Human Activity and the Environment

Cover from a photograph by Maxine Feldman.

D. TRANT.

STATISTICS CANADA
Office of the Senior Adviser on Integration

HUMAN ACTIVITY AND THE ENVIRONMENT

Published by Authority of
The Minister of Industry, Trade and Commerce

March 1978
3-0001-504

Price: Canada $2.80
Other Countries $3.40

Ottawa

PREFACE

This publication presents statistical series detailing human activities which have a potential for imposing stress on the natural environment. Although many of the data have previously been published by Statistics Canada, they are presented here for the first time within a thematic framework related to the environment. The organization of information according to watersheds of Canada, for example, presents these statistics in a new light.

This report was prepared in the Office of the Senior Adviser on Integration, primarily by A.M. Friend, L.L. Kaplansky and B.W. Mitchell.

Considerable assistance was obtained from other groups in Statistics Canada and other federal government departments. This help is gratefully acknowledged, with special thanks to the Drafting Unit of the Water Resources Branch, Inland Waters Directorate, Fisheries and Environment Canada.

Comments on this report are welcome and should be addressed to H.J. Adler, Senior Adviser on Integration.

PETER G. KIRKHAM,
Chief Statistician of Canada.

SYMBOLS

The following standard symbols are used in Statistics Canada publications:

. . figures not available.

. . . figures not appropriate or not applicable.

— nil or zero.

- - amount too small to be expressed.

P preliminary figures.

r revised figures.

x confidential to meet secrecy requirements of the Statistics Act.

NOTE

In some tables, figures will not add to totals, because of rounding.

TABLE OF CONTENTS

INTRODUCTION

Getting and spending, we lay waste our powers:
Little we see in Nature that is ours;
We have given our hearts away, a sordid boon!

William Wordsworth, 1770 - 1850

The Romantic poets decried the sordid environment created by the process of industrialization. These sentiments were dismissed as too pessimistic in an age of scientific and technological progress. The traditional bounds which limited man's productive capacity appeared to be steadily expanding and it did not appear that this process would stop short of fulfillment of all the material needs of mankind – the Malthusian warning notwithstanding.

As the Malthusian warning seems to approach reality for the economically impoverished and densely populated countries, other limits to conventional economic growth patterns appear on the horizon for the industrialized countries. These limits are imposed by the environmental transformations effected by man's activities as producer, consumer and accumulator.

Canadians are becoming increasingly concerned about the risks to human health and to natural ecosystems as a result of environmental contamination and other man-caused stresses. That human activities can drastically alter the suitability of landscapes for human existence is a fact that has been recorded since ancient times. Today the scope and scale of these transformations has increased markedly. As the amount of wilderness area decreases at an increasingly rapid rate, man no longer has the ready option to become a fugitive species, to escape to a new continent, as in centuries past. Having run out of new parts of the planet to colonize, we are now forced to turn our attention to maintaining the quality of the present environment to ensure the survival of future generations.

The degree of stress placed on natural communities as a result of human activities would appear to be a function of the size of the human population, the sophistication and use of its technology and the degree of environmental awareness.

It is the purpose of this publication to outline certain classes of human activity which produce stress on the natural environment. Hopefully, the availability of this information will allow further analysis by others, improving our understanding of man's impact on the environment. A necessary foundation for such analysis may be found in the quantitative description of human activities which act potentially as environmental stress generators.

In this publication, several major categories of "man-caused" stressors have been selected and examined on the basis of their presumed importance in effecting environmental transformations. A major criterion was that most of these data be available from Statistics Canada sources, in effect making this in part an attempt to synthesize much of this department's available information pertaining to the environment.

Over the years, Statistics Canada has collected and compiled data in many areas which have some bearing on the question of environmental transformation. It was felt that many of these data could contribute to the understanding of some of the underlying relations between man-made activity and stress on the environment. Naturally and it is quite evident from the statistics compiled for this publication, the available data were collected for other purposes; nevertheless, selecting and recasting the information with an environmental perspective in mind can contribute to the improvement of at least one component of a comprehensive description of the environment and its related dynamics.

The statistics are not intended to show deterioration (or improvement) of the quality of the environment. Data of this kind, referred to as "response" data, are now being developed by the Department of Fisheries and the Environment. At some future date, it would be useful to correlate "stress" data of the type employed in this book with "response" data.

Some Comments on the Data

The reader will discern a somewhat uneven presentation of data. There is, for example, greater detail in the series on population and agricultural characteristics by watershed than in other series. The novelty of the information made this worthwhile. In the energy chapter, some new (and somewhat complex) statistical information has been introduced. Most of the remaining data are summaries of already published series, although some are from sources other than Statistics Canada. These latter series are included primarily to complement Statistics Canada data; however, due to resource constraints, the process of choice was of necessity somewhat eclectic in the face of the large and growing body of statistics relevant to the environment that is produced outside the department.

Highlights

Watersheds

National data, when disaggregated, are usually presented according to provinces, municipalities and

other political entities. Using the concept of natural statistical areas,[1] this chapter divides Canada into a manageable number of watersheds and presents data, particularly population characteristics, for those areas. Maps and a coding system are included to aid the reader. Watershed information may also be found in the chapters on agriculture and manufacturing.

Renewable Resources

This topic is covered in the chapters dealing with agriculture, forestry and fisheries. Abundant data exist for agriculture and forestry; however, there is less information on fisheries. Significant data gaps that do exist have been identified in the chapter introductions. Some manipulation of data was carried out to obtain indicators of technological change in agriculture and the depletion of forest resources. The competition between urban and agriculture uses for land in good growing areas is illustrated in chart form and through the use of airphotos.

Transportation

The transportation chapter presents information that will allow an assessment of the amount of environmental stress imposed by transportation related factors, including network mileages, vehicle stocks and the movement of goods and passengers. Data on less visible but environmentally significant networks such as oil and gas pipelines and electric power corridors are also included. The spatial distribution of major electric power lines and roads and highways is illustrated in map form.

Manufacturing

In this chapter, attention is focussed on the transformation processes. The first set of tables examines manufacturing activity in terms of number of establishments, production workers, value added and fuel and water use, with manufacturing industries grouped into high-, medium- and low-stressor categories. A second set of tables contains data from claims for pollution abatement equipment and its installation under the Accelerated Capital Cost Allowance Program (ACCA). Selected inputs and products of the manufacturing industry that have high environmental impact form the basis for a third set of tables.

Energy

The final chapter covers various aspects of energy supply and use and emphasizes changes in energy sources and consumption. All the quantities of fuels and electricity have been converted to British Thermal Units (B.t.u.'s) as a basis for comparing equivalent heat content regardless of source.

The chapter concludes with a set of statistics on the production, use and reserves of petroleum and natural gas. Other data on energy use may be found in the chapters on agriculture and transportation, where information concerning the rapid growth of energy transportation networks is provided.

Appendices

Appendices 1 - 9 contain the detailed watershed tables on agriculture, household water sources and sewage disposal facilities, and manufacturing activity. Also included is an explanation of how the watersheds were delineated and how the population census and manufacturing data were retrieved with respect to these watersheds.

---

[1] For an explanation of how these areas were arrived at, see Appendix 1.

CHAPTER I

WATERSHEDS

LIST OF CONTENTS

WATERSHEDS

In recent years, the demand for socio-economic data by natural spatial units, as opposed to those defined by administrative and political boundaries, has been growing. Conceptually, the watershed is reasonably simple to construct because its boundaries – heights of land – are well defined.

The actual number of watersheds in Canada, however, is far greater than the number that can be properly displayed, hence there is a need to aggregate watersheds at various levels. The aggregation process also includes two basic factors: first, river basins have a natural hierarchical base for classification; and second, the density of population and the intensity of economic activity vary greatly by location. Thus, in the more densely populated parts of the country, river basins are more finely differentiated than in the lightly or unpopulated regions.

The coding system used is such that the specified watersheds can be aggregated up to the level of the five Canadian drainage basins. There are three levels of aggregation: the specific watershed receives a three-digit code; a natural grouping of watersheds, a two-digit code and the five drainage basins are each given a one digit code. In addition, watersheds which cross provincial boundaries have been split into their provincial parts. For example, the Qu'Appelle River (241), with a Manitoba part (241 - 46) and a Saskatchewan part (241 - 47), is a sub-division of the Assiniboine grouping (24), which is a component of the Hudson Bay Drainage Basin (2).

Another approach, the presentation of data for biomes, was also examined. This work, however, was not completed in time for inclusion in this publication, though it is hoped that the socio-economic data base by biomes can be made available in the future.

Data

The following tables, as well as those in the other chapters of the publication, are examples of data which have the potential to be related to natural areas. Only those data with some bearing on water use or quality were selected. Census of Population and Census of Manufactures data are collected and coded geographically and, therefore, can be organized and retrieved with respect to delineated areas. A more detailed explanation of how this was done is found in Appendix 1.

The tables are summary population statistics from the 1971 Census of Canada for some of the more heavily populated watersheds. It will probably be possible to present data from future censuses in terms of these watersheds; unfortunately, however, historical data cannot be shown this way.

It should be noted that the areal measures of the sheds were calculated using a different method than was used for retrieving the other data. The areal measurements are approximations only and should be used more as relative indicators of size than as absolute measures. The data related to population, water and sewerage facilities for households, agriculture and manufacturing establishments, for all the watersheds, can be found in Appendices 3 - 6. Summary tables of these data are provided in the relevant chapters.

Watershed Code and Provincial Code

1. Atlantic Basin
   10. Atlantic Ocean
      100 - 10 Labrador
      101 - 10 North Coast Newfoundland
      102 - 10 Trinity Bay
      103 - 10 St. John's
      104 - 12 South Coast Nova Scotia
   11. Gulf of St. Lawrence
      110 North Coast Mainland:
      110 - 10 Labrador
      110 - 24 Quebec
      111 - 10 West and South Coast Newfoundland
      112 - 24 North Gaspé Peninsula
      113 West Coast Mainland:
      113 - 12 Nova Scotia
      113 - 13 New Brunswick
      113 - 24 Quebec
      114 - 11 Prince Edward Island
      115 - 12 Cape Breton Island
   12. Bay of Fundy
      120 - 12 Nova Scotia part
      121 - 13 New Brunswick part
   13. Saint John River
      130 Saint John River:
      130 - 13 New Brunswick part
      130 - 24 Quebec part
   14. St. Lawrence River
      140 - 24 Saguenay River
      141 - 24 Québec City
      142 - 24 Chaudière River
      143 - 24 St. Maurice River
      144 - 24 Eastern Townships
      145 - 24 Eastern Laurentians
      146 - 24 Montréal
      147 West St. Lawrence:
      147 - 24 Quebec part
      147 - 35 Ontario part
   15. Ottawa River
      150 Lower Ottawa:
      150 - 24 Quebec part
      150 - 35 Ontario part
      151 Upper Ottawa:
      151 - 24 Quebec part
      151 - 35 Ontario part
   16. Lake Ontario
      160 - 35 Belleville
      161 - 35 Trent System
      162 - 35 Oshawa-Colborne
      163 - 35 Toronto
      164 - 35 Hamilton
      165 - 35 Niagara Peninsula
   17. Lake Erie and Lake St. Clair
      170 - 35 Grand River
      171 - 35 Erie Shoreline
      172 - 35 Thames River
      173 - 35 Sydenham River
   18. Lake Huron
      180 - 35 South Huron
      181 - 35 Georgian Bay-Lake Simcoe
      182 - 35 North Huron
   19. Lake Superior
      190 - 35 Lake Superior

2. Hudson Bay and Ungava Basin
   20. East plus Ungava
      200 - 24 East plus Ungava
   21. South and West
      210 South and Southwest:
      210 - 24 Quebec part
      210 - 35 Ontario part
      210 - 46 Manitoba part
      211 North of Nelson River:
      211 - 46 Manitoba part including Churchill
      211 - 47 Saskatchewan part
      211 - 48 Alberta part
      211 - 61 Northwest Territories part
   22. Nelson River
      220 - 46 Nelson River
   23. Lake Winnipeg
      230 Lake Winnipeg:
      230 - 35 Lake of the Woods (Ontario)
      230 - 46 Lake Winnipeg Shoreline (Manitoba)
      231 - 46 Red River
      232 Dauphin:
      232 - 46 Manitoba part
      232 - 47 Saskatchewan part
   24. Assiniboine River
      240 Assiniboine and Souris:
      240 - 46 Manitoba part
      240 - 47 Saskatchewan part
      241 Qu'Appelle River:
      241 - 46 Manitoba part
      241 - 47 Saskatchewan part
   25. Saskatchewan River
      250 Saskatchewan River:
      250 - 46 Manitoba part
      250 - 47 Saskatchewan part
      251 - 48 Upper North Saskatchewan (above Edmonton)
      252 Lower North Saskatchewan:
      252 - 47 Saskatchewan part
      252 - 48 Alberta part
      253 South Saskatchewan and Red Deer:
      253 - 47 Saskatchewan part
      253 - 48 Alberta part
      254 - 48 Bow River

3. Arctic Basin
   30. Mackenzie River
      300 Mackenzie River:
      300 - 47 Saskatchewan part

Watershed Code and Provincial Code – Concluded

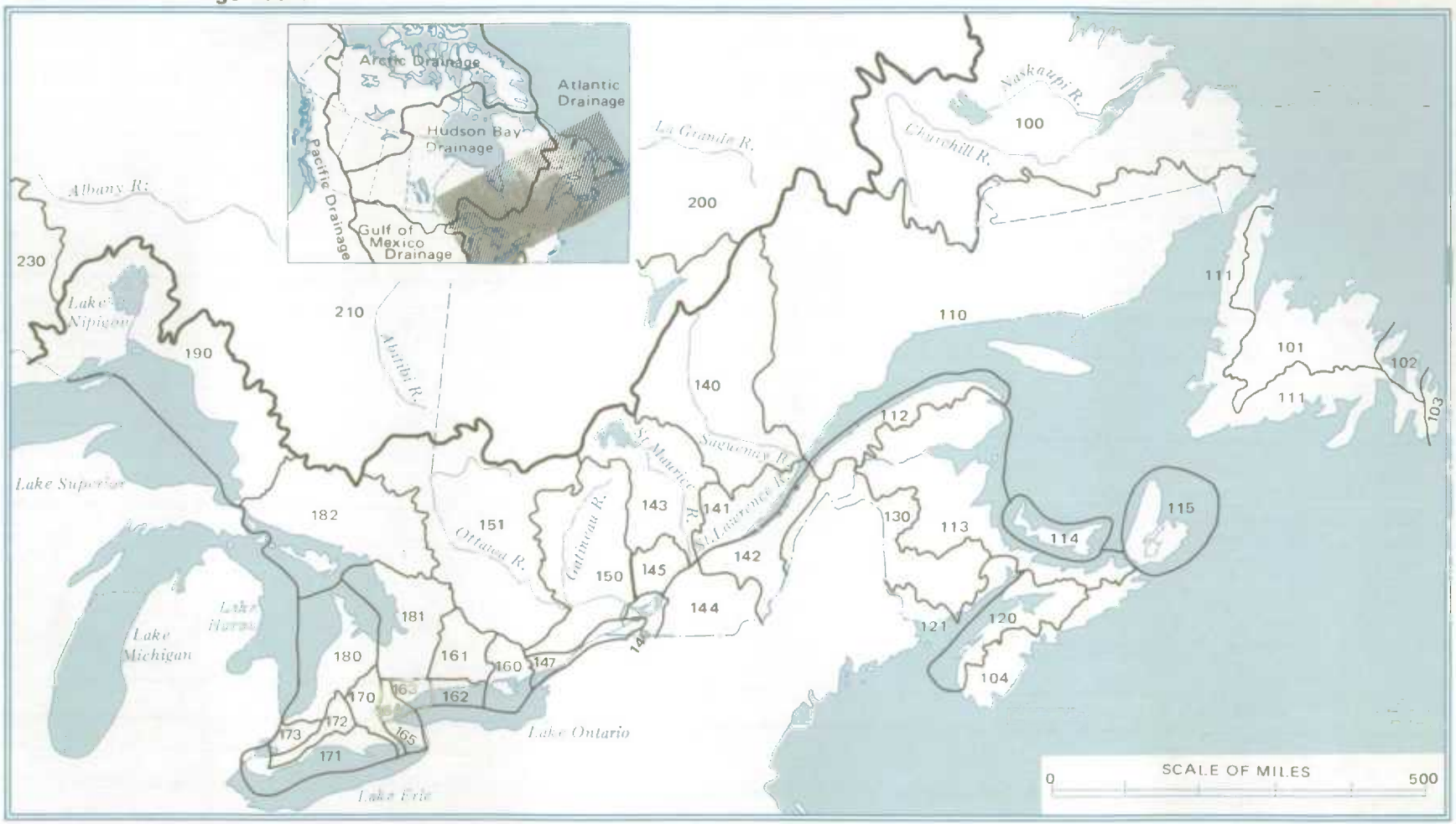
3. Arctic Basin – Concluded:
   30. Mackenzie River – Concluded:
      300 - 48 Alberta part
      300 - 59 British Columbia part
      300 - 60 Yukon part
      300 - 61 Northwest Territories part
   31. Athabasca River
      310 Athabasca River:
      310 - 47 Saskatchewan part
      310 - 59 Alberta part
   32. Peace River
      320 Peace River:
      320 - 48 Alberta part
      320 - 59 British Columbia part
   33. Arctic Ocean
      330 - 61 Arctic Ocean (Arctic Islands and North Shore Northwest Territories)

4. Pacific Basin
   40. Columbia River
      400 - 59 Columbia River
      401 - 59 Okanagan River
      402 - 59 Similkameen River
   41. Fraser River
      410 - 59 Upper Fraser River
      411 - 59 Thompson River
      412 - 59 Lower Fraser River (Vancouver)
   42. Yukon River
      420 Yukon River:
      420 - 59 British Columbia part
      420 - 60 Yukon part
   43. West Coast
      430 Alsek River:
      430 - 59 British Columbia part
      430 - 60 Yukon part
      431 - 59 Northern Coast
      432 - 59 Southern Coast
      433 - 59 South Vancouver Island (Victoria)
      434 - 59 Skagit River

5. Gulf of Mexico Basin
   50. Gulf of Mexico Basin:
      500 Gulf of Mexico Basin:
      500 - 47 Saskatchewan part
      500 - 48 Alberta part

Map — 1.1

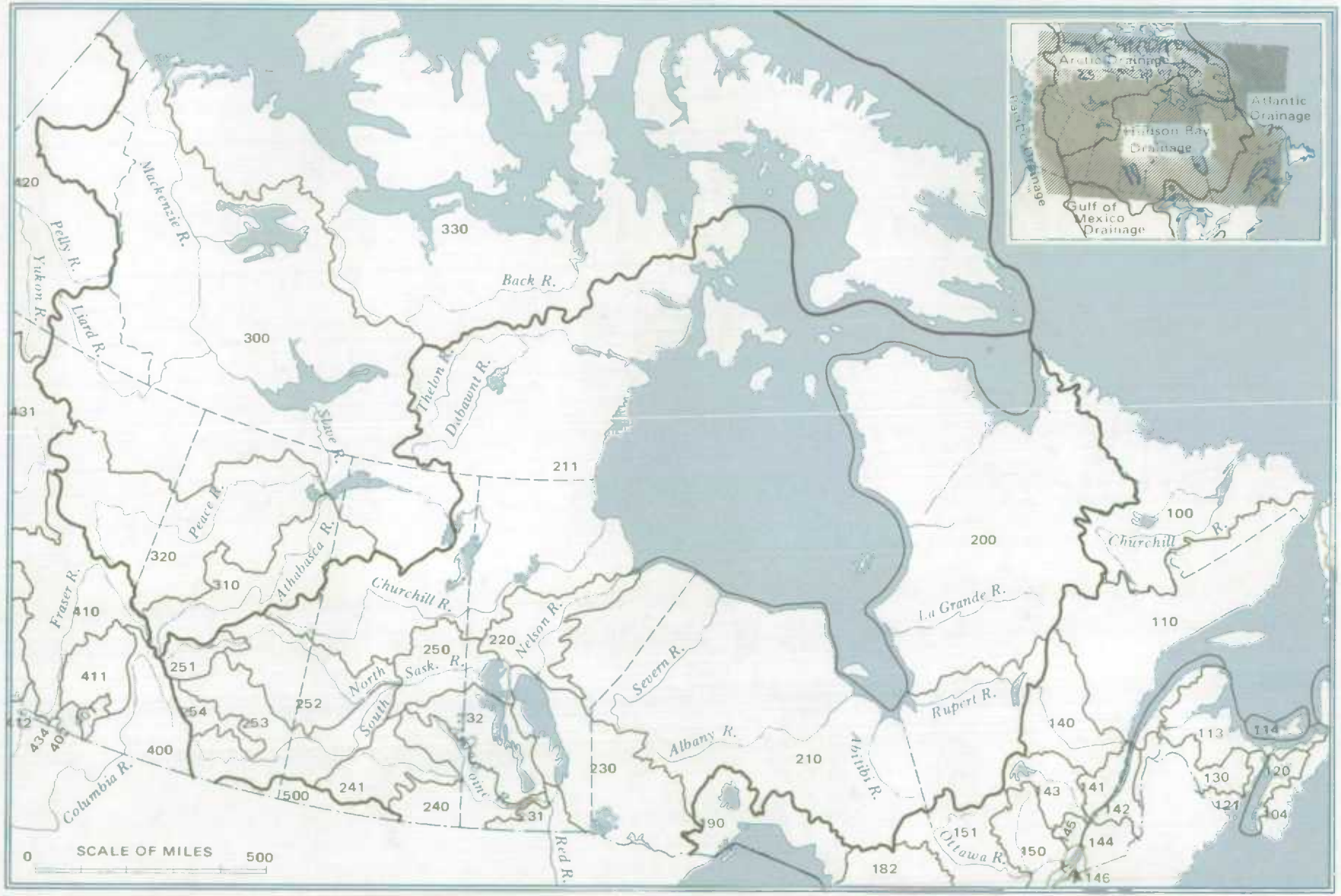
The Atlantic Drainage Basin



Source: Based on information from a series of Hydrographic Maps, Water Resources Branch, Fisheries and Environment Canada and unpublished information from Statistics Canada.

