivers | 18 | 21 | 19 | 5.6 | 19 | 33 | 16 | -15.8 |
| 2. | **Hudson Bay and Ungava Bay Basin** | | | | | | | | |
| 200.1-24 | East Hudson Bay Coast Rivers | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 200.2-24 | Ungava Bay Coast Rivers | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 200.3-24 | Eastmain and LaGrande Rivers | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 210.1-24 | Rupert and Nottaway Rivers | 0 | 1 | 1 | ... | 4 | 8 | 3 | -25.0 |
| 210.2 | Harricanaw River: | 3 | 8 | 7 | 133.3 | 48 | 31 | 17 | -64.6 |
| 210.2-24 | Québec part | 3 | 8 | 7 | 133.3 | 48 | 31 | 17 | -64.6 |
| 210.2-35 | Ontario part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 210.3 | Moose River: | 13 | 13 | 16 | 23.1 | 91 | 56 | 34 | -62.6 |
| 210.3-24 | Québec part | 1 | 2 | 5 | 400.0 | 63 | 34 | 18 | -71.4 |
| 210.3-35 | Ontario part | 12 | 11 | 11 | -8.3 | 28 | 22 | 16 | -42.9 |
| 210.4-35 | Albany River | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 210.5 | Southwest Hudson Bay Coast Rivers: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 210.5-35 | Ontario part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 210.5-46 | Manitoba part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |

Appendix 3, Table 1
## Monoculture Farms by Drainage Basin 1971, 1976 and 1981 (continued)

| | Drainage Basin | Wide-row | | | | Close-row | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | | number | | | percent | number | | | percent |
| 210.6 | Hayes River: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 210.6-35 | Ontario part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 210.6-46 | Manitoba part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.1 | West Hudson Bay Coast Rivers: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.1-46 | Manitoba part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.1-47 | Saskatchewan part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.1-61 | Northwest Territories part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.2 | Thelon - Kazan Rivers: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.2-46 | Manitoba part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.2-47 | Saskatchewan part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.2-61 | Northwest Territories part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.3 | Churchill River: | 4 | 1 | 1 | -75.0 | 1 415 | 922 | 1 192 | -15.8 |
| 211.3-46 | Manitoba part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 211.3-47 | Saskatchewan part | 4 | 0 | 1 | -75.0 | 896 | 627 | 735 | -18.0 |
| 211.3-48 | Alberta part | 0 | 0 | 2 | ... | 519 | 295 | 457 | -11.9 |
| 220 -46 | Nelson River | 0 | 0 | 1 | ... | 0 | 0 | 1 | ... |
| 230 Lake | Winnipeg Shore Rivers: | 8 | 9 | 15 | 87.5 | 1 313 | 883 | 957 | -27.1 |
| 230 -35 | Ontario part | 2 | 2 | 4 | 100.0 | 40 | 39 | 41 | 2.5 |
| 230 -46 | Manitoba part | 6 | 7 | 11 | 83.3 | 1 273 | 844 | 916 | -28.0 |
| 231 -46 | Red River | 136 | 105 | 164 | 20.6 | 6 931 | 6 605 | 5 119 | -26.1 |
| 232 | Dauphin River: | 10 | 13 | 34 | 240.0 | 8 256 | 6 353 | 6 046 | -26.8 |
| 232 -46 | Manitoba part | 7 | 11 | 31 | 342.9 | 5 579 | 4 285 | 3 944 | -29.3 |
| 232 -47 | Saskatchewan part | 3 | 2 | 3 | 0.0 | 2 677 | 2 068 | 2 102 | -21.5 |
| 240 | Assiniboine and Souris Rivers: | 36 | 31 | 51 | 41.7 | 23 788 | 20 082 | 18 770 | -21.1 |
| 240 -46 | Manitoba part | 30 | 19 | 39 | 30.0 | 7 735 | 6 445 | 5 801 | -25.0 |
| 240 -47 | Saskatchewan part | 6 | 12 | 12 | 100.0 | 16 053 | 13 637 | 12 969 | -19.2 |
| 241 | Qu'Appelle River - Old Wives Lake: | 20 | 16 | 20 | 0 | 17 707 | 1/40 | 15 820 | -10.7 |
| 241 -46 | Manitoba part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 241 -47 | Saskatchewan part | 20 | 16 | 20 | 0 | 17 707 | 16 140 | 15 820 | 10.7 |
| 250 | Saskatchewan River: | 4 | 1 | 3 | -25.0 | 4 400 | 3 878 | 3 807 | -13.5 |
| 250 -46 | Manitoba part | 2 | 1 | 2 | 0 | 68 | 59 | 71 | 4.4 |
| 250 -47 | Saskatchewan part | 2 | 0 | 1 | -50.0 | 4 332 | 3 819 | 3 736 | -13.8 |
| 251 -48 | Upper North Saskatchewan River | 6 | 14 | 10 | 66.7 | 939 | 822 | 682 | -27.4 |
| 252 | Lower North Saskatchewan River: | 40 | 37 | 51 | 27.5 | 24 898 | 20 824 | 20 980 | -15.7 |
| 252 -47 | Saskatchewan part | 5 | 8 | 12 | 140.0 | 11 278 | 9 855 | 9 866 | -12.5 |
| 252 -48 | Albert part | 35 | 29 | 39 | 11.4 | 13 620 | 10 969 | 11 114 | -18.4 |
| 253 | South Saskatchewan River and Red Deer River: | 78 | 66 | 69 | -11.5 | 21 104 | 18 980 | 18 634 | -11.7 |
| 253 -47 | Saskatchewan part | 17 | 9 | 26 | 52.9 | 10 911 | 9 809 | 9 263 | -15.1 |
| 253 -48 | Alberta part | 61 | 57 | 43 | -29.5 | 10 193 | 9 171 | 9 371 | -8.1 |
| 254 -48 | Bow River | 11 | 11 | 8 | -27.3 | 1 487 | 1 301 | 1 329 | -10.6 |
| 3. | **Arctic Ocean Basin** | | | | | | | | |
| 300.1 | Mackenzie River: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.1-60 | Yukon part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.1-61 | Northwest Territories part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.2 | Great Slave Lake Shore Rivers: | 0 | 0 | 0 | ... | 0 | 0 | 1 | ... |
| 300.2-47 | Saskatchewan part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.2-48 | Alberta part | 0 | 0 | 0 | ... | 0 | 0 | 1 | ... |
| 300.2-59 | British Columbia part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.2-61 | Northwest Territories part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.3 | Liard River: | 0 | 0 | 0 | ... | 0 | 0 | 1 | ... |
| 300.3-48 | Alberta part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.3-59 | British Columbia part | 0 | 0 | 0 | ... | 0 | 0 | 1 | ... |
| 300.3-60 | Yukon part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 300.3-61 | Northwest Territories part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 301 | Athabasca River: | 2 | 8 | 8 | 300.0 | 1 853 | 1 225 | 1 305 | -29.6 |
| 301 -47 | Saskatchewan part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 301 -48 | Alberta part | 2 | 8 | 8 | 300.0 | 1 853 | 1 225 | 1 305 | -29.6 |
| 302 | Peace River: | 17 | 13 | 19 | 11.8 | 4 698 | 4 849 | 5 047 | 7.4 |
| 302 -48 | Alberta part | 9 | 8 | 10 | 11.1 | 3 965 | 4 273 | 4 448 | 12.2 |
| 302 -59 | British Columbia part | 8 | 5 | 9 | 12.5 | 733 | 576 | 599 | -18.3 |
| 330.1 | Mainland Arctic Coast Rivers: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 330.1-60 | Yukon part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 330.1-61 | Northwest Territories part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 330.2-61 | Arctic Islands Rivers | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 4. | **Pacific Ocean Basin** | | | | | | | | |
| 400 -59 | Columbia River | 15 | 22 | 20 | 33.3 | 48 | 55 | 42 | 12.5 |
| 401 -59 | Okanagan River | 70 | 80 | 71 | 1.4 | 53 | 48 | 67 | 26.4 |
| 402 -59 | Similkameen River | 5 | 6 | 4 | -20.0 | 3 | 2 | 2 | -33.3 |
| 410 -59 | Upper Fraser River | 71 | 66 | 63 | -11.3 | 65 | 86 | 64 | -1.5 |
| 411 -59 | Thompson River | 17 | 23 | 40 | 135.3 | 49 | 48 | 53 | 8.2 |
| 412 -59 | Lower Fraser River | 199 | 194 | 224 | 12.6 | 112 | 72 | 40 | -64.3 |

Appendix 3, Table 1
## Monoculture Farms by Drainage Basin 1971, 1976 and 1981 (concluded)

| | Drainage Basin | Wide-row | | | | Close-row | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1971 | 1976 | 1981 | Change 1971 to 1981 | 1971 | 1976 | 1981 | Change 1971 to 1981 |
| | | number | | | percent | number | | | percent |
| 420.1 | Yukon River: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 420.1-59 | British Columbia part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 420.1-60 | Yukon part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 420.2-60 | Porcupine River | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 430 | Alsek River: | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 430 -59 | British Columbia part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 430 -60 | Yukon part | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| 431.1-59 | Pacific Ocean, North Coast Rivers | 0 | 0 | 2 | ... | 1 | 0 | 2 | 100.0 |
| 431.2-59 | Skeena River | 11 | 14 | 9 | -18.2 | 8 | 21 | 11 | 37.5 |
| 431.3-59 | Queen Charlotte Islands Rivers | 0 | 1 | 1 | ... | 2 | 0 | 1 | -50.0 |
| 432.1-59 | Pacific Ocean, South Coast Rivers | 1 | 6 | 1 | 0 | 3 | 4 | 2 | -33.3 |
| 432.2-59 | Northern Vancouver Island Rivers | 18 | 25 | 34 | 88.9 | 21 | 32 | 11 | -47.6 |
| 433 -59 | Southern Vancouver Island Rivers | 29 | 33 | 29 | 0 | 23 | 20 | 28 | 21.7 |
| 434 -59 | Skagit River | 0 | 0 | 0 | ... | 0 | 0 | 0 | ... |
| **5.** | **Gulf of Mexico Basin** | | | | | | | | |
| 500 | Milk - Missouri Tributary Rivers: | 0 | 0 | 0 | ... | 2 062 | 1 755 | 1 775 | -13.9 |
| 500 -47 | Saskatchewan part | 0 | 0 | 0 | ... | 1 721 | 1 471 | 1 491 | -13.4 |
| 500 -48 | Alberta part | 0 | 0 | 0 | ... | 341 | 284 | 284 | -16.7 |
| | **Canada** | **13 686** | **12 986** | **16 488** | **20.5** | **130 996** | **112 271** | **108 628** | **-17.1** |

[1] Monoculture is defined as the planting of one crop type on a continuous year to year basis. Monoculture farms in the above table are farms where eighty percent of cropland is under one crop type. For more detail see Technical Box 3.1.17.

**Source:**
Statistics Canada, Census of Agriculture 1971, 1976 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

**Note:**
Disaggreations of tables in Chapter 3.1 to the drainage basin level are available on special request.

Appendix 4, Table 1
## Estimated Efficiency Rating of Energy Forms by Use[1]

| Fuel | Residential | Commercial | Industrial | Transportation | | | |
|---|---|---|---|---|---|---|---|
| | | | | Road | Rail | Air | Marine |
| | percent | | | | | | |
| Coal, Coke | 50 | 65 | 87 | ... | 8 | ... | 8 |
| Liquid Propane Gas | 75 | 78 | 85 | ... | ... | ... | ... |
| Still Gas | ... | ... | 85 | ... | ... | ... | ... |
| Kerosene | 55 | 82 | 82 | ... | 55 | ... | 55 |
| Diesel Oil | 23 | 23 | 26 | 23 | 23 | ... | 15 |
| Light Fuel Oil | 65 | 82 | 82 | ... | 82 | ... | 10 |
| Heavy Fuel Oil | 80 | 80 | 87 | ... | 80 | ... | 10 |
| Motor Gasoline | ... | ... | ... | 20 | ... | ... | ... |
| Aviation Gas | ... | ... | ... | ... | ... | 20 | ... |
| Aviation Turbofuel | ... | ... | ... | ... | ... | 30 | ... |
| Natural Gas | 75 | 78 | 85 | ... | ... | ... | ... |
| Electricity | 100 | 100 | 100 | ... | ... | ... | ... |
| Petroleum Coke | ... | ... | 87 | ... | ... | ... | ... |
| Crude Oil | ... | ... | 87 | ... | ... | ... | ... |
| Coke Oven Gas | ... | ... | 85 | ... | ... | ... | ... |
| Wood and Wood Residue | 50 | 50 | 50 | ... | ... | ... | ... |

[1] The efficiency rating of a fuel is the percentage of its per unit energy content that performs the work or function at hand. The remaining proportion is essentially wasted. For example, when aviation gas is consumed to provide motive power for an aircraft, only twenty percent of its energy content is used for that purpose; the other eighty percent is transformed largely to heat energy and goes unused.

**Source:**
Energy, Mines and Resources Canada *Energy Demand Projections, A Total Energy Approach*, Ottawa, 1977.

Appendix 5 Table 1

## Large Dams[1] by Drainage Basin, 1982

| | | Primary Purpose of Dam[2] | | | | |
|---|---|---|---|---|---|---|
| | | Irrigation | Hydro-Power | Water Supply | Water Control, Navigation, Recreation | Total |
| | | number of dams | | | | |
| **Atlantic Ocean Basin** | | | | | | |
| 100.1 - 10 | Labrador Coast Rivers | 0 | 1 | 0 | 0 | 1 |
| 100.2 - 10 | Churchill and Naskaupi Rivers | 0 | 38[3] | 0 | 0 | 38[3] |
| 101 - 10 | Newfoundland, North Coast Rivers | 0 | 3 | 0 | 0 | 3 |
| 102 - 10 | Trinity Bay Coast Rivers | 0 | 2 | 0 | 0 | 2 |
| 103 - 10 | St. John's area Rivers | 0 | 1 | 0 | 0 | 1 |
| 104 - 12 | Nova Scotia, Southeast Coast Rivers | 0 | 9 | 0 | 0 | 9 |
| 110.1 | Gulf, Mainland North Coast Rivers: | | | | | |
| 110.1 - 10 | Labrador part | 0 | 0 | 0 | 0 | 0 |
| 110.1 - 24 | Québec part | 0 | 1 | 0 | 0 | 1 |
| 110.2 - 24 | Manicouagon and Outardes Rivers | 0 | 20[4] | 0 | 0 | 20[4] |
| 110.3 - 24 | Betsiamites River | 0 | 5 | 0 | 0 | 5 |
| 111 - 10 | Gulf, Newfoundland West and South Coast Rivers | 0 | 11 | 0 | 0 | 11 |
| 112 - 24 | North Gaspé Peninsula Rivers | 0 | 2 | 0 | 1 | 3 |
| 113 | Gulf, Mainland South and West Coast Rivers: | | | | | |
| 113 - 12 | Nova Scotia part | 0 | 0 | 2 | 0 | 2 |
| 113 - 13 | New Brunswick part | 0 | 0 | 2 | 0 | 2 |
| 113 - 24 | Québec part | 0 | 1 | 0 | 0 | 1 |
| 114 - 11 | Prince Edward Island Rivers | 0 | 0 | 0 | 0 | 0 |
| 115 - 12 | Cape Breton Island Rivers | 0 | 7 | 0 | 0 | 7 |
| 120 | Bay of Fundy Coast Rivers: | | | | | |
| 120 - 12 | Nova Scotia part | 1 | 13 | 0 | 1 | 15 |
| 121 - 13 | New Brunswick part | 0 | 3 | 1 | 2 | 6 |
| 130 | Saint John River: | | | | | |
| 130 - 13 | New Brunswick part | 0 | 7 | 0 | 0 | 7 |
| 130 - 24 | Québec part | 0 | 0 | 0 | 0 | 0 |
| 140 - 24 | Saguenay River | 0 | 21[5] | 1 | 0 | 22[5] |
| 141 - 24 | Québec City area — Middle North Shore Rivers | 0 | 3 | 0 | 0 | 3 |
| 142 - 24 | Chaudière River — Middle South Shore Rivers | 0 | 1 | 0 | 1 | 2 |
| 143 - 24 | St. Maurice River | 0 | 8 | 0 | 0 | 8 |
| 144 - 24 | Eastern Townships Rivers — Richelieu River | 0 | 4 | 0 | 0 | 4 |
| 145 - 24 | Eastern Laurentians Rivers | 0 | 0 | 0 | 0 | 0 |
| 146 - 24 | Montreal area Rivers | 0 | 1 | 0 | 0 | 1 |
| 147 | West St. Lawrence River: | | | | | |
| 147 - 24 | Québec part | 0 | 6 | 0 | 2 | 8 |
| 147 - 35 | Ontario part | 0 | 2 | 0 | 1 | 3 |
| 150 | Lower Ottawa River: | | | | | |
| 150 - 24 | Québec part | 0 | 17 | 0 | 0 | 17 |
| 150 - 35 | Ontario part | 0 | 0 | 0 | 0 | 0 |
| 151 | Upper Ottawa River: | | | | | |
| 151 - 24 | Québec part | 0 | 7 | 0 | 0 | 7 |
| 151 - 35 | Ontario part | 0 | 15 | 0 | 0 | 15 |
| 160 - 35 | Belleville — Napanee area Rivers | 0 | 0 | 0 | 1 | 1 |
| 161 - 35 | Trent River | 0 | 1 | 0 | 0 | 1 |
| 162 - 35 | Oshawa — Colborne area Rivers | 0 | 0 | 0 | 0 | 0 |
| 163 - 35 | Toronto area Rivers | 0 | 0 | 0 | 1 | 1 |
| 164 - 35 | Hamilton area Rivers | 0 | 0 | 0 | 1 | 1 |
| 165 - 35 | Niagara Peninsula Rivers | 0 | 3 | 0 | 0 | 3 |
| 170 - 35 | Grand River | 0 | 0 | 0 | 2 | 2 |
| 171 - 35 | Lake Erie Shore Rivers | 0 | 0 | 0 | 0 | 0 |
| 172 - 35 | Thames River | 0 | 0 | 1 | 3 | 4 |
| 173 - 35 | Sydenham River | 0 | 0 | 0 | 0 | 0 |
| 180 - 35 | South Huron Shore Rivers | 0 | 1 | 1 | 1 | 3 |
| 181 - 35 | Georgian Bay Shore — Lake Simcoe Shore Rivers | 0 | 1 | 0 | 0 | 1 |
| 182 - 35 | North Huron Shore Rivers | 0 | 9 | 0 | 0 | 9 |
| 190 - 35 | Lake Superior Shore Rivers | 0 | 12 | 0 | 0 | 12 |
| **Hudson Bay and Ungava Bay Basin** | | | | | | |
| 200.1 - 24 | East Hudson Bay Coast Rivers | 0 | 0 | 0 | 0 | 0 |
| 200.2 - 24 | Ungava Bay Coast Rivers | 0 | 24[6] | 0 | 0 | 24[6] |
| 200.3 - 24 | Eastmain and LaGrande Rivers | 0 | 57[7] | 0 | 0 | 57[7] |
| 210.1 - 24 | Rupert and Nottaway Rivers | 0 | 0 | 0 | 0 | 0 |
| 210.2 | Harricanaw River: | | | | | |
| 210.2 - 24 | Québec part | 0 | 0 | 0 | 0 | 0 |
| 210.2 - 35 | Ontario part | 0 | 0 | 0 | 0 | 0 |
| 210.3 | Moose River: | | | | | |
| 210.3 - 24 | Québec part | 0 | 0 | 0 | 0 | 0 |
| 210.3 - 35 | Ontario part | 0 | 12 | 0 | 0 | 12 |
| 210.4 - 35 | Albany River | 0 | 0 | 0 | 0 | 0 |
| 210.5 | Southwest Hudson Bay Coast Rivers: | | | | | |
| 210.5 - 35 | Ontario part | 0 | 0 | 0 | 0 | 0 |
| 210.5 - 46 | Manitoba part | 0 | 0 | 0 | 0 | 0 |
| 210.6 | Hayes River: | | | | | |
| 210.6 - 35 | Ontario part | 0 | 0 | 0 | 0 | 0 |
| 210.6 - 46 | Manitoba part | 0 | 0 | 0 | 0 | 0 |

Appendix 5 Table 1
## Large Dams[1] by Drainage Basin, 1982 (continued)

| | | Primary Purpose of Dam[2] | | | | |
|---|---|---|---|---|---|---|
| | | Irrigation | Hydro-Power | Water Supply | Water Control, Navigation, Recreation | Total |
| | | number of dams | | | | |
| 211.1 | West Hudson Bay Coast Rivers: | | | | | |
| 211.1 - 46 | Manitoba part | 0 | 0 | 0 | 0 | 0 |
| 211.1 - 47 | Saskatchewan part | 0 | 0 | 0 | 0 | 0 |
| 211.1 - 61 | Northwest Territories part | 0 | 0 | 0 | 0 | 0 |
| 211.2 | Thelon - Kazan Rivers: | | | | | |
| 211.2 - 46 | Manitoba part | 0 | 0 | 0 | 0 | 0 |
| 211.2 - 47 | Saskatchewan part | 0 | 0 | 0 | 0 | 0 |
| 211.2 - 61 | Northwest Territories part | 0 | 0 | 0 | 0 | 0 |
| 211.3 | Churchill River: | | | | | |
| 211.3 - 46 | Manitoba part | 0 | 4 | 0 | 0 | 4 |
| 211.3 - 47 | Saskatchewan part | 0 | 2 | 0 | 0 | 2 |
| 211.3 - 48 | Alberta part | 0 | 0 | 0 | 0 | 0 |
| 220 - 46 | Nelson River | 0 | 14[8] | 0 | 0 | 14[8] |
| 230 | Lake Winnipeg Shore Rivers: | | | | | |
| 230 - 35 | Ontario part | 0 | 5 | 0 | 4 | 9 |
| 230 - 46 | Manitoba part | 0 | 6 | 0 | 0 | 6 |
| 231 - 46 | Red River | 0 | 0 | 2 | 2 | 4 |
| 232 | Dauphin River: | | | | | |
| 232 - 46 | Manitoba part | 0 | 0 | 1 | 0 | 1 |
| 232 - 47 | Saskatchewan part | 0 | 0 | 0 | 0 | 0 |
| 240 | Assiniboine and Souris Rivers: | | | | | |
| 240 - 46 | Manitoba part | 1 | 0 | 1 | 2 | 4 |
| 240 - 47 | Saskatchewan part | 2 | 0 | 4 | 0 | 6 |
| 241 | Qu'Appelle River - Old Wives Lake: | | | | | |
| 241 - 46 | Manitoba part | 0 | 0 | 0 | 0 | 0 |
| 241 - 47 | Saskatchewan part | 8 | 0 | 1 | 1 | 10 |
| 250 | Saskatchewan River: | | | | | |
| 250 - 46 | Manitoba part | 0 | 1 | 0 | 0 | 1 |
| 250 - 47 | Saskatchewan part | 0 | 1 | 1 | 0 | 2 |
| 251 - 48 | Upper North Saskatchewan River | 0 | 4 | 0 | 0 | 4 |
| 252 | Lower North Saskatchewan River: | | | | | |
| 252 - 47 | Saskatchewan part | 0 | 0 | 0 | 0 | 0 |
| 252 - 48 | Alberta part | 0 | 0 | 1 | 0 | 1 |
| 253 | South Saskatchewan River and Red Deer River: | | | | | |
| 253 - 47 | Saskatchewan part | 9 | 0 | 1 | 1 | 11 |
| 253 - 48 | Alberta part | 16 | 0 | 1 | 3 | 20 |
| 254 - 48 | Bow River | 5 | 14 | 1 | 0 | 20 |
| **Arctic Ocean Basin** | | | | | | |
| 300.1 | Mackenzie River: | | | | | |
| 300.1 - 60 | Yukon part | 0 | 0 | 0 | 0 | 0 |
| 300.1 - 61 | Northwest Territories part | 0 | 0 | 0 | 0 | 0 |
| 300.2 | Great Slave Lake Shore Rivers: | | | | | |
| 300.2 - 47 | Saskatchewan part | 0 | 1 | 0 | 0 | 1 |
| 300.2 - 48 | Alberta part | 0 | 0 | 0 | 0 | 0 |
| 300.2 - 59 | British Columbia part | 0 | 0 | 0 | 0 | 0 |
| 300.2 - 61 | Northwest Territories part | 0 | 3 | 0 | 0 | 3 |
| 300.3 | Liard River: | | | | | |
| 300.3 - 48 | Alberta part | 0 | 0 | 0 | 0 | 0 |
| 300.3 - 59 | British Columbia part | 0 | 0 | 0 | 0 | 0 |
| 300.3 - 60 | Yukon part | 0 | 0 | 0 | 0 | 0 |
| 300.3 - 61 | Northwest Territories part | 0 | 0 | 0 | 0 | 0 |
| 301 | Athabasca River: | | | | | |
| 301 - 47 | Saskatchewan part | 0 | 0 | 0 | 0 | 0 |
| 301 - 48 | Alberta part | 0 | 0 | 0 | 0 | 0 |
| 302 | Peace River: | | | | | |
| 302 - 48 | Alberta part | 0 | 1 | 0 | 0 | 1 |
| 302 - 59 | British Columbia part | 0 | 2 | 0 | 0 | 2 |
| 330.1 | Mainland Arctic Coast Rivers: | | | | | |
| 330.1 - 60 | Yukon part | 0 | 0 | 0 | 0 | 0 |
| 330.1 - 61 | Northwest Territories part | 0 | 0 | 0 | 0 | 0 |
| 330.2 - 61 | Arctic Islands Rivers | 0 | 0 | 0 | 0 | 0 |
| **Pacific Ocean Basin** | | | | | | |
| 400 - 59 | Columbia River | 0 | 15 | 2 | 0 | 17 |
| 401 - 59 | Okanagan River | 12 | 2 | 1 | 0 | 15 |
| 402 - 59 | Similkameen River | 0 | 0 | 0 | 0 | 0 |
| 410 - 59 | Upper Fraser River | 0 | 5 | 2 | 0 | 7 |
| 411 - 59 | Thompson River | 1 | 0 | 0 | 0 | 1 |
| 412 - 59 | Lower Fraser River | 0 | 6 | 0 | 0 | 6 |
| 420.1 | Yukon River: | | | | | |
| 420.1 - 59 | British Columbia part | 0 | 0 | 0 | 0 | 0 |
| 420.1 - 60 | Yukon part | 0 | 2 | 0 | 0 | 2 |
| 420.2 - 60 | Porcupine River | 0 | 0 | 0 | 0 | 0 |
| 430 | Alsek River: | | | | | |
| 430 - 59 | British Columbia part | 0 | 0 | 0 | 0 | 0 |
| 430 - 60 | Yukon part | 0 | 0 | 0 | 0 | 0 |

Appendix 5 Table 1
## Large Dams[1] by Drainage Basin, 1982 (concluded)

| | | Primary Purpose of Dam[2] | | | | |
|---|---|---|---|---|---|---|
| | | Irrigation | Hydro-Power | Water Supply | Water Control, Navigation, Recreation | Total |
| | | number of dams | | | | |
| 431.1 - 59 | Pacific Ocean, North Coast Rivers | 0 | 1 | 1 | 0 | 2 |
| 431.2 - 59 | Skeena River | 0 | 3 | 3 | 0 | 6 |
| 431.3 - 59 | Queen Charlotte Islands Rivers | 0 | 0 | 0 | 0 | 0 |
| 432.1 - 59 | Pacific Ocean, South Coast Rivers | 0 | 9 | 3 | 0 | 12 |
| 432.2 - 59 | Northern Vancouver Island Rivers | 0 | 7 | 5 | 1 | 13 |
| 433 - 59 | Southern Vancouver Island Rivers | 0 | 3 | 6 | 0 | 9 |
| 434 - 59 | Skagit River | 0 | 0 | 0 | 0 | 0 |
| **Gulf of Mexico Basin** | | | | | | |
| 500 | Milk-Missouri Tributary Rivers: | | | | | |
| 500 - 47 | Saskatchewan part | 1 | 0 | 0 | 1 | 2 |
| 500 - 48 | Alberta part | 0 | 0 | 0 | 0 | 0 |

[1] Large dams are defined by the International Commission on Large Dams as any dam higher than 15 metres, as well as any dams between 10 and 15 metres in height, provided one of the following conditions is met: a) length of crest ≥ 500 metres, b) reservoir capacity ≥ 1 million cubic metres, c) maximum discharge ≥ 2000 cubic metres/second, d) dam has specially difficult foundation problems, e) dam is of unusual design.

[2] The primary purpose of the dam is used here for classification. Some dams, however, may serve several purposes, for example, a hydro dam may also control water levels in a supply resevoir.

[3] Thirty-six of these dams are components of the Churchill Falls Power Project.

[4] Six of these dams are components of the Outardes 4 Power Project; some of the other dams are components of multiple dam projects.

[5] Six of these dams are components of the Isle Maligne Power Project.

[6] These are all component dams and dykes of the James Bay Power Project.

[7] These are all component dams and dykes of the James Bay Power Project.

[8] Seven of these dams are components of the Kettle Rapids Power Project; many of the other dams are components of the Nelson River Power Project.

**Source:**
Canadian National Committee, International Commission on Large Dams, *Register of Dams in Canada*, 1982.

Appendix 6 Table 1
## Mining Activity[1] by Ecozone, 1971, 1976 and 1981[2]

| Ecozone | Metal Mines | | Coal Mines | | Non-Metal Mines[3] | | Sand Pits and Quarries | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] |
| **Atlantic Maritime** | | | | | | | | | | |
| 1971 | 5 | 1 772 | 7 | 3 159 | 46 | 1 312 | 23 | 262 | 81 | 6 505 |
| 1976 | 6 | 2 478 | 11 | 3 493 | 39 | 1 139 | 16 | 396 | 72 | 7 506 |
| 1981 | 8 | 2 550 | 14 | 3 500-3 999 | 45 | 1 240 | 20 | 348 | 87 | 7 500-7 999 |
| **Mixed-Wood Plain** | | | | | | | | | | |
| 1971 | 6 | 1 211 | 0 | 0 | 31 | 6 373 | 202 | 2 994 | 239 | 10 578 |
| 1976 | 3 | 794 | 0 | 0 | 31 | 5 531 | 194 | 3 289 | 228 | 9 614 |
| 1981 | 0 | 0 | 0 | 0 | 31 | 5 578 | 154 | 2 180 | 185 | 7 758 |
| **Boreal Shield** | | | | | | | | | | |
| 1971 | 82 | 37 269 | 0 | 0 | 13 | 1 010 | 29 | 336 | 124 | 38 615 |
| 1976 | 64 | 34 678 | 0 | 0 | 13 | 1 300 | 24 | 221 | 101 | 36 199 |
| 1981 | 67 | 32 799 | 0 | 0 | 15 | 1 011 | 22 | 178 | 104 | 33 988 |
| **Prairie** | | | | | | | | | | |
| 1971 | 0 | 0 | ..[6] | ..[6] | 19 | 2 166 | 23 | 348 | ... | ... |
| 1976 | 0 | 0 | 8 | 390 | 19 | 2 880 | 14 | 281 | 41 | 3 551 |
| 1981 | 0 | 0 | 9 | 500-999 | 19 | 3 766 | 13 | 100-199 | 41 | 4 455 |
| **Boreal Plain** | | | | | | | | | | |
| 1971 | 2 | 100-199 | ..[6] | ..[6] | 6 | 125 | 3 | 22 | ... | ... |
| 1976 | 3 | 560 | 3 | 717 | 7 | 160 | 1 | 1-99 | 14 | 1 000-1 499 |
| 1981 | 3 | 877 | 5 | 1 224 | 7 | 236 | 1 | 1-99 | 16 | 2 000-2 499 |
| **Montane Cordillera** | | | | | | | | | | |
| 1971 | 19 | 3 256 | ..[6] | ..[6] | 4 | 60 | 4 | 52 | ... | ... |
| 1976 | 17 | 3 931 | 6 | 3 177 | 2 | 2-99 | 4 | 4-99 | 29 | 7 108 |
| 1981 | 21 | 5 414 | 5 | 3 500-3 999 | 2 | 2-99 | 2 | 2-99 | 30 | 9 243 |
| **Pacific Maritime** | | | | | | | | | | |
| 1971 | 9 | 1 956 | 0 | 0 | 7 | 201 | 19 | 262 | 35 | 2 419 |
| 1976 | 8 | 1 376 | 0 | 0 | 4 | 133 | 11 | 155 | 23 | 1 664 |
| 1981 | 7 | 1 633 | 0 | 0 | 3 | 80 | 7 | 100-199 | 17 | 1 500-1 999 |
| **Boreal Cordillera** | | | | | | | | | | |
| 1971 | 3 | 606 | 0 | 0 | 2 | 626 | 0 | 0 | 5 | 1 232 |
| 1976 | 4 | 641 | 0 | 0 | 1 | 500-999 | 0 | 0 | 5 | 1 000-1 499 |
| 1981 | 6 | 928 | 0 | 0 | 1 | 200-499 | 0 | 0 | 7 | 1 000-1 499 |
| **Tundra Cordillera** | | | | | | | | | | |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1981 | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| **Taiga Plain** | | | | | | | | | | |
| 1971 | 4 | 625 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 625 |
| 1976 | 1 | 500-999 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 500-999 |
| 1981 | 1 | 200-499 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 200-499 |
| **Taiga Shield** | | | | | | | | | | |
| 1971 | 7 | 3 174 | 0 | 0 | 0 | 0 | 1 | 1-99 | 8 | 3 000-3 499 |
| 1976 | 12 | 4 661 | 0 | 0 | 1 | 200-499 | 1 | 1-99 | 14 | 4 500-4 999 |
| 1981 | 10 | 4 733 | 0 | 0 | 1 | 100-199 | 0 | 0 | 11 | 4 500-4 999 |
| **Northern Arctic** | | | | | | | | | | |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 1 | 1-99 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1-99 |
| 1981 | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| **Canada** | | | | | | | | | | |
| 1971 | 137 | 50 033 | 35 | 6 343 | 128 | 11 873 | 304 | 4 282 | 604 | 72 531 |
| 1976 | 118 | 49 834 | 28 | 7 777 | 116 | 12 035 | 265 | 4 412 | 527 | 74 058 |
| 1981 | 125 | 49 586 | 33 | 9 188 | 124 | 12 557 | 219 | 3 109 | 501 | 74 440 |

[1] Excludes crude petroleum and natural gas industry and services incidental to mining.
[2] Ranges are used to meet the confidentiality restrictions of the Statistics Act.
[3] Includes asbestos, salt, potash, sulfur and miscellaneous non-metallic mineral mines.
[4] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.
[5] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.
[6] It was not possible to allocate the 1971 coal mining data by ecozone for Saskatchewan, Alberta and British Columbia. The unallocated figures are 28 establishments and 3 184 production workers. Coal mining is confined to Prairie, Boreal Plain and Montane Cordillera ecozones. These figures are included in the totals.

**Sources:**
Energy Mines and Resources Canada, Annual Census of Metal Mines, Non-Metal Mines and Sand Pits and Quarries, 1971, 1976 and 1981.
Statistics Canada, Annual Census of Coal Mines, 1976 and 1981. Statistics Canada, *Coal Mines*, Catalogue 26-206, 1971.
Statistics Canada, special tabulations by the Office of the Senior Adviser on Integration.

Appendix 6, Table 2
## Mining Activity[1] by Drainage Basin, 1981[2]

| Drainage Basin | Metal Mines | | Coal Mines | | Non-Metal Mines[3] | | Sand Pits and Quarries | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] |
| **Atlantic Ocean Basin** | | | | | | | | | | |
| 100.2-10 Churchill and Naskaupi Rivers | 2 | 3 000-3 499 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 000-3 499 |
| 101 -10 Newfoundland, North Coast Rivers | 2 | 200-499 | 0 | 0 | 1 | 200-499 | 0 | 0 | 3 | 883 |
| 103 -10 St. John's area Rivers | 0 | 0 | 0 | 0 | 1 | 1-99 | 1 | 1-99 | 2 | 2-99 |
| 104 -12 Nova Scotia, Southeast Coast Rivers | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 94 | 4 | 94 |
| 110.1-24 Gulf, Mainland North Coast Rivers | 3 | 742 | 0 | 0 | 0 | 0 | 2 | 2-99 | 5 | 500-999 |
| 110.2-24 Manicouagan and Outardes Rivers | 2 | 1 500-1 999 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 500-1 599 |
| 110.3-24 Betsiamites River | 0 | 0 | 0 | 0 | 1 | 1-99 | 0 | 0 | 1 | 1-99 |
| 111 -10 Gulf, Newfoundland West and South Coast Rivers | 1 | 100-199 | 0 | 0 | 2 | 2-99 | 0 | 0 | 3 | 207 |
| 112 -24 North Gaspé Peninsula Rivers | 1 | 1-99 | 0 | 0 | 10 | 73 | 0 | 0 | 11 | 100-199 |
| 113 Gulf, Mainland South and West Coast Rivers: | 3 | 3 029 | 2 | 2-99 | 14 | 419 | 2 | 2-99 | 21 | 3 542 |
| 113 -12 Nova Scotia | 0 | 0 | 2 | 2-99 | 1 | 100-199 | 0 | 0 | 3 | 200-499 |
| 113 -13 New Brunswick | 2 | 1 500-1 999 | 0 | 0 | 13 | 259 | 1 | 1-99 | 16 | 2 117 |
| 113 -24 Québec | 1 | 1 000-1 499 | 0 | 0 | 0 | 0 | 1 | 1-99 | 2 | 1 000-1 499 |
| 115 -12 Cape Breton Island Rivers | 1 | 1-99 | 11 | 3 388 | 2 | 100-199 | 1 | 1-99 | 15 | 3 559 |
| 120 Bay of Fundy Coast Rivers: | 2 | 100-199 | 0 | 0 | 5 | 345 | 4 | 109 | 11 | 500-999 |
| 120 -12 Nova Scotia | 1 | 1-89 | 0 | 0 | 5 | 345 | 2 | 2-99 | 8 | 493 |
| 121 -13 New Brunswick | 1 | 1-14 | 0 | 0 | 0 | 0 | 2 | 2-99 | 3 | 3-99 |
| 130 -13 Saint John River | 0 | 0 | 1 | 200-499 | 0 | 0 | 5 | 86 | 6 | 200-499 |
| 140 -24 Saguenay River | 1 | 100-199 | 0 | 0 | 2 | 2-99 | 6 | 57 | 9 | 215 |
| 141 -24 Québec City area - Middle North Shore Rivers | 1 | 200-499 | 0 | 0 | 5 | 27 | 15 | 117 | 21 | 500-999 |
| 142 -24 Chaudière River - Middle South Shore Rivers | 0 | 0 | 0 | 0 | 22 | 3 417 | 8 | 60 | 30 | 3 477 |
| 143 -24 St. Maurice River | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 14 | 4 | 14 |
| 144 -24 Eastern Townships Rivers - Richelieu River | 0 | 0 | 0 | 0 | 4 | 1 459 | 24 | 205 | 28 | 1 664 |
| 145 -24 Eastern Laurentians Rivers | 0 | 0 | 0 | 0 | 1 | 1-99 | 8 | 55 | 9 | 100-199 |
| 146 -24 Montréal area Rivers | 0 | 0 | 0 | 0 | 3 | 36 | 21 | 439 | 24 | 475 |
| 147 West St. Lawrence River: | 0 | 0 | 0 | 0 | 1 | 1-99 | 4 | 34 | 5 | 37 |
| 147 -24 Québec | 0 | 0 | 0 | 0 | 1 | 1-99 | 2 | 2-99 | 3 | 17 |
| 147 -35 Ontario | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2-99 | 2 | 2-99 |
| 150 Lower Ottawa River: | 0 | 0 | 0 | 0 | 1 | 1-99 | 8 | 92 | 9 | 100-199 |
| 150 -24 Québec | 0 | 0 | 0 | 0 | 1 | 1-99 | 3 | 16 | 4 | 4-99 |
| 150 -35 Ontario | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 76 | 5 | 76 |
| 151 Upper Ottawa River: | 17 | 2 340 | 0 | 0 | 0 | 0 | 2 | 2-99 | 19 | 2 000-2 499 |
| 151 -24 Québec | 9 | 901 | 0 | 0 | 0 | 0 | 2 | 2-99 | 11 | 500-999 |
| 151 -35 Ontario | 8 | 1 439 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 1 439 |
| 160 -35 Belleville-Napanee area Rivers | 0 | 0 | 0 | 0 | 1 | 1-99 | 1 | 1-99 | 2 | 2-99 |
| 161 -35 Trent River | 0 | 0 | 0 | 0 | 2 | 100-199 | 4 | 37 | 6 | 200-499 |
| 162 -35 Oshawa-Colborne area Rivers | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2-99 | 2 | 2-99 |
| 163 -35 Toronto area Rivers | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 282 | 19 | 282 |
| 164 -35 Hamilton area Rivers | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 381 | 12 | 381 |
| 165 -35 Niagara Peninsula Rivers | 0 | 0 | 0 | 0 | 1 | 1-99 | 8 | 120 | 9 | 100-199 |
| 170 -35 Grand River | 0 | 0 | 0 | 0 | 3 | 136 | 9 | 89 | 12 | 225 |
| 171 -35 Lake Erie Shore Rivers | 0 | 0 | 0 | 0 | 2 | 200-499 | 1 | 1-99 | 3 | 326 |
| 172 -35 Thames River | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 153 | 5 | 153 |
| 173 -35 Sydenham River | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2-99 | 2 | 2-99 |
| 180 -35 South Huron Shore Rivers | 0 | 0 | 0 | 0 | 2 | 200-499 | 0 | 0 | 2 | 200-499 |