Map — 1.2

The Hudson Bay and Arctic Drainage Basins



Source: Same as in Map 1.1.

Map — 1.3

The Pacific Drainage Basin

Source: Same as in Map 1.1.

TABLE 1.4. Population, Area and Density for Drainage Basins and Primary Watersheds, 1971

Watershed	Code	Population	Area[1]	Population density
			square miles	persons per square mile
Atlantic Basin	1	15,481,700	510,991	30.3
Atlantic Ocean	10	716,275	131,627	5.4
Gulf of St. Lawrence	11	1,089,635	124,671	8.7
St. Lawrence River	14	5,276,660	82,909	63.6
Ottawa River	15	1,178,150	57,977	20.3
Lake Ontario	16	3,981,490	12,273	324.4
Lake Erie and Lake St. Clair	17	1,472,295	9,394	156.7
Lake Huron	18	966,330	36,549	26.4
Lake Superior	19	150,340	30,972	4.9
St. Lawrence River and Great Lakes[2]	**14 - 19**	**13,025,265**	**230,074**	**56.6**
Hudson Bay and Ungava Basin	2	3,669,060	1,335,650	2.7
Nelson River	220	30,315	34,435	0.9
Lake Winnipeg	23 - 25	3,336,175	328,067	10.2
Arctic Basin	3	...	...	...
Mackenzie River	300, 310, 320	240,945	650,458	0.4
Pacific Basin	4	2,153,125	381,714	5.6
Columbia River	40	252,030	39,685	6.4
Fraser River	41	1,261,595	89,693	14.1
Gulf of Mexico Basin	5	13,825	9,905	1.4

[1] The areas are approximate and should only be used as relative indicators of size.

[2] These are figures for the Canadian portion of the Great Lakes Basin only. The following are population figures for the American portions of those basins in 1970: Lake Ontario, 2,898,485; Lake Erie, 10,111,571; Lake Huron, 1,390,880; Lake Superior, 429,053; and Lake Michigan, 10,566,266.

Source: Special tabulation by the Census Field, Statistics Canada; *Population Estimates for the Great Lakes Basins and their Major Tributaries*, Canada Centre for Inland Waters, Environment Canada, Burlington, Ontario, 1973.

TABLE 1.5. Populations of Selected Watersheds Which Contain Census Metropolitan Areas (CMA's) and Other Large Cities, 1971

Watershed	Code	Total population	Area	Population density	City, CA or CMA	City, CA or CMA population
			square miles	persons per square mile		
Saint John River	130	337,080	14,542	23.2	Saint John, CMA	106,744
St. Lawrence River	14	5,276,660	82,909	63.6	Québec, CMA	480,502
					Trois Rivières, CA	97,930
					Montréal, CMA	2,743,208
					Valleyfield, CA	37,430
					Cornwall	47,116
					Kingston, CA	85,877
Saguenay River	140	267,400	34,022	7.9	Chicoutimi - Jonquière, CMA	133,703
St. Maurice River	143	183,510	17,536	10.5	Shawinigan, CA	57,246
Ottawa River	15	1,178,150	57,977	20.3	Ottawa - Hull, CMA	602,510
Lake Ontario	16	3,981,490	12,273	324.4	Oshawa, CA	120,318
					Toronto, CMA	2,628,043
					Hamilton, CMA	498,523
Trent System	161	193,760	5,198	37.3	Peterborough, CA	63,531
Niagara Peninsula	165	389,775	1,268	307.4	St. Catharines - Niagara, CMA	303,429
Lake Erie and Lake St. Clair	17	1,472,295	9,394	156.7	Windsor, CMA	258,643
Grand River	170	489,875	2,999	163.3	Kitchener - Waterloo, CMA	226,846
					Brantford, CA	80,284
Thames River	172	426,045	2,318	183.8	London, CMA	286,011
Lake Huron	18	966,330	36,549	26.4	Sarnia, CA	78,444
Lake Winnipeg	23	625,845	108,453	6.0		
Red River and Assiniboine River	231 and 24	1,247,085	72,267	17.0	Winnipeg, CMA	540,262
					Regina, CMA	140,734
Saskatchewan River	25	1,870,510	157,344	11.9	Edmonton, CMA	495,702
South Saskatchewan River	253 and 254	952,275	68,769	13.8	Saskatoon, CMA	126,449
					Lethbridge	41,217
					Calgary, CMA	403,319
					Red Deer	27,674
Columbia River	40	252,030	39,685	6.4		
Okanagan River	401	113,160	3,262	34.7		
Fraser River	41	1,261,595	89,693	14.1	Prince George, CA	49,100
					Vancouver, CMA	1,082,352
Thompson River	411	100,820	21,685	4.6	Kamloops, CA	43,790

Source: Same as in Table 1.4.

TABLE 1.6. Watersheds with High Population Densities, 1971

Watershed	Code	Population	Area	Population density
			square miles	persons per square mile
Toronto[1]	163-35	2,434,505	1,203	2,023.7
Montréal[1]	146-24	2,667,375	1,926	1,384.9
Hamilton[1]	164-35	630,530	996	633.1
Lower Fraser River	412-59	1,007,420	2,389	421.7
Niagara Peninsula	165-35	389,775	1,268	307.4
Thames River	172-35	426,045	2,318	183.8
Grand River	170-35	489,875	2,999	163.3
West St. Lawrence (Quebec part)	147-24	64,010	395	162.1
Lower Ottawa (Ontario part)	150-35	479,175	3,700	129.5

[1] These sheds are constructed to enclose an urban area and may contain a number of small river basins.

Source: Same as in Table 1.4.

CHAPTER II

AGRICULTURE

LIST OF CONTENTS

Traditional agriculture, from the perspective of material transformation, is the extension of the natural process in which energy is obtained from solar radiation and transformed through the process of photosynthesis into biological matter. Livestock production is a secondary natural process in which the energy is obtained from the solar energy contained (trapped) in the plants consumed. In traditional agriculture, part of this "secondary energy source" (work animals) was utilized in ploughing, harvesting and carrying materials and people. Thus, there was little need for energy from outside sources. Similarly, the cycle of sustained yields, i.e., upkeep of soil quality, was maintained by "recycling" nutrient matter and by crop rotation. Man's intervention in this natural process consisted primarily of the elimination of the undesired, and selection of the desired species, and the provision of the best possible environment for cultivation.

As the need for food has increased, however, the result has been an ever-growing demand for both direct and indirect energy inputs into the process, as illustrated by the increasing dependence of agriculture on complex machinery and chemical fertilizers. The spectacular achievements in yields and output per man in modern agriculture are largely the result of two factors: the application of scientific knowledge and changes in the organizational structure of agriculture as influenced by market imperatives. It is to a large measure the long-term effects of these scientific interventions and structural changes in modern agriculture that have given rise to environmental concerns.

The major environmental concerns in agriculture are related to competition for land, the reliance on certain kinds of inputs for high productivity and the changing structure of agriculture, such as increasing monoculture and animal feed lot production. The problems are briefly commented on below, although such "problems" must be weighed against the great success of Canadian agriculture as a producer of food, not only for national needs, but also as a major supplier for the world market.

Competition for Land Between Agriculture Uses and Requirements for Urban Growth and Industrialization

This problem should not be considered in terms of total farmland (as may be the case in densely populated countries) but rather in the context of relative scarcity of land suitable for agriculture. The length of the growing season, for example, is a key factor in determining the quality and quantity of agricultural production. In Canada, only about 10% of farmland has a growing season in excess of 80 days, but many of these areas are in great demand for residential and industrial purposes. The narrow "fruit belt" of the Niagara Peninsula and the rich farmland of the Lower Fraser Valley are two evident examples. Airphotos 2.5 and 2.6 present a striking example of the speed with which conversion from farmland to urban uses often takes place. Airphotos 2.7 and 2.8 show other aspects of land competition in the rural-urban fringe.

The Increasing Reliance on Chemical Fertilizers, Herbicides and Insecticides in the Agricultural Process

Traditionally, the productivity of the land was maintained by rotating crops, allowing some fields to lie fallow and returning animal manures and crop residues to the land. These practices have been supplemented, and to a large extent replaced, by the use of chemical fertilizers. For the use of fertilizers to be most effective, their application must be related to the soil, its type, condition and drainage and to climate conditions; otherwise, the nutrients will accumulate in the surface and ground waters, making the water unfit for other uses.

The benefits derived from the use of pesticides, although great, are now being increasingly weighed against the unexpected and often adverse effects. Destruction of waterfowl populations due to mercurial seed treatments and DDT and the side effects on farm workers and rural populations of aerial applications of chemicals are two well documented examples. Perhaps even more important, though, is the fact that the long term, and possibly synergistic effects of exposure to chemicals are virtually unknown with the evidence of adverse effects becoming visible only after many years.

This problem may also be compounded by two other factors. Firstly, many new chemicals whose long-run effects are unknown are being placed on the market each year and secondly, since urbanization is encroaching on some of Canada's best farmland, poorer farmland may have to be used, with a concomitant increase in the demand for fertilizer, pesticides and herbicides.

Structural Changes

The environmental impact of structural change in agriculture is more difficult to assess than the more specific technological changes. Recently, the increasing specialization of large-scale "agro-industries" has become a concern. Examples of this type of activity are the planting of single (or related) crops over extensive areas, sometimes referred to as "monoculture", and the increasing intensity of production within relatively small spaces, for example, animal feed lots and chicken hatcheries. The latter can also result in a pollution problem related to the disposal of wastes. Such developments are considered by some to be environmentally unsound because they lack the healthy symbiotic relationship obtained from species diversity. Such systems seem to require increasing reliance on artificial means in terms of chemical inputs, genetic control and, in the case of meat production, creation of high energy use "indoor" environments.

Agricultural Land as a Recipient of Urban Waste

An animal feed lot and an urban settlement have many similar problems in the collection of food and disposal of waste. With increasing urbanization and industrialization, there is a demand for the surrounding agricultural land for this disposal, resulting in actual and potential sources of hazard, not only from the accumulation of heavy metals and toxic materials, but also because of the concentration of pathogenic organisms. Air pollution brought about by a metropolis or an industry influences plant growth by direct toxic action and by changing the spectrum of the light reaching the plants. Since urbanization is often focused on regions of high agricultural activity, the combined impact necessitates exploitation of the poorer land for farming.

Data

Exhibits 2.1 to 2.3 contain data on farmland use for Canada and the provinces from 1901 - 71. Chart 2.4 illustrates the fact that urban living space is in competition with agriculture for the land in the warmest parts of the country.

Table 2.10 and Chart 2.11 provide data on quantities of fertilizers sold. The sharp drops in 1969 and 1970 were due to cutbacks in grain planting because of surpluses. The data on pesticides (exhibits 2.12 to 2.14) are given in value of sales rather than quantity. Although data are collected on quantity it is not possible, at this stage, to reduce these to a common denominator such as "pounds of active ingredients". Certain types of pesticides were aggregated due to confidentiality restrictions. The data represent only part of the picture because expenditures by all levels of government on pesticides are not readily available. Most of these expenditures are for control of forest insects and weeds along highway rights of way.

Further details of the summary statistics of area fertilized, sprayed with pesticides and irrigated as presented in Table 2.15 can be found in Appendix 4.

The potential polluting properties of animal wastes are highlighted in Table 2.16. Livestock, by type, are multiplied by coefficients to arrive at an estimate of the nitrogen and phosphate content of their manures.

Crude indicators outlining the changes in agricultural inputs are presented in Table 2.17 and Chart 2.18. Tables 2.19 and 2.20 cover the main uses of grain.

Table 2.21 summarizes the data collected by watersheds for some of the more important "agricultural" watersheds. Agriculture data for the remaining watersheds can be found in Appendices 4 and 5.

TABLE 2.1. Farms and Farmlands

	1901	1911	1921	1931	1941	1951	1961[1]	1971
	millions of acres							
Canada	...	...	...	...	...	...	...	2,278.6
Improved farmland:								
Cropland	20.1	35.7	50.0	58.3	56.3	62.2	62.4	68.8
Pasture	..	..	7.6	8.0	8.5	10.0	10.2	10.2
Summer fallow	..	2.5	12.0	17.0	23.5	22.0	28.2	26.7
Other	..	..	1.1	2.4	3.3	2.6	2.5	2.4
Total	**30.2**	**48.7**	**70.8**	**85.7**	**91.6**	**96.9**	**103.4**	**108.1**
Unimproved farmland:								
Woodland	16.8	17.5	23.8	26.6	22.3	22.8	17.2	11.5
Other	16.5	42.8	46.3	50.7	59.7	54.4	51.9	50.0
Total	**33.3**	**60.2**	**70.1**	**77.4**	**81.9**	**77.2**	**69.1**	**61.5**
Grand total	**63.5**	**108.9**	**140.9**	**163.1**	**173.5**	**174.1**	**172.5**	**169.6**
	thousands							
Number of farms	511.1	682.8	711.1	728.6	732.9	623.1	480.9	366.1
	acres							
Average size of farms	124.2	159.5	198.1	223.9	236.7	279.4	358.7	463.3

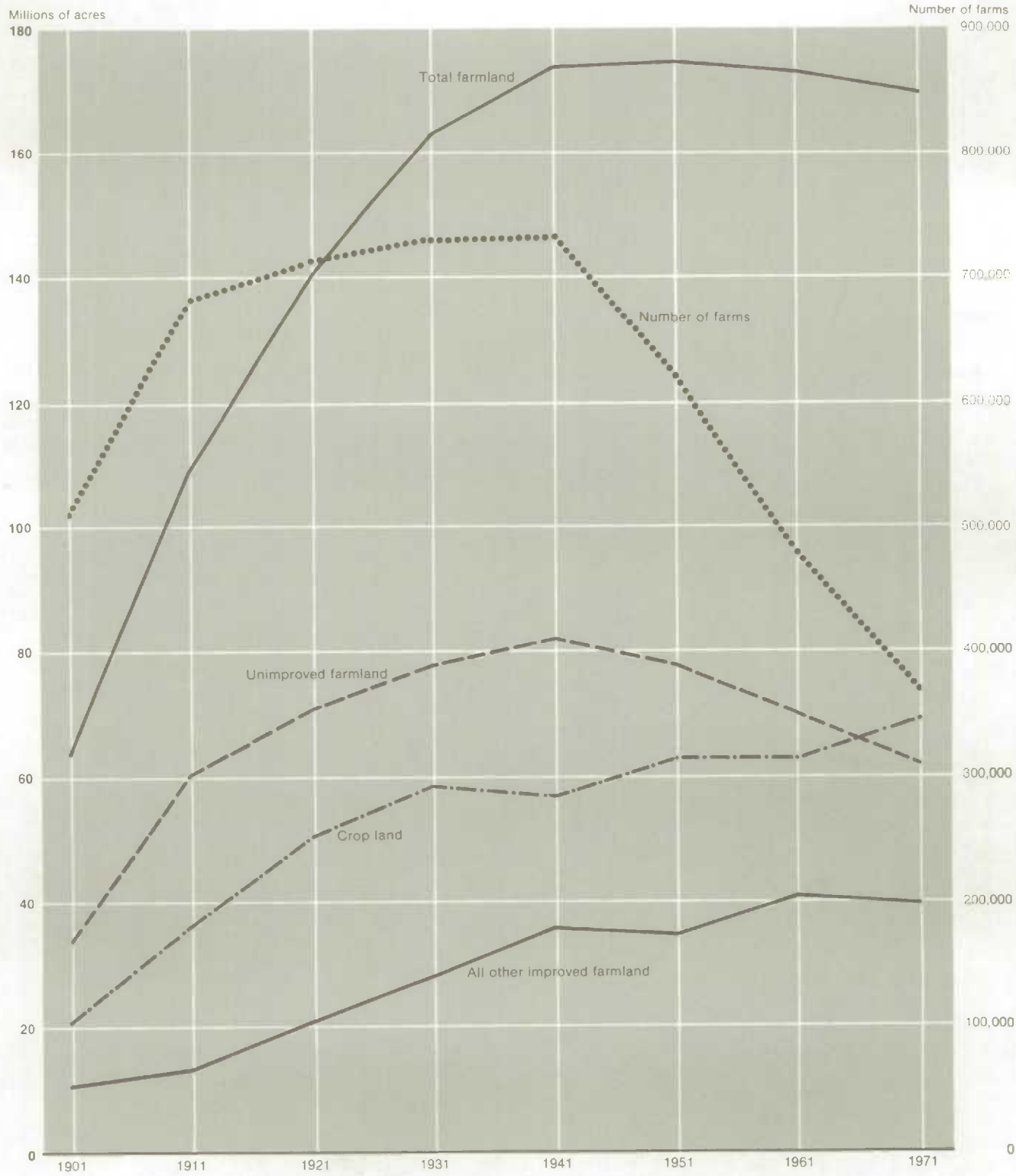
[1] For the 1961 Census, the definition of a census farm was changed from an agricultural holding of either more than three acres or one to three acres with annual production valued at $250 or more, to an agricultural holding of at least one acre with annual agriculture sales of $50 or more.

Source: Catalogue 21-503, *Handbook of Agriculture Statistics* (August 1955); *1941 Census of Canada*, Vol. VIII (1); Catalogue 96-701, *1971 Census of Canada.*

Pumpkin harvest, Ottawa Valley (photo by Tony Friend)

Chart — 2.2

Farms and Farmland



Source: Same as in Table 2.1.

TABLE 2.3. Farms[1] and Farmlands by Region

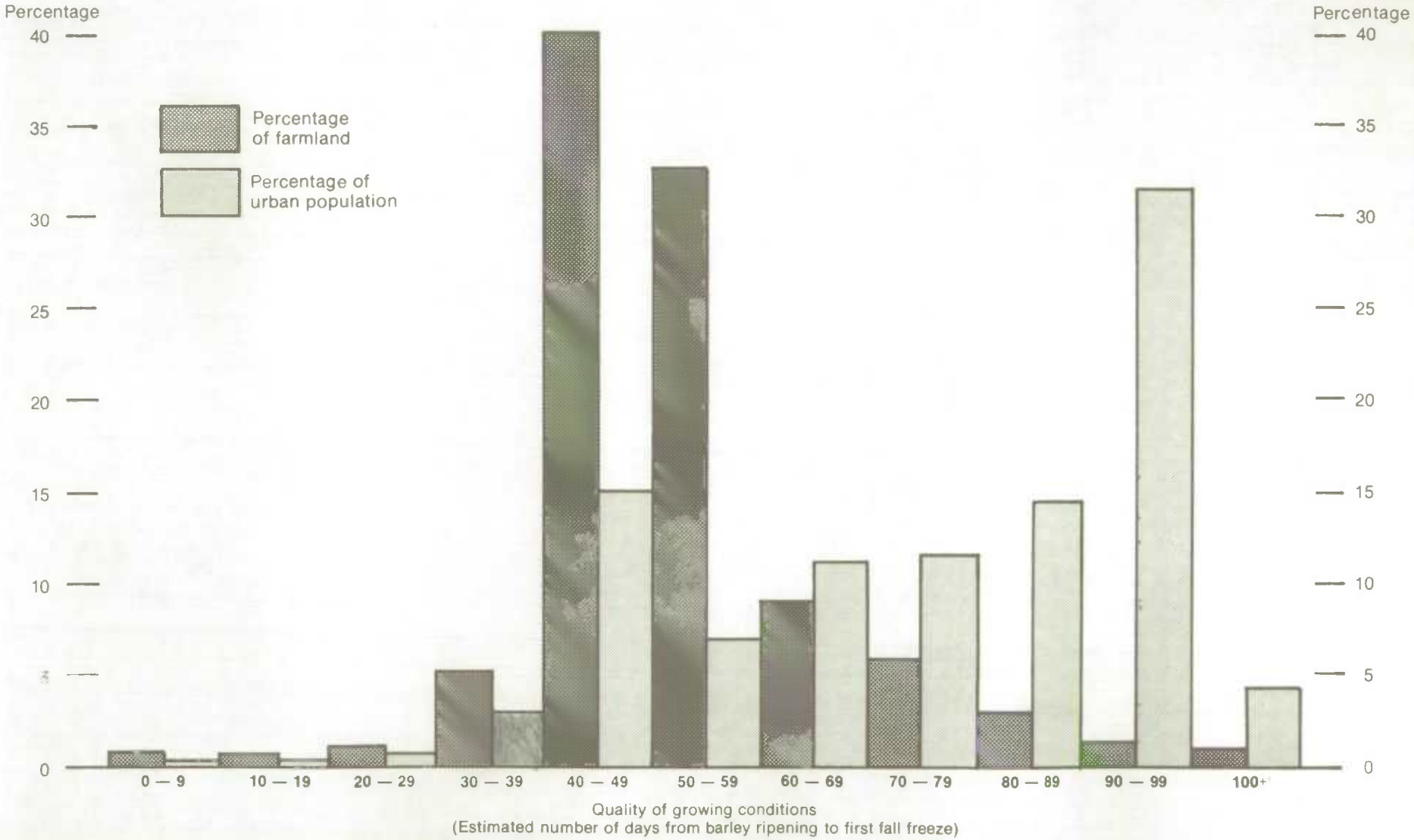
	1901	1911	1921	1931	1941	1951	1961	1971
	thousands							
Number of farms:								
Atlantic[2]	105.2	104.4	97.8	86.3	77.1	63.7	33.4	17.1
Central	344.2	361.8	335.7	328.1	332.9	284.3	217.1	156.0
Prairie	55.2	199.2	255.7	288.1	296.5	248.7	210.4	174.7
British Columbia	6.5	17.0	22.0	26.1	26.4	26.4	19.9	18.4
	acres							
Average size of farms:								
Atlantic[2]	102	105	104	112	116	125	163	205
Central	104	104	119	122	122	132	151	172
Prairie	279	289	344	381	405	498	617	765
British Columbia	230	150	130	136	153	178	226	316
	thousands of acres							
Improved farmland:								
Atlantic[2]	3,393	3,471	3,128	2,941	2,785	2,343	1,832	1,387
Central	20,706	21,815	22,234	22,267	22,426	21,522	19,897	17,314
Prairie	5,593	22,970	44,863	59,819	65,532	71,840	80,370	87,691
British Columbia	474	478	544	705	893	1,148	1,303	1,755
Improved farmland as a percentage of total land area:								
Atlantic[2]	10.5	10.8	9.7	9.1	8.6	1.9	1.5	1.1
Central	5.8	6.1	3.4	4.1	3.9	3.8	3.6	3.1
Prairie	2.4	6.5	10.2	13.7	15.0	16.5	18.4	20.2
British Columbia	0.2	0.2	0.2	0.3	0.4	0.5	0.6	0.8

[1] For definition of a census farm and the changes in the definition, see footnote 1, Table 2.1.
[2] Newfoundland included in the Atlantic region, 1951 - 71.