Appendix 6, Table 2
## Mining Activity[1] by Drainage Basin, 1981[2] (continued)

| Drainage Basin | Metal Mines | | Coal Mines | | Non-Metal Mines[3] | | Sand Pits and Quarries | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] |
| 181 -35 Georgian Bay Shore - Lake Simcoe Shore Rivers | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 56 | 5 | 56 |
| 182 -35 North Huron Shore Rivers | 6 | 12 775 | 0 | 0 | 2 | 100-199 | 6 | 69 | 14 | 12 500-12 999 |
| 190 -35 Lake Superior Shore Rivers | 2 | 1 000-1 499 | 0 | 0 | 0 | 0 | 2 | 2-99 | 4 | 1 109 |
| **Hudson Bay and Ungava Bay Basin** | | | | | | | | | | |
| 200.1-24 East Hudson Bay Coast Rivers | 0 | 0 | 0 | 0 | 1 | 100-199 | 0 | 0 | 1 | 100-199 |
| 200.2-24 Ungava Bay Coast Rivers | 1 | 1-99 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1-99 |
| 200.3-24 Eastmain and LaGrande Rivers | 4 | 1 416 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 416 |
| 210.1-24 Rupert and Nottaway Rivers | 5 | 1 182 | 0 | 0 | 1 | 1-99 | 0 | 0 | 6 | 1 000-1 499 |
| 210.2-24 Harricanaw River | 7 | 1 113 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 1 113 |
| 210.3-35 Moose River | 3 | 3 116 | 0 | 0 | 1 | 1-99 | 0 | 0 | 4 | 3 000-3 499 |
| 210.5-35 Southwest Hudson Bay Coast Rivers | 1 | 1-99 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| 211.3 Churchill River: | 3 | 1 233 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 233 |
| 211.3-46 Manitoba | 1 | 500-999 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 500-999 |
| 211.3-47 Saskatchewan | 2 | 500-999 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 500-999 |
| 220 -46 Nelson River | 2 | 2 500-2 000 | 0 | 0 | 0 | 0 | 1 | 1-99 | 3 | 2 506 |
| 230 Lake Winnipeg Shore Rivers: | 9 | 1 932 | 0 | 0 | 2 | 100-199 | 0 | 0 | 11 | 2 000-2 499 |
| 230 -35 Ontario | 8 | 1 500-1 999 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 1 500-1 999 |
| 230 -46 Manitoba | 1 | 1-99 | 0 | 0 | 2 | 100-199 | 0 | 0 | 3 | 269 |
| 231 -46 Red River | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 61 | 5 | 61 |
| 232 -46 Dauphin River | 0 | 0 | 0 | 0 | 1 | 1-99 | 1 | 1-99 | 2 | 2-99 |
| 240 Assiniboine and Souris Rivers: | 0 | 0 | 5 | 321 | 0 | 0 | 1 | 1-99 | 6 | 200-499 |
| 240 -46 Manitoba | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1-99 | 1 | 1-99 |
| 240 -47 Saskatchewan | 0 | 0 | 5 | 321 | 0 | 0 | 0 | 0 | 5 | 321 |
| 241 -47 Qu'Appelle River - Old Wives Lake | 0 | 0 | 0 | 0 | 7 | 1 786 | 0 | 0 | 7 | 1 786 |
| 250 Saskatchewan River: | 2 | 500-999 | 0 | 0 | 1 | 1-99 | 0 | 0 | 3 | 544 |
| 250 -46 Manitoba | 1 | 200-499 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 200-499 |
| 250 -47 Saskatchewan | 1 | 200-499 | 0 | 0 | 1 | 1-99 | 0 | 0 | 2 | 200-499 |
| 251 -48 Upper North Saskatchewan River | 0 | 0 | 1 | 1-99 | 0 | 0 | 0 | 0 | 1 | 1-99 |
| 252 Lower North Saskatchewan River: | 0 | 0 | 3 | 334 | 7 | 246 | 5 | 97 | 15 | 677 |
| 252 -47 Saskatchewan | 0 | 0 | 0 | 0 | 3 | 110 | 0 | 0 | 3 | 110 |
| 252 -48 Alberta | 0 | 0 | 3 | 334 | 4 | 136 | 5 | 97 | 12 | 567 |
| 253 South Saskatchewan River and Red Deer River: | 0 | 0 | 2 | 2-99 | 6 | 1 807 | 2 | 2-99 | 10 | 1 922 |
| 253 -47 Saskatchewan | 0 | 0 | 0 | 0 | 6 | 1 807 | 1 | 1-99 | 7 | 1 500-1 999 |
| 253 -48 Alberta | 0 | 0 | 2 | 2-99 | 0 | 0 | 1 | 1-99 | 3 | 100-199 |
| **Arctic Ocean Basin** | | | | | | | | | | |
| 300.1-61 Mackenzie River | 2 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 100-199 |
| 300.2 Great Slave Lake Shore Rivers: | 5 | 1 524 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1 524 |
| 300.2-47 Saskatchewan | 1 | 500-999 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 500-999 |
| 300.2-61 Northwest Territories | 4 | 500-999 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 500-999 |
| 300.3 Liard River: | 4 | 212 | 0 | 0 | 1 | 200-499 | 0 | 0 | 5 | 500-999 |
| 300.3-59 British Columbia | 3 | 3-99 | 0 | 0 | 1 | 200-499 | 0 | 0 | 4 | 553 |
| 300.3-61 Northwest Territories | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| 301 -48 Athabasca River | 0 | 0 | 3 | 914 | 2 | 2-99 | 0 | 0 | 5 | 500-999 |
| 302 -48 Peace River | 0 | 0 | 1 | 500-999 | 1 | 1-99 | 0 | 0 | 2 | 500-999 |
| 330.2-61 Arctic Islands Rivers | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |

Appendix 6, Table 2
## Mining Activity[1] by Drainage Basin, 1981[2] (concluded)

| Drainage Basin | Metal Mines | | Coal Mines | | Non-Metal Mines[3] | | Sand Pits and Quarries | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] | Establishments[4] | Workers[5] |
| **Pacific Ocean Basin** | | | | | | | | | | |
| 400 -59 Columbia River | 6 | 2 135 | 3 | 2 767 | 2 | 2-99 | 1 | 1-99 | 12 | 4 990 |
| 401 -59 Okanagan River | 1 | 200-499 | 0 | 0 | 0 | 0 | 1 | 1-99 | 2 | 200-499 |
| 402 -59 Similkameen River | 2 | 2-99 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2-99 |
| 410 -59 Upper Fraser River | 8 | 2 106 | 0 | 0 | 1 | 1-99 | 0 | 0 | 9 | 2 000-2 499 |
| 411 -59 Thompson River | 2 | 200-499 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 200-499 |
| 412 -59 Lower Fraser River | 0 | 0 | 0 | 0 | 2 | 2-99 | 3 | 63 | 5 | 100-199 |
| 420.1-60 Yukon River | 3 | 838 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 838 |
| 431.1-59 Pacific Ocean, North Coast Rivers | 3 | 416 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 416 |
| 431.2-59 Skeena River | 2 | 200-499 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 200-499 |
| 431.3-59 Queen Charlotte Islands Rivers | 1 | 100-199 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100-199 |
| 432.1-59 Pacific Ocean, South Coast Rivers | 1 | 1-99 | 0 | 0 | 0 | 0 | 3 | 80 | 4 | 100-199 |
| 432.2-59 Northern Vancouver Island Rivers | 2 | 1 000-1 499 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 000-1 499 |
| 433 -59 Southern Vancouver Island Rivers | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1-99 | 1 | 1-99 |
| **Gulf of Mexico Basin** | | | | | | | | | | |
| 500 -47 Milk - Missouri Tributary Rivers | 0 | 0 | 1 | 1-99 | 0 | 0 | 0 | 0 | 1 | 1-99 |
| **Canada** | **125** | **49 586** | **33** | **9 188** | **124** | **12 557** | **219** | **3 109** | **501** | **74 440** |

[1] Excludes crude petroleum and natural gas industry and services incidental to mining.
[2] Ranges are used to meet the confidentiality restrictions of the Statistics Act.
[3] Includes asbestos, salt, potash, sulfur and miscellaneous non-metallic minerals mines.
[4] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.
[5] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.

**Source:**
Energy, Mines and Resources Canada, Annual Census of Metal Mines, Non-Metal Mines and Sand Pits and Quarries, 1981.
Statistics Canada, Annual Census of Coal Mines, 1981.
Statistics Canada, special tabulation by the Office of the Senior Adviser on Integration.

Appendix 6, Table 3

## Manufacturing Activity by Ecozone, 1973[1], 1976 and 1981[2]

| Ecozone | High Stressor | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|
| | Establishments[3] | | Workers[4] | | Establishments[3] | | Workers[4] | |
| | Number | Percent of Total | Number | Percent of Total | Number | Percent of Total | Number | Percent of Total |
| **Atlantic Maritime** | | | | | | | | |
| 1973 | 43 | 2.3 | 14 336 | 22.5 | 1 898 | 100.0 | 63 847 | 100.0 |
| 1976 | 43 | 2.6 | 14 612 | 23.2 | 1 641 | 100.0 | 62 880 | 100.0 |
| 1981 | 38 | 1.9 | 14 408 | 21.5 | 2 048 | 100.0 | 66 987 | 100.0 |
| **Mixed-Wood Plain** | | | | | | | | |
| 1973 | 190 | 0.9 | 66 830 | 7.1 | 20 553 | 100.0 | 935 914 | 100.0 |
| 1976 | 188 | 1.0 | 67 539 | 7.3 | 19 335 | 100.0 | 929 045 | 100.0 |
| 1981 | 207 | 0.9 | 70 458 | 7.4 | 23 508 | 100.0 | 947 246 | 100.0 |
| **Boreal Shield** | | | | | | | | |
| 1973 | 61 | 3.8 | 39 418 | 52.7 | 1 620 | 100.0 | 74 841 | 100.0 |
| 1976 | 61 | 4.1 | 42 066 | 54.2 | 1 473 | 100.0 | 77 551 | 100.0 |
| 1981 | 61 | 3.3 | 43 295 | 49.5 | 1 835 | 100.0 | 87 403 | 100.0 |
| **Prairie** | | | | | | | | |
| 1973 | 45 | 1.3 | 3 854 | 4.7 | 3 373 | 100.0 | 81 611 | 100.0 |
| 1976 | 43 | 1.3 | 3 961 | 4.3 | 3 227 | 100.0 | 91 967 | 100.0 |
| 1981 | 44 | 1.1 | 5 347 | 5.0 | 4 079 | 100.0 | 106 758 | 100.0 |
| **Boreal Plain** | | | | | | | | |
| 1973 | 9 | 2.2 | 1 981 | 23.9 | 402 | 100.0 | 8 290 | 100.0 |
| 1976 | 10 | 3.0 | 2 694 | 29.9 | 338 | 100.0 | 9 003 | 100.0 |
| 1981 | 10 | 2.4 | 2 770 | 25.8 | 425 | 100.0 | 10 722 | 100.0 |
| **Montane Cordillera** | | | | | | | | |
| 1973 | 17 | 2.5 | 5 548 | 19.3 | 693 | 100.0 | 28 681 | 100.0 |
| 1976 | 16 | 2.4 | 5 621 | 20.0 | 662 | 100.0 | 28 117 | 100.0 |
| 1981 | 17 | 1.9 | 6 711 | 20.8 | 905 | 100.0 | 32 234 | 100.0 |
| **Pacific Maritime** | | | | | | | | |
| 1973 | 40 | 1.6 | 12 771 | 15.5 | 2 579 | 100.0 | 82 584 | 100.0 |
| 1976 | 40 | 1.7 | 13 228 | 17.0 | 2 346 | 100.0 | 77 815 | 100.0 |
| 1981 | 40 | 1.4 | 13 487 | 15.7 | 2 947 | 100.0 | 85 660 | 100.0 |
| **Boreal Cordillera** | | | | | | | | |
| 1973 | 1 | 20.0 | 1-99 | 9.5 | 5 | 100.0 | 5-99 | 100.0 |
| 1976 | 1 | 20.0 | 1-99 | 9.5 | 5 | 100.0 | 5-99 | 100.0 |
| 1981 | 2 | 28.6 | 2-99 | 4.9 | 7 | 100.0 | 7-99 | 100.0 |
| **Taiga Plain** | | | | | | | | |
| 1973 | 1 | 25.0 | 1-99 | 63.5 | 4 | 100.0 | 4-99 | 100.0 |
| 1976 | 1 | 16.7 | 1-99 | 44.3 | 6 | 100.0 | 6-99 | 100.0 |
| 1981 | 1 | 12.5 | 1-99 | 16.4 | 8 | 100.0 | 100-199 | 100.0 |
| **Taiga Shield** | | | | | | | | |
| 1973 | 0 | 0.0 | 0 | 0.0 | 11 | 100.0 | 77 | 100.0 |
| 1976 | 0 | 0.0 | 0 | 0.0 | 10 | 100.0 | 92 | 100.0 |
| 1981 | 0 | 0.0 | 0 | 0.0 | 12 | 100.0 | 111 | 100.0 |
| **Hudson Bay Plain** | | | | | | | | |
| 1973 | 0 | 0.0 | 0 | 0.0 | 2 | 100.0 | 2-99 | 100.0 |
| 1976 | 0 | 0.0 | 0 | 0.0 | 2 | 100.0 | 2-99 | 100.0 |
| 1981 | 0 | 0.0 | 0 | 0.0 | 1 | 100.0 | 1-99 | 100.0 |
| **Southern Arctic** | | | | | | | | |
| 1973 | 0 | 0.0 | 0 | 0.0 | 5 | 100.0 | 44 | 100.0 |
| 1976 | 0 | 0.0 | 0 | 0.0 | 5 | 100.0 | 54 | 100.0 |
| 1981 | 0 | 0.0 | 0 | 0.0 | 2 | 100.0 | 2-99 | 100.0 |
| **Northern Arctic** | | | | | | | | |
| 1973 | 0 | ... | 0 | ... | 0 | 100.0 | 0 | 100.0 |
| 1976 | 0 | 0.0 | 0 | 0.0 | 3 | 100.0 | 22 | 100.0 |
| 1981 | 0 | 0.0 | 0 | 0.0 | 3 | 100.0 | 27 | 100.0 |
| **Canada** | | | | | | | | |
| 1973 | 407 | 1.3 | 144 780 | 11.3 | 31 145 | 100.0 | 1 275 985 | 100.0 |
| 1976 | 403 | 1.4 | 149 762 | 11.7 | 29 053 | 100.0 | 1 276 693 | 100.0 |
| 1981 | 420 | 1.2 | 156 499 | 11.7 | 35 780 | 100.0 | 1 337 329 | 100.0 |

[1] Census of Manufactures introduced the Standard Geographical Code in 1973; earlier data could not be readily allocated to ecozones.

[2] Ranges are used in order to meet the confidentiality restrictions of the Statistics Act.

[3] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.

[4] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.

**Source:**

Statistics Canada, Annual Census of Manufactures, 1973, 1976 and 1981, special tabulations by the Office of the Senior Adviser on Integration.

Appendix 6, Table 4

## Manufacturing Activity by Stressor Type: Stress to Water, by Drainage Basin[1], 1981

| Drainage Basin | High Stressor | | | Medium Stressor | | | Low Stressor | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] |
| | | Number | Percent of Total | | Number | Percent of Total | | Number | Percent of Total | | |
| **Atlantic Ocean Basin** | | | | | | | | | | | |
| 100.2-10 Churchill and Naskaupi Rivers | 0 | 0 | 0 | 1 | 1-99 | 60.0 | 3 | 3-99 | 40.0 | 4 | 4-99 |
| 101 -10 Newfoundland, North Coast Rivers | 1 | 500-999 | 38.4 | 26 | 1 500-1 999 | 50.4 | 39 | 200-499 | 11.2 | 66 | 2 500-2 999 |
| 102 -10 Trinity Bay Coast Rivers | 0 | 0 | 0 | 28 | 2 008 | 89.1 | 31 | 245 | 10.9 | 59 | 2 253 |
| 103 -10 St. John's area Rivers | 2 | 2-99 | 2.8 | 51 | 1 500-1 999 | 60.7 | 53 | 1 000-1 499 | 36.4 | 106 | 3 000-3 499 |
| 104 -12 Nova Scotia, Southeast Coast Rivers | 5 | 1 066 | 9.0 | 137 | 6 197 | 52.4 | 252 | 4 567 | 38.6 | 394 | 11 830 |
| 110.1-24 Gulf, Mainland North Coast Rivers | 2 | 2 000-2 499 | 85.2 | 17 | 200-499 | 10.0 | 22 | 100-199 | 4.8 | 41 | 2 500-2 999 |
| 110.2-24 Manicouagan and Outardes Rivers | 0 | 0 | 0 | 6 | 19 | 6.9 | 9 | 257 | 93.1 | 15 | 278 |
| 110.3-24 Betsiamites Rivers | 0 | 0 | 0 | 2 | 2-99 | 22.5 | 5 | 5-99 | 77.5 | 7 | 7-99 |
| 111 -10 Gulf, Newfoundland West and South Coast Rivers | 3 | 1 869 | 26.1 | 41 | 4 662 | 65.0 | 37 | 636 | 8.9 | 81 | 7 167 |
| 112 -24 North Gaspé Peninsula Rivers | 1 | 100-199 | 6.1 | 37 | 500-999 | 36.6 | 113 | 1 000-1 499 | 57.4 | 151 | 1 500-1 999 |
| 113 Gulf, Mainland South and West Coast Rivers: | 14 | 4 800 | 29.1 | 143 | 6 352 | 38.5 | 230 | 5 352 | 32.4 | 387 | 16 504 |
| 113 -12 Nova Scotia | 2 | 500-999 | 10.9 | 20 | 2 000-2 499 | 47.5 | 49 | 2 000-2 499 | 41.7 | 71 | 5 000-5 499 |
| 113 -13 New Brunswick | 9 | 3 067 | 38.1 | 79 | 2 563 | 31.8 | 123 | 2 423 | 30.1 | 211 | 8 053 |
| 113 -24 Québec | 3 | 1 000-1 499 | 35.7 | 44 | 1 000-1 499 | 40.7 | 58 | 500-999 | 23.7 | 105 | 3 000-3 499 |
| 114 -11 Prince Edward Island Rivers | 0 | 0 | 0 | 70 | 1 841 | 77.3 | 80 | 541 | 22.7 | 150 | 2 382 |
| 115 -12 Cape Breton Island Rivers | 5 | 2 724 | 55.9 | 35 | 1 653 | 33.9 | 58 | 499 | 10.2 | 98 | 4 876 |
| 120 Bay of Fundy Coast Rivers: | 3 | 439 | 4.1 | 146 | 4 788 | 44.3 | 241 | 0 | 51.7 | 390 | 10 811 |
| 120 -12 Nova Scotia | 1 | 100-199 | 2.2 | 94 | 3 000-3 499 | 45.8 | 156 | 3 000-3 499 | 52.0 | 251 | 6 500-6 999 |
| 121 -13 New Brunswick | 2 | 200-299 | 7.1 | 52 | 1 500-1 999 | 41.9 | 85 | 2 000-2 499 | 51.0 | 139 | 4 000-4 499 |
| 130 Saint John River: | 7 | 2 549 | 18.0 | 86 | 3 562 | 25.2 | 252 | 8 052 | 56.9 | 345 | 14 163 |
| 130 -13 New Brunswick | 6 | 2 000-2 499 | 19.9 | 76 | 3 500-3 999 | 28.5 | 194 | 6 000-6 499 | 51.5 | 276 | 12 000-12 499 |
| 130 -24 Québec | 1 | 100-199 | 5.5 | 10 | 10-99 | 3.3 | 58 | 1 500-1 999 | 91.2 | 69 | 1 500-1 999 |
| 140 -24 Saguenay River | 10 | 8 930 | 64.4 | 67 | 1 510 | 10.9 | 182 | 3 422 | 24.7 | 259 | 13 862 |
| 141 -24 Québec City area — Middle North Shore Rivers | 8 | 3 837 | 21.9 | 155 | 4 461 | 25.4 | 486 | 9 253 | 52.7 | 649 | 17 551 |
| 142 -24 Chaudiere River — Middle South Shore Rivers | 5 | 748 | 3.1 | 222 | 5 333 | 22.2 | 607 | 17 896 | 74.6 | 834 | 23 977 |
| 143 -24 St. Maurice River | 9 | 7 268 | 48.1 | 70 | 3 621 | 24.0 | 161 | 4 221 | 27.9 | 240 | 15 110 |
| 144 -24 Eastern Townships Rivers — Richelieu River | 24 | 6 195 | 9.0 | 536 | 22 614 | 32.8 | 1 219 | 40 194 | 58.2 | 1 779 | 69 003 |
| 145 -24 Eastern Laurentians Rivers | 4 | 1 006 | 9.8 | 100 | 3 289 | 32.1 | 298 | 5 944 | 58.1 | 402 | 10 239 |
| 146 -24 Montreal area Rivers | 41 | 6 882 | 3.4 | 1 333 | 49 307 | 24.6 | 4 379 | 144 546 | 72.0 | 5 753 | 200 735 |
| 147 West St. Lawrence River: | 17 | 2 976 | 13.4 | 148 | 11 397 | 51.2 | 200 | 7 885 | 35.4 | 365 | 22 258 |
| 147 -24 Québec | 6 | 1 223 | 22.3 | 35 | 3 717 | 67.8 | 35 | 539 | 9.8 | 76 | 5 479 |
| 147 -35 Ontario | 11 | 1 753 | 10.4 | 113 | 7 680 | 45.8 | 165 | 7 346 | 43.8 | 289 | 16 779 |
| 150 Lower Ottawa River: | 14 | 5 251 | 20.3 | 232 | 5 776 | 22.3 | 613 | 14 895 | 57.5 | 859 | 25 922 |
| 150 -24 Québec | 9 | 4 099 | 31.8 | 90 | 2 298 | 17.8 | 277 | 6 494 | 50.4 | 376 | 12 891 |
| 150 -35 Ontario | 5 | 1 152 | 8.8 | 142 | 3 478 | 26.7 | 336 | 8 401 | 64.5 | 483 | 13 031 |