Source: *1951 Census of Agriculture*, Vol. IV (1 and 2); *1971 Census of Agriculture*, Vol. IV (1 - 3).

Chart — 2.4

Distribution of Farmland and Urban Population Relative to Good Growing Conditions



Source: Unpublished data from G.D.V. Williams, Agriculture Canada.

Airphoto — 2.5

An Example of Conversion of Farmland to Urban Uses in the Toronto C.M.A., 1949-1974

N

1949

Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources.

Airphoto — 2.6

An Example of Conversion of Farmland to Urban Uses in the Toronto C.M.A., 1949-1974

Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources.

Airphoto — 2.7

Land Use Competition in the Rural-Urban Fringe: Agriculture, Highway 401, and an Auto Wrecking Yard (Near Oshawa)

Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources.

Airphoto — 2.8

Land Use Competition in the Rural-Urban Fringe: Agriculture, Quarry and Golf Course

Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources

TABLE 2.9. Livestock and Poultry[1]

	1901	1911	1921	1931	1941	1951	1961	1971
	thousands							
Milk cows	2,409	2,595	3,229	3,523	3,626	2,908	2,990	2,257
Other cattle	3,163	3,931	5,141	4,450	4,891	5,463	8,952	11,021
Pigs	2,354	3,635	3,324	4,700	6,081	4,916	5,333	8,107
Sheep	2,510	2,174	3,200	3,627	2,840	1,479	1,564	861
Horses	1,577	2,599	3,452	3,114	2,789	1,307	512	354
Hens and chickens	17,923	29,773	41,125	61,277	58,994	64,615	69,612	87,537
Other poultry		2,020	2,222	3,875	4,476	3,319	8,383	10,512

[1] Includes only animals on census farms; see Table 2.1 for definition of a census farm.

Source: *1941 Census of Canada*, Vol. I; *1951 Census of Agriculture*, Vol. VI (1); *1971 Census of Agriculture*, Catalogue 96-701.

TABLE 2.10. Fertilizers[1] Sold in Canada

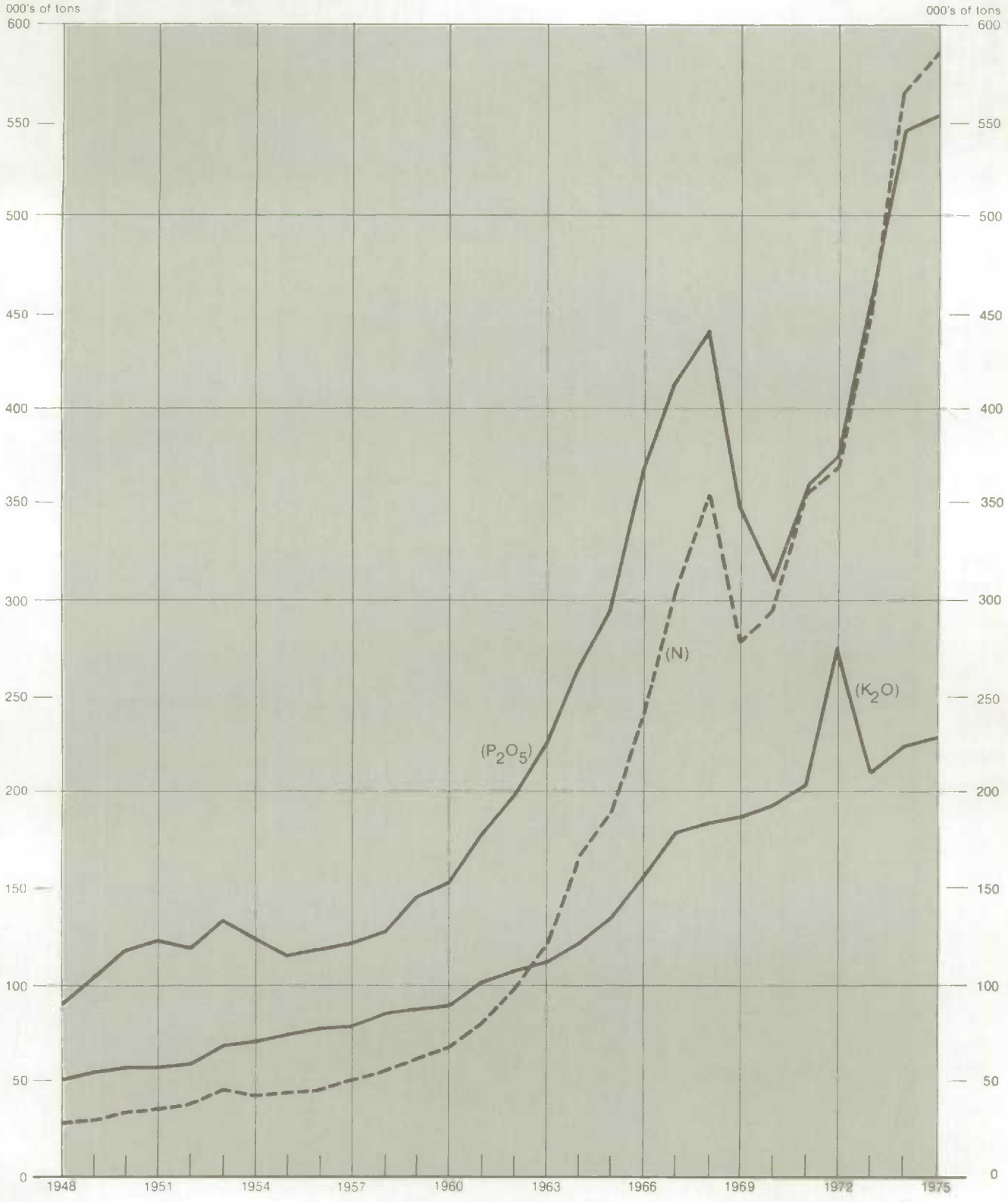
	Total fertilizers sold		Total fertilizers sold
	thousands of tons		thousands of tons
1929	224	1952	769
1930	321	1953	820
1931	284	1954	812
1932	180	1955	791
1933	166	1956	801
1934	195	1957	808
1935	212	1958	871
1936	234	1959	908
1937	298	1960	935
1938	323	1961	1,077
1939	334	1962	1,144
1940	347	1963	1,257
1941	324	1964	1,454
1942	420	1965	1,594
1943	499	1966	1,918
1944	535	1967	2,183
1945	575	1968	2,293
1946	633	1969	1,898
1947	661	1970	1,868
1948	672	1971	2,111
1949	742	1972	2,175
1950	765	1973	2,492
1951	771	1974	2,876

[1] Includes animal manure.

Source: Catalogue 46-207, *Fertilizer Trade.*

Chart — 2.11

Nutrient Content of Fertilizers Sold:
Tons of Nitrogen (N), Phosphoric Acid (P_2O_5) and Potash (K_2O)



Source: Same as in Table 2.10.

TABLE 2.12. Sales of Pest Control Products[1] by Canadian Registrants, by Use

	Agriculture	Home, garden and industrial	Rodenticides	Not specified	Total[2]	
	thousands of current dollars					thousands of constant 1971 dollars
1947	5,431	1,561	208	...	7,200	..
1948	8,088	2,024	202	...	10,315	..
1949	10,158	1,825	177	...	12,160	..
1950	11,048	2,343	167	...	13,558	..
1951	12,610	2,872	319	...	15,801	..
1952	12,708	3,033	459	...	16,200	..
1953	13,578	3,795	314	...	17,687	..
1954	14,876	4,133	347	...	19,356	..
1955	18,362	4,104	387	...	22,853	..
1956	20,154	4,208	323	...	24,685	..
1957[3]	14,834	4,096	344	351	19,625	..
1958	15,356	4,207	349	700	20,612	..
1959	18,986	5,405	447	485	25,323	..
1960	20,157	5,785	511	579	27,032	..
1961	25,044	7,426	561	671	33,702	..
1962	27,833	6,784	482	704	35,803	..
1963	28,710	6,295	557	855	36,417	..
1964	27,216	6,697	579	2,028	36,520	..
1965	29,929	6,832	603	1,666	39,030	..
1966	40,228	8,483	597	227	49,535	..
1967	45,581	13,380	620	...	59,581	..
1968	53,842	11,140	708	...	65,690	..
1969	46,138	12,219	681	...	59,038	..
1970	39,945	14,081	609	...	54,635	..
1971	41,866	14,893	566	...	57,325	57,325
1972	52,763	16,048	467	...	69,278	66,742
1973	77,070	18,632	599	...	96,301	92,419
1974	108,139	21,155	435[4]	...	129,729	91,358
1975	169,497	24,507	621	...	194,625	103,579

[1] Does not include sales to governments.
[2] Constant dollar figures were determined using the Industry Selling Price Index for Pest Control Products.
[3] Since 1957, the 12-month reporting period has ended September 30 rather than December 31.
[4] Agriculture rodenticides only, home and garden rodenticides are confidential.

Source: Catalogue 46-212, *Sales of Pest Control Products by Canadian Registrants*; Catalogue 62-001, *Industry Price Indexes*.

TABLE 2.13. Sales of Pesticides for Agricultural Use

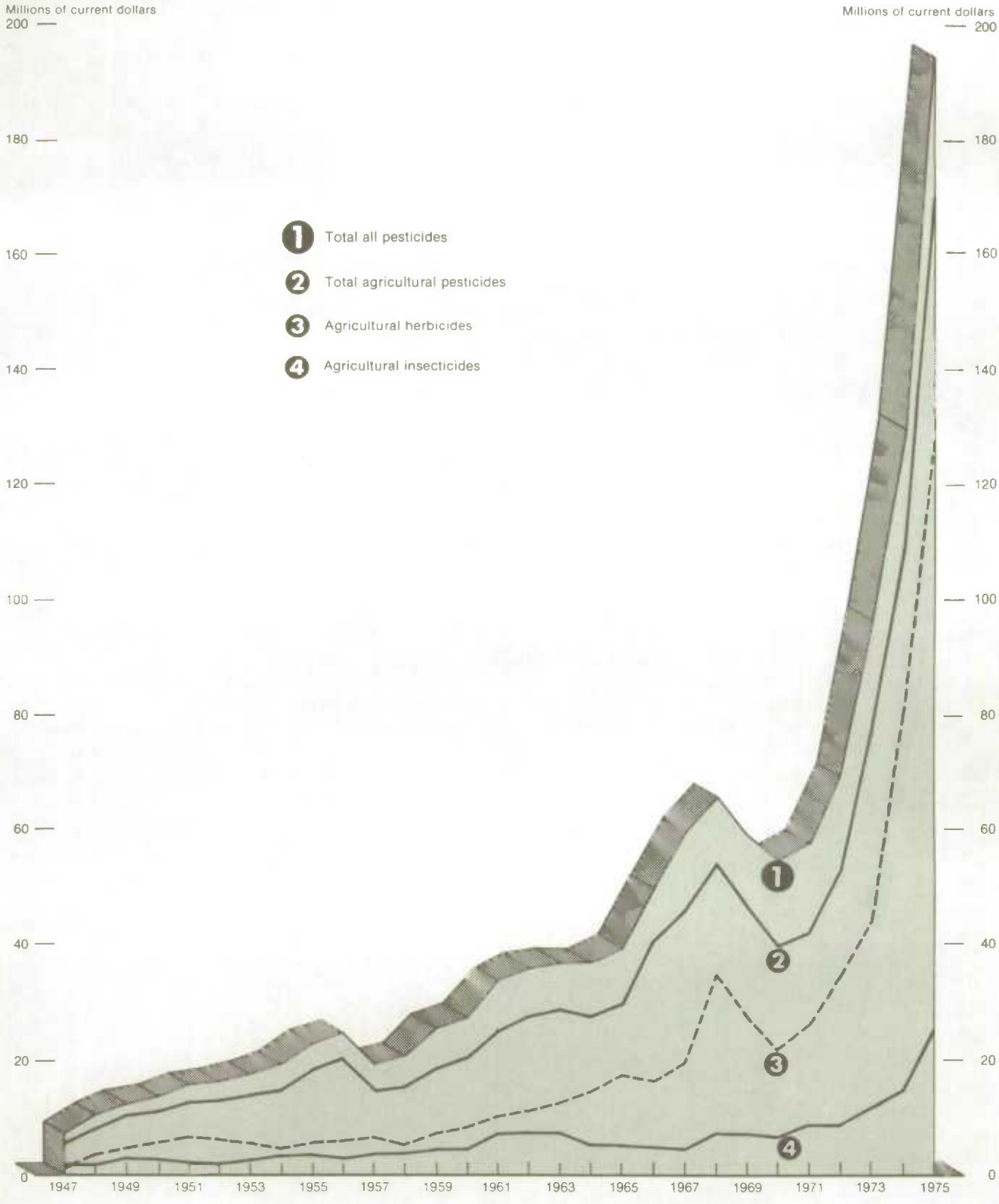
	Insecticides	Herbicides	Insecticides[1]	Herbicides[1]
	thousands of current dollars		thousands of constant 1971 dollars	
1947	1,799	1,046	..	..
1948	1,692	3,570	..	..
1949	2,669	4,676	..	..
1950	2,587	5,763	..	..
1951	2,199	6,926	..	..
1952	1,876	6,247	..	..
1953	2,107	5,700	..	..
1954	3,069	4,721	..	..
1955	3,223	5,730	..	..
1956	2,799	5,974	..	..
1957	3,354	6,450	..	..
1958	3,698	5,666	..	..
1959	4,742	7,608	..	..
1960	4,364	8,396	..	..
1961	7,268	10,295	..	..
1962	7,679	11,333	..	..
1963	7,642	12,736	..	..
1964	5,355	14,561	..	..
1965	5,110	17,194	..	..
1966	5,000	16,082	..	..
1967	4,815	19,672	..	..
1968	7,048	34,672	..	..
1969	7,105	27,524	..	..
1970	6,953	21,286	..	..
1971	8,987	25,805	8,987	25,805
1972	8,925	34,797	8,598	33,523
1973	11,628	53,330	11,159	51,180
1974	14,784	79,792	10,411	56,192

[1] See footnote 2, Table 2.12.

Source: Same as in Table 2.12.

Chart — 2.14

Sales of Pest Control Products



Source: Same as in Table 2.12.

TABLE 2.15. Improved Farmlands Sprayed, Fertilized and Irrigated, by Province, 1971

	Improved farmlands	Percentage of improved farmlands				
		Sprayed for		Fertilized	Irrigated by	
		Insects	Weeds		Sprinkler	Other
	acres					
Newfoundland	19,148	6.4	4.8	29.7	0.2	0.4
Prince Edward Island	494,131	13.0	21.6	28.1	--	0.1
Nova Scotia	386,021	6.4	10.0	24.4	0.2	0.3
New Brunswick	487,380	12.5	14.9	18.9	0.1	0.6
Quebec	6,449,992	2.1	6.4	18.0	0.2	1.3
Ontario	10,864,601	5.3	25.4	28.5	0.5	0.4
Manitoba	12,803,988	2.4	32.8	22.9	--	--
Saskatchewan	46,426,487	1.3	17.2	8.0	--	0.2
Alberta	28,460,328	1.4	19.2	19.6	0.4	1.4
British Columbia	1,755,247	4.3	7.8	18.2	4.6	8.0
Canada	**108,148,877**	**2.1**	**19.6**	**15.8**	**0.3**	**0.7**

Source: Catalogue 96-701, *1971 Census of Agriculture.*

TABLE 2.16. Nitrogen (N) and Phosphorus (P_2O_5) Content of Manure by Species, 1971

	Population	N coefficient	Total nitrogen	P_2O_5 coefficient	Total P_2O_5
		pounds per animal year	tons	pounds per animal year	tons
Cattle:					
Milk cows	2,257,465	140	158,023	65	73,368
Bulls	258,066	140	18,065	65	8,387
Beef cows	3,515,847	70	123,055	32	56,254
Calves	3,668,486	30	55,027	11	20,177
Steers	1,721,118	58	49,912	36	30,980
Heifers	1,857,251	58	53,860	36	33,431
Total	..	..	457,942	..	222,597
Poultry:					
Hens	27,299,147	1.5	20,474	1	13,650
Pullets	60,238,032	0.5	15,060	0.3	9,036
Other	10,512,362	1.2	6,307	0.1	526
Total	..	..	41,841	..	23,212
Mink	1,402,028	0.8	561	2.4	1,682
Hogs	8,106,926	23	93,230	14	56,748
Sheep	860,789	15	6,456	9	3,874
Horses	354,297	95	16,829	33	5,846
Grand total[1]	..	..	616,859	..	313,959

[1] The nutrient content of commercial fertilizers sold in 1971 was: nitrogen 356,140 tons and phosphorus 359,781 tons.

Source: *1971 Census of Agriculture,* Vol. IV (1); *Agricultural Land Uses, Livestock and Soils of the Canadian Great Lakes Basin,* Agriculture Canada, June 1974.

TABLE 2.17. Indicators of Technological Change, Selected Agricultural Inputs

	Croplands	Labour force[1]	Fertilizers	Tractors and combines[2]	Per 1,000 acres of cropland		
					Workers	Fertilizers	Machinery
	thousands of acres	number	tons	number		tons	number
1901	20,242	718,281	..	..	36	..	..
1911	35,898	928,336	..	..	26	..	..
1921	50,034	1,025,358	..	47,455	20	..	1
1931	58,340	1,118,342	284,207	114,277	19	5	2
1941	56,280	1,074,904	324,201	178,765	19	6	3
1951	62,212	826,093	770,507	490,186	13	12	8
1961	62,436	648,910	1,077,412	705,400	10	17	11
1971	68,766	512,150	2,110,978	759,449	7	31	11

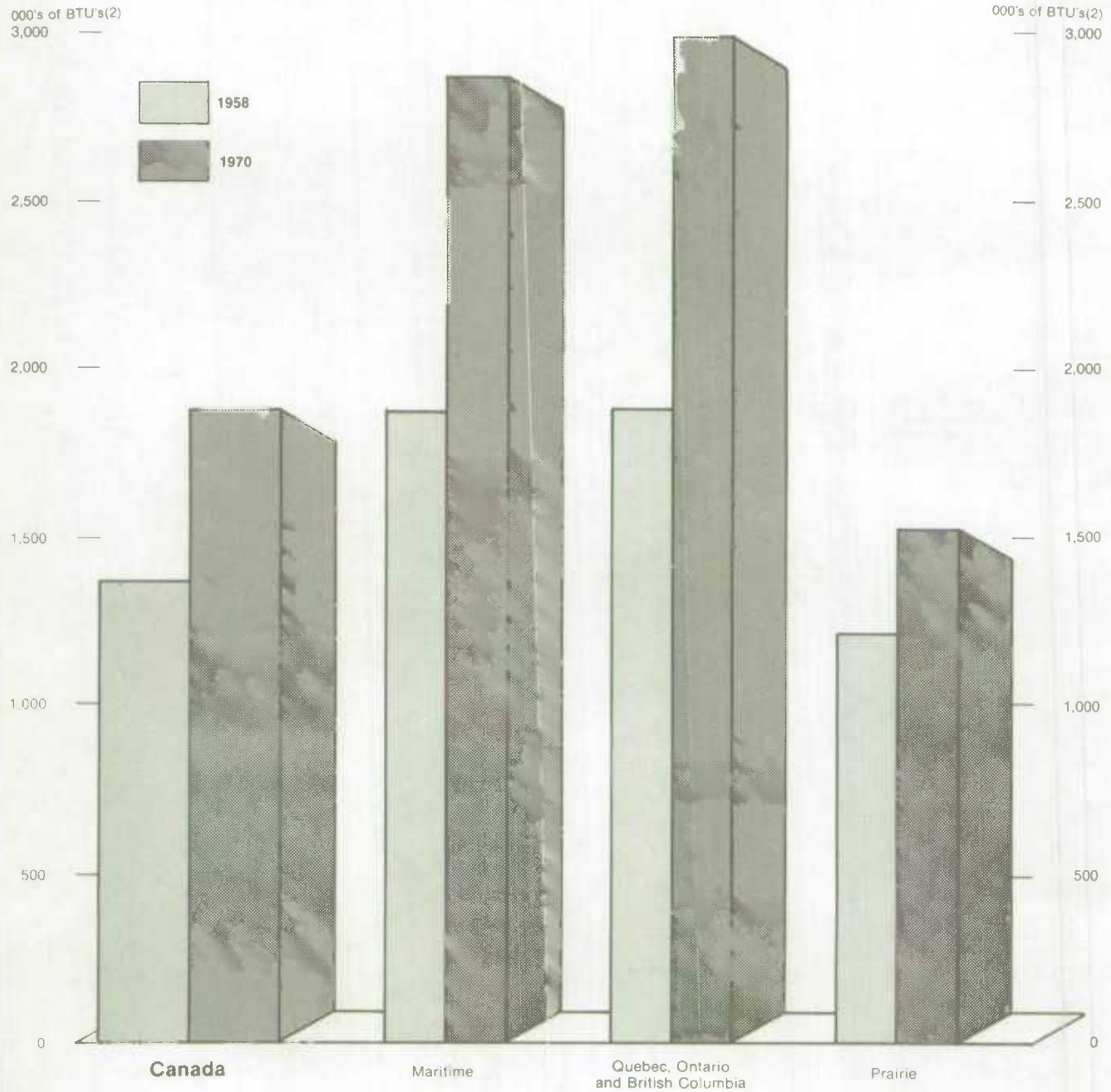
[1] Includes workers aged 10 and over in 1901 and 15 and over in all other years.
[2] Includes only tractors in 1921.