Appendix 6, Table 4

## Manufacturing Activity by Stressor Type: Stress to Water, by Drainage Basin[1], 1981 (continued)

| Drainage Basin | High Stressor | | | Medium Stressor | | | Low Stressor | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] |
| | | Number | Percent of Total | | Number | Percent of Total | | Number | Percent of Total | | |
| 151 Upper Ottawa River: | 5 | 1 915 | 15.0 | 76 | 2 302 | 18.0 | 228 | 8 537 | 66.9 | 309 | 12 754 |
| 151 -24 Québec | 3 | 1 500-1 999 | 47.2 | 13 | 100-199 | 5.1 | 40 | 1 500-1 999 | 47.7 | 56 | 3 000-3 499 |
| 151 -35 Ontario | 2 | 200-499 | 4.3 | 63 | 2 000-2 499 | 22.4 | 188 | 7 000-7 499 | 73.3 | 253 | 9 500-9 999 |
| 160 -35 Belleville-Napanee area Rivers | 2 | 200-499 | 2.9 | 67 | 2 500-2 999 | 42.2 | 102 | 3 599-3 999 | 54.9 | 171 | 7 000-7 499 |
| 161 -35 Trent River | 2 | 200-499 | 2.6 | 101 | 2 000-2 499 | 17.1 | 207 | 10 000-10 499 | 80.2 | 310 | 12 500-12 999 |
| 162 -35 Oshawa-Colborne area Rivers | 2 | 500-999 | 2.8 | 62 | 1 500-1 999 | 10.3 | 124 | 16 000-16 499 | 86.9 | 188 | 18 500-18 999 |
| 163 -35 Toronto area Rivers | 23 | 2 724 | 1.1 | 2 022 | 65 936 | 26.7 | 4 871 | 178 639 | 72.2 | 6 916 | 247 299 |
| 164 -35 Hamilton area Rivers | 15 | 20 747 | 33.6 | 367 | 15 194 | 24.6 | 578 | 25 797 | 41.8 | 960 | 61 738 |
| 165 -35 Niagara Peninsula Rivers | 15 | 5 429 | 15.0 | 275 | 11 075 | 30.6 | 339 | 19 692 | 54.4 | 629 | 36 196 |
| 170 -35 Grand River | 7 | 531 | 0.8 | 492 | 23 212 | 35.8 | 766 | 41 055 | 63.4 | 1 265 | 64 798 |
| 171 -35 Lake Erie Shore Rivers | 3 | 1 500-1 999 | 3.8 | 318 | 11 500-11 999 | 29.5 | 430 | 27 000-27 499 | 66.7 | 751 | 40 000-40 499 |
| 172 -35 Thames River | 1 | 1-99 | -- | 276 | 9 500-9 999 | 29.2 | 448 | 23 500-23 999 | 70.8 | 725 | 33 500-33 999 |
| 173 -35 Sydenham River | 16 | 5 653 | 42.9 | 97 | 3 509 | 26.6 | 95 | 4 028 | 30.5 | 208 | 13 190 |
| 180 -35 South Huron Shore Rivers | 1 | 200-499 | 3.8 | 129 | 2 500-2 999 | 22.9 | 231 | 8 000-8 499 | 73.3 | 361 | 11 000-11 499 |
| 181 -35 Georgian Bay Shore — Lake Simcoe Shore Rivers | 3 | 500-999 | 2.8 | 162 | 7 000-7 499 | 38.9 | 363 | 11 000-11 499 | 58.4 | 528 | 18 500-18 999 |
| 182 -35 North Huron Shore Rivers | 13 | 14 837 | 76.2 | 84 | 1 735 | 8.9 | 167 | 2 906 | 14.9 | 264 | 19 478 |
| 190 -35 Lake Superior Shore Rivers | 9 | 5 105 | 57.7 | 28 | 337 | 3.8 | 88 | 3 401 | 38.5 | 125 | 8 843 |
| **Hudson Bay and Ungava Bay Basin** | | | | | | | | | | | |
| 200.3-24 Eastmain and LaGrande Rivers | 0 | 0 | 0 | 1 | 1-99 | 100.0 | 0 | 0 | 0 | 1 | 1-99 |
| 210.1-24 Rupert and Nottaway Rivers | 1 | 200-499 | 20.2 | 4 | 4-99 | 1.6 | 20 | 1 500-1 999 | 78.2 | 25 | 2 000-2 499 |
| 210.2-24 Harricanaw River | 0 | 0 | 0 | 11 | 129 | 9.3 | 33 | 1 263 | 90.7 | 44 | 1 392 |
| 210.3 Moose River: | 6 | 3 500-3 999 | 54.2 | 23 | 100-199 | 2.6 | 63 | 2 500-2 999 | 43.2 | 92 | 6 500-6 999 |
| 210.3-24 Québec | 0 | 0 | 0 | 10 | 66 | 5.4 | 23 | 1 161 | 94.6 | 33 | 1 227 |
| 210.3-35 Ontario | 6 | 3 500-3 999 | 66.3 | 13 | 100-199 | 2.0 | 40 | 1 500-1 999 | 31.7 | 59 | 5 000-5 499 |
| 210.4-35 Albany River | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 404 | 100 | 6 | 404 |
| 211.1-61 West Hudson Bay Coast Rivers | 0 | 0 | 0 | 1 | 1-99 | 100.0 | 0 | 0 | 0 | 1 | 1-99 |
| 211.3 Churchill River: | 0 | 0 | 0 | 11 | 78 | 22.4 | 23 | 270 | 77.6 | 34 | 348 |
| 211.3-46 Manitoba | 0 | 0 | 0 | 1 | 1-99 | 33.3 | 2 | 2-99 | 66.7 | 3 | 3-99 |
| 211.3-47 Saskatchewan | 0 | 0 | 0 | 5 | 5-99 | 12.9 | 6 | 100-199 | 87.1 | 11 | 200-499 |
| 211.3-48 Alberta | 0 | 0 | 0 | 5 | 47 | 38.5 | 15 | 75 | 61.5 | 20 | 122 |
| 220 -46 Nelson River | 1 | 500-999 | 88.7 | 3 | 3-99 | 3.8 | 5 | 5-99 | 7.5 | 9 | 500-999 |
| 230 Lake Winnipeg Shore Rivers: | 5 | 2 500-2 999 | 70.8 | 20 | 200-499 | 5.7 | 72 | 500-999 | 23.5 | 97 | 4 000-4 999 |
| 230 -35 Ontario | 4 | 2 500-2 999 | 74.0 | 9 | 9-99 | 2.0 | 49 | 500-999 | 24.0 | 62 | 3 000-3 499 |
| 230 -46 Manitoba | 1 | 200-499 | 55.4 | 11 | 100-199 | 23.4 | 23 | 100-199 | 21.2 | 35 | 500-999 |
| 231 -46 Red River | 8 | 935 | 2.5 | 307 | 9 652 | 26.0 | 732 | 26 496 | 71.5 | 1 047 | 37 083 |
| 232 Dauphin River: | 1 | 200-499 | 16.2 | 25 | 200-499 | 28.2 | 41 | 500-999 | 55.6 | 67 | 1 500-1 999 |
| 232 -46 Manitoba | 1 | 200-499 | 27.0 | 22 | 200-499 | 45.2 | 36 | 200-499 | 27.8 | 59 | 500-999 |
| 232 -47 Saskatchewan | 0 | 0 | 0 | 3 | 16 | 2.6 | 5 | 604 | 97.4 | 8 | 620 |

Appendix 6, Table 4
**Manufacturing Activity by Stressor Type: Stress to Water, by Drainage Basin[1], 1981 (continued)**

| Drainage Basin | High Stressor | | | Medium Stressor | | | Low Stressor | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] |
| | | Number | Percent of Total | | Number | Percent of Total | | Number | Percent of Total | | |
| 240 Assiniboine and Souris Rivers: | 2 | 100-199 | 2.6 | 92 | 1 500-1 999 | 45.5 | 143 | 2 000-2 499 | 51.9 | 237 | 3 500-3 999 |
| 240 -46 Manitoba | 2 | 100-199 | 4.7 | 46 | 1 000-1 499 | 55.6 | 74 | 500-999 | 39.8 | 122 | 2 000-2 499 |
| 240 -47 Saskatchewan | 0 | 0 | 0 | 46 | 544 | 32.3 | 69 | 1 142 | 67.7 | 115 | 1 686 |
| 241 -47 Qu'Appelle River — Old Wives Lake: | 4 | 200-499 | 3.9 | 88 | 2 500-2 999 | 53.2 | 169 | 2 000-2 499 | 42.8 | 261 | 5 000-5 499 |
| 250 Saskatchewan River: | 2 | 500-999 | 41.2 | 22 | 100-199 | 13.1 | 38 | 500-999 | 45.8 | 62 | 1 000-1 499 |
| 250 -46 Manitoba | 1 | 200-499 | 61.7 | 1 | 1-99 | 1.7 | 11 | 200-499 | 36.6 | 13 | 500-999 |
| 250 -47 Saskatchewan | 1 | 200-499 | 26.1 | 21 | 100-199 | 21.4 | 27 | 200-499 | 52.5 | 49 | 500-999 |
| 251 -48 Upper North Saskatchewan River | 0 | 0 | 0 | 24 | 320 | 46.7 | 24 | 365 | 53.3 | 48 | 685 |
| 252 Lower North Saskatchewan River: | 20 | 3 935 | 13.6 | 360 | 11 120 | 38.5 | 725 | 13 802 | 47.8 | 1 105 | 28 857 |
| 252 -47 Saskatchewan | 1 | 200-499 | 27.9 | 22 | 200-499 | 23.6 | 59 | 500-999 | 48.4 | 82 | 1 000-1 499 |
| 252 -48 Alberta | 19 | 3 500-3 999 | 12.9 | 338 | 10 500-10 999 | 39.3 | 666 | 13 00-13 499 | 47.8 | 1 023 | 27 000-27 499 |
| 253 South Saskatchewan River and Red Deer River: | 9 | 794 | 6.0 | 233 | 5 917 | 44.6 | 357 | 6 554 | 49.4 | 599 | 13 265 |
| 253 -47 Saskatchewan | 3 | 78 | 1.5 | 83 | 2 324 | 45.6 | 149 | 2 690 | 52.8 | 235 | 5 092 |
| 253 -48 Alberta | 6 | 716 | 8.8 | 150 | 3 593 | 44.0 | 208 | 3 864 | 47.3 | 364 | 8 173 |
| 254 -48 Bow River | 7 | 930 | 4.6 | 259 | 7 871 | 38.7 | 582 | 11 556 | 56.8 | 848 | 20 357 |
| **Arctic Ocean Basin** | | | | | | | | | | | |
| 300.1-61 Mackenzie River | 1 | 1-99 | 29.2 | 0 | 0 | 0 | 2 | 2-99 | 70.8 | 3 | 3-99 |
| 300.2 Great Slave Lake Shore Rivers: | 0 | 0 | 0 | 3 | 26 | 21.3 | 10 | 96 | 78.7 | 13 | 122 |
| 300.2-47 Saskatchewan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1-99 | 100.0 | 1 | 1-99 |
| 300.2-61 Northwest Territories | 0 | 0 | 0 | 3 | 26 | 21.3 | 9 | 9-99 | 78.7 | 12 | 100-199 |
| 300.3 Liard River: | 0 | 0 | 0 | 2 | 2-99 | 6.8 | 3 | 100-199 | 93.2 | 5 | 100-199 |
| 300.3-59 British Columbia | 0 | 0 | 0 | 2 | 2-99 | 9.4 | 1 | 100-199 | 90.6 | 3 | 100-199 |
| 300.3-60 Yukon | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2-99 | 100.0 | 2 | 2-99 |
| 301 -48 Athabasca River | 0 | 0 | 0 | 26 | 255 | 15.5 | 59 | 1 389 | 84.5 | 85 | 1 644 |
| 302 Peace River: | 3 | 500-999 | 21.5 | 36 | 200-499 | 11.4 | 68 | 2 000-2 499 | 67.2 | 107 | 3 500-3 999 |
| 302 -48 Alberta | 1 | 200-499 | 22.3 | 25 | 200-499 | 16.4 | 35 | 1 000-1 499 | 61.3 | 61 | 1 500-1 999 |
| 302 -59 British Columbia | 2 | 200-499 | 20.5 | 11 | 100-199 | 5.8 | 33 | 1 000-1 499 | 73.7 | 46 | 1 500-1 999 |
| 330.1-61 Mainland Arctic Coast Rivers | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1-99 | 100 | 1 | 1-99 |
| 330.2-61 Arctic Islands Rivers | 0 | 0 | 0 | 1 | 1-99 | 44.4 | 2 | 2-99 | 55.6 | 3 | 3-99 |
| **Pacific Ocean Basin** | | | | | | | | | | | |
| 400 -59 Columbia River | 5 | 4 131 | 48.8 | 33 | 430 | 5.1 | 132 | 3 898 | 46.1 | 170 | 8 459 |
| 401 -59 Okanagan River | 0 | 0 | 0 | 84 | 1 000-1 499 | 26.1 | 206 | 3 500-3 999 | 73.9 | 290 | 5 000-5 499 |
| 402 -59 Similkameen River | 0 | 0 | 0 | 2 | 2-99 | 6.7 | 10 | 10-99 | 93.3 | 12 | 12-99 |
| 410 -59 Upper Fraser River | 8 | 1 746 | 13.3 | 56 | 922 | 7.0 | 199 | 10 461 | 79.7 | 263 | 13 129 |
| 411 -59 Thompson River | 3 | 624 | 12.7 | 46 | 413 | 8.4 | 131 | 3 894 | 79.0 | 180 | 4 931 |
| 412 -59 Lower Fraser River | 18 | 1 816 | 3.5 | 541 | 15 645 | 29.9 | 1 434 | 34 881 | 66.6 | 1 993 | 52 342 |
| 420.1-60 Yukon River | 2 | 2-99 | 5.3 | 1 | 1-99 | 10.5 | 3 | 3-99 | 84.2 | 6 | 6-99 |
| 431.1-59 Pacific Ocean, North Coast Rivers | 3 | 2 000-2 499 | 85.5 | 6 | 100-199 | 6.5 | 5 | 200-499 | 8.1 | 14 | 2 500-2 999 |
| 431.2-59 Skeena River | 1 | 500-999 | 19.5 | 20 | 1 000-1 499 | 43.0 | 41 | 1 000-1 499 | 37.6 | 62 | 3 000-3 499 |
| 431.3-59 Queen Charlotte Islands Rivers | 0 | 0 | 0 | 1 | 1-99 | 68.2 | 2 | 2-99 | 31.8 | 3 | 3-99 |
| 432.1-59 Pacific Ocean, South Coast Rivers | 10 | 3 274 | 32.9 | 85 | 1 801 | 18.1 | 247 | 4 878 | 49.0 | 342 | 9 953 |

Appendix 6, Table 4
## Manufacturing Activity by Stressor Type: Stress to Water, by Drainage Basin[1], 1981 (concluded)

| Drainage Basin | High Stressor | | | Medium Stressor | | | Low Stressor | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] | | Establishments[2] | Workers[3] |
| | | Number | Percent of Total | | Number | Percent of Total | | Number | Percent of Total | | |
| 432.2-59 Northern Vancouver Island Rivers | 6 | 4 000-4 499 | 51.0 | 40 | 200-499 | 5.6 | 144 | 3 500-3 999 | 43.4 | 190 | 8 500-8 999 |
| 433 -59 Southern Vancouver Island Rivers | 2 | 500-999 | 11.7 | 73 | 1 000-1 499 | 17.1 | 231 | 5 500-5 999 | 71.1 | 306 | 7 500-7 999 |
| **Gulf of Mexico Basin** | | | | | | | | | | | |
| 500 Milk - Missouri Tributary Rivers | 0 | 0 | 0 | 1 | 1-99 | 0.7 | 4 | 100-199 | 99.3 | 5 | 100-199 |
| 500 -47 Saskatchewan | 0 | 0 | 0 | 1 | 1-99 | 1.3 | 1 | 1-99 | 98.7 | 2 | 2-99 |
| 500 -48 Alberta | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 60 | 100.0 | 3 | 60 |
| **Canada** | **420** | **156 499** | **11.7** | **10 786** | **370 208** | **27.7** | **24 574** | **810 622** | **60.6** | **35 780** | **1 337 329** |

[1] Ranges are used in order to meet the confidentiality restrictions of the Statistics Act.
[2] The establishment is defined as the smallest operating unit capable of reporting a specified range of basic industrial statistics.
[3] Includes production and related workers, e.g. those at the establishment engaged in processing, assembling and other activities such as storing, inspecting and handling.

**Source:**
Statistics Canada, Annual Census of Manufactures, 1981, special tabulation by the Office of the Senior Adviser on Integration.

Appendix 6, Table 5
## Manufacturing Water Use by Industry Group, 1976[1]

| Industry Group | Number of Plants | Total Water Intake[2] | Recirculated[3] | Gross Water Use[4] | Consumption[5] | Total Water Discharge[6] | Use Rate[7] | Consumption Rate[8] |
|---|---|---|---|---|---|---|---|---|
| | | millions of cubic metres | | | | | | percent |
| Paper and Allied | 461 | 3 132 | 5 736 | 8 868 | 170 | 2 962 | 2.8 | 5.4 |
| Primary Metal | 238 | 2 094 | 1 977 | 4 071 | 77 | 2 018 | 1.9 | 3.7 |
| Chemical and Chemical Products | 656 | 1 463 | 1 548 | 3 010 | 104 | 1 359 | 2.1 | 7.1 |
| Petroleum and Coal Products | 85 | 616 | 1 017 | 1 633 | 35 | 581 | 2.7 | 5.7 |
| Transportation Equipment | 476 | 376 | 427 | 803 | 1 | 374 | 2.1 | 0.3 |
| Food and Beverage | 2 123 | 359 | 162 | 521 | 31 | 328 | 1.5 | 8.6 |
| Wood | 1 079 | 331 | 158 | 489 | 8 | 323 | 1.5 | 2.4 |
| Textile | 414 | 139 | 104 | 242 | 7 | 131 | 1.7 | 5.0 |
| Non-Metallic Mineral Products | 641 | 95 | 152 | 247 | 16 | 79 | 2.6 | 16.8 |
| Rubber and Plastic | 359 | 60 | 81 | 140 | 6 | 54 | 2.3 | 10.0 |
| **Total** | **6 532** | **8 664** | **11 360** | **20 024** | **456** | **8 207** | **2.3** | **5.3** |

[1] Data obtained from the 1976 Water Use Survey. Only the larger establishments (i.e. those receiving the long form questionnaires during the 1976 Census of Manufactures) and the ten major SIC industrial groups identified as the largest users of water in manufacturing were covered by this survey.
[2] Total amount of water added to the water system of the plant to replace water discharged or consumed during production.
[3] Water used at least twice in the manufacturing process.
[4] New water intake plus recycled water.
[5] Water which is lost in the production process.
[6] Water returned to the environment.
[7] The ratio of gross water use to water intake; represents an index of recirculation.
[8] Proportion of the water lost during production, most commonly through evaporation or incorporation of water into products.