Source: *1921 Census of Canada*, Vol IV; *1961 Census of Canada*, Vol. III (2); Catalogue 46-207, *Fertilizer Trade; 1971 Census of Agriculture*, Vol IV. (1).

Sheep, Ottawa Valley (N.F.B. Phototheque, photo by Hans Blohm)

Chart — 2.18

Fuel (1) Use per Cultivated Acre(3), by Region



(1) Includes gasoline and diesel fuel used on farms by trucks, tractors and combines. The 1958 fuel amounts are from a special survey. The 1970 amounts of fuel were estimated using fuel expenditures, provincial fuel prices and numbers of trucks, tractors and combines.

(2) The BTU contents of the gasoline and diesel fuel was calculated using the following equivalents:
gasoline 0.1492 x 10^6 BTU/gallon
diesel 0.1665 x 10^6 BTU/gallon

(3) The cultivated acreage is based on the harvested acres of principal field crops, vegetables and tobacco.

Source: Catalogue 21-003, QUARTERLY BULLETIN OF AGRICULTURAL STATISTICS (1959, 1966 and 1971); Catalogue 21-510, 1958 FARM SURVEY REPORT, MOTOR VEHICLES AND MACHINERY ON FARMS; unpublished data from the Agriculture Division, Statistics Canada.

TABLE 2.19. Domestic Use of Principal Grains[1]

Crop year	Human food	Seed requirements	Industrial use[2]	Loss in handling[3]	Animal feed[4]	Total	Total domestic grain use
	per cent						thousands of bushels
1955-56	8.1	11.1	2.7	0.1	78.0	100.0	700,420
1956-57	8.5	11.3	2.9	0.1	77.2	100.0	681,688
1957-58	8.6	11.2	3.0	0.1	77.1	100.0	676,481
1958-59	8.4	11.0	2.7	0.1	77.8	100.0	696,974
1959-60	8.8	10.8	2.8	0.8	76.8	100.0	690,200
1960-61	8.7	10.4	2.8	0.1	78.0	100.0	713,285
1961-62	10.8	12.6	3.2	0.2	73.2	100.0	599,826
1962-63	8.8	11.3	3.2	0.1	76.6	100.0	666,239
1963-64	9.2	10.7	2.8	0.1	77.2	100.0	710,508
1964-65	9.2	10.6	3.2	0.2	76.8	100.0	700,779
1965-66	9.1	10.5	3.5	0.4	76.5	100.0	736,981
1966-67	8.4	9.7	3.7	0.3	77.9	100.0	775,060
1967-68	9.2	10.5	4.1	--	76.2	100.0	719,968
1968-69	9.1	9.8	4.1	0.8	76.2	100.0	728,325
1969-70	8.7	6.7	4.0	0.2	80.4	100.0	802,488
1970-71	8.1	8.0	4.0	0.1	79.8	100.0	857,404
1971-72	7.8	7.3	4.3	0.2	80.4	100.0	910,334
1972-73	7.9	8.2	4.5	0.2	79.2	100.0	885,618
1973-74	8.2	7.7	4.5	0.3	79.3	100.0	866,891

[1] Includes wheat, oats, barley, rye and flaxseed. Rapeseed is included from 1965-66.
[2] Includes grains used in the following industries: distilling, alcohol, malting, brewing, feed, starch, adhesives, miscellaneous chemicals, explosives, pulp and paper; also flaxseed and rapeseed crushed for subsequent export as oil and oil meal.
[3] Includes drying loss, outturn loss (lake and rail), fire and storage loss, etc.
[4] Residual after estimating for other uses; includes waste and dockage.

Source: Catalogue 22-201, *Grain Trade of Canada* (1961-62, 1966-67, 1972-73).

TABLE 2.20. Grain[1] Consumed Per Grain Consuming Animal Unit[2]

Crop year	Total amount consumed	Grain consuming animal units	Consumption per unit
	thousands of tons	thousands	tons
1950-51	11,547	14,016	0.82
1951-52	13,525	14,595	0.93
1952-53	12,052	15,250	0.79
1953-54	12,056	14,321	0.84
1954-55	12,049	15,015	0.80
1955-56	13,278	15,277	0.87
1956-57	12,808	15,525	0.82
1957-58	12,801	15,900	0.81
1958-59	13,310	17,063	0.78
1959-60	13,002	17,634	0.74
1960-61	13,370	16,312	0.82
1961-62	11,067	16,004	0.69
1962-63	12,759	15,485	0.82
1963-64	13,430	15,903	0.84
1964-65	13,490	16,775	0.80
1965-66	14,585	16,427	0.89
1966-67	15,799	16,633	0.94
1967-68	15,125	17,215	0.88
1968-69	16,068	16,771	0.96
1969-70	17,764	17,116	1.04
1970-71	18,885	18,879	1.00
1971-72	20,360	19,251	1.06
1972-73	20,000	19,037	1.05
1973-74P	20,336	19,205	1.06

[1] Includes wheat, oats, barley, rye, corn, buckwheat and mixed grains.
[2] Grain consuming animal unit equals the equivalent in consumption of grain of one average milk cow per year.

Weights used:

Milk cows	1.00	Hogs	0.87
Other cattle	0.51	Sheep	0.04
Horses	0.50	Poultry	0.045

The units for a particular crop year are based on the estimated number of livestock and poultry as at June 1 immediately preceding that crop year.
The amount of grain consumed is somewhat dependent on prices, therefore, if prices are high, cattle are switched to pasture or fodder. Hogs, however, are always fed on grain.

Source: Catalogue 21-003, *Quarterly Bulletin of Agricultural Statistics* (1961, 1962, 1963, 1973 and October-December 1974).

TABLE 2.21. Intensity of Agricultural Activity by Selected Watersheds, 1971

Watersheds[1]	Code	Total area	Farmlands		Percentage of farmlands fertilized
		thousands of acres		per cent of area	
Assiniboine River	24	39,852.9	35,927.3	90.1	5.5
South Saskatchewan, Red Deer Rivers	253	37,842.6	32,070.8	84.7	7.6
North Saskatchewan River	251, 252	37,837.8	27,693.7	73.2	11.5
Lake Winnipeg	23	69,409.9	14,221.3	20.5	17.9
Peace River	320	77,281.9	7,157.0	9.3	12.9
Gulf of Mexico Basin	5	6,339.2	5,998.1	94.6	0.6
Lake Erie and Lake St. Clair	17	6,012.4	4,477.3	74.5	56.8
Bow River	254	6,169.6	3,285.1	53.2	13.1
Eastern Townships, Quebec	144	5,642.8	3,111.8	55.1	22.8
Fraser River	41	57,403.8	2,869.4	5.0	9.1
South Lake Huron	180	4,013.4	2,832.8	70.6	26.9
Chaudière River	142	4,777.9	2,172.4	45.5	12.0
Lower Ottawa River (Ontario part)	150-35	2,367.9	1,372.4	58.0	14.0
Lake Simcoe	181	5,561.5	1,238.6	22.3	31.9
Saint John River	13	9,307.2	1,188.0	12.8	29.8
Trent System	161	3,326.5	1,121.2	33.7	12.3
Columbia River	40	25,398.7	903.2	3.6	23.8
Belleville	160	1,998.8	813.5	40.7	11.1
Prince Edward Island	114	1,399.0	774.6	55.4	56.0
West St. Lawrence River	147	1,488.2	739.7	49.7	12.9
North Gaspé Coast	112	3,448.2	733.8	21.3	13.5
Bay of Fundy (south part)	120	3,797.6	666.6	17.6	27.3
Montréal	146	1,232.5	573.9	46.6	53.9
Niagara	165	811.7	363.2	44.7	85.4

	Croplands	Cattle	Pigs	Number of farms
	thousands of acres	thousands		
Assiniboine River	16,561.8	1,618.1	720.7	48,090
South Saskatchewan, Red Deer Rivers	11,536.8	2,061.3	814.6	31,678
North Saskatchewan River	11,313.2	1,817.4	995.3	38,363
Lake Winnipeg	6,680.4	803.6	828.0	28,255
Peace River	2,979.2	29.4	12.8	9,630
Gulf of Mexico Basin	1,166.3	257.8	27.1	2,431
Lake Erie and Lake St. Clair	3,094.4	331.4	468.2	32,544
Bow River	1,101.8	345.2	84.6	3,394
Eastern Townships, Quebec	1,411.9	570.1	450.6	17,673
Fraser River	357.2	393.8	49.8	9,598
South Lake Huron	1,410.7	751.0	599.3	15,784
Chaudière River	812.6	400.4	498.1	13,261
Lower Ottawa River (Ontario part)	604.9	286.4	58.3	7,290
Lake Simcoe	534.0	256.0	158.8	7,287
Saint John River	299.9	98.5	41.7	4,605
Trent System	404.3	219.6	83.9	5,808
Columbia River	157.4	100.3	10.6	4,854
Belleville	285.6	120.1	34.9	3,767
Prince Edward Island	351.4	106.1	100.9	4,543
West St. Lawrence River	318.7	144.9	23.2	4,009
North Gaspé Coast	258.7	92.7	41.6	3,358
Bay of Fundy (south part)	145.8	75.6	56.5	2,894
Montréal	345.3	97.6	38.8	4,622
Niagara	240.7	54.5	79.5	4,956

[1] Ranked by farmland acreage.

Source: Same as in Table 1.4.

CHAPTER III

FORESTS

LIST OF CONTENTS

FORESTS

The great expanse of forests that blanket Canada's mid-latitudes is a central part of the nation's image. Canadian history is laced with references to the role of the forest as an arena for events, as a resource, or as an impediment to movement and development. A common theme underlying much of the forest's use throughout the period is that it has been an object to be conquered, controlled and modified for man's benefit.

These modifications result in a variety of stresses, some of which may produce unforseen and undesirable consequences. Every use of the forest by man gives rise to stresses. An approximate measure of their relative strengths can be made by determining the length of time it takes the system to return to an approximation of its natural state.

The short-term effects of stressors can be predicted fairly accurately and, with proper resource management, impacts can be softened. The long-term effects of stress on the forest system are not as clear. While certain probabilities can be estimated and scenarios designed, ultimate consequences for extended periods of time are largely unknown.

The forest is much more than just a tree resource. It is, first of all, a diverse biological community consisting of trees, plants and animals, together with other components, such as soils, water resources and climate. A change in one sector of this community causes reactions in other parts. The greatest stresses on this system usually come from the forestry industry.

In 1973, 31% of Canada's area was classed as forest land (see Table 3.2). Of this total, slightly over 50% is considered to be suitable and economically profitable for regular harvest.

Although the depletion of the forest as a resource may appear to be a first concern, there is no national shortage of forest resources in this country at present. By moving into ever more remote areas and by introducing new techniques of harvesting, the industry has been able to find sufficient quantities of good timber to satisfy demands, albeit with continually escalating costs. At regional levels, however, there have been a number of cases where serious depletion has taken place. An indication of the extent to which Canadian forests have been cut over is that 54% of land presently inventoried for timber production is classed as young or immature growth.[1] (Tables 3.6 to 3.8 present data on forest depletion.) The logging industry in Nova Scotia and New Brunswick suffers from a lack of large numbers of mature trees due to the demand placed on the resource over many years. In British Columbia, the fast replacement rate for trees, due to a long growing season, fertile soil and great quantities of moisture, allows more intensive harvesting to take place. Even here, however, the methods of the forestry industry are likely to put stress on local environments.

Photograph 3.1 illustrates current techniques used widely on Vancouver Island. This airphoto, taken from 30,000 feet, presents several valleys that have been clear cut and a number of mountain sides that have been strip cut of trees. A network of logging roads covers much of the area. The total effect of such action on the local environment is not entirely known. Clear cutting of trees tends to increase the chance of soil erosion and long-term exposure of previously tree-covered soil could change its chemical composition. Activity patterns of wildlife in the area have undoubtedly been altered and their populations may have been reduced. Intensive forestry in an area also affects water quality in lakes and streams, at least to the extent that soil runoff changes water clarity. Local drainage patterns may be changed by the presence of roads and other physical alterations of the landscape. Removal of forest is known to produce small-scale local climate changes. The exposed areas are likely to experience greater temperature variations, for instance, than adjacent treed lands. In time, the natural regenerative processes restore the affected areas, although certain adverse effects of lumbering may be evident for some time after the actual cutting operations cease.

The timber industry often tends to concentrate efforts on one or several species that have proven to be more valuable than others. As a result of this, one type of tree may be over-harvested, upsetting the natural species mix in the forest and placing some pressures on the depleted species' ability to regenerate in numbers. An active policy of reforestation on the part of the forest industry is the best method to help restore the forest to some semblance of its former state. This process, however, has proven to be exceedingly expensive for an industry in which profit margins are already slim in many parts of the country. (In fact, only 5% of the annual depleted acreage in Canada is replanted.)[2] The remainder is left to be reforested by slow natural methods. As harvests increase each year (Table 3.6) it seems inevitable that the pressures put on the remaining forests will grow at an accelerating rate.

The reforestation process itself may also result in pressures on the natural community. Species replanted

[1] Manning, G.H., and Grinnel, H.R., *Forest Resources and Utilization in Canada to the Year 2000*, Environment Canada, Ottawa, 1971.

[2] Chapman, J.D., Natural Resource Developments in Canada, 1970 - 75, *The Canadian Geographer*, Vol. XX, 1, spring 1976.

are only those considered economically valuable. By introducing an overabundance of one species of tree and failing to consider other necessary members of the system, the natural balance could be upset and unforseen changes conceivably could occur.

The logging industry, however, is not the only cause of man-made stress on the forest. The use of the forest as prime recreation land, for hunting and for transportation corridors, subjects it to a variety of man-induced pressures, one of the most notable being forest fires.

Available data on forest stocks (Tables 3.2 to 3.5) are quite good when compared with information available on other natural resource stocks such as, for example, quantities of fish in the North Atlantic, or total potential commercial reserves of oil. Excellent estimates of forest reserves can be made by ground-sampling counts, airphoto analysis, or simple calculations based on the known percentage of forested land in an area. Other methods of remote sensing, including false colour airphoto and satellite pictures, may allow judgments to be made concerning the quality of the trees present. The data available in most cases, however, are still closely geared to providing information for the logging industry. While it is necessary to have information in a format suitable for the needs of industry, it would also be useful in the future to organize data in a more scientifically-oriented format. To be specific, little or no data are currently available concerning the effects of the man-induced stressors mentioned in this chapter on the forest system. Also, collection of data for biological sub-areas, covering all components of the forest system, might in future provide a better handle for more effective management of this valuable resource.

Airphoto — 3.1

Logging Activity on Vancouver Island

Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources.

TABLE 3.2. Classification of Forest Lands, 1973

	Acres	Per cent of total
	thousands	
Private	56,120	7.0
Federal and provincial Crown lands:		
Reserved for parks, conservation areas	38,235	4.7
Allocated for forestry production	348,647	43.3
Not allocated	96,828	12.0
Not suitable for regular harvest[1]	19,961	2.5
Not economically viable	246,092	30.5
Total	805,883	100.0
Total area of Canada	2,478,993	...

[1] Because of low productivity.

Source: Catalogue 25-202, *Canadian Forestry Statistics* (1973).

TABLE 3.3. Classification of Forest Lands by Province, 1973

	Private	Crown lands					Total	
		Reserved	Allocated to wood production	Not allocated to wood production	Not suitable for regular harvest	Not economical for regular harvest		
	per cent							thousands of acres
Newfoundland	4	2	11	8	7	68	100	31,504
Prince Edward Island	94	1	4	1	–	–	100	619
Nova Scotia	72	4	24	–	–	–	100	10,982
New Brunswick	54	2	44	–	–	–	100	15,594
Quebec	10	–	32	52	6	–	100	171,998
Ontario	10	–	82	–	–	8	100	106,806
Manitoba	2	3	65	–	–	30	100	33,476
Saskatchewan	3	5	63	2	–	27	100	31,678
Alberta	2	18	52	–	9	19	100	75,663
British Columbia	5	3	71	5	–	16	100	134,652
Yukon and Northwest Territories	–	8	8	–	–	84	100	192,611

Source: Same as in Table 3.2.

TABLE 3.4. Merchantable[1] Timber by Province, 1973

	Softwoods	Hardwoods	Total	Provincial share of total
	millions of cubic feet			per cent
Newfoundland	7,775	1,241	9,016	1.3
Prince Edward Island	136	64	200	--
Nova Scotia	6,283	2,672	8,955	1.3
New Brunswick	14,655	5,793	20,448	3.0
Quebec	96,965	33,466	130,431	19.4
Ontario	91,390	58,269	149,659	22.2
Manitoba	12,174	3,584	15,758	2.3
Saskatchewan	10,343	7,011	17,354	2.6
Alberta	33,638	20,102	53,740	8.0
British Columbia	260,375	7,224	267,599	39.8
Canada	533,734	139,426	673,160	100.0

[1] Suitable for commercial purposes, but not necessarily economically profitable to harvest.

Source: Same as in Table 3.2.

TABLE 3.5. Merchantable Timber by Species, 1973

Species	Volume	Percentage of total merchantable timber	Species	Volume	Percentage of total merchantable timber
	millions of cubic feet			millions of cubic feet	
Softwoods:			Hardwoods:		
Spruce	220,098	32.7	Poplar	66,368	9.9
Balsam fir	98,493	14.6	White birch	32,981	4.9
Douglas fir	17,865	2.7	Yellow birch	12,897	1.9
Hemlock	63,755	9.5	Maple	18,322	2.7
White pine	6,827	1.0	Beech	3,182	0.5
Red pine	1,432	0.2	Elm	98	--
Jack and lodgepole pines	82,243	12.2	Ash	998	0.1
Ponderosa pine	277	--	Basswood	738	0.1
Cedar	35,919	5.3	Oak	607	0.1
Yellow cypress	5,198	0.8	Other	3,235	0.5
Other	1,626	0.2			
Total	533,734	79.3	Total	139,426	20.7
			Grand total	673,160	100.0

Source: Same as in Table 3.2.

TABLE 3.6. Primary Forest Harvest by Province – Five-year Averages

	1949-53	1954-58	1959-63	1964-68	1969-73
	thousands of cubic feet				
Newfoundland	109,409	99,776	97,017	93,158	95,223
Prince Edward Island	10,551	10,051	8,629	6,199	7,099
Nova Scotia	115,282	103,871	90,583	110,955	118,336
New Brunswick	216,941	202,243	178,426	209,056	258,567
Quebec	982,783	956,915	892,151	969,584	1,068,333
Ontario	528,145	527,040	524,279	587,174	635,668
Manitoba	67,491	59,322	45,868	40,081	66,918
Saskatchewan	70,696	55,077	45,690	52,043	98,622
Alberta	119,355	113,797	133,411	124,672	216,155
British Columbia	861,266	1,045,626	1,271,444	1,585,040	2,120,821
Yukon and Northwest Territories	3,945	4,787	3,685	3,588	113,230
Canada	**3,085,864**	**3,178,505**	**3,291,183**	**3,781,550**	**4,798,972**

Source: Catalogue 25-202, *Canadian Forestry Statistics.*

TABLE 3.7. Primary Depletion of Forest Resources – Five-year Averages

	Volume cut	Fire losses	Total depletion	
	millions of cubic feet			millions of acres[1]
1949-53	3,086	219	3,305	2.1
1954-58	3,179	354	3,533	2.2
1959-63	3,291	666	3,957	2.5
1964-68	3,782	388	4,170	2.6
1969-73	4,456	344	4,800	3.0

[1] Approximately 1,600 cubic feet of wood per acre.

Source: Same as in Table 3.6.

TABLE 3.8. Selected Forestry Indicators

	Production	Imports	Exports	Harvested area[1]	Total apparent supply[2]	Consumption per household	
	millions of cubic feet			thousands of acres	millions of cubic feet	cubic feet[3]	trees[4]
Softwood lumber:							
1951	1,016	12	519	635	509	149	10
1956	1,150	27	606	719	571	146	10
1961	1,234	23	762	771	495	109	7
1966	1,583	24	893	1,016	714	138	9
1971	1,939	25	1,324	1,212	640	108	7
1973	2,361	41	1,552	1,475	850	136	9
Hardwood lumber:							
1951	98	9	28	61	79	23	2
1956	87	18	20	54	85	22	1
1961	81	18	19	51	80	18	1
1966	108	21	38	68	91	18	1
1971	87	16	28	54	75	12	1
1973	119	22	28	74	113	18	1
Newsprint:							
1951	631	–	580	394	51	16	1
1956	732	–	677	457	55	14	1
1961	762	–	710	476	52	11	1
1966	968	–	888	605	80	15	1
1971	967	–	885	605	82	14	1
1973	1,046	–	953	654	93	15	1

[1] Production divided by 1,600 cubic feet per acre.
[2] Production plus imports, minus exports.
[3] Total apparent supply divided by the number of households.
[4] Consumption per household in cubic feet divided by 15 cubic feet per tree.