**Source:**
Environment Canada, Water Use in Manufacturing Industries 1976 Survey, special tabulation by the Office of the Senior Adviser on Integration, Statistics Canada.

**Note:**
Individual items may not add to totals due to rounding.

Appendix 6, Table 6

## Population Served by Municipal Wastewater Treatment System by Drainage Basin[1]

| | Drainage Basin | Municipal Population Served by Wastewater Treatment Systems | | | | | Municipal Population[6] | Percent of Municipal Population Served |
|---|---|---|---|---|---|---|---|---|
| | | Primary[2] | Secondary[3] | Lagoons[4] | Other[5] | Total | | |
| | | | | | | | | percent |
| | **Atlantic Ocean Basin** | | | | | | | |
| 100.1-10 | Labrador Coast Rivers | 0 | 0 | 0 | 0 | 0 | 3 994 | 0 |
| 100.2-10 | Churchill and Naskaupi Rivers | 0 | 17 600 | 0 | 0 | 17 600 | 28 608 | 61.5 |
| 101 -10 | Newfoundland, North Coast Rivers | 1 200 | 15 010 | 0 | 1 245 | 17 455 | 114 319 | 15.3 |
| 102 -10 | Trinity Bay Coast Rivers | 0 | 4 690 | 1 200 | 490 | 6 380 | 50 342 | 12.7 |
| 103 -10 | St. John's area Rivers | 0 | 1 931 | 0 | 0 | 1 931 | 153 060 | 1.3 |
| 104 -12 | Nova Scotia, Southeast Coast Rivers | 0 | 27 465 | 0 | 3 121 | 30 586 | 294 081 | 10.4 |
| 110.1 | Gulf, Mainland North Coast Rivers: | 0 | 6 200 | 0 | 11 500 | 17 700 | 76 133 | 23.2 |
| 110.1-10 | Labrador | 0 | 0 | 0 | 0 | 0 | 1 780 | 0 |
| 110.1-24 | Québec | 0 | 6 200 | 0 | 11 500 | 17 700 | 74 353 | 23.8 |
| 110.2-24 | Manicouagan and Outardes Rivers | 0 | 8 600 | 0 | 0 | 8 600 | 24 801 | 34.7 |
| 110.3-24 | Betsiamites Rivers | 0 | 0 | 1 530 | 0 | 1 530 | 13 133 | 11.7 |
| 111 -10 | Gulf, Newfoundland West and South Coast Rivers | 0 | 6 632 | 0 | 5 282 | 11 914 | 155 590 | 7.7 |
| 112 -24 | North Gaspé Peninsula Rivers | 35 | 6 372 | 5 300 | 1 875 | 13 582 | 136 934 | 9.9 |
| 113 | Gulf, Mainland South and West Coast Rivers: | 0 | 88 600 | 49 797 | 160 | 138 557 | 235 521 | 58.8 |
| 113 -12 | Nova Scotia | 0 | 25 943 | 5 442 | 0 | 31 385 | 36 574 | 85.8 |
| 113 -13 | New Brunswick | 0 | 41 750 | 43 675 | 0 | 85 425 | 94 359 | 90.5 |
| 113 -24 | Québec | 0 | 20 907 | 680 | 160 | 21 747 | 104 588 | 20.8 |
| 114 -11 | Prince Edward Island Rivers | 37 439 | 1 878 | 13 452 | 0 | 52 769 | 56 865 | 92.8 |
| 115 -12 | Cape Breton Island Rivers | 0 | 15 445 | 1 757 | 820 | 18 022 | 120 560 | 14.9 |
| 120 | Bay of Fundy Coast Rivers: | 0 | 39 340 | 22 293 | 0 | 61 633 | 183 661 | 33.6 |
| 120 -12 | Nova Scotia | 0 | 35 740 | 11 962 | 0 | 47 702 | 86 051 | 55.4 |
| 121 -13 | New Brunswick | 0 | 3 600 | 10 331 | 0 | 13 931 | 97 610 | 14.3 |
| 130 | Saint John River: | 0 | 95 526 | 50 530 | 6 564 | 152 620 | 251 674 | 60.6 |
| 130 -13 | New Brunswick | 0 | 94 926 | 44 295 | 3 364 | 142 585 | 210 599 | 67.7 |
| 130 -24 | Québec | 0 | 600 | 6 235 | 3 200 | 10 035 | 41 075 | 24.4 |
| 140 -24 | Saguenay River | 0 | 4 068 | 2 990 | 1 500 | 8 558 | 288 825 | 3.0 |
| 141 -24 | Québec City area - Middle North Shore Rivers | 0 | 7 950 | 600 | 0 | 8 550 | 658 710 | 1.3 |
| 142 -24 | Chaudière River - Middle South Shore Rivers | 9 200 | 14 015 | 16 765 | 3 755 | 43 735 | 395 202 | 11.1 |
| 143 -24 | St. Maurice River | 0 | 1 100 | 0 | 0 | 1 100 | 185 219 | 0.6 |
| 144 -24 | Eastern Township Rivers - Richelieu River | 4 150 | 26 598 | 13 020 | 180 | 43 948 | 837 625 | 5.2 |
| 145 -24 | Eastern Laurentian Rivers | 0 | 11 973 | 850 | 200 | 13 023 | 218 863 | 6.0 |
| 146 -24 | Montréal area Rivers | 41 452 | 118 092 | 0 | 3 375 | 162 919 | 2 983 527 | 5.5 |
| 147 | West St. Lawrence River: | 144 376 | 3 825 | 12 365 | 4 569 | 165 135 | 242 251 | 68.2 |
| 147 -24 | Québec | 0 | 2 525 | 0 | 0 | 2 525 | 73 176 | 3.5 |
| 147 -35 | Ontario | 144 376 | 1 300 | 12 365 | 4 569 | 162 610 | 169 075 | 96.2 |
| 150 | Lower, Ottawa River: | 396 229 | 23 389 | 19 254 | 5 442 | 444 314 | 827 158 | 53.7 |
| 150 -24 | Québec | 0 | 11 585 | 2 025 | 1 890 | 15 500 | 352 661 | 4.4 |
| 150 -35 | Ontario | 396 229 | 11 804 | 17 229 | 3 552 | 428 814 | 474 497 | 90.4 |
| 151 | Upper Ottawa River: | 37 606 | 59 437 | 29 084 | 5 000 | 131 127 | 290 555 | 45.1 |
| 151 -24 | Québec | 4 000 | 2 100 | 12 340 | 0 | 18 440 | 90 165 | 20.5 |
| 151 -35 | Ontario | 33 606 | 57 337 | 16 744 | 5 000 | 112 687 | 200 390 | 56.2 |
| 160 -35 | Belleville-Napanee area Rivers | 5 300 | 55 843 | 6 158 | 172 | 67 473 | 98 147 | 68.7 |
| 161 -35 | Trent River | 14 600 | 79 735 | 22 856 | 0 | 117 191 | 151 213 | 77.5 |
| 162 -35 | Oshawa-Colborne area Rivers | 0 | 182 547 | 1 300 | 750 | 184 597 | 232 408 | 79.4 |
| 163 -35 | Toronto area Rivers | 0 | 2 602 050 | 0 | 0 | 2 602 050 | 2 750 971 | 94.6 |
| 164 -35 | Hamilton area Rivers | 0 | 572 697 | 32 628 | 0 | 605 325 | 647 642 | 93.5 |
| 165 -35 | Niagara Peninsula Rivers | 133 841 | 157 964 | 6 996 | 0 | 298 801 | 373 528 | 80.0 |
| 170 -35 | Grand River | 0 | 385 723 | 15 348 | 4 810 | 405 881 | 493 067 | 82.3 |
| 171 -35 | Lake Erie Shore Rivers | 166 260 | 191 997 | 39 102 | 4 952 | 402 311 | 472 302 | 85.2 |
| 172 -35 | Thames River | 0 | 350 291 | 15 942 | 2 500 | 368 733 | 445 202 | 82.8 |
| 173 -35 | Sydenham River | 62 417 | 21 924 | 12 405 | 750 | 97 496 | 143 301 | 68.0 |
| 180 -35 | South Huron Shore Rivers | 19 697 | 42 437 | 32 951 | 1 320 | 96 405 | 136 409 | 70.7 |
| 181 -35 | Georgian Bay Shore - Lake Simcoe Shore Rivers | 27 226 | 119 921 | 19 673 | 0 | 166 820 | 260 842 | 64.0 |
| 182 -35 | North Huron Shore Rivers | 76 500 | 176 754 | 21 540 | 0 | 274 794 | 343 372 | 80.0 |
| 190 -35 | Lake Superior Shore Rivers | 59 294 | 0 | 4 420 | 1 566 | 65 280 | 132 157 | 49.4 |
| | **Hudson Bay and Ungava Bay Basin** | | | | | | | |
| 200.2-24 | Ungava Bay Coast Rivers | 0 | 4 300 | 0 | 0 | 4 300 | 4 300 | 100.0 |
| 210.1-24 | Rupert and Nottaway Rivers | 0 | 4 800 | 0 | 0 | 4 800 | 32 055 | 15.0 |
| 210.2-24 | Harricanaw River | 0 | 0 | 1 500 | 0 | 1 500 | 46 642 | 3.2 |
| 210.3 | Moose River: | 28 204 | 17 492 | 10 367 | 3 525 | 59 588 | 109 276 | 54.5 |
| 210.3-24 | Québec | 140 | 0 | 1 100 | 0 | 1 240 | 23 129 | 5.4 |
| 210.3-35 | Ontario | 28 064 | 17 492 | 9 267 | 3 525 | 58 348 | 86 147 | 67.7 |
| 210.4-35 | Albany River | 0 | 6 657 | 0 | 0 | 6 657 | 7 794 | 85.4 |
| 211.1-61 | West Hudson Bay Coast Rivers | 0 | 0 | 3 063 | 169 | 3 232 | 3 833 | 84.3 |
| 211.3 | Churchill River: | 0 | 4 450 | 14 111 | 0 | 18 561 | 21 884 | 84.8 |
| 211.3-46 | Manitoba | 0 | 4 450 | 2 700 | 0 | 7 150 | 7 200 | 99.3 |
| 211.3-47 | Saskatchewan | 0 | 0 | 5 326 | 0 | 5 326 | 5 677 | 93.8 |
| 211.3-48 | Alberta | 0 | 0 | 6 085 | 0 | 6 085 | 9 007 | 67.6 |
| 220 -46 | Nelson River | 14 000 | 2 675 | 7 508 | 1 300 | 25 483 | 25 924 | 98.3 |

Appendix 6, Table 6

## Population Served by Municipal Wastewater Treatment System by Drainage Basin[1] (continued)

| | Drainage Basin | Municipal Population Served by Wastewater Treatment Systems | | | | | Municipal Population[6] | Percent of Municipal Population Served |
|---|---|---|---|---|---|---|---|---|
| | | Primary[2] | Secondary[3] | Lagoons[4] | Other[5] | Total | | |
| | | | | | | | | percent |
| 230 | Lake Winnipeg Shore Rivers: | 9 000 | 24 513 | 9 756 | 0 | 43 269 | 61 346 | 70.5 |
| 230 -35 | Ontario | 9 000 | 23 402 | 700 | 0 | 33 102 | 44 233 | 74.8 |
| 230 -46 | Manitoba | 0 | 1 111 | 9 056 | 0 | 10 167 | 17 113 | 59.4 |
| 231 -46 | Red River | 0 | 587 689 | 44 267 | 0 | 631 956 | 643 256 | 98.2 |
| 232 | Dauphin River: | 0 | 0 | 33 678 | 0 | 33 678 | 40 847 | 82.4 |
| 232 -46 | Manitoba | 0 | 0 | 27 522 | 0 | 27 522 | 34 400 | 80.0 |
| 232 -47 | Saskatchewan | 0 | 0 | 6 156 | 0 | 6 156 | 6 447 | 95.5 |
| 240 | Assiniboine and Souris Rivers: | 0 | 68 159 | 79 974 | 0 | 148 133 | 155 170 | 95.5 |
| 240 -46 | Manitoba | 0 | 52 659 | 24 423 | 0 | 77 082 | 82 561 | 93.4 |
| 240 -47 | Saskatchewan | 0 | 15 500 | 55 551 | 0 | 71 051 | 72 609 | 97.9 |
| 241 -47 | Qu'Appelle River-Old Wives Lake | 0 | 0 | 217 147 | 0 | 217 147 | 219 132 | 99.1 |
| 250 | Saskatchewan River: | 13 742 | 0 | 19 810 | 0 | 33 552 | 36 109 | 92.9 |
| 250 -46 | Manitoba | 9 500 | 0 | 8 000 | 0 | 17 500 | 19 757 | 88.6 |
| 250 -47 | Saskatchewan | 4 242 | 0 | 11 810 | 0 | 16 052 | 16 352 | 98.2 |
| 251 -48 | Upper North Saskatchewan River | 0 | 12 628 | 37 971 | 0 | 50 599 | 50 724 | 99.8 |
| 252 | Lower North Saskatchewan River: | 30 500 | 532 093 | 124 251 | 3 937 | 690 781 | 820 387 | 84.2 |
| 252 -47 | Saskatchewan | 30 500 | 16 255 | 35 382 | 0 | 82 137 | 83 859 | 97.9 |
| 252 -48 | Alberta | 0 | 515 838 | 88 869 | 3 937 | 608 644 | 736 528 | 82.6 |
| 253 | South Saskatchewan River and Red Deer River: | 135 900 | 65 310 | 169 386 | 0 | 370 596 | 387 771 | 95.6 |
| 253 -47 | Saskatchewan | 135 900 | 0 | 36 672 | 0 | 172 572 | 173 353 | 99.5 |
| 253 -48 | Alberta | 0 | 65 310 | 132 714 | 0 | 198 024 | 214 418 | 92.4 |
| 254 -48 | Bow River | 100 000 | 414 060 | 16 558 | 0 | 530 618 | 536 671 | 98.9 |
| | **Arctic Ocean Basin** | | | | | | | |
| 300.1-61 | Mackenzie River | 0 | 0 | 4 033 | 384 | 4 417 | 7 719 | 57.2 |
| 300.2 | Great Slave Lake Shore Rivers | 0 | 0 | 15 923 | 1 640 | 17 563 | 19 095 | 92.0 |
| 300.2-48 | Alberta | 0 | 0 | 0 | 0 | 0 | 1 122 | 0 |
| 300.2-61 | Northwest Territories | 0 | 0 | 15 923 | 1 640 | 17 563 | 17 973 | 97.7 |
| 300.3 | Liard River | 0 | 0 | 4 200 | 0 | 4 200 | 4 409 | 95.3 |
| 300.3-59 | British Columbia | 0 | 0 | 3 600 | 0 | 3 600 | 3 600 | 100.0 |
| 300.3-60 | Yukon | 0 | 0 | 600 | 0 | 600 | 809 | 74.2 |
| 301 -48 | Athabasca River | 0 | 4 056 | 57 263 | 3 091 | 64 410 | 64 410 | 100.0 |
| 302 | Peace River: | 0 | 200 | 72 919 | 0 | 73 119 | 78 330 | 93.3 |
| 302 -48 | Alberta | 0 | 200 | 41 654 | 0 | 41 854 | 46 965 | 89.1 |
| 302 -59 | British Columbia | 0 | 0 | 31 265 | 0 | 31 265 | 31 365 | 99.7 |
| 330.1-61 | Mainland Arctic Coast Rivers | 0 | 0 | 762 | 0 | 762 | 762 | 100.0 |
| 330.2-61 | Arctic Islands Rivers | 0 | 0 | 594 | 0 | 594 | 4 739 | 12.5 |
| | **Pacific Ocean Basin** | | | | | | | |
| 400 -59 | Columbia River | 29 435 | 21 798 | 38 250 | 0 | 89 483 | 96 376 | 92.8 |
| 401 -59 | Okanagan River | 0 | 70 075 | 4 300 | 0 | 74 375 | 123 299 | 60.3 |
| 402 -59 | Similkameen River | 0 | 0 | 3 100 | 0 | 3 100 | 3 800 | 81.6 |
| 410 -59 | Upper Fraser River | 1 550 | 86 800 | 20 600 | 2 073 | 111 023 | 111 023 | 100.0 |
| 411 -59 | Thompson River | 0 | 64 107 | 2 450 | 0 | 66 557 | 89 107 | 74.7 |
| 412 -59 | Lower Fraser River | 0 | 27 370 | 7 000 | 13 500 | 47 870 | 981 386 | 4.9 |
| 420.1-60 | Yukon River | 0 | 160 | 17 150 | 800 | 18 110 | 20 629 | 87.8 |
| 430 -60 | Alsek River | 0 | 0 | 350 | 0 | 350 | 450 | 77.8 |
| 431.1-59 | Pacific Ocean, North Coast Rivers | 0 | 1 200 | 13 000 | 0 | 14 200 | 14 400 | 98.6 |
| 431.2-59 | Skeena River | 10 000 | 6 830 | 2 600 | 0 | 19 430 | 40 430 | 48.1 |
| 431.3-59 | Queen Charlotte Islands Rivers | 0 | 0 | 0 | 0 | 0 | 1 000 | 0 |
| 432.1-59 | Pacific Ocean, South Coast Rivers | 130 000 | 22 453 | 1 241 | 0 | 153 694 | 171 968 | 89.4 |
| 432.2-59 | Northern Vancouver Island Rivers | 32 000 | 21 650 | 29 355 | 9 900 | 92 905 | 116 525 | 79.7 |
| 433 -59 | Southern Vancouver Island Rivers | 3 600 | 10 500 | 11 700 | 192 436 | 218 236 | 219 136 | 99.6 |
| | **Gulf of Mexico Basin** | | | | | | | |
| 500 | Milk - Missouri Tributary Rivers: | 0 | 0 | 3 216 | 0 | 3 216 | 3 280 | 98.0 |
| 500 -47 | Saskatchewan | 0 | 0 | 2 402 | 0 | 2 402 | 2 466 | 97.4 |
| 500 -48 | Alberta | 0 | 0 | 814 | 0 | 814 | 814 | 100.0 |
| | **Canada** | **1 774 753** | **7 627 644** | **1 571 459** | **304 653** | **11 278 509** | **20 883 166** | **54.0** |

[1] Data obtained from MUNDAT (a national inventory of waterworks and wastewater systems in Canada). The updating of the information occurs on a continuous basis, as received from participating agencies. The data presented here are current as of May 1984. The extent to which the information is obtained and its completeness is not uniform for all of Canada.

[2] Primary systems are those which depend on physical or mechanical unit operations (e.g. bar screen, grit removal, sedimentation tank) as the sole component for removing solids.

[3] Secondary systems include mechanical plants having aerobic biological treatment processes (use of naturally occurring bacteria in sewage) and secondary clarifiers.

[4] Lagoons are man-made pools where natural waste decomposition occurs through contact with the air and naturally occurring micro-organisms, and through the settling of solids.

[5] Other types of treatment systems which are not specified (e.g. comminution only, grit removal only)

Appendix 6, Table 6
## Population Served by Municipal Wastewater Treatment System by Drainage Basin[1] (concluded)

[6] Current municipal population as reported to MUNDAT. This represents about eighty-six percent of the total population of Canada (1981 Census). Much of the remaining population lives in rural areas and for the most part is serviced by private waste treatment and disposal systems such as septic tanks and tile fields. Population in certain drainage basins may appear to be inconsistent with 1981 Census figures. These discrepencies may be the result of errors such as the following: non-inclusion or double counting of populated areas; variations in respondants' interpretation of the survey questions; variations in the completeness and correctness of information available to respondants; processing of data.

**Source:**
Environment Canada, Environmental Protection Service, MUNDAT Data Base, special tabulation.

Appendix 6, Table 7
## Estimated Daily Waste Discharged from Municipalities by Drainage Basin[1]

| Drainage Basin | Waste Generated[2] | | | Waste Removed[3] | | | Waste Discharged | | |
|---|---|---|---|---|---|---|---|---|---|
| | $BOD_5$ | Suspended Solids | Phosphorus | $BOD_5$ | Suspended Solids | Phosphorus | $BOD_5$ | Suspended Solids | Phosphorus |
| | kilograms per day | | | percent | | | kilograms per day | | |
| **Atlantic Ocean Basin** | | | | | | | | | |
| 100.1-10 Labrador Coast Rivers | 549 | 494 | 17 | 0 | 0 | 0 | 549 | 494 | 17 |
| 100.2-10 Churchill and Naskaupi Rivers | 3 990 | 3 590 | 127 | 49.7 | 55.9 | 22.8 | 2 007 | 1 583 | 98 |
| 101 -10 Newfoundland, North Coast Rivers | 22 344 | 20 110 | 715 | 17.5 | 27.5 | 7.0 | 18 437 | 14 587 | 665 |
| 102 -10 Trinity Bay Coast Rivers | 6 399 | 5 759 | 204 | 4.7 | 5.3 | 2.9 | 6 096 | 5 452 | 198 |
| 103 -10 St. John's area Rivers | 21 017 | 18 915 | 672 | 0.9 | 1.0 | 0.9 | 20 826 | 18 721 | 666 |
| 104 -12 Nova Scotia, Southeast Coast Rivers | 38 667 | 34 800 | 1 237 | 4.4 | 5.0 | 2.3 | 36 961 | 33 074 | 1 209 |
| 110.1 Gulf, Mainland North Coast Rivers: | 8 921 | 8 029 | 284 | 5.5 | 6.2 | 2.8 | 8 430 | 7 532 | 276 |
| 110.1-10 Labrador | 244 | 220 | 7 | 0 | 0 | 0 | 244 | 220 | 7 |
| 110.1-24 Québec | 8 677 | 7 809 | 277 | 5.7 | 6.4 | 2.9 | 8 186 | 7 312 | 269 |
| 110.2-24 Manicouagan and Outardes Rivers | 2 586 | 2 327 | 82 | 11.1 | 12.5 | 6.1 | 2 298 | 2 035 | 77 |
| 110.3-24 Betsiamites Rivers | 2 011 | 1 809 | 64 | 5.1 | 4.3 | 3.1 | 1 908 | 1 732 | 62 |
| 111 -10 Gulf, Newfoundland West and South Coast Rivers | 21 087 | 18 978 | 674 | 2.9 | 3.2 | 1.8 | 20 485 | 18 370 | 662 |
| 112 -24 North Gaspe Peninsula Rivers | 17 900 | 16 110 | 572 | 2.7 | 2.8 | 1.7 | 17 409 | 15 654 | 562 |
| 113 Gulf, Mainland South and West Coast Rivers: | 28 085 | 25 278 | 897 | 42.3 | 44.5 | 19.3 | 16 193 | 14 023 | 724 |
| 113 -12 Nova Scotia | 5 326 | 4 794 | 170 | 64.3 | 72.3 | 30.0 | 1 903 | 1 329 | 119 |
| 113 -13 New Brunswick | 8 903 | 8 014 | 284 | 73.2 | 72.8 | 30.6 | 2 385 | 2 180 | 197 |
| 113 -24 Québec | 13 856 | 12 470 | 443 | 14.1 | 15.7 | 7.9 | 11 905 | 10 514 | 408 |
| 114 -11 Prince Edward Island Rivers | 6 719 | 6 047 | 215 | 36.0 | 58.7 | 15.3 | 4 297 | 2 499 | 182 |
| 115 -12 Cape Breton Island Rivers | 14 666 | 13 199 | 469 | 3.0 | 3.4 | 1.7 | 14 226 | 12 754 | 461 |
| 120 Bay of Fundy Coast Rivers: | 20 943 | 18 848 | 669 | 15.7 | 16.0 | 8.7 | 17 664 | 15 828 | 811 |
| 120 -12 Nova Scotia | 9 088 | 8 179 | 290 | 30.6 | 31.7 | 17.2 | 6 309 | 5 583 | 240 |
| 121 -13 New Brunswick | 11 855 | 10 669 | 379 | 4.2 | 4.0 | 2.1 | 11 355 | 10 245 | 371 |
| 130 Saint John River: | 28 792 | 25 913 | 920 | 38.9 | 41.9 | 17.4 | 17 596 | 15 046 | 760 |
| 130 -13 New Brunswick | 23 278 | 20 950 | 744 | 47.1 | 51.0 | 20.8 | 12 322 | 10 274 | 589 |
| 130 -24 Québec | 5 514 | 4 963 | 176 | 4.4 | 3.8 | 2.8 | 5 274 | 4 772 | 171 |
| 140 -24 Saguenay River | 39 134 | 35 220 | 1 252 | 0.9 | 1.0 | 1.1 | 38 782 | 34 880 | 1 238 |
| 141 -24 Québec City area - Middle North Shore Rivers | 91 415 | 82 273 | 2 925 | 1.7 | 1.9 | 1.9 | 89 864 | 80 717 | 2 869 |
| 142 -24 Chaudière River - Middle South Shore Rivers | 53 269 | 47 942 | 1 704 | 3.8 | 5.4 | 6.9 | 51 270 | 45 361 | 1 587 |
| 143 -24 St. Maurice River | 25 316 | 22 784 | 810 | 0 | 0 | 0 | 25 316 | 22 784 | 810 |
| 144 -24 Eastern Townships Rivers - Richelieu River | 114 066 | 102 659 | 3 650 | 3.0 | 3.4 | 4.0 | 110 615 | 99 163 | 3 505 |
| 145 -24 Eastern Laurentians Rivers | 30 193 | 27 173 | 966 | 4.8 | 5.3 | 5.6 | 28 730 | 25 731 | 912 |
| 146 -24 Montréal area Rivers | 413 465 | 372 119 | 13 230 | 4.0 | 4.9 | 5.3 | 396 950 | 353 926 | 12 530 |
| 147 West St. Lawrence River: | 50 613 | 45 551 | 1 618 | 24.3 | 46.4 | 65.9 | 38 321 | 24 434 | 551 |
| 147 -24 Québec | 9 930 | 8 936 | 317 | 1.7 | 1.9 | 2.2 | 9 757 | 8 762 | 310 |
| 147 -35 Ontario | 40 683 | 36 615 | 1 301 | 29.8 | 57.2 | 81.5 | 28 564 | 15 672 | 241 |
| 150 Lower Ottawa River: | 130 459 | 117 413 | 4 174 | 17.8 | 57.9 | 51.6 | 107 257 | 49 482 | 2 021 |
| 150 -24 Québec | 50 228 | 45 205 | 1 607 | 5.7 | 6.4 | 6.3 | 47 364 | 42 305 | 1 505 |
| 150 -35 Ontario | 80 231 | 72 208 | 2 567 | 25.3 | 55.3 | 79.9 | 59 893 | 32 280 | 516 |
| 151 Upper Ottawa River: | 38 081 | 34 272 | 1 218 | 35.4 | 42.6 | 49.8 | 24 608 | 19 666 | 612 |
| 151 -24 Québec | 12 138 | 10 924 | 388 | 11.7 | 13.0 | 16.8 | 10 720 | 9 504 | 323 |
| 151 -35 Ontario | 25 943 | 23 348 | 830 | 46.5 | 56.5 | 65.2 | 13 888 | 10 162 | 289 |
| 160 -35 Belleville-Napanee area Rivers | 18 635 | 16 772 | 596 | 55.3 | 64.1 | 66.6 | 8 322 | 6 018 | 199 |
| 161 -35 Trent River | 26 123 | 23 511 | 835 | 62.8 | 69.5 | 73.1 | 9 713 | 7 180 | 225 |
| 162 -35 Oshawa-Colborne area Rivers | 27 188 | 24 469 | 870 | 67.5 | 75.5 | 74.0 | 8 831 | 6 003 | 226 |
| 163 -35 Toronto area Rivers | 375 474 | 337 927 | 12 015 | 71.7 | 80.7 | 78.5 | 106 219 | 65 304 | 2 588 |
| 164 -35 Hamilton area Rivers | 91 239 | 82 115 | 2 919 | 70.1 | 78.9 | 76.9 | 27 260 | 17 337 | 674 |
| 165 -35 Niagara Peninsula Rivers | 62 263 | 56 037 | 1 992 | 48.3 | 66.0 | 75.8 | 32 184 | 19 073 | 482 |
| 170 -35 Grand River | 66 639 | 59 975 | 2 132 | 70.2 | 78.7 | 77.2 | 19 867 | 12 781 | 486 |
| 171 -35 Lake Erie Shore Rivers | 91 332 | 82 199 | 2 922 | 47.6 | 61.8 | 69.0 | 47 863 | 31 404 | 905 |
| 172 -35 Thames River | 68 014 | 61 213 | 2 176 | 67.3 | 75.2 | 73.8 | 22 236 | 15 198 | 571 |
| 173 -35 Sydenham River | 20 713 | 18 641 | 662 | 21.6 | 39.4 | 53.9 | 16 242 | 11 303 | 305 |

Appendix 6, Table 7
## Estimated Daily Waste Discharged from Municipalities by Drainage Basin[1] (continued)

| Drainage Basin | Waste Generated[2] | | | Waste Removed[3] | | | Waste Discharged | | |
|---|---|---|---|---|---|---|---|---|---|
| | $BOD_5$ | Suspended Solids | Phos-phorus | $BOD_5$ | Suspended Solids | Phos-phorus | $BOD_5$ | Suspended Solids | Phos-phorus |
| | kilograms per day | | | percent | | | kilograms per day | | |
| 180 -35 South Huron Shore Rivers | 20 749 | 18 674 | 663 | 51.6 | 60.3 | 70.1 | 10 042 | 7 419 | 198 |
| 181 -35 Georgian Bay Shore - Lake Simcoe Shore Rivers | 37 724 | 33 951 | 1 207 | 43.4 | 52.7 | 58.3 | 21 365 | 16 072 | 503 |
| 182 -35 North Huron Shore Rivers | 49 474 | 44 526 | 1 583 | 52.4 | 65.2 | 71.2 | 23 535 | 15 510 | 456 |
| 190 -35 Lake Superior Shore Rivers | 13 426 | 10 083 | 429 | 31.5 | 63.7 | 74.4 | 9 193 | 3 656 | 110 |
| **Hudson Bay and Ungava Bay Basin** | | | | | | | | | |
| 200.2-24 Ungava Bay Coast Rivers | 1 473 | 1 326 | 47 | 74.1 | 83.4 | 34.0 | 382 | 220 | 31 |
| 210.1-24 Rupert and Nottaway Rivers | 4 145 | 3 730 | 132 | 7.7 | 8.7 | 3.8 | 3 826 | 3 407 | 127 |
| 210.2-24 Harricanaw River | 6 312 | 5 681 | 201 | 1.5 | 1.3 | 0.5 | 6 217 | 5 609 | 200 |
| 210.3 Moose River: | 13 791 | 12 411 | 440 | 26.7 | 39.0 | 9.3 | 10 108 | 7 574 | 399 |
| 210.3-24 Quebec | 3 365 | 3 028 | 107 | 3.7 | 3.0 | 0.9 | 3 242 | 2 936 | 106 |
| 210.3-35 Ontario | 10 426 | 9 383 | 333 | 34.1 | 50.6 | 12.0 | 6 866 | 4 638 | 293 |
| 210.4-35 Albany River | 746 | 671 | 23 | 63.4 | 71.4 | 30.4 | 273 | 192 | 16 |
| 211.1-61 West Hudson Bay Coast Rivers | 441 | 397 | 14 | 7.7 | 6.5 | 14.3 | 407 | 371 | 12 |
| 211.3 Churchill River: | 3 021 | 2 719 | 96 | 69.1 | 62.2 | 31.3 | 934 | 1 029 | 66 |
| 211.3-46 Manitoba | 994 | 895 | 32 | 84.2 | 84.8 | 46.9 | 157 | 136 | 17 |
| 211.3-47 Saskatchewan | 784 | 705 | 25 | 82.8 | 69.9 | 40.0 | 135 | 212 | 15 |
| 211.3-48 Alberta | 1 243 | 1 119 | 39 | 48.4 | 39.1 | 12.8 | 642 | 681 | 34 |
| 220 -46 Nelson River | 2 374 | 2 137 | 75 | 47.6 | 63.8 | 18.7 | 1 244 | 774 | 61 |
| 230 Lake Winnipeg Shore Rivers: | 9 057 | 8 151 | 289 | 50.2 | 63.6 | 23.2 | 4 506 | 2 966 | 222 |
| 230 -35 Ontario | 7 546 | 6 791 | 241 | 53.5 | 70.0 | 23.2 | 3 512 | 2 039 | 185 |
| 230 -46 Manitoba | 1 511 | 1 360 | 48 | 34.2 | 31.8 | 22.9 | 994 | 927 | 37 |
| 231 -46 Red River | 78 464 | 70 617 | 2 510 | 78.4 | 87.5 | 34.5 | 16 952 | 8 842 | 1 643 |
| 232 Dauphin River: | 3 351 | 3 015 | 106 | 61.3 | 51.2 | 26.4 | 1 296 | 1 471 | 78 |
| 232 -46 Manitoba | 3 311 | 2 980 | 105 | 62.1 | 51.8 | 26.7 | 1 256 | 1 436 | 77 |
| 232 -47 Saskatchewan | 40 | 35 | 1 | 0 | 0 | 0 | 40 | 35 | 1 |
| 240 Assiniboine and Souris Rivers: | 10 969 | 9 872 | 350 | 73.7 | 76.2 | 33.7 | 2 881 | 2 347 | 232 |
| 240 -46 Manitoba | 7 560 | 6 804 | 241 | 70.7 | 76.2 | 34.4 | 2 218 | 1 622 | 158 |
| 240 -47 Saskatchewan | 3 409 | 3 068 | 109 | 80.6 | 76.4 | 32.1 | 663 | 725 | 74 |
| 241 -47 Qu'Appelle River - Old Wives Lake | 19 315 | 17 383 | 618 | 89.1 | 74.2 | 30.6 | 2 113 | 4 481 | 429 |
| 250 Saskatchewan River: | 2 298 | 2 068 | 73 | 48.2 | 57.2 | 17.8 | 1 190 | 886 | 60 |
| 250 -46 Manitoba | 2 002 | 1 802 | 64 | 52.1 | 57.9 | 18.8 | 958 | 758 | 52 |
| 250 -47 Saskatchewan | 296 | 266 | 9 | 21.6 | 51.9 | 11.1 | 232 | 128 | 8 |
| 251 -48 Upper North Saskatchewan River | 2 166 | 1 949 | 69 | 85.3 | 80.7 | 34.8 | 319 | 377 | 45 |
| 252 Lower North Saskatchewan River: | 98 200 | 88 379 | 3 142 | 64.8 | 81.4 | 28.3 | 34 566 | 16 396 | 2 253 |
| 252 -47 Saskatchewan | 10 038 | 9 032 | 321 | 67.0 | 75.1 | 37.7 | 3 310 | 2 251 | 200 |
| 252 -48 Alberta | 88 162 | 79 347 | 2 821 | 64.5 | 82.2 | 27.2 | 31 256 | 14 145 | 2 053 |
| 253 South Saskatchewan River and Red Deer River: | 46 344 | 41 710 | 1 482 | 55.0 | 61.8 | 20.0 | 20 835 | 15 931 | 1 186 |
| 253 -47 Saskatchewan | 15 335 | 13 802 | 490 | 29.6 | 60.7 | 6.9 | 10 789 | 5 424 | 456 |
| 253 -48 Alberta | 31 009 | 27 908 | 992 | 67.6 | 62.4 | 26.4 | 10 046 | 10 507 | 730 |
| 254 -48 Bow River | 86 980 | 78 282 | 2 783 | 71.6 | 84.6 | 30.4 | 24 673 | 12 024 | 1 937 |
| **Arctic Ocean Basin** | | | | | | | | | |
| 300.1-61 Mackenzie River | 901 | 811 | 28 | 43.6 | 36.5 | 17.9 | 508 | 515 | 23 |
| 300.2 Great Slave Lake Shore Rivers: | 1 270 | 1 142 | 39 | 60.4 | 50.4 | 20.5 | 503 | 566 | 31 |
| 300.2-48 Alberta | 154 | 138 | 4 | 0 | 0 | 0 | 154 | 138 | 4 |
| 300.2-61 Northwest Territories | 1 116 | 1 004 | 35 | 68.7 | 57.4 | 22.9 | 349 | 428 | 27 |
| 300.3 Liard River: | 959 | 863 | 30 | 87.5 | 73.0 | 33.3 | 120 | 233 | 20 |
| 300.3-59 British Columbia | 795 | 715 | 25 | 90.1 | 75.1 | 32.0 | 79 | 178 | 17 |
| 300.3-60 Yukon | 164 | 148 | 5 | 75.0 | 62.8 | 40.0 | 41 | 55 | 3 |
| 301 -48 Athabasca River | 2 516 | 2 264 | 80 | 63.2 | 52.8 | 28.8 | 925 | 1 069 | 57 |
| 302 Peace River: | 8 550 | 7 695 | 273 | 84.6 | 71.0 | 30.8 | 1 314 | 2 235 | 189 |
| 302 -48 Alberta | 2 608 | 2 347 | 83 | 74.9 | 63.8 | 30.1 | 655 | 850 | 58 |
| 302 -59 British Columbia | 5 942 | 5 348 | 190 | 88.9 | 74.1 | 31.1 | 659 | 1 385 | 131 |
| 330.1-61 Mainland Arctic Coast Rivers | 104 | 94 | 3 | 0 | 0 | 0 | 104 | 94 | 3 |
| 330.2-61 Arctic Islands Rivers | 684 | 615 | 19 | 11.0 | 8.9 | 5.3 | 609 | 560 | 18 |
| **Pacific Ocean Basin** | | | | | | | | | |
| 400 -59 Columbia River | 10 125 | 9 112 | 324 | 59.9 | 67.9 | 22.8 | 4 065 | 2 927 | 250 |
| 401 -59 Okanagan River | 11 620 | 10 458 | 371 | 35.4 | 39.3 | 39.1 | 7 512 | 6 347 | 226 |
| 402 -59 Similkameen River | 498 | 448 | 15 | 72.7 | 60.7 | 20.0 | 136 | 176 | 12 |
| 410 -59 Upper Fraser River | 9 904 | 8 914 | 316 | 48.8 | 52.4 | 21.5 | 5 072 | 4 239 | 248 |
| 411 -59 Thompson River | 9 702 | 8 732 | 310 | 56.4 | 63.1 | 63.2 | 4 234 | 3 224 | 114 |
| 412 -59 Lower Fraser River | 27 228 | 24 505 | 871 | 6.3 | 7.1 | 3.0 | 25 500 | 22 756 | 845 |
| 420.1-60 Yukon River | 4 802 | 4 322 | 153 | 81.0 | 67.5 | 28.1 | 913 | 1 403 | 110 |
| 430 -60 Alsek River | 53 | 47 | 1 | 69.8 | 57.4 | 100.0 | 16 | 20 | 0 |
| 431.1-59 Pacific Ocean, North Coast Rivers | 2 911 | 2 620 | 93 | 90.0 | 75.0 | 30.1 | 291 | 655 | 65 |
| 431.2-59 Skeena River | 4 905 | 4 414 | 156 | 19.7 | 28.5 | 7.7 | 3 938 | 3 156 | 144 |
| 431.3-59 Queen Charlotte Islands Rivers | 137 | 123 | 4 | 0 | 0 | 0 | 137 | 123 | 4 |

Appendix 6, Table 7
## Estimated Daily Waste Discharged from Municipalities by Drainage Basin[1] (concluded)

| Drainage Basin | Waste Generated[2] | | | Waste Removed[3] | | | Waste Discharged | | |
|---|---|---|---|---|---|---|---|---|---|
| | $BOD_5$ | Suspended Solids | Phosphorus | $BOD_5$ | Suspended Solids | Phosphorus | $BOD_5$ | Suspended Solids | Phosphorus |
| | kilograms per day | | | percent | | | kilograms per day | | |
| 432.1-59 Pacific Ocean, South Coast Rivers | 16 601 | 14 941 | 531 | 30.7 | 61.2 | 9.0 | 11 503 | 5 795 | 483 |
| 432.2-59 Northern Vancouver Island Rivers | 11 833 | 10 649 | 378 | 27.8 | 40.0 | 10.1 | 8 543 | 6 392 | 340 |
| 433 -59 Southern Vancouver Island Rivers | 50 815 | 45 733 | 1 626 | 5.4 | 5.4 | 2.1 | 48 083 | 43 269 | 1 592 |
| **Gulf of Mexico Basin** | | | | | | | | | |
| 500 Milk - Missouri Tributary Rivers: | 206 | 185 | 6 | 86.9 | 72.4 | 33.3 | 27 | 51 | 4 |
| 500 -47 Saskatchewan | 8 | 7 | 0 | 0 | 0 | ... | 8 | 7 | 0 |
| 500 -48 Alberta | 198 | 178 | 6 | 90.4 | 75.3 | 33.3 | 19 | 44 | 4 |
| **Canada** | **2 892 451** | **2 486 870** | **88 443** | **37.2** | **45.3** | **37.2** | **1 744 253** | **1 360 488** | **55 568** |

[1] Data obtained from MUNDAT (a national inventory of waterworks and wastewater systems in Canada). The updating of the information occurs on a continuous basis, as received from participating agencies. The data presented here are current as of May 1984.