Source: Catalogue 35-204, *Sawmills, Planing Mills and Shingle Mills;* Catalogue 36-204, *Pulp and Paper Mills;* Catalogue 65-202, *Exports.*

TABLE 3.9. Exports of Pulp and Paper by Type of Product

	Newsprint	Printing paper	Fine paper	Tissue and sanitary paper	Wrapping paper	Paperboard	Pulp	Total	Total volume exported
	per cent								millions of cubic feet
1951	62.0	0.4	0.1	0.1	0.3	1.1	36.0	100.0	946
1956	63.2	0.5	–	–	0.3	1.0	35.0	100.0	1,066
1961	60.0	0.5	0.2	–	0.7	0.9	37.7	100.0	1,186
1966	57.0	1.2	0.3	0.1	0.6	1.7	39.0	100.0	1,552
1971	46.6	1.9	0.4	0.1	1.4	1.7	47.8	100.0	1,901
1973	44.4	1.6	0.7	0.2	2.6	2.2	48.3	100.0	2,146

Conversion Factors

	Product unit	Roundwood conversion in cubic feet
Newsprint	thousands of tons	113.5 per ton
Softwood lumber	millions of bd. ft.	158 per thousand bd. ft.
Hardwood lumber	millions of bd. ft.	189 per thousand bd. ft.
Printing paper	thousands of tons	136.5 per ton
Fine paper	thousands of tons	136.5 per ton
Tissue and sanitary paper	thousands of tons	177.7 per ton
Wrapping paper	thousands of tons	187.9 per ton
Paperboard	thousands of tons	99.2 per ton
Pulp (D and A)	thousands of tons	220.0 per ton
Pulp (other)	thousands of tons	156 per ton

Source: Catalogue 65-202, *Exports.*

CHAPTER IV

FISHERIES

LIST OF CONTENTS

FISHERIES

One of Canada's earliest industries was fishing. By the early 1500's, the news of great numbers of codfish in the waters off eastern North America had attracted fishermen from a host of nations.

The importance of the marine resource as a major source of protein in a food-short world is becoming increasingly clear. Canada, therefore, has a signal responsibility to manage and maintain the valuable fish, mollusc and crustacean communities found on this nation's continental margins.

The abundance and variety of marine life on Canada's continental shelves can be attributed to a variety of natural processes acting in harmony. The major requirement for large concentrations of fish is food supply, usually in the form of zooplankton, phytoplankton and other micro-organisms. The presence of this basic resource allows the existence of a vertically linked food chain, running from the micro-invertebrates through larger invertebrates such as shrimp and squid, to small and, finally, large species of fish. In most instances, however, it is the larger, economically harvestable fish varieties that man, the consumer, is most concerned with.

The existence of sufficiently large volumes of plankton depends on local area conditions. Phytoplankton development is limited by the light energy that is available for photosynthesis and by the amount of phosphorous and nitrogen nutrients. Currents that produce upwellings of these nutrients from bottom sediments stimulate the growth of phytoplankton in upper ocean layers where light is available. The bottom substratum is also important in determining the level of biological activity in this process. A rocky, topographically varied bottom will allow fewer nutrients to be moved than a gently sloping silt-covered shelf. Too muddy a bottom, however, may result in insufficient amounts of oxygen being present for bottom-dwelling species due to its depletion by the organic decomposition process. Depth of water and temperature are also important for the development of fertile marine environments. Water depth determines, to a degree, the amount of nutrients that are brought up from the bottom. In addition, if the foregoing conditions for ensuring an adequate food supply are met, shallow areas tend to support large populations of bottom-dwelling species. Organisms, especially bottom dwellers, usually have shorter life spans at higher temperatures. Decomposition also takes place more rapidly as temperature increases. Again, the result may be oxygen depletion in the bottom layer of water.

Large areas of continental shelf on the Atlantic and Pacific margins of Canada meet the necessary biological requirements to support large populations of marine life; indeed, the Grand Banks of Newfoundland meet them so well that it is considered possibly the most productive of the world's fishing grounds. As a result, the area has been subjected to several hundred years of extensive exploitation by foreign and Canadian fishing fleets.

Marine life has historically been viewed as an inexhaustible resource, but the pressures placed upon the resource by modern fishing techniques have proven that this is not the case. Exhaustion of existing stocks caused the Pacific Coast herring catch to drop to levels a fraction of their former size by the late 1960's (see Table 4.3). In the North Atlantic, extreme pressure has been imposed on stocks of already scarce halibut and haddock by nature of their economic value. The measures for conservation of fish stocks, especially in international waters, have had few teeth to ensure that catch and type limitations are being followed, a problem compounded by the fact that each country has, in the past, been responsible for much of the policing of its own fleet under the regulations of the International Commission for the North Atlantic Fisheries.

A major factor encountered in marine resource conservation is the proliferation of technological improvements which increase capture levels. In the past, it has been difficult to convince an industry concerned primarily with maximizing returns within limits set essentially for that group's benefit that a real need exists to allow stocks to replenish themselves. The method of vacuuming the oceans of nearly all swimming life over large areas has undoubtedly been one example of the short-sighted attitude prevailing in some parts of the international fishing industry. However, while these foreign nations tend to exploit a wide range of species, thereby spreading out the impact in some measure, domestic efforts concentrate mostly on a few scarce, high-value species. Tables 4.2 and 4.3 illustrate Canadian fish landings by species and point up the degree of concentration. In 1974, four species comprised 83% of total Atlantic Coast fish landings by weight. On the Pacific Coast, only two species made up 83% of total fish landings the same year.

Fishing in Canada has traditionally been a labour-intensive, small-scale operation for the most part, especially in areas where for many years inshore fishermen were unable to accumulate capital to allow an increase in the scale of operations. Limitations in fish handling and preserving, of course, also restricted the size of the market served. Tables 4.4 and 4.5 indicate, however, that although the number of marine fishermen in the industry has remained relatively constant for the past 20 years, the number of large fishing vessels in service has risen significantly. This move to more capital-intensive operations is in part a response to the competition with foreign fleets for the available resource. Canadian

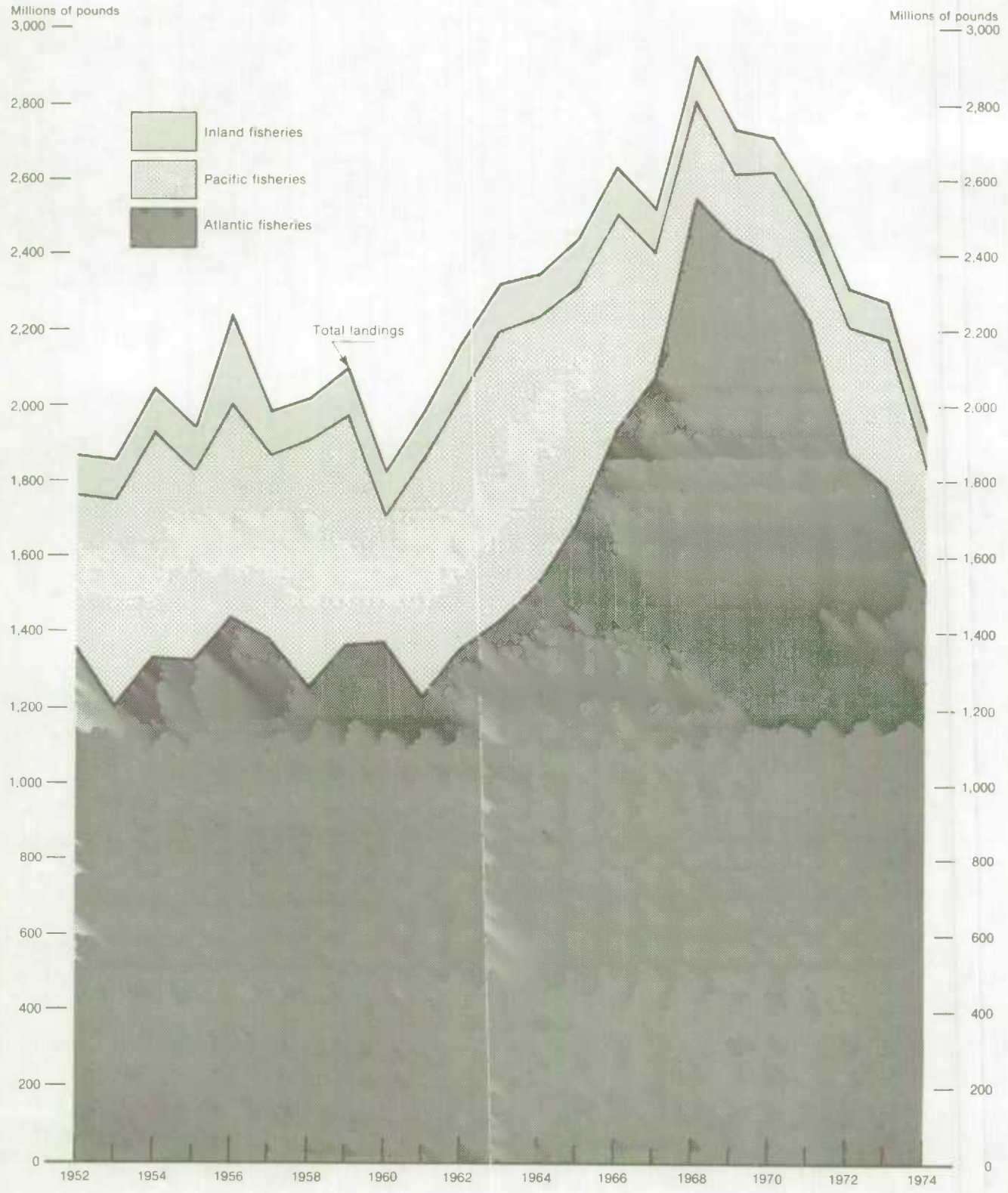
catches, as a result, rose steadily until the late 1960's, when the pressures of overfishing produced painfully evident results.

Continued pollution of the ocean and inland lakes and rivers has also produced adverse effects on the marine environment. Mercury poisoning from contaminated fish was first recognized as a very serious problem in the Minimata, Japan incident a number of years ago. Since that time, the ocean fishery for swordfish has been curtailed due to mercury pollution and commercial operations in many inland areas of Canada have been stopped due to similar problems.

Hope exists for a rational operation of the fishing industry in Canada. The new 200-mile zone of economic control over the continental shelves which Canada implemented on January 1, 1977, should allow this country better control over this valuable resource. Most important, it must be viewed as an opportunity to rebuild for the future a resource that has been seriously depleted.

Chart — 4.1

Canadian Fish Landings by Region



Source: Catalogue 24-201, FISHERIES STATISTICS OF CANADA.

TABLE 4.2. Canadian Fish Landings by Species, Atlantic Coast

	1957	1961	1966	1971	1973	1974
	millions of pounds					
Groundfish:						
Cod[1]	641.8	516.9	563.1	449.2	324.5	287.9
Haddock[1]	131.6	118.4	112.8	53.6	33.5	27.2
Redfish[2]	46.3	56.2	183.1	248.6	349.3	193.3
Halibut[3]	7.6	6.1	4.6	3.3	2.7	2.5
Plaice, flounders[2]	86.5	107.3	224.2	282.4	269.3	217.7
Turbot[1]	1.3	1.4	30.8	22.9	16.9	15.2
Pollock[1]	36.8	49.7	34.6	22.1	50.0	46.2
Other	34.1	29.3	48.7	56.0	52.2	48.8
Total	**986.0**	**885.3**	**1,201.9**	**1,138.1**	**1,098.4**	**838.8**
Pelagic and estuarial:						
Herring[2]	222.3	193.3	569.9	924.4	499.0	497.4
Mackerel[2]	19.7	14.1	25.7	32.9	47.7	36.7
Swordfish[3]	5.2	3.2	7.4	–	–	–
Tuna[3]	0.1	0.1	0.4	6.8	14.0	13.9
Salmon[2]	3.0	3.5	5.2	4.0	4.8	4.9
Other	44.8	24.5	26.8	22.5	34.0	54.6
Total	**295.1**	**238.7**	**635.4**	**990.6**	**599.5**	**607.5**
Molluscs and crustaceans:						
Oysters	3.7	4.1	3.5	2.7	2.3	2.8
Scallops[4]	3.3	10.5	18.2	11.2	11.1	14.0
Lobsters	44.4	47.5	37.3	38.2	35.6	31.4
Crabs	–	–	–	15.4	22.4	23.4
Other	13.4	24.0	17.3	21.1	15.7	14.6
Total	**64.8**	**86.1**	**76.3**	**88.6**	**87.1**	**86.2**

[1] Weighed gutted, head on.
[2] Weighed round, that is fresh, uncleaned.
[3] Weighed gutted, head off.
[4] Weighed shucked from shell.

Source: Same as in Chart 4.1.

TABLE 4.3. Canadian Fish Landings by Species, Pacific Coast

	1957	1961	1966	1971	1973	1974
	millions of pounds, common landed form[1]					
Groundfish:						
Halibut[2]	25.0	29.5	32.0	25.3	14.5	7.4
Sole	8.0	6.1	10.5	10.7	6.8	7.2
Cod	13.4	9.3	27.8	13.6	18.0	20.2
Other	0.3	0.4	0.3	2.5	3.0	1.4
Total	**46.7**	**45.3**	**70.6**	**52.1**	**42.3**	**36.2**
Pelagic and estuarial:						
Herring	295.4	448.4	162.9	22.1	122.6	98.5
Salmon	131.9	121.6	307.7	132.4	185.2	134.2
Other	4.3	8.7	12.5	10.6	22.6	13.0
Total	**431.6**	**578.7**	**483.1**	**165.1**	**330.4**	**245.7**
Molluscs and crustaceans:						
Clams	3.8	2.3	2.5	2.5	1.6	2.4
Crabs	3.0	4.6	4.5	2.0	2.6	2.5
Oysters	5.1	6.4	12.4	6.3	9.9	8.1
Shrimps and prawns	1.6	1.2	1.7	0.7	1.7	2.7
Other	–	–	–	0.1	0.2	0.1
Total	**13.5**	**14.5**	**21.1**	**11.6**	**16.0**	**15.8**

[1] Form in which the species of fish involved is most commonly weighed.
[2] Includes halibut landed in United States ports by Canadian fishermen.

Source: Same as in Chart 4.1.

TABLE 4.4. Primary Employment in Fishing

	Number of persons employed		
	Sea	Inland	Total
1951	47,740	17,448	65,188
1961	61,457	16,903	78,360
1962	62,134	16,684	78,818
1963	64,377	17,305	81,682
1964	61,879	16,246	78,125
1965	62,335	15,822	78,157
1966	57,918	15,328	73,246
1967	57,327	13,923	71,250
1968	57,842	13,743	71,585
1969	53,873	11,110	64,983
1970	53,404	9,545	62,949
1971	50,741	8,104	58,845
1972	49,643	..	..

Source: Same as in Chart 4.1.

TABLE 4.5. Canadian Vessels Involved in Marine Fisheries

	Atlantic			Pacific			Total
	Under 10 tons	10 - 99.9 tons	Over 100 tons	Under 10 tons	10 - 99.9 tons	Over 100 tons	
	number of vessels						
1963	35,393	2,060	179	..	..	..	..
1964	35,798	2,172	195	..	..	..	..
1965	36,757	2,373	237	..	1,484	113	..
1966	33,752	2,498	273	5,337	1,926	79	43,865
1967	32,458	2,569	333	5,515	2,160	95	43,130
1968	31,194	2,703	361	5,386	2,206	94	41,944
1969	29,254	2,796	356	4,827	2,273	81	39,587
1970	29,113	2,905	365	4,576	2,321	78	39,358
1971	28,402	2,949	351	4,272	2,359	67	38,400
1972	25,409	3,152	321	4,252	2,344	74	35,552
1973	..	..	..	4,174	2,334	81	..
1974	..	..	..	4,402	2,586	96	..

Source: Same as in Chart 4.1.

TABLE 4.6. Catches of All Species in the Northwest Atlantic by Selected Nations

	1961	1966	1971	1974
	metric tons, round fresh[1]			
Canada	655	997	1 105	845
Denmark	104	124	73	71
France	180	152	56	39
Federal Republic of Germany	174	178	134	83
German Democratic Republic	...	95	142	131
Norway	49	43	35	59
Poland	4	72	270	215
Portugal	197	202	153	145
Spain	208	240	269	184
Soviet Union	341	841	1 022	1 157
United States	441	968	979	1 029
Other	48	70	108	89
Total	**2 401**	**3 982**	**4 346**	**4 047**

[1] Round refers to fish in whole, i.e., uncleaned, not gutted form.

Source: *International Commission for Northwest Atlantic Fisheries*, Statistical Bulletin, Vol. 24, 1974.

Filleting fish, Gaspé, Quebec (photo by Tony Friend)

CHAPTER V

TRANSPORTATION

LIST OF CONTENTS

TRANSPORTATION

Technological improvements in transport vehicles that use fossil fuels have effectively shrunk man's world so that today he can cross whole continents in equivalent time and with considerably less effort than it took his ancestors to journey to the next town two centuries ago. Not only have these improvements resulted in decreased travel time, but they have permitted a manyfold increase in the number of movements of people and goods. These many trips, plus the required supporting infrastructure, have made transport activity one of the most visible of the various stresses man places on the environment.

The need to improve and expand transportation systems will continue in future, but greater care will probably be taken in systems planning. The single-minded economic efficiency criteria will increasingly give way to a "cost-benefit" approach where the objectives will be to minimize social and environmental stress. Environmental impact statements have in many cases become mandatory for large-scale projects, for example, the Mackenzie Valley Pipeline. Assessment of whole systems, however, is difficult and serious considerations of alternative (environmentally less harmful) systems have not gone much beyond public debate.

Environmental stress resulting from transportation activity tends to be generalized in nature and can rarely be described in direct cause and effect terms. The comments below touch on some of these general concerns.

Air Pollution

It is obvious that the exhaust products of the internal combustion engine contribute to the amount of hydrocarbons, nitrous oxides and carbon monoxide found in the ambient air of cities. The size of that contribution, however, is not easily ascertained, either in absolute terms or in comparison with the share attributable to industry or residential heating. The actual concentration of these gases in the atmosphere is in part a function of prevailing weather conditions. Regulations limiting the quantity of noxious exhaust gases discharged per vehicle may reduce the problem somewhat; efforts to reduce traffic density represent another approach to improving the situation.

Noise

Noise is an inevitable by-product of the use of machinery. The familiar car "muffler" was one of the first anti-noise-pollution devices required by law. The movement of vehicles is one of the major sources of noise and consequently the measurement of "noise shadows" (from airports, expressways, major arterials) is increasingly being recognized as an important tool for physical planning.

Spillage of Hazardous Substances

Spillage of hazardous substances is one of the major concerns in the control of environmental contamination. Transportation and storage is considered one of the primary sources of this type of pollution and new regulations are being implemented to minimize this risk. Nevertheless, the increase in volume of transportation and storage of these substances may mean that even with reduced risk per unit transported, the "spillage" in absolute terms may, in fact, increase.

Landform Transformation

Landform transformation is a phenomenon associated with construction of transportation networks and their terminals. Because of the scale of many of these operations, they often result in the total restructuring of local habitats. Although in terms of the country as a whole these "restructuring" processes may seem insignificant, they may have considerable impact on the quality of local environments and fragile ecosystems.

Energy Sources of Modern Transportation Systems

Energy sources of modern transportation systems are almost exclusively fossil fuels. A large part of the environmental stress originating from exploration, extraction, refining, storage and transportation of these fuels can be attributed directly to the demand for energy in transportation.

Physical Infrastructure, Networks and Stocks (Chart 5.1 to Table 5.22)

The statistical tabulations in this chapter are quantitative in nature rather than qualitative, and relate indirectly to the measurement of environmental stress attributable to transportation. These include data detailing the extension or growth of networks, growth of transport equipment stocks and parallel technical changes. The purpose of the data presented here is primarily to raise issues that can ultimately only be examined with more environmentally oriented data from other areas of research. In many cases, these data are not available.

The reader is cautioned to consult the source documents carefully in order to become familiar with the limitations of the data in this publication. For example, motor vehicle registrations are frequently used as a proxy for vehicle movements and fuel consumption estimates. The user must also be aware of a number of technical shortcomings, such as differences in definition and licensing practices between provinces and the possibility of a commercial vehicle being registered in several provinces.

Extensions of transportation networks into new areas are, in a sense, intrusions into "stable" ecosystems. Although they may in themselves create only minor disturbances, the indirect impact can have dramatic end results. The extension of railways into the Prairie grasslands in the late 19th and early 20th centuries and the subsequent settlement of these regions, are examples. Today, the expansion of networks is largely confined to providing access to resources in remote regions.

Density of networks may be considered a function of population, economic activity and transport technology. The tendency for an increasing proportion of the population to live in a few large, interconnected urban agglomerations (for example, the Windsor - Quebec Axis) is both a cause and an effect of high-density systems. Careful planning and control of transportation and utility corridors are required if the quality of the rural landscape between these cities is to be preserved.

Increases in the volume of traffic place stresses on the system itself and, until recently, acceptable solutions for the provision of additional capacity have been largely dictated by engineering criteria. Today, however, social and environmental factors are becoming important terms of reference for planning and design. This is reflected in changes in urban expressway construction policy and renewed interests shown in the area of urban public transportation.