[2] Discharge coefficients were applied to the average daily wastewater received by sewage collection systems. These were 0.25 kg./cu. metres of Biochemical Oxygen Demand ($BOD_5$), 0.225 kg./cu. metres of suspended solids and 0.008 kg./cu. metres of phosphorus. This assumes the composition of wastewater is identical across Canada. For residential, commercial and institutional sectors this may be valid, however this may not be the case for industrial wastewater.

[3] Waste removed accounts for the portion of the wastewater flow undergoing primary, secondary and lagoon treatment. In calculating the amount of waste removed by treatment, standard waste removal efficiency coefficients were used, i.e. primary treatment: 25 percent $BOD_5$ removal, 60 percent suspended solids removal and 5 percent phosphorus removal; secondary treatment; 80 percent $BOD_5$ removal, 90 percent suspended solids removal and 35 percent phosphorus removal; lagoon treatment: 90 percent $BOD_5$ removal, 75 percent suspended solids removal and 30 percent phosphorus removal. The untreated proportion of wastewater has also been considered in this calculation.

**Source:**
Environment Canada, Environmental Protection Service, MUNDAT Data Base, special tabulation.

Appendix 7, Table 1

## Flora and Fauna Species with Designated Status[1], 1985

| Mammal Species | 1985 Status |
|---|---|
| Eastern Mole *Scalopus aquaticus* | Rare |
| Vancouver Island Marmot *Marmota vancouverensis* | Endangered |
| Black-tailed Prairie Dog *Cynomys ludovicianus* | Rare |
| Fox Squirrel *Sciurus niger* | N.I.A.C. |
| Pocket Gopher *Geomys bursarius* | Rare |
| Right Whale *Balaena glacialis* | Endangered |
| Bowhead Whale *Balaena mysticetus* | Endangered |
| Swift Fox *Vulpes velox* | Extirpated |
| Grey Fox *Urocyon cinereoargenteus* | Rare |
| Grizzly Bear *Ursus arctos horribilis* | N.I.A.C. |
| Newfoundland Marten *Martes americana atrata* | N.I.A.C. |
| Black-footed Ferret *Mustela nigripes* | Extirpated |
| Badger *Taxidea taxus* | N.I.A.C. |
| Sea Otter *Enhydra lutris* | Endangered |
| Eastern Cougar *Felis concolor cougar* | Endangered |
| Peary Caribou *Rangifer tarandus pearyi* | Threatened |
| Wood Bison *Bison bison athabascae* | Endangered |
| Wolverine *Gulo gulo* | Rare |
| Long-tailed Weasel (Prairies) *Mustela frenata longicauda* | Threatened |
| Humpback Whale *Megaptera novaeangliae* | |
| North Atlantic Population | Rare |
| North Pacific Population | Threatened |
| St. Lawrence White Whale (Beluga) *Delphinapterus leucas* | Endangered |
| Beaufort Sea White Whale (Beluga) | N.I.A.C. |
| Blue Whale *Balaenoptera musculus* | Rare |
| Mountain Beaver *Aplodontia rufa* | N.I.A.C. |
| Queen Charlotte Islands Ermine *Mustela erminea haidarum* | Rare |
| Woodland Caribou: (by population) *Rangifer tarandus caribou* | |
| Dawson Woodland Caribou | Extinct |
| Western Woodland Caribou | Rare |
| Northeastern Woodland Caribou | N.I.A.C. |
| Maritime Woodland Caribou | Threatened |
| Newfoundland Woodland Caribou | N.I.A.C. |

| Bird Species | 1985 Status |
|---|---|
| White Pelican *Pelecanus erythrorhynchos* | Threatened |
| Double-crested Cormorant *Phalacrocorax auritus* | N.I.A.C. |
| Trumpeter Swan *Olor buccinator* | Rare |
| Ferruginous Hawk *Buteo regalis* | Threatened |
| Gyrfalcon *Falco rusticolus* | N.I.A.C. |
| Peregrine Falcon: *Falco peregrinus* | |
| *Pealei* | Rare |
| *Tundrius* | Threatened |
| *Anatum* | Endangered |
| Greater Prairie Chicken *Tympanuchus cupido pinnatus* | Endangered |
| Whooping Crane *Grus americana* | Endangered |
| Greater Sandhill Crane *Grus canadensis* | N.I.A.C. |
| Piping Plover *Charadrius melodus* | Endangered |
| Eskimo Curlew *Numenius borealis* | Endangered |
| Ivory Gull *Pagophila eburnea* | Rare |
| Caspian Tern *Sterna caspia* | Rare |
| Burrowing Owl *Athene cunicularia* | Threatened |
| Great Gray Owl *Strix nebulosa* | Rare |
| Kirtland's Warbler *Dendroica kirtlandii* | Endangered |
| Ipswich Sparrow *Passerculus sandwichensis princeps* | Rare |
| Ross' Gull *Rhodostethia rosea* | Rare |
| Red-Necked Grebe *Podiceps grisegena* | N.I.A.C. |
| Prairie Falcon *Falco mexicanus* | N.I.A.C. |
| Red-Shouldered Hawk *Buteo lineatus* | Rare |
| Cooper's Hawk *Accipiter cooperii* | Rare |
| Prothonotary Warbler *Protonotaria citrea* | Rare |
| Henslow's Sparrow *Ammondramus henslowii* | Threatened |
| Eastern Bluebird *Sialia sialis* | Rare |
| Barn Owl *Tyto alba* | Rare |
| Bald Eagle *Haliaeetus leucocephalus* | N.I.A.C. |
| Merlin *Falco columbarius* | N.I.A.C. |
| King Rail *Rallus elegans* | Rare |
| Prairie Warbler *Dendroica discolor* | Rare |

Appendix 7, Table 1
## Flora and Fauna Species with Designated Status[1], 1985 (concluded)

| Reptile Species | | 1985 Status |
|---|---|---|
| Leatherback Turtle | *Dermochelys coriacea* | Endangered |

| Fish Species | | 1985 Status |
|---|---|---|
| Shortnose Sturgeon | *Acipenser brevirostrum* | Rare |
| Speckled Dace | *Rhinichthys osculus* | Rare |
| Giant Stickleback | *Gasterosteus sp.* | Rare |
| Blueback Herring | *Alosa aestivalis* | N.I.A.C. |
| Spotted Gar | *Lepisosteus oculatus* | Rare |
| Spotted Sucker | *Minytrema melanops* | Rare |
| Silver Shiner | *Notropis photogenis* | Rare |
| River Redhorse | *Moxostoma carinatum* | Rare |
| Charlotte Unarmoured Stickleback | *Gasterosteus aculeatus* | Rare |
| Acadian Whitefish | *Coregonus canadensis* | Endangered |
| Shorthead Sculpin | *Cottus confusus* | Threatened |
| Longjaw Cisco | *Coregonus alpenae* | Extinct |
| Blue Walleye | *Stizostedion vitreum* | Extinct |
| Pugnose Shiner | *Notropis anogenus* | Rare |
| Gravel Chub | *Hybopsis x-punctata* | Endangered |
| Silver Chub | *Hybopsis storeriana* | Rare |
| Brindled Madtom | *Noturus miurus* | Rare |
| Pugnose Minnow | *Notropis emilae* | Rare |
| Bigmouth Shiner | *Notropis dorsalis* | Rare |
| Central Stoneroller | *Campostoma anomalum* | Rare |
| Blackstripe Topminnow | *Fundulus notatus* | Rare |

| Plant Species | | 1985 Status |
|---|---|---|
| Furbish Lousewort | *Pedicularis furbishiae* | Endangered |
| Small White Lady Slipper | *Cypripedium candidum* | Endangered |
| Willow | *Salix planifolia tyrrellii* | Threatened |
| Thrift | *Armeria maritima interior* | Threatened |
| Small Whorled Pogonia | *Isotria medeoloides* | Endangered |
| Kentucky Coffee Tree | *Gymnocladus dioica* | Threatened |
| Blue Ash | *Fraxinus quadrangulata* | Threatened |
| Broad Beech Fern | *Phegopteris hexagonaptera* | Rare |
| Southern Maidenhair Fern | *Adiantum capillus-veneris* | Endangered |
| Green Dragon | *Arisaema dracontium* | Rare |
| Plymouth Gentian | *Sabatia kennedyana* | Threatened |
| Pink Coreopsis | *Coreopsis rosea* | Endangered |
| False Mermaid | *Floerkea proserpinacoides* | N.I.A.C. |
| American Water-Willow | *Justicia americana* | Threatened |
| Shumard Oak | *Quercus shumardii* | Rare |
| Hop Tree | *Ptelea trifoliata* | Rare |
| Giant Helleborine | *Epipactis gigantea* | Threatened |
| Cucumber Tree | *Magnolia acuminata* | Endangered |
| Pink Milkwort | *Polygala incarnata* | Endangered |
| Mosquito Fern | *Azolla mexicana* | Threatened |
| Soapweed | *Yucca glauca* | Rare |
| Heart-Leaved Plantain | *Plantago cordata* | Endangered |
| Eastern Prickly Pear Cactus | *Opuntia humifusa* | Endangered |
| Bluehearts | *Buchnera americana* | Threatened |
| Water Pennywort | *Hydrocotyle umbellata* | Endangered |
| Dwarf Hackberry | *Celtis tenuifolia* | Rare |

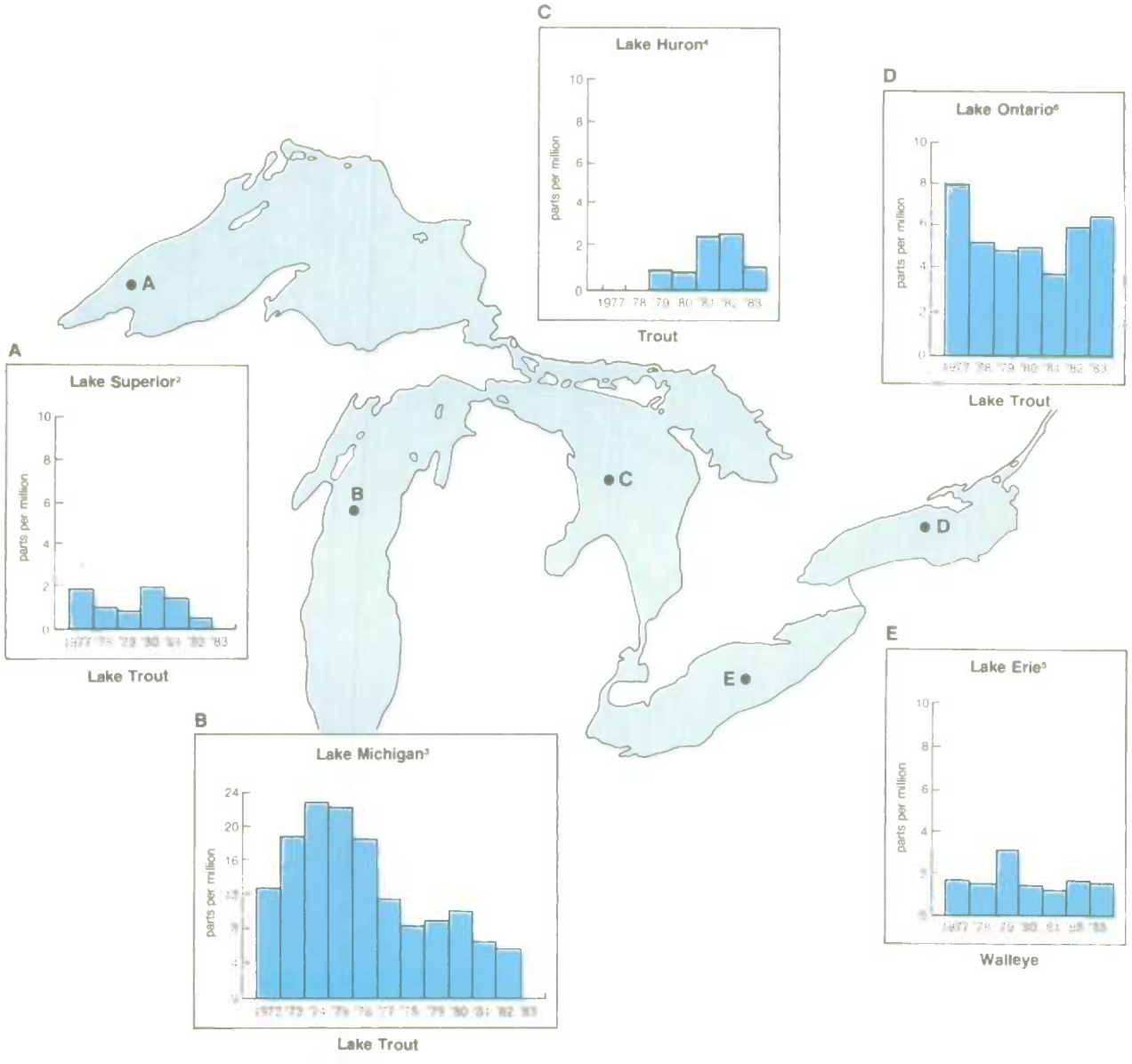
[1] A categorization of species by degree of threat to their continued existence has been established by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) This list is as follows.
Rare Species: Any indigenous species of fauna or flora that, because of its biological characteristics, or because it occurs at the fringe of its range, or for some other reason, exists in low numbers or in very restricted areas in Canada but is not a threatened species.
Threatened Species: Any indigenous species of fauna or flora that is likely to become endangered in Canada if the factors affecting its vulnerability do not became reversed.
Endangered Speicies: Any indigenous species of fauna of flora whose existence in Canada is threatened with immediate extinction through all or a significant portion of its range, owing to the action of man.
Extirpated Species: Any indigenous species of fauna or flora no longer existing in the wild in Canada but existing elsewhere.
Extinct Species: Any species of fauna or flora formerly indigenous to Canada but no longer existing anywhere.
N.I.A.C.: Not in any category, current status is uncertain.

**Source:**
Environment Canada, Canadian Wildlife Service, The Committee on the Status of Endangered Wildlife in Canada, (COSEWIC), 1985.

**Note:**
COSEWIC was founded in 1977 by the Federal-Provincial Wildlife Conference, to which it reports annually.

Appendix 7 Map 2

## Mean PCB Concentrations[1] in Whole Fish Samples of Trout and Walleye in the Great Lakes, 1972 to 1983




[1] Measured in milligrams per kilogram wet weight of whole fish (parts per million). The Great Lakes Agreement objective for PCBs is 0.1 parts per million for whole fish.

[2] Data are for fish collected from the Apostle Islands area of the western basin of Lake Superior.

[3] There is a sport fish consumption advisory for Lake Michigan for large lake trout, carp and brown trout. It is recommended that no one should eat these fish.

[4] Includes data for splake (hydrid of brown trout and lake trout). Since sampling locations are not fixed in Lake Huron, changes in measured values may reflect geographic differences and not temporal changes.

[5] There are no lake trout in Lake Erie; walleye are the top predators. Since these fish have a lower fat content than trout, they accumulate chlorinated hydrocarbons (such as PCBs) to a lesser extent.

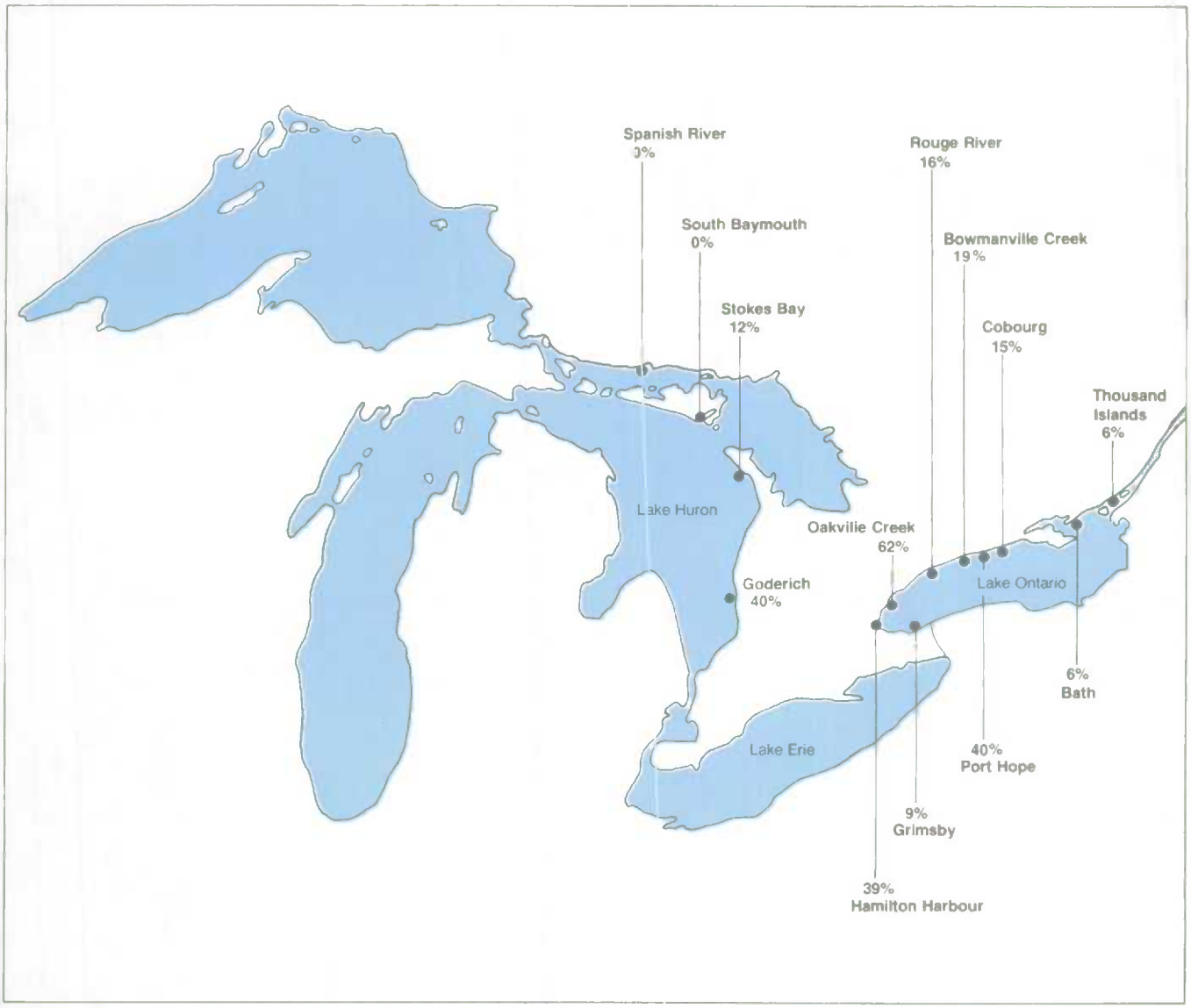
[6] All fish were collected for the whole of Lake Ontario and were at least four years old. This is the only lake where the age of the fish have been determined.

**Source:**
International Joint Commission, 1985 Report on Great Lakes Water Quality, Windsor, Ontario.

**Note:**
These species are top-predators in the food chain and are at the end of a process of slow accumulation of contaminants in the ecosystem. Larger, older fish generally have higher contaminant levels. The monitoring program is designed to show "whole lake" response to the regulation of all types of contaminants loadings (see Maps 7.2.2 to 7.2.4 for examples of early warning responses to point sources).

Appendix 7 Map 3

## Evidence of Lip Tumours on White Suckers from Lakes Huron and Ontario, 1981-1983[1]




[1] Prevalence of lip papillomas (tumours) in white suckers as a percentage of total male and female fish greater than 40 cm (fork length). These fish were collected during spring spawning runs of 1981 through 1983. The number of fish collected at each site was approximately 100.

**Source:**
International Joint Commission, 1983 Report on Great Lakes Water Quality, Appendix, Great Lakes Surveillance, Windsor, Ontario.

**Note:**
Measure of contaminants in tissues of organisms such as fish and birds help to determine the pathways that these substances take once they have entered the environment. However, toxicological data are expensive to produce given the overwhelming number of chemicals that have been indentified in ecosystems. The health of individual organisms is a direct way to ascertain if exposure to man-made substances has adverse effects. In the 1960's, the reproductive failures of top-predator bird species drew attention to substances such as DDT and led to the prohibition of the use of many pesticides. Today a number of Great Lakes fish show elevated frequency of pathological anomalies, eg tumours, growth abnormalities. Although the individual chemical stresses have not been identified (as with the example of DDT), health surveillance provides an early warning mechanism identifying location and species. The Great Lakes Water Quality Board in its 1983 report to the IJC suggests that

"This type of monitoring, if acceptable could provide an appropriate link between contaminated environments and biological responses."