Improvements in technology have a major impact on the shifts in popularity of various transport modes. The underlying dynamics can be attributed to the drive for more efficient means for transporting goods and people which, in economic terms, can be expressed as reductions in cost/time per "ton mile" and cost/time per "passenger mile". Technological change in one sphere tends to effect a set of responses in other spheres, such as the impact on urban development due to the spread of ownership of the private automobile.

Technological change is difficult to capture statistically, although it may be indirectly reflected in the data on the weight of aircraft (Table 5.22) and the increase in the average length of freight trains (Table 5.25). Specialization is also a reflection of technological change. The most striking example has been the growth of energy networks (Tables 5.9 and 5.10). In the 1960's, improvement in electric transmission technology made it possible to tap distant hydro sources. Map 5.13 shows some of the results of this technical breakthrough, with high-tension systems connecting the remote sources of hydro power of the Peace, Nelson, Churchill and Manicouagan Rivers with the population centers in the south.

Movement of Goods and People (Tables 5.23 to 5.36)

Statistics in this section measure the intensity of use of the transportation network and its terminals. Data on the movement of goods and people are only available for the organized public transportation systems. As a result, one of the major missing pieces of statistical information is that of the movement of people by private automobile. Even a rough calculation would show that this mode of transportation totally dominates in terms of the number of vehicle-miles travelled and energy consumed. If an average figure of 10,000 miles a year per passenger car is assumed, the corresponding number of miles travelled for the eight million passenger cars in Canada would be 80 billion miles. A second assumption (that the car on average carried two people) would provide a figure of 160 billion passenger miles Compare this with the 16.7 billion passenger miles for airlines and 1.9 billion passenger miles for railways, which combined are less than 12% of those of the automobile.[1]

Evidence of the wasteful use of automobile travel is demonstrated in Table 5.33, which indicates that less than 10% of automobiles carry passengers other than the driver. The same table notes that less than 16% of workers take some form of public transport to work, although in highly urbanized areas, the latter figure is undoubtedly higher.

Another area where comprehensive data are lacking is that of the movement of goods by truck. Regular surveys in this area cover only those "for hire", which account for less than 3% of all registered trucks. A major part of this universe consists of small pickup-type trucks.

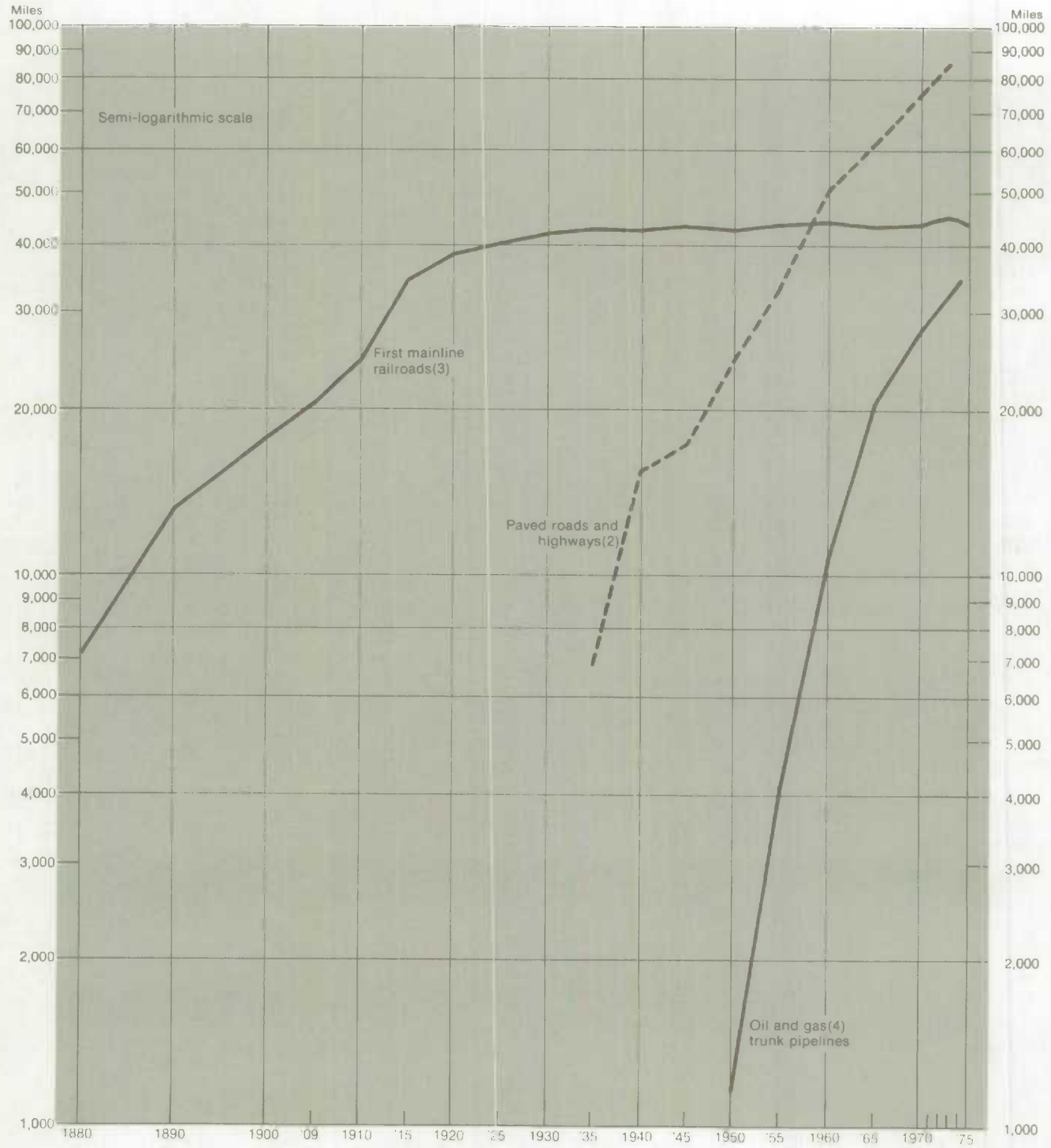
The data on the movement of goods and people by rail and air are generally good and provide background data on the flow of aggregate movements.

---

[1] These are assumptions for the sake of argument only and in no way reflect available "hard" data.

Chart — 5.1

Railroad, Road and Pipeline Mileage(1)

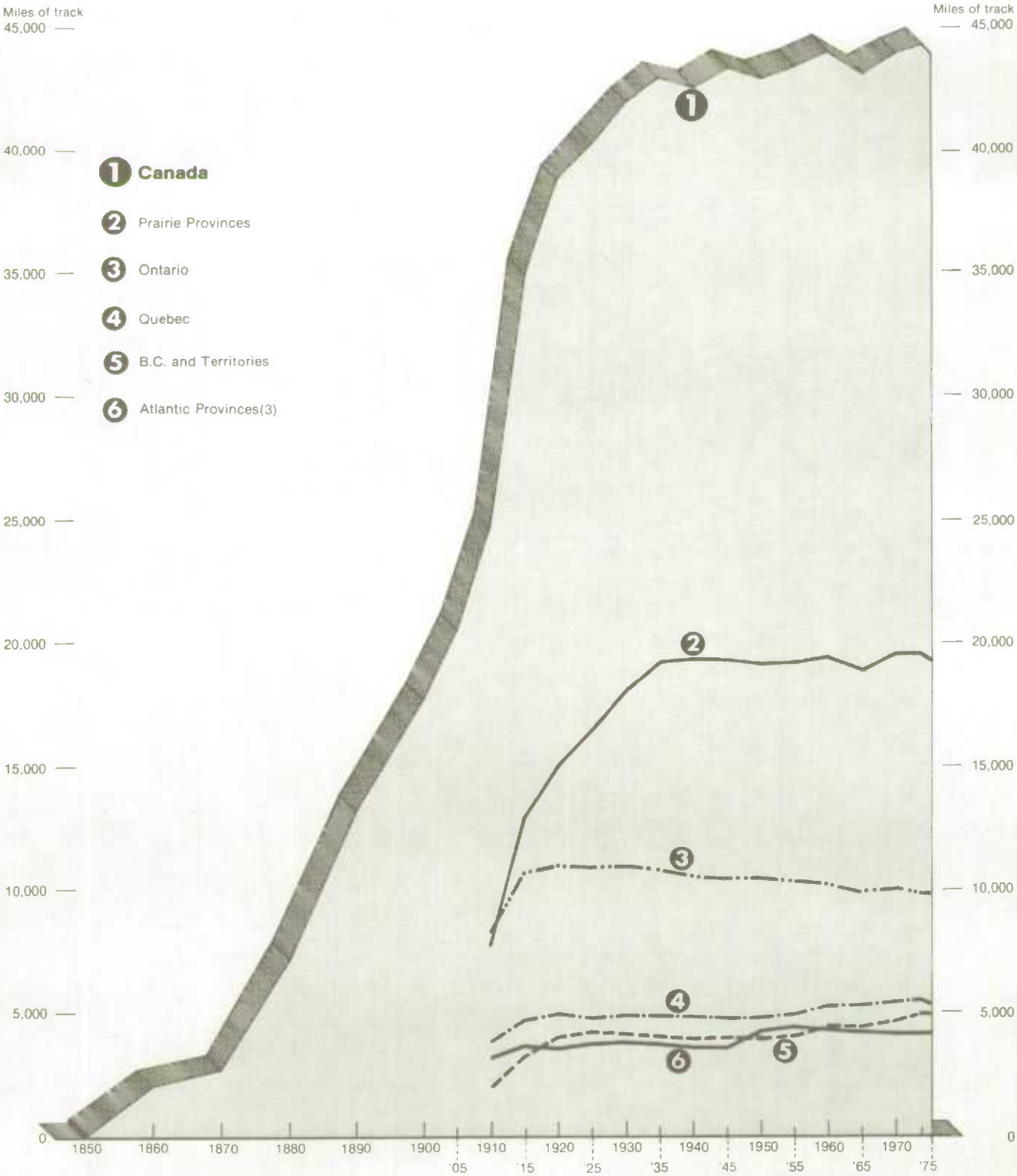


(1) Data are presented from earliest possible year; semi-log scale is employed to allow comparisons of rates of growth.
(2) Does not include urban streets.
(3) First mainline is mileage between stations only, i.e., does not include sidings and switching yards.
(4) Major point to point lines only, does not include collectors from fields.

Source: Catalogue 53-201, ROAD AND STREET MILEAGE; Catalogue 55-201, OIL AND PIPELINE TRANSPORT; Catalogue 52-209, RAILWAY TRANSPORT, PART 3; unpublished data from Manufacturing and Primary Industries Division, Statistics Canada.

Chart — 5.2

Mainline Railroad Track(1) by Region(2)



(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: Catalogue 52-209, RAILWAY TRANSPORT, PART III.

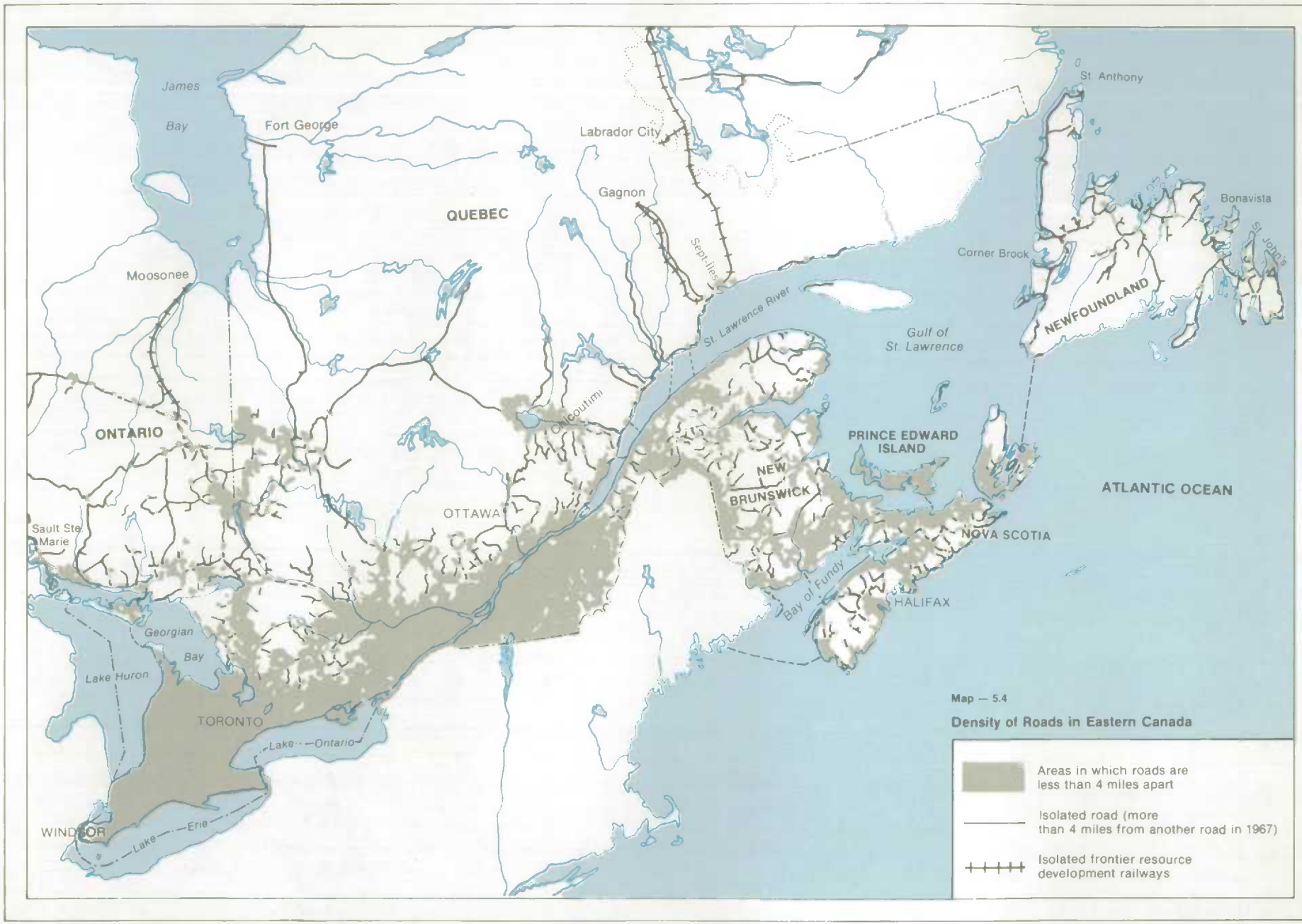
TABLE 5.3. Road and Highway Mileage[1]

	Paved roads	Expressways[2]	All roads[3]	Percentage of road[3] miles paved
	miles			
1935	6,848	..	410,808	1.7
1940	15,594	..	499,191	3.1
1945	17,440	..	491,380	3.5
1950	24,519	..	567,155	4.3
1955	33,240	..	455,404	7.3
1960	50,119	..	421,448	11.9
1965	61,631	847[4]	448,378	13.7
1970	75,647	1,680	460,422	16.4
1973[5]	85,098	2,057[6]	482,460	17.6

[1] Does not include urban streets.
[2] For details see Table 5.6.
[3] Total road miles vary greatly over time due, in part, to changes in definitions by the reporting provinces. For this reason, paved roads are a more accurate measure of this transportation network. In addition, the majority of automobiles, especially in recent years, travel infrequently on unpaved roads.
[4] Mileage for 1964.
[5] The 1973 data are from the Roads and Transportation Association of Canada.
[6] Mileage for 1972.

Source: Catalogue 53-201, *Road and Street Mileage and Expenditure;* Roads and Transportation Association of Canada, *Nation on the Move.*

Fraser Street Car Dump, Vancouver (N.F.B. Phototheque, photo by Tony Scammell)



Source: Based on information from THE NATIONAL ATLAS OF CANADA, FOURTH EDITION, Ottawa, 1974

Map — 5.5

Density of Roads
Western Canada

Areas in which roads are less than 4 miles apart

Isolated road (more than 4 miles from another road in 1967)

Isolated frontier resource development railways

YUKON TERRITORY

NORTHWEST TERRITORIES

BRITISH COLUMBIA

ALBERTA

SASKATCHEWAN

MANITOBA

ONTARIO

HUDSON BAY

PACIFIC OCEAN

WHITEHORSE

Watson Lake

Fort Nelson

YELLOWKNIFE

Pine Point

Uranium City

Churchill

James Bay

Lynn Lake

Flin Flon

Terrace

Smithers

Grande Prairie

EDMONTON

SASKATOON

CALGARY

REGINA

WINNIPEG

Golden

Kelowna

VANCOUVER

VICTORIA

Hearst

Thunder Bay

Lake Superior

Source: Basedon information from THE NATIONAL ATLAS OF CANADA, FOURTH EDITION, Ottawa, 1974

TABLE 5.6. Expressways[1]

	1964	1970	1972	1975
	miles			
Newfoundland	–	–	–	7
Prince Edward Island	–	–	–	–
Nova Scotia	–	–	–	34
New Brunswick	–	–	4	25
Quebec	150	567	872	1,137
Ontario	522	737	762	1,057
Manitoba	45	138	169	220
Saskatchewan	6	6	10	280
Alberta	49	131	139	395
British Columbia	75	101	101	103
Canada	847	1,680	2,057	3,258

[1] Includes divided, controlled access highways with four or more lanes. They may be maintained by either federal or provincial governments.

Source: Roads and Transportation Association of Canada, *Nation on the Move.*

TABLE 5.7. Paved Roads and Highways by Region

	Atlantic provinces[1]	Quebec	Ontario	Prairie provinces	British Columbia, Yukon and North-west Territories
	miles				
1935	361	1,235	4,008	565	679
1940	2,077	3,866	6,847	1,345	1,459
1945	2,207	4,483	7,709	1,434	1,607
1950	2,848	6,433	10,102	2,749	2,387
1955	3,735	8,995	11,515	5,657	3,338
1960	6,036	13,804	16,372	8,761	5,146
1965	8,060	14,389	21,518	12,289	5,375
1970	9,276	16,387	24,398	18,269	7,317
1973[2]	10,925	17,479	26,453	21,732	8,509

[1] Newfoundland included after 1949.
[2] The 1973 data is from the Roads and Transportation Association of Canada.

Source: Same as in Table 5.3.

TABLE 5.8. Air Travel Between Major Canadian Metropolitan Centres[1]

City pair	1968	1970	1974	1975
	thousands of passengers			
Montréal - Toronto	725.4	898.4	1,232.0	1,165.8
Rank	1	1	1	1
Ottawa - Toronto	269.8	359.5	581.5	583.6
Rank	2	2	2	2
Toronto - Vancouver	161.9	223.8	422.1	435.8
Rank	4	4	3	3
Calgary - Edmonton	181.2	239.8	386.8	421.3
Rank	3	3	4	4
Calgary - Vancouver	141.3	195.9	316.6	342.1
Rank	6	6	5	5
Edmonton - Vancouver	128.1	169.0	278.7	287.8
Rank	7	7	7	6
Toronto - Winnipeg	153.1	207.2	281.3	285.4
Rank	5	5	6	7
Calgary - Toronto	88.2	111.4	204.4	221.7
Rank	11	11	8	8
Halifax - Toronto	77.1	107.6	171	182.3
Rank	15	13	12	9
Montréal - Vancouver	83.8	112.5	197.2	176.1
Rank	13	10	9	10
Edmonton - Toronto	70.1	92.2	162.5	175.3
Rank	17	16	13	11
Montréal - Québec	111.5	136.8	181.9	171.9
Rank	9	9	11	12
Ottawa - Montréal	115.1	146.6	194	169.2
Rank	8	8	10	13
Thunder Bay - Toronto	69.9	92.2	152.8	159.9
Rank	18	17	15	14
Vancouver - Winnipeg	78.6	108.9	153.1	159.3
Rank	14	12	14	15

[1] Includes domestic portions of international journeys.

Source: Catalogue 51-204, *Air Passenger Origin and Destination, Domestic Report* (1968, 1970, 1974 and 1975).

TABLE 5.9. Miles of Oil and Natural Gas Pipelines

	Trunk Lines[1]			Product lines[2]			Total
	Oil	Natural gas	Total	Oil	Natural gas	Total	
	miles						
1950	1,158	..	1,158	..	..	..	1,158
1955	4,192	..	4,192	..	..	..	4,192
1960	4,473	6,301	10,774	1,189	462	1,651	12,425
1965	6,565	14,206	20,771	1,695	467	2,162	22,933
1970	8,756	19,282	28,038	1,782	390	2,172	30,210
1974	9,324	25,107	34,431	2,305	328	2,633	37,064

[1] Trunk lines are defined as the main transporting lines for unrefined oil or natural gas.
[2] Product lines are defined as lines built to carry refined products such as gasoline or fuel oil.

Source: Catalogue 55-201, *Oil Pipeline Transport;* unpublished data, Manufacturing and Primary Industries Division, Statistics Canada.

TABLE 5.10. Electric Transmission Circuit Mileage by Power Line Voltage[1]

Power line voltage	1956	1961	1966	1971	1973	1974
	miles					
20 - 99 kilovolts	37,609	41,160	44,457	49,001	48,794	49,316
100 - 199 "	12,905	16,723	20,793	25,079	25,907	26,225
200 - 299 "	4,397	5,752	8,220	14,690	15,692	15,963
300 - 399 "	911[2]	2,330[2]	2,710	3,610	3,893	4,168
400 - 599 "	..	..	436	1,572	2,699	2,908
600 kilovolts and over	..	..	623	1,223	2,531	2,508
Total transmission circuit mileage	55,822	65,965	77,239	95,175	99,516	101,088

[1] The right of way swath cut for power lines varies directly with the voltage that line carries. The following table presents some indication of the right of way sizes involved:

	Single line		Double line	
	Width of right of way	Acres of right of way for one mile of line	Width of right of way	Acres of right of way for one mile of line
	feet		feet	
69 kilovolts	100	12	125	15
161 "	125	15	175	21
345 "	150	18	175	21
500 "	200	24	200	24

[2] Includes all lines 300 kilovolts and over for 1956 and 1961.

Source: Catalogue 57-202, *Electric Power Statistics;* United States Federal Power Commission, *Hydroelectric Power Evaluation,* Washington, D.C., March 1968.

TABLE 5.11. Electric Transmission Circuit Mileage by Region, 1973

Power line voltage	Atlantic provinces	Quebec	Ontario	Prairie provinces	British Columbia	Yukon and Northwest Territories	Canada
	miles						
20-99 kilovolts	4,940	3,911	9,947	25,946	3,675	375	48,794
100-199 "	2,284	4,649	7,249	8,588	2,616	521	25,907
200-299 "	1,035	2,037	7,450	3,808	1,362	–	15,692
300-399 "	49	3,533	3	–	308	–	3,893
400-599 "	–	–	435	1,113	1,151	–	2,699
600 kilovolts and over	–	2,531	–	–	–	–	2,531
Total transmission circuit mileage	8,308	16,661	25,084	39,455	9,112	896	99,516
Percentage of Canadian total	8.4	16.7	25.2	39.6	9.2	0.9	100.0

Source: Catalogue 57-202, *Electric Power Statistics* (1973).

Shipping Activity, St. Joseph de la Rive, Quebec (photo by Tony Friend)

Airphoto — 5.12

Hydro-power Line Right of Way Through Forested Land Near Bancroft, Ontario

Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources.

Source: *Department of Energy, Mines and Resources.*

*NOTE: Only stations with total installed generating capacities of not less than 1,500 KW are shown.

TABLE 5.14. Airport Activity as Measured by the Number of Passengers and Length of Longest Runway, 1975

Airport	Number of arriving scheduled passengers[1]	Length of longest runway[2]	
	thousands	metres	feet
Toronto International	9,706	3 368	11,050
Montréal International	7,026	3 353	11,000
Vancouver International	4,533	3 353	11,000
Calgary International	2,487	3 864	12,675
Winnipeg International	2,145	3 353	11,000
Ottawa International	1,726	3 048	10,000
Edmonton International	1,574	3 353	11,000
Halifax International	1,351	2 682	8,800
Québec	650	2 286	7,500
Edmonton Municipal	616	1 789	5,868
Regina	554	2 408	7,900
Saskatoon	488	2 530	8,300
Victoria International	462	2 134	7,000
St. John's	385	2 591	8,500
Thunder Bay	379	1 890	6,200
Saint John	288	2 134	7,000
Prince George	285	1 951	6,400
Sept-Îles	281	2 003	6,572
Sydney	280	2 155	7,070
Moncton	266	2 439	8,000
Windsor	255	2 408	7,900
Gander	230	3 201	10,500
Fort St. John	224	2 103	6,900
London	218	2 682	8,800
Fredericton	214	1 829	6,000

[1] The number of passengers is used as a correlate of total airport activity. More passengers arriving should mean more and larger aircraft using the facilities. The level of environmental stress is related to size of plane and the amount of aircraft activity at airports.

[2] The length of the longest runway acts as a rough indicator of the size of the largest plane that may land at an airport. The requirements per plane vary with its loads, the air temperature, elevation of airport, weather conditions and runway gradients. A Beechcraft D185, a small aircraft, requires approximately 1 035 metres for landing and 850 metres for takeoff under normal conditions. A Boeing 707-300, a large passenger plane, is likely to require 2 450 metres for landing and 3 000 metres for takeoff under similar conditions if it is carrying a full load.

Source: Catalogue 51-203, *Airport Activity Statistics* (1975); Surveys and Mapping Branch, Department of Energy, Mines and Resources, *VFR Chart Supplement*, 1975.

TABLE 5.15. Licensed and Other Significant Canadian Airports and Airstrips,[1] With and Without Radio Control Towers by Province, 1975

	With radio control towers	Without radio control towers	Total
Newfoundland	4	9	13
Prince Edward Island	1	2	3
Nova Scotia	4	8	12
New Brunswick	4	10	14
Quebec	10	65	75
Ontario	18	91	109
Manitoba	5	27	32
Saskatchewan	3	35	38
Alberta	8	57	65
British Columbia	12	47	59
Yukon	1	8	9
Northwest Territories	2	38	40
Canada	**72**	**397**	**469**

[1] Includes all publicly (Ministry of Transport, Department of National Defence, city and provincial) and privately owned airports and airstrips, but does not include seaplane landing sites.

Source: Surveys and Mapping Branch, Department of Energy, Mines and Resources, *VFR Chart Supplement*, 1975.

TABLE 5.16. Port Activity as Measured by Net Registered Tonnage of Vessels,[1] 1975

Port	Vessels arriving and departing, total net registered tonnage[2]	Total tonnage of cargo loaded and unloaded	Number of vessels arriving at port[3]	Ice conditions during winter[4]
	thousands of tons			
Vancouver[5]	44,794	35,521	9,736	open
Montréal[6]	32,082	18,632	3,373	restricted
Sept-Îles[7]	25,666	30,195	1,303	restricted
Thunder Bay	21,396	20,027	1,310	closed
Halifax	16,642	11,742	1,429	open
Hamilton	16,091	14,270	935	closed
Port Cartier	15,817	17,627	663	restricted
Saint John	13,935	10,850	988	open
Québec	12,758	12,496	1,016	restricted
North Sydney	11,502	623	1,728	open
Sarnia	10,124	9,090	1,552	closed
Baie Comeau	8,563	7,334	621	open
Sault Ste. Marie	7,744	5,930	506	closed
Sorel	6,977	7,428	530	closed
Port Hawkesbury	6,804	7,718	364	open
Victoria	5,752	1,976	2,058	open
Toronto	5,299	2,987	654	closed
New Westminster	5,237	2,481	2,013	open
Trois-Rivières	3,914	2,841	611	restricted
Port Alfred	3,882	4,004	353	closed

[1] Total net registered tonnage provides the capacity of the spaces within the hull and the enclosed spaces above the deck available for cargo and passengers, but excludes spaces used for the accommodation of officers and crew, and for storing navigation propelling machinery and fuel.

[2] Total net registered tonnage is counted for the arrival and the departure of each vessel.

[3] Includes coastal traffic.

[4] "Open" indicates that the port use is not restricted by ice; "restricted" indicates that use of the port is restricted by ice at some time during the winter and "closed" indicates that the port is closed by ice at some time during the winter.

[5] Includes Roberts Bank.

[6] Excludes Contrecoeur, Varennes and Verchères.

[7] Includes Point Noire.

Source: Catalogue 54-203, *Shipping Report: Part II, International Seaborne Shippins* (1975),Catalogue 54-204, *Shipping Report: Part III, Coastwise Shipping* (1975); *The National Atlas of Canada*, Fourth Edition, Ottawa 1974.

TABLE 5.17. Number of Transport Vehicles Registered in Canada

	Registered motor vehicles	Railroad motive power and rolling stock	Ships[1]	Aircraft[2]
1910	5,945	128,112	..	..
1920	282,450	237,076	..	..
1930	1,232,489	227,824	..	520
1940	1,500,829	171,272	..	473
1950	2,600,269	186,590	14,816	2,242
1960	5,256,341	200,424	19,507	5,318
1970	8,497,339	194,955	27,072	11,315
1973	10,158,440	192,590	29,539	15,618
1975	11,442,643	199,110	30,563	17,990

[1] Includes fishing vessels.
[2] Includes aircraft with or without valid certification of airworthiness.

Source: Catalogue 52-209, *Railway Transport: Part III*; Catalogue 53-203, *The Motor Vehicle*; Catalogue 53-219, *The Motor Vehicle: Part III, Registrations;* Catalogue 51-202, *Civil Aviation;* unpublished information, Transportation Division, Statistics Canada.

TABLE 5.18. Inventory of Railroad Motive Power and Rolling Stock

	Motive power			Rolling stock	
	Steam locomotives	Diesel electric locomotives	Electric locomotives	Sleeping cars	Total passenger cars
1910	4,079	–	..	283	4,320
1920	6,014	–	16	584	6,557
1930	5,414	–	37	1,224	7,346
1940	4,272[1]	..	36	915	6,267
1950	4,272	350	33	795	6,338
1960	403	3,308	41	861	5,119
1965	–	3,301	22	641	3,638
1970	–	3,399	18	482	2,801
1973	–	3,748	14	393	2,175
1974	–	3,870	14	369	2,056
1975	–	3,963	14	344	1,936

	Rolling stock			Passenger cars as a percentage of total rolling stock
	Box cars	Flat cars	Total freight cars	
1910	75,983	20,769	119,713	3.5
1920	155,964	24,939	224,489	2.8
1930	151,500	17,728	215,027	3.3
1940	116,629	12,049	160,697	3.8
1950	122,419	11,263	175,597	3.5
1960	111,217	12,645	191,553	2.6
1965	105,822	13,475	182,090[2]	2.0
1970	101,746	18,043	188,737	1.5
1973	95,239	22,010	186,653	1.2
1974	95,538	24,898	190,892	1.1
1975	92,669	25,722	193,197	1.0

[1] Includes diesel electric locomotives.
[2] The power of locomotives and capacity of freight cars increased significantly in the period 1950-70. Thus a drop in the number of cars does not necessarily mean a decline in actual carrying capacity.

Source: Catalogue 52-209, *Railway Transport: Part III.*

TABLE 5.19. Number of Vessels Owned by Canadian Commercial, Chartering and Private Water Carriers, by Province of Domicile, 1974

	Canadian flag			Non-Canadian flag – Active	Grand total
	Active	Inactive	Total		
Newfoundland	60	8	68	–	68
Prince Edward Island	6	–	6	–	6
Nova Scotia	66	15	81	11	92
New Brunswick	56	2	58	2	60
Quebec	270	12	282	40	322
Ontario	1,526	66	1,592	8	1,600
Manitoba	38	1	39	–	39
Saskatchewan	21	–	21	–	21
Alberta	48	–	48	–	48
British Columbia	1,345	92	1,437	–	1,437
Northwest Territories	5	1	6	–	6
Yukon	4	–	4	–	4
Other	8	–	8	6	14
Canada	3,453	197	3,650	67	3,717

Source: Transportation and Communications Divisions, Statistics Canada, *The Water Transportation Data Sheet, 1974, Advance Statistics.*

TABLE 5.20. Number of Registered Motor Vehicles

	Passenger automobiles	Commercial vehicles	Motorcycles	Total
1905	553	..	..	553
1910	5,890	..	55	5,945
1920	251,945	22,310	8,195	282,450
1930	1,061,500	161,562	9,427	1,232,489
1940	1,236,492	250,958	13,379	1,500,829
1950	1,913,355	643,244	43,670	2,600,269
1960	4,104,415	1,117,450	34,476	5,256,341
1970	6,602,176	1,737,761	157,402	8,497,339
1973	7,866,084	2,004,536	287,820	10,158,440
1974	8,472,224	2,208,613	321,167	11,002,004
1975	8,870,307	2,211,462	360,874	11,442,643

Source: Catalogue 53-203, *The Motor Vehicle;* Catalogue 53-219, *The Motor Vehicle: Part III, Registrations.*

TABLE 5.21. Registered Civil Aircraft by Type of License

	Type of license				Total
	Private	Commercial	Government[1]	Experimental	
All aircraft:[2]					
1940	134	268	71	..	473
1950	945	1,297	..	..	2,242
1960	3,247	1,863	204	4	5,318
1965	5,184	2,137	200	21	7,542
1970	7,816	3,261	201	37	11,315
1975	12,875	4,810	287	18	17,990
Aircraft certified airworthy:[3]					
1975	10,395	3,941	264	10	14,610

[1] Government aircraft includes aircraft owned by federal, provincial and local governments. It does not include military aircraft.
[2] These figures include planes that are registered but are either inactive or not airworthy.
[3] The certificate is proof that in that year a licensed mechanic has inspected the aircraft and certified it mechanically sound and safe. Only aircraft with this certificate may actually fly.

Source: Catalogue 51-202, *Civil Aviation*; unpublished data, Aviation Statistics Centre, Statistics Canada.

TABLE 5.22. Aircraft by Weight

	Weight class[1]					Total
	Less than 4,000 pounds	4,000 - 12,500 pounds	12,501 - 30,000 pounds	30,001 - 100,000 pounds	More than 100,000 pounds	
	number of aircraft					
1960	4,280	685	160	161	32	5,318
1965	6,211	958	164	139	70	7,542
1970	9,443	1,350	205	178	139	11,315
1975	15,286	1,980	299	210	215	17,990

[1] The following are examples of aircraft for each weight class:

Less than 4,000 pounds . . . . . Cessna 180, Piper Cherokee
4,000 - 12,500 pounds. . . . . Beech Baron, DeHavilland Beaver
12,501 - 30,000 pounds. . . . . DeHavilland Twin Otter, Lockheed Starfighter F104
30,001 - 100,000 pounds. . . . . Douglas Super DC-3, Douglas DC-9
More than 100,000 pounds . . . . . Boeing 747, Douglas DC-10.

Source: Transport Canada, Canadian Civil Aircraft Register; unpublished data, Aviation Statistics Centre, Statistics Canada.

TABLE 5.23. Movement of Goods by Mode of Transport, 1973

Mode	Millions of ton miles
Railroad	133,197
Road (for hire trucking only)[1]	21,631
Oil pipeline	82,530
Air	520

[1] For hire trucking accounts for only 43,000 of the nearly two million registered trucks in Canada. Although the for hire trucks generally carry larger loads and haul over longer distances than the average truck, it is unlikely that the ton miles carried would be over 10% of the total.

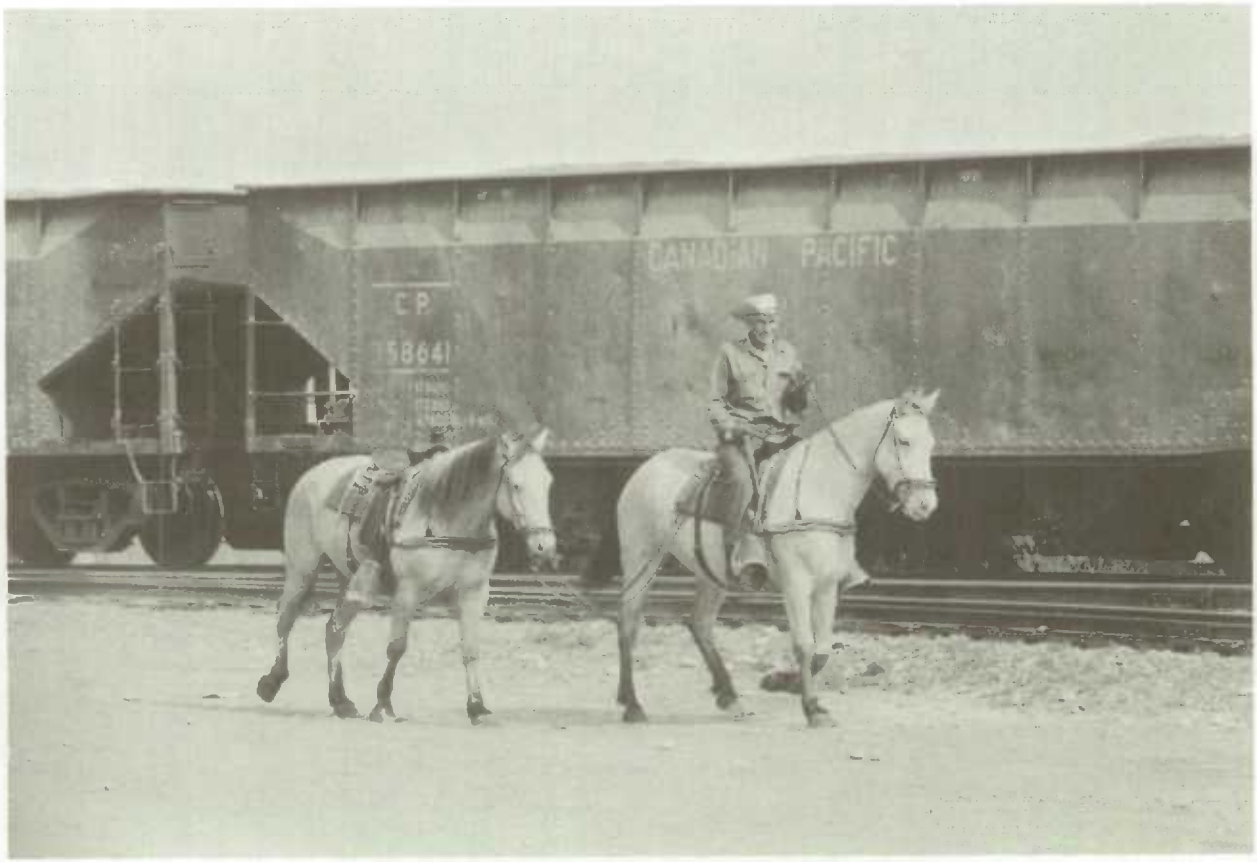
Source: Catalogue 52-207, *Railway Transport: Part I* (1973); Catalogue 54-202, *Shipping Report: Part II, International Seaborne Shipping* (1973); Catalogue 54-204, *Shipping Reports: Part III, Coastwise Shipping* (1973); Catalogue 55-201, *Oil Pipeline Transport* (1973); Catalogue 51-002, *Air Carrier Operations in Canada* (1973); unpublished data, Transportation Division, Statistics Canada.

TABLE 5.24. Total Weight of Goods Carried by Mode of Transport, 1973

Mode	Millions of tons
Railroad	316.6
Road (for hire trucking only)[1]	101.3
Oil pipeline[2]	106.3
Ship	318.6
Air	0.5

[1] See footnote 1, Table 5.23.
[2] Tons of oil are obtained by using a conversion factor of 6.762 barrels equals one ton.

Source: Same as in Table 5.23.



Freight train, horses and rider, Alberta (N.F.B. Phototheque, photo by John de Visser)

TABLE 5.25. Railroad Freight Traffic

	Tons carried	Ton miles	Freight train cars per freight train	Train hours[1]
	thousands	millions		thousands
1925	111,251	35,584	35.6	..
1930	132,355	33,259	35.7	..
1940	125,167	41,920	38.2	..
1950	184,477	60,789	38.0	..
1960	188,375	67,326	50.9	3,152
1970	283,150	112,872	69.8	2,948
1973	316,629	133,197	65.6	2,905
1974	326,232	141,403	63.6	3,164
1975	300,109	138,577	67.6	2,882

[1] Train hours are defined as the hours trains are in actual service.

Source: Catalogue 52-210, *Steam Railroad Statistics*; Catalogue 52-207, *Railway Transport: Part I.*

TABLE 5.26. Cargo Movements Through Canadian Ports

	Cargo loaded and unloaded			Vessel arrivals and departures		
	International shipping[1]	Domestic shipping[2]	Total	International shipping[1]	Domestic shipping[2]	Total
	thousands of short tons			number		
1935	18,522	..	..	70,132	136,986	207,118
1940	27,773	..	..	93,653	156,278	249,931
1950[3]	57,471	..	..	64,923	166,289	231,212
1960	89,518	81,367	170,885	68,419	233,861	302,280
1965	135,914	106,327	242,241	57,912	195,211	253,123
1970	164,210	124,817	289,027	50,604	156,379	206,983
1971	164,090	122,515	286,605	49,450	135,423	184,873
1972	175,672	122,404	298,076	49,016	125,617	174,633
1973	196,646	121,947	318,593	47,091	116,510	163,601
1974	183,897	118,241	302,138	42,272	106,529	148,801
1975	183,227	119,871	303,098	40,522	93,742	134,264

[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.

Source: Same as in Table 5.16.

TABLE 5.27. Oil Movement by Pipeline

	Barrel miles (trunk lines only)	Net received flows of crude oil[1] into pipelines
	billions	millions of barrels
1951	23.62	47.5
1955	83.86	112.8
1960	119.11	185.1
1965	203.99	315.4
1970	367.77	501.3
1973	558.09	718.8
1974	535.13	691.4
1975	448.88	590.0

[1] The net receipts are the unduplicated receipts of crude oil of all pipeline companies in Canada.