Appendix 8, Table 1

## Federal and Provincial Environmental Legislation (a) Canada and Eastern Provinces

| Subject | Canada | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec |
|---|---|---|---|---|---|---|
| **Air, Atmosphere** | Motor Vehicle Safety Act, 1970, 1980<br>Weather Modification Information Act, 1971, 1974<br>Clean Air Act, 1971, 1974 | | Highway Traffic, Act, 1974 | | Motor Vehicle Act, 1971, 1983 | Artificial Inducement of Rain Act, 1970, 1979 |
| **Water** | Boundary Waters Treaty, 1909<br>International River Improvement Act, 1955<br>Canada Water Act, 1970<br>Arctic Waters Pollution Prevention Act, 1970<br>Northern Inland Waters Act, 1970<br>Canada Shipping Act 1970, 1979<br>Navigable Waters Protection Act, 1970<br>National Housing Act, 1970 | Water Protection Act, 1964, 1970, 1981<br>Water Resources and Pollution Control Act, 1967<br>Well Drilling Act, 1981 | Well Drillers Act, 1974<br>Water and Sewerage Act, 1974<br>Water Authority Act, 1965<br>Beaches Protection Act, 1963 | Well Drilling Act, 1967<br>Beaches Preservation and Protection Act, 1975<br>Marshland Reclamation Act, 1967 | Flood and Storm Damage Act, 1973, 1976<br>Dams and Sluiceways Act, 1966<br>Marshland Reclamation Act 1977, 1979 | Water Courses Act, 1964, 1978 |
| **Land-Use and Heritage** | National Parks Acts, 1930, 1970<br>Historic Sites and Monuments Act, 1953, 1970<br>Territorial Lands Act, 1955, 1972<br>Indian Act, 1970, 1979 | Provincial Parks Act, 1953<br>Crown Lands Act, 1970, 1975<br>Development Areas (Lands) Act, 1970, 1982<br>Environmental Assessment Act, 1980, 1981<br>Wilderness and Ecological Reserves Act, 1980<br>Historic Objects, Sites and Records Act, 1973 | Recreation Development Act, 1969, 1974<br>Planning Act, 1968<br>Community Improvement Act, 1968 | Provincial Parks Act, 1967<br>Lands and Forests Act, 1967<br>Special Places Protection Act, 1980<br>Trails Act, 1978<br>Camping Establishments Regulation Act, 1969<br>Historic Property Designation Act, 1976<br>Historic Objects Protection Act, 1970 | Ecological Reserves Act, 1973, 1979<br>Parks Act, 1977, 1982<br>Community Planning Act, 1972<br>Municipal Heritage Preservation Act, 1978 | Provincial Parks Act, 1964, 1977<br>Lands and Forest Act, 1964, 1974<br>James Bay Development Act, 1971<br>Ecological Reserves Act, 1974, 1977, 1982<br>Roadside Advertising Act, 1965<br>Historic Monuments Act, 1963 |
| **Hazardous Chemicals/ Products** | Atomic Energy Control Act, 1946, 1976<br>Food and Drug Act, 1954<br>Hazardous Products Act, 1969, 1983<br>Radiation Emission Devices Act, 1970, 1982<br>Railway Act, 1970, 1978<br>National Transportation Act, 1970, 1980<br>Nuclear Liability Act, 1970 | Pesticides Control Act, 1970, 1981<br>Dangerous Goods Transportation Act, 1982<br>Waste Material (Disposal) Act, 1973 | Dangerous Goods Transportation Act, 1981<br>Mineral Resources Act, 1978 | Pest Control Products Act, 1970<br>Dangerous Goods Transportation Act, 1982 | Pesticide Control Act, 1973, 1982<br>Pipeline Act, 1976, 1983 | Transport Act, 1972, 1981 |
| **Hazardous Chemicals/ Products — Concluded** | Pest Control Products Act, 1970<br>Environmental Contaminants Act, 1975, 1980<br>Ocean Dumping Control Act, 1975, 1981<br>Transportation of Dangerous Goods Act, 1980<br>Northern Pipeline Act, 1978 | | | | | |

Appendix 8, Table 1
## Federal and Provincial Environmental Legislation (continued) (a) Canada and Eastern Provinces

| Subject | Canada | Newfoundland | Prince Edward Island | Nova Scotia | New Brunswick | Québec |
|---|---|---|---|---|---|---|
| **Solid Waste/ Noise** | Aeronautics Act, 1970 | Waste Material Disposal Act, 1971, 1981<br>Ore Treatment Tailings Act, 1973<br>Quarry Materials Act, 1975 | Mineral Resources Act, 1974<br>Automobile Junk Yards Act, 1969<br>Unsightly Premises Act, 1966 | Beverage Containers Act, 1975<br>Mineral Resources Act, 1975 | Highway Act, 1973, 1983<br>Quarriable Substances Act, 1973, 1983<br>Mining Act, 1973, 1983<br>Beverage Containers Act, 1977, 1980 | Mining Act, 1965 |
| **Agriculture** | Fertilizers Act, 1957, 1970<br>Pesticide Residue Compensation Act, 1970 | Rural Agricultural Development Act, 1973 | Agricultural Rehabilitation and Development Act, 1962<br>Plant Diseases Eradication Act, 1974<br>Agricultural Chemicals Act, 1972, 1974 | Agricultural and Marketing Act, 1967<br>Weed Control Act, 1967 | Agriculture Rehabilitation and Development Act, 1973<br>Plant Diseases Act, 1968, 1978<br>Potato Disease Eradication Act, 1979 | Plant Protection Act, 1964, 1973<br>Protection of Agricultural Land Act, 1978<br>Agricultural and Rural Development Act, 1963<br>Agriculture and Colonization Act, 1962 |
| **Fisheries** | Fisheries Act, 1970, 1977<br>Fishing and Recreational Harbours Act, 1978 | Fisheries Act, 1970, 1973, 1980<br>Fisheries Development Authority, 1982 | | Fisheries Act, 1977<br>Agriculture Act, 1983<br>Fisheries Development Act, 1978 | Fish and Wildlife Act, 1981 | Tourism, Fish and Game Act, 1963 |
| **Forestry** | Eastern and Rocky Mountain Forest Conservation Act, 1947<br>Forest Development and Resources Act, 1966, 1970 | Forest Fires Act, 1970<br>Forest Travel Act, 1970<br>Newfoundland and Labrador Forest (Protection) Act, 1967, 1970<br>Forest Exchange and Acquisitions Act, 1970<br>Forest Land Management and Tax Act, 1974<br>Forest and Lands Act, 1981 | Forestry Act, 1956<br>Fire Prevention Act, 1983 | Lands and Forests Act, 1967<br>Forest Improvement Act, 1967<br>Forest Improvement Act, 1962, 1965 | Crown Lands and Forest Act, 1976, 1980, 1983<br>Forest Fires Act, 1970, 1973, 1983 | Lands and Forests Act, 1964, 1974<br>Tree Protection Act, 1964<br>Fire Prevention Act, 1968 |
| **Wildlife** | Migratory Birds Convention Act, 1917, 1970<br>Game Export Act, 1970<br>Canada Wildlife Act, 1973 | Wildlife Act, 1970 | Fish and Game Protection Act, 1974 | | Apiary Inspection Act, 1973, 1974<br>Fish and Wildlife Act, 1980, 1984<br>Wildlife Council, 1968 | Tourism, Fish and Game Act, 1964<br>Wildlife Conservation Act, 1969, 1978 |
| **Energy** | Oil and Gas Production Conservation Act, 1969, 1970<br>National Energy Board Act, 1970, 1975 | | Oil, Natural Gas and Minerals Act, 1971 | Tidal Power Corporation Act, 1971 | Underground Storage Act, 1978<br>Oil and Natural Gas Act, 1976, 1983 | |
| **General** | Income Tax Act, 1966, 1977<br>Government Organization Act, 1970, 1979<br>Canadian Environment Week Act, 1971 | Health Act, 1970, 1979<br>Department of Environment Act, 1981<br>Provincial Affairs and Environment Act, 1973 | Public Health Act, 1974, 1980<br>Environmental Protection Act, 1975, 1983 | Public Health Act, 1967, 1973<br>Environmental Protection Act, 1973, 1977<br>Environmental Pollution Act, 1970 | Clean Environment Act, 1973, 1983<br>Health Act, 1973, 1983<br>Emergency Measures Act, 1978<br>Clean Environment Act, 1971 | Environmental Quality Act, 1973, 1983<br>Public Health Protection Act, 1972, 1979<br>Ministry of the Environment Act, 1979, 1982 |

Appendix 8, Table 1
## Federal and Provincial Environmental Legislation (continued) (b) Western Provinces and Territories

| Subject | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia | Yukon (Y) and Northwest Territories (N) |
|---|---|---|---|---|---|---|
| **Air/Atmosphere** | Air Pollution Control Act, 1967 | Mining and Metallurgy Act, 1970 | Air Pollution Control Act, 1965, 1978 | Clean Air Act, 1971, 1983 | Weather Modification Act, 1973, 1983<br>Motor Vehicle Act, 1979<br>Geothermal Resources Act, 1973, 1982 | |
| **Water** | Ontario Water Resources Act, 1956, 1983<br>Drainage Act, 1963, 1975, 1980<br>Lakes and Rivers Improvement Act, 1970, 1980<br>Beach Protection Act, 1970, 1980<br>Shoreline Property Assistance Act, 1973 | Water Reserves Administration Act, 1970<br>Rivers and Streams Act, 1970, 1972<br>Ground Water and Water Wells Act, 1970, 1972<br>Water Rights Act, 1983<br>Construction of Dykes Act,1966<br>Water Control and Conservation Branch Act, 1967 | Ground Water Conservation Act, 1959, 1978<br>Water Pollution Control and Assistance Act, 1969<br>Pollution Control Act, 1971, 1984<br>Water Corporation Act, 1984<br>Drainage Approval Board Act, 1984<br>Drainage Control Act, 1980<br>Water Resources Management Act, 1972<br>Sewage Drainage Inquiry Act, 1969 | Water Resources Act, 1970, 1978<br>Clean Water Act, 1971, 1983<br>Ground Water Development Act, 1980<br>Water Resources Commission Act, 1983 | Water Act, 1960, 1979<br>River Bank Protection Act, 1979 | Water Resources Agreement Ordinance 1983 (N) |
| **Land Use and Heritage** | Public Lands Act, 1970, 1972<br>Conservation Authorities Act, 1968, 1970, 1980<br>Provincial Parks Act, 1970<br>Wilderness Areas Act, 1970, 1980<br>Environmental Assessment Act, 1974, 1975, 1981<br>Land Corporation Act, 1975<br>Niagara Escarpment Planning and Development Act, 1973<br>Niagara Escarpment Protection Act, 1970<br>Ontario Heritage Act, 1975 | Crown Lands Act, 1970<br>Provincial Park Lands Act, 1972<br>Ecological Reserves Act, 1981<br>Northern Affairs Act, 1974<br>Surface Rights Act, 1983<br>Heritage Manitoba Act, 1974<br>Resource Conservation Districts Act, 1970 | Provincial Parks and Protected Areas Act, 1965, 1978<br>Conservation and Development Act, 1965, 1978<br>Environmental Assessment Act, 1980<br>Ecological Reserves Act, 1980<br>Regional Parks Act, 1979<br>Saskatchewan Heritage Act, 1975 | Public Lands Act, 1966, 1970, 1980<br>Wilderness Areas Act, 1971, 1981<br>Provincial Parks Act, 1964, 1974<br>Land Surface Conservation Act, 1973, 1983<br>Surface Rights Act, 1972, 1983<br>Special Areas Act, 1964<br>Surface Reclamation Act, 1963 | Park Act, 1965<br>Land Act, 1965, 1970<br>Environment and Land Use Act, 1971, 1979<br>Ecological Reserves Act, 1971, 1983<br>Greenbelt Act, 1977<br>Heritage Conservation Archeological and Historic Sites Act, 1972 | Commissioners Land Ordinance, 1969 (N)<br>Historic Resources Ordinance 1970 (N)<br>Territorial Parks Ordinance 1973, 1983 (N)<br>Travel and Tourism Ordinance, 1983 (N)<br>Lands Ordinance, 1971(Y) |
| **Hazardous Chemicals/ Products** | Pesticides Act, 1971, 1973,1982<br>Highway Traffic Act, 1980<br>Dangerous Goods Transportation Act, 1981 | Pesticide and Fertilizer Control Act, 1976<br>Transportation of Dangerous Goods Act, 1983 | Radiation Health and Safety Act, 1978<br>Pest Control Products Act, 1978 | Agriculture Products Act, 1970, 1982<br>Radiation Protection Act, 1970, 1980<br>Hazardous Chemicals Act, 1978, 1982<br>Pipeline Act, 1975, 1981<br>Transportation of Dangerous Goods Act, 1982<br>Special Waste Management Corporation Act, 1982 | Pesticide Control Act, 1977, 1980<br>Pipeline Act, 1979, 1981 | Pesticide Ordinance, 1970<br>Transport of Dangerous Goods Ordinance, 1982 |

Appendix 8, Table 1

## Federal and Provincial Environmental Legislation (continued) (b) Western Provinces and Territories

| Subject | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia | Yukon (Y) and Northwest Territories (N) |
|---|---|---|---|---|---|---|
| **Solid Waste/ Noise** | Mining Act, 1980<br>Pits and Quarries Control Act, 1980<br>Ontario Waste Management Corporation, 1981<br>Motorized Snow Vehicles Act, 1968, 1982 | Mines Act, 1973<br>Industrial Minerals Drilling Act, 1977<br>Snow Vehicles Act, 1970 | Litter Control Act 1970, 1973, 1978<br>Mineral Resources Act, 1978 | Litter Act, 1972, 1980<br>Beverage Containers Act, 1977, 1982<br>Quarries Regulation Act, 1980<br>Snow Vehicles Act, 1979 | Litter Act, 1970, 1979<br>Waste Management Act, 1982, 1983<br>Placer Mining Act, 1974<br>Mines Act, 1980<br>Mineral Act, 1977 | Noise Prevention Ordinance, 1971 (Y) |
| **Agriculture** | Agricultural Rehabilitation and Development Act, 1962, 1970<br>Plant Diseases Act, 1970, 1980<br>Abandoned Orchards Act, 1966, 1978<br>Tile Drainage Act, 1909, 1983<br>Weed Control Act, 1927, 1973<br>Wild Rice Harvesting Act, 1960, 1971<br>Top Soil Preservation Act, 1977, 1980 | Wild Rice Act, 1983<br>Farmlands Protection Act, 1977<br>Noxious Weeds Act, 1968<br>Control of Predators Act, 1965<br>Plant, Pets and Diseases Act, 1963<br>Dutch Elm Disease Act, 1980 | Agricultural Development and Adjustment Act, 1965, 1978 | Soil Conservation Act, 1970, 1980<br>Irrigation Act, 1970, 1980<br>Weed Control Act, 1972, 1979<br>Agricultural Pests Act, 1974 | Agriculture Land Commission, 1972, 1977<br>Soil Conservation Act, 1977, 1979<br>Range Act, 1978<br>Agriculture and Rural Development Act, 1982 | |
| **Fisheries** | Game and Fish Act, 1962, 1970 | Fisheries Act, 1969<br>Fisheries Assistance and Pollution Liability Act, 1970 | Fisheries Act, 1965, 1978 | | Fisheries Act, 1982 | Freshwater Fish Marketing Ordinance (N) |
| **Forestry** | Tree Planting Act, 1927, 1979<br>Forestry Act, 1970<br>Forest Fires Protection Act, 1968, 1970<br>Forest Tree Pest Control Act, 1968, 1970<br>Crown Timber Act, 1970<br>Woodlands Improvement Act, 1966, 1970 | Forest Act, 1964, 1974 | Forest Act, 1965, 1978<br>Prairie and Forest Fires Act, 1965, 1978, 1980 | Forest Reserves Act, 1964, 1970 1980<br>Forests Act, 1971, 1980<br>Forest and Prairie Protection Act, 1971, 1980 | Forest Act, 1978<br>Forest and Range Resource Fund, 1980 | Forest Protection Ordinance, 1971 (Y)<br>Forest Protection Ordinance, 1959 (N) |
| **Wildlife** | Fish and Game Act, 1962, 1970<br>Bee Act, 1970<br>Tourism Act, 1970, 1980<br>Endangered Species Act, 1971, 1980 | Wildlife Act, 1980<br>Bee Act 1970<br>Wildlife Foundation of Manitoba, 1966 | Wildlife Act, 1979<br>Critical Wildlife Habitat Protection Act, 1984<br>Apiaries Act, 1978 | Wildlife Act, 1970<br>Bee Act, 1972<br>Recreation, Parks and Wildlife Act, 1977 | Dogwood, etc., Protection Act, 1960<br>Creston Valley Wildlife Act, 1968, 1977<br>Wildlife Act, 1966, 1973, 1982<br>Bee Act, 1980 | Wildlife Ordinance, 1978 (N) |
| **Energy** | Petroleum Resources Act, 1971 | Manitoba Oil and Gas Corporation, 1983<br>Manitoba Energy Council Act, 1980<br>Manitoba Energy Authority, 1980 | Water Power Act, 1965, 1978<br>Oil and Gas Conservation and Development Act, 1973, 1978 | Oil and Gas Conservation Act, 1970, 1976<br>Oil Sands Conservation Act, 1969, 1983<br>Energy Resources Conservation Act, 1971 | Underground Storage Act, 1964<br>Coal Act, 1974 | Petroleum Protection Ordinance, 1976 (N) |

Appendix 8, Table 1

## Federal and Provincial Environmental Legislation (concluded) (b) Western Provinces and Territories

| Subject | Ontario | Manitoba | Saskatchewan | Alberta | British Columbia | Yukon (Y) and Northwest Territories (N) |
|---|---|---|---|---|---|---|
| General | Environmental Protection Act, 1971, 1983<br>Public Health Act, 1980<br>Health Protection Act, 1983<br>Pollution Abatement Incentives Act, 1970 | Public Health Act, 1970, 1980<br>Clean Environment Act, 1968, 1970, 1974, 1976, 1980 | Department of the Environment Act, 1972, 1984<br>Public Health Act, 1968, 1978<br>Environmental Management and Protection Act, 1984<br>Tourism and Renewable Resources Act, 1974 | Public Health Act, 1970, 1980<br>Environmental Council Act, 1970, 1980<br>Department of Environment Act, 1971, 1981<br>Environmental Research Trust Act, 1980, 1981<br>Environment Conservation Act, 1970 | Department of Environment Act, 1960, 1980<br>Health Act, 1971, 1983<br>Environmental Management Act, 1981, 1983<br>Pollution Control Act, 1967, 1974 | Public Health Ordinance 1957, 1977 (N)<br>Area Development Ordinance, 1956, 1979, (N)<br>Environmental Protection Ordinance, 1973 (N)<br>Scientists Ordinance, 1974 (N)<br>Public Health Ordinance 1971 (Y)<br>Area Department Ordinance, 1971 (Y) |

**Source:**
Statutes of Canada and Provinces, and Ordinances of Territories, various years; prepared by Dr. P. Bird, Environment Canada, 1984.

**Note:**
Dates refer to year of assent of either the act or amendment. Very few dates of amendments are included since there are hundreds of amendments to the acts listed, and many of the amendments are minor. The short title of the act has been used in all cases. The list of legislation here is representative rather than exhaustive. Moreover, legislation concerned with the environment of the workplace or effects on human health from foods and drugs have been excluded. At best the list should be considered as illustrative of the range and scope of Federal and Provincial legislation enacted to protect the environment and human health, and to conserve the natural resource base. The relatively recent increase in environmental legislation probably reflects the growth of concern for environmental protection rather than an introduction of a new area of jurisprudence. In many cases old laws have been amended to strengthen environmental elements, in other cases new laws have replaced earlier more limited ones, and in a few cases completely new legislation has been introduced.

# Human Activity and the Environment

## A Statistical Compendium

**Human Activity and the Environment** is a collection of environmental statistics brought together from many sources including Statistics Canada, Environment Canada and other Federal and Provincial Government Departments. The publication provides a statistical picture of Canada's physical environment while placing special emphasis on the relationship between human activities and other elements of the natural system such as the air, water, soil, plants, and animals.

**Human Activity and the Environment** will be useful both as a source of pertinent stalistics about the environment and as a guide to the wide variety of environment statistics available in Canada.