Source: Catalogue 55-201, *Oil Pipeline Transport*; Catalogue 55-001, *Oil Pipeline Transport.*

TABLE 5.28. Air Freight Movement

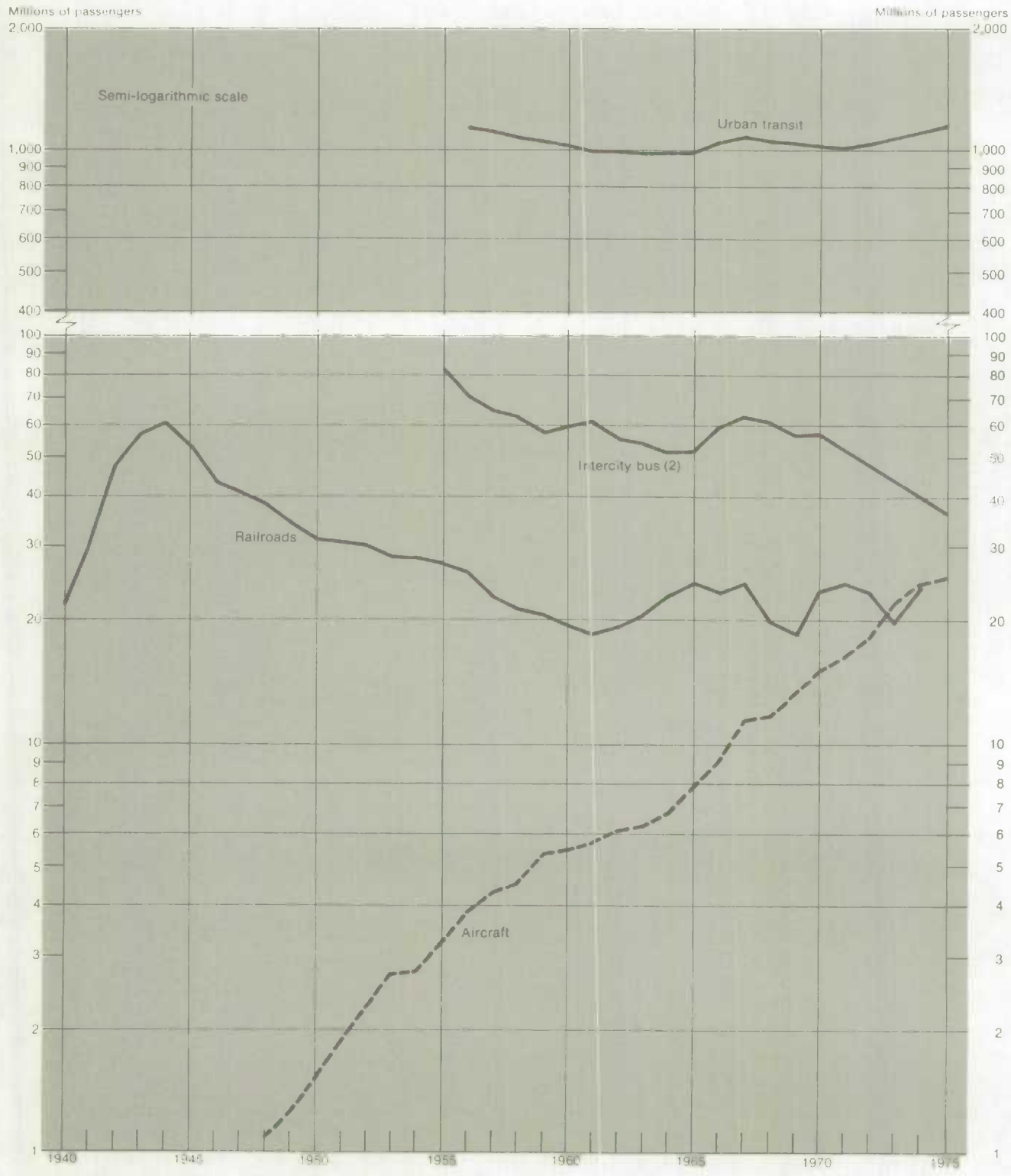
	Goods carried	Goods ton miles
	thousands of tons	millions
1951	35.38	13.87
1955	130.09	27.13
1960	130.89	53.37
1965	185.21	133.42
1970	379.26	380.20
1973	524.48	520.28
1974	535.70	550.79
1975	553.14	564.80

Source: Catalogue 51-002, *Air Carrier Operations in Canada;* Catalogue 51-501, *Aviation in Canada* (1971).

Resolute Bay, N.W.T. (N.F.B. Phototheque, photo by Crombie McNeill)

Chart — 5.29

Passengers Carried by Transportation Mode

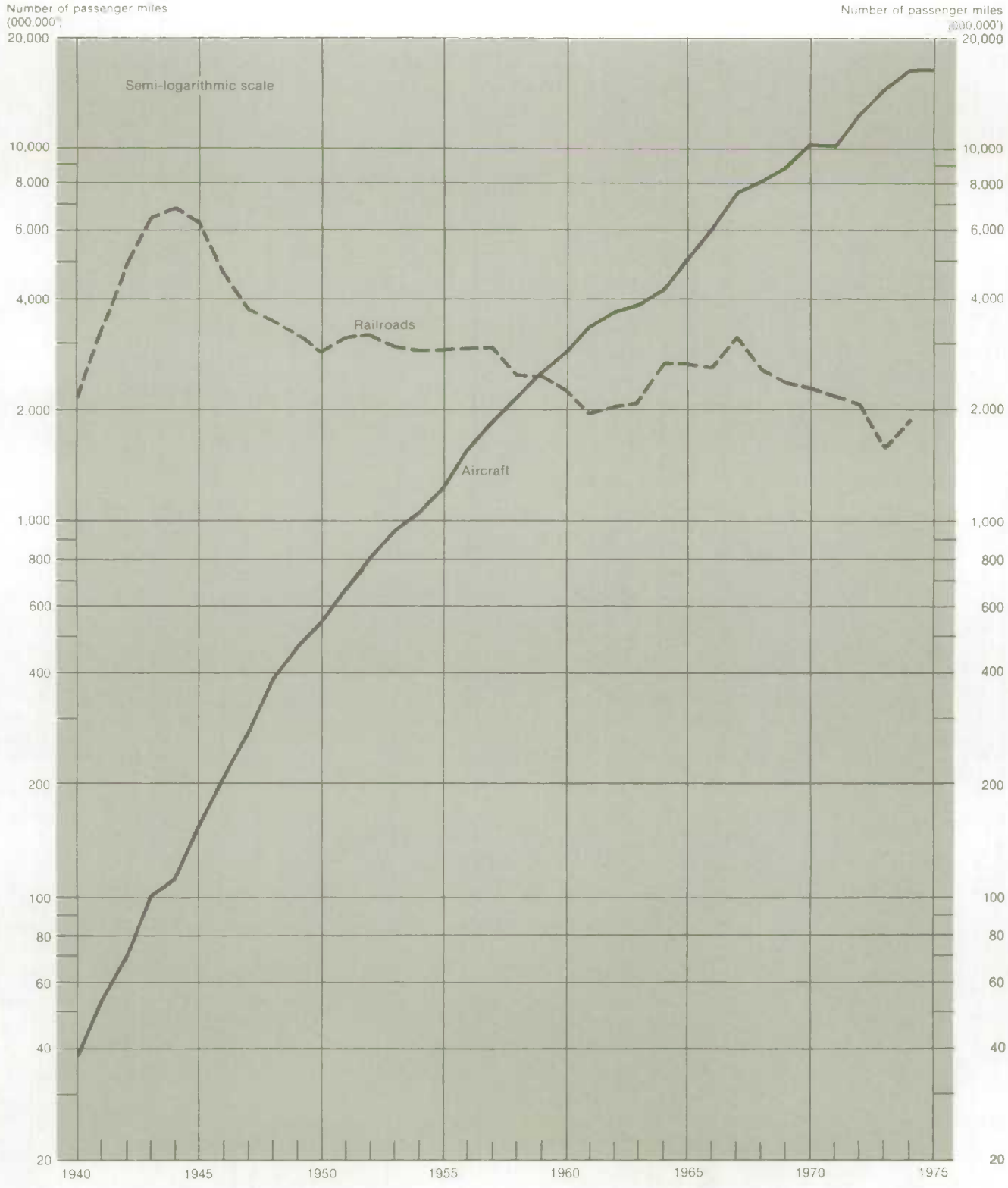


(1) In the cases of Urban Transit and Intercity Bus, trends are shown from the earliest year that comparable data were available.
(2) Includes only class one operations. These are defined as those earning more than $100,000 in gross revenues/year.

Sources: See Tables 5.8, 5.14, 5.31, 5.34, 5.35 and 5.36.

Chart — 5.30

Railroads and Aircraft Passenger Miles



Source: Same as in chart 5.29.

TABLE 5.31. Railroad Passenger Movement

	Passengers carried	Passenger miles	Average number of passengers per car in service	Passenger cars per passenger train
	millions			
1925	45.5	2,911	13	4.5
1930	34.7	2,423	11	4.5
1940	22.0	2,176	13	4.7
1944[1]	60.3	6,873	24	6.2
1950	31.1	2,816	14	4.9
1960	19.5	2,264	13	5.8
1965	24.6	2,666	16	6.5
1970	23.9	2,272	16	6.4
1973	19.8	1,599	16	4.8
1974	24.1	1,878	15	4.8
1975	23.6	1,821	15	5.3

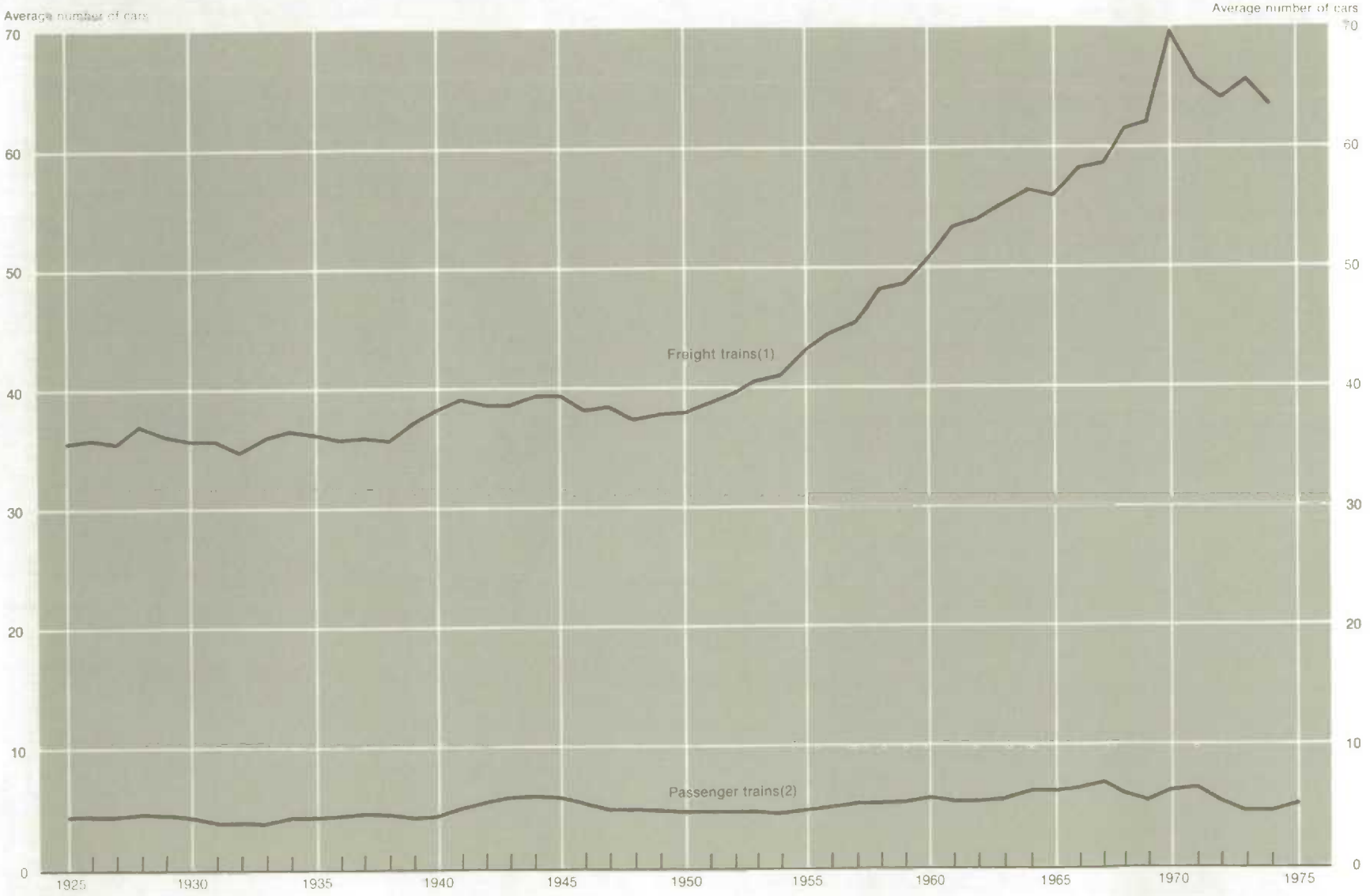
[1] The year 1944 was the peak of rail service. This figure is presented to show the capacities railways have been able to operate at in the past when intermodal competition was limited.

Source: Catalogue 57-212, *Steam Railway Statistics*; Catalogue 57-207, *Railway Transport.*

Casselman, Ontario. (photo par Bruce Mitchell)

Chart — 5.32

Average Number of Cars per Train



(1) Includes all freight cars whether full or empty.
(2) Includes only passenger carrying cars.

Source: Same as in Table 5.31.

TABLE 5.33. The Journey to Work, Modal Split

Method	November 1973	June 1974	November 1974
	per cent		
Driver of car (with passenger)	9.0	8.8	9.4
Driver of car (without passenger)	50.4	50.0	50.7
Passenger in private car	13.1	13.1	13.3
Passenger in taxi	0.6	0.5	0.5
Motorcycle, bicycle	0.4	2.0	0.5
Walks to work	8.6	9.1	8.9
Bus, street car, subway	16.0	15.1	15.3
Commuter train	0.4	0.4	0.5
Other and don't know	1.5	1.0	0.9
Total	100.0	100.0	100.0

Source: Catalogue 71-001, *The Labour Force* (November 1973, June 1974 and November 1974).

TABLE 5.34. Urban Transit

	Number of fare passengers		Revenue vehicle miles	
	Urban routes	All activities[1]	Urban routes	All activities[1]
	millions			
1956	..	1,151.9	..	203.9
1960	..	1,029.3	..	200.1
1965	974.6	985.2	210.0	213.8
1970	1,006.8	1,018.4	247.6	251.7
1975	1,133.2	1,143.2	316.7	324.2

[1] Includes urban services, charter operations and some rural services.

Source: Catalogue 53-216, *Urban Transit;* Catalogue 53-003, *Urban Transit.*

TABLE 5.35. Intercity and Rural Passenger Bus Transit [1]

	Number of fare passengers		Vehicle miles	
	Intercity and rural routes only	All services[2]	Intercity and rural routes only	All services[2]
	thousands			
1955	64,814	82,237	83,202	90,640
1960	49,117	59,848	80,415	89,020
1965	41,704	51,797	83,627	96,689
1970	44,617	57,369	105,005	126,356
1975	33,242	36,743	116,368	129,477

[1] See footnote 2, Chart 5.29.
[2] Includes intercity and rural operations, some urban operations and charter services.

Source: Catalogue 53-207, *Motor Carriers – Freight and Passenger;* Catalogue 53-215, *Passenger Bus Statistics;* Catalogue 53-002, *Passenger Bus Statistics – Intercity and Rural;* Catalogue 11-001, *Statistics Canada Daily* (February 5, 1976).

TABLE 5.36. Air Transportation Passenger Movements[1]

	Miles flown	Passengers	Passenger miles[2]	Passenger load factor[3]
	millions	thousands	millions	per cent
1940	11.012	149.03[2]	38.4	..
1950	41.368	1,511.02[2]	550.5	65.5
1960	109.699	5,451.72[2]	2,847.0	63.3
1965	124.448	7,838.54[4]	5,065.5	62.0
1970	229.410	15,040.41	10,280.0	55.8
1973	267.786	22,094.31	14,605.6	64.8
1974	288.574	24,621.11	16,719.2	62.2
1975	300.255	25,626.25	16,672.8	57.8

[1] Includes all foreign and domestic services by Canada carriers and that part of service by foreign carriers taking place over Canadian territory.

[2] 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.

[3] The "passenger load factor" refers to the percentage of an aircraft's seating capacity occupied by unit toll operations of the two transcontinental and five regional air carriers. The figure is arrived at by taking passenger miles as a percentage of available seat miles.

[4] Includes unit toll operations only for foreign carriers.

Source: Catalogue 51-501, *Aviation in Canada (1971);* Catalogue 51-002, *Air Carrier Operations;* Catalogue 51-001, *Civil Aviation;* Catalogue 51-202, *Civil Aviation.*

TABLE 5.37. Population Affected by Airport Noise[1] in Selected Metropolitan Areas

	International airports			
	Montréal		Ottawa	
	Number of persons	Per cent[2]	Number of persons	Per cent[2]
Population in noise zone:				
Lower[3]	252,280	9.2	32,955	5.5
Intermediate[4]	130,035	4.7	4,515	0.7
Upper[5]	59,270	2.2	1,600	0.3
Total	441,585	16.1	39,070	6.5
Total population in metropolitan area, 1971	2,743,230	100.0	602,560	100.0

	Toronto		Edmonton		Vancouver	
	Number of persons	Per cent[2]	Number of persons	Per cent[2]	Number of persons	Per cent[2]
Population in noise zone:						
Lower[3]	51,019	1.9	27,925	5.6	12,385	1.1
Intermediate[4]	45,958	1.8	10,810	2.2	6,145	0.6
Upper[5]	24,093	0.9	3,165	0.6	3,835	0.4
Total	121,070	4.6	41,900	8.4	22,365	2.1
Total population in metropolitan area, 1971	2,628,125	100.0	495,915	100.0	1,082,350	100.0

[1] Based on noise contours prepared for Central Mortgage and Housing Corporation by the Canadian Air Transportation Administration, Ministry of Transport. Values are derived by measuring the noise generated by each type of aircraft (both arriving and departing) in effective perceived noise decibels, which take into account the subjectively annoying effects of the noise including pure tones and duration. These values are aggregated into a single number evaluation which is known as the Noise Exposure Forecast (NEF). It should be noted that NEF values increase logarithmically; hence, an increase of 10 NEF units has the effect of making the noise seem twice as loud.

[2] The percentage figures are the populations of the specified zones as a proportion of the total metropolitan population.

[3] In the "lower" noise zone values range between 25 and 30 estimated potential noise decibels (EPNDB). For the Toronto International Airport values range between 28 and 30.

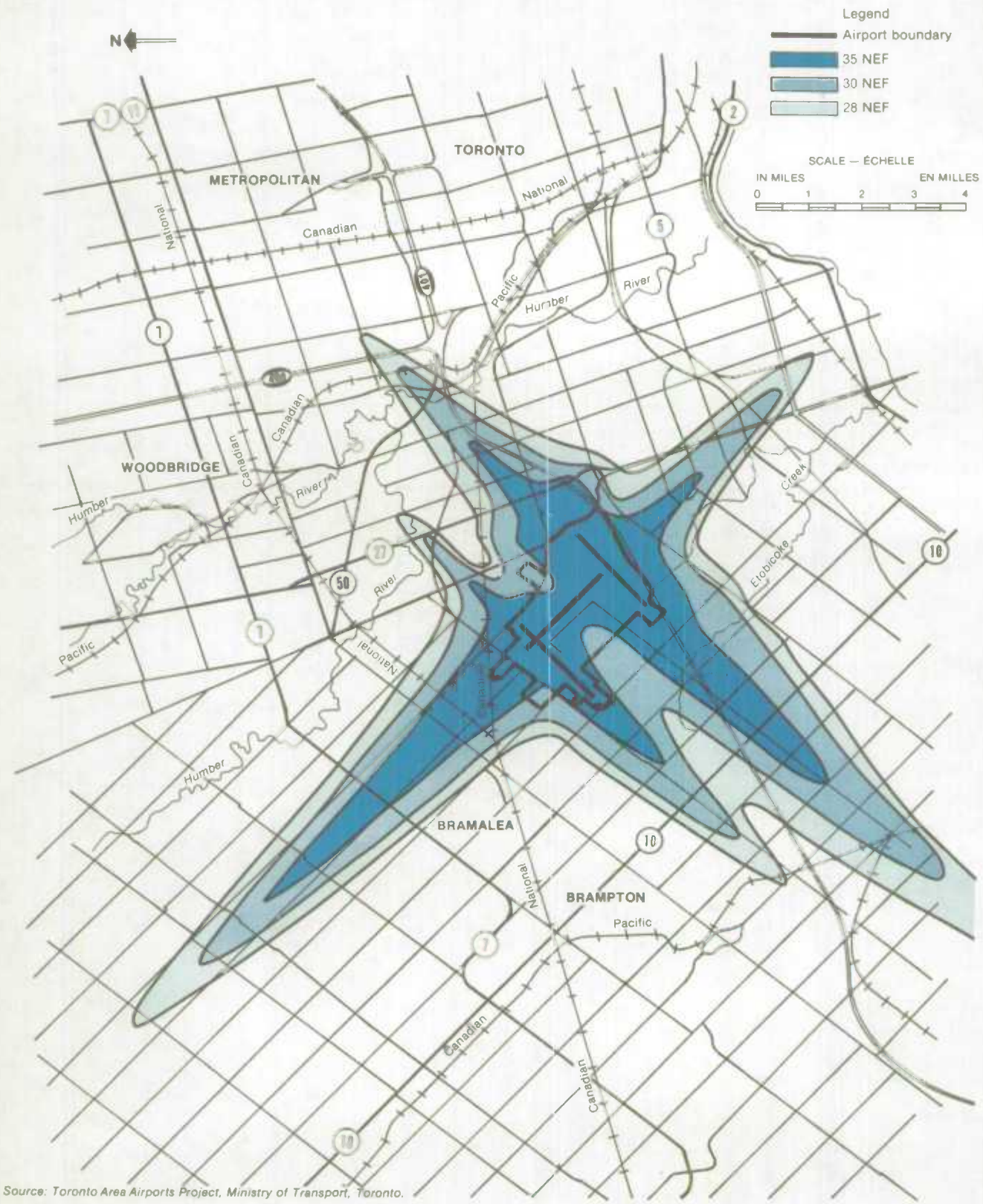
[4] In the "intermediate" noise zone, values fall between 30 and 35 EPNDB's.

[5] In the "upper" noise zone NEF values are greater than 35 EPNDB's.

Source: Catalogues 95-704, 95-715, 95-721, 95-727 and 95-728, *1971 Census of Canada;* Central Mortgage and Housing Corporation, *New Housing and Airport Noise,* Ottawa; Noise exposure contour maps for selected cities, Central Mortgage and Housing Corporation; Noise contours for Toronto from Toronto Area Airports Project, Ministry of Transport, Toronto.

Map — 5.38

Noise Exposure Forecast for Toronto International Airport (Malton), 1974



Source: Toronto Area Airports Project, Ministry of Transport, Toronto.

TABLE 5.39. Annual Amounts of Energy Consumed[1] by Transportation Mode

	Road	Rail	Air	Marine	Total
	10^{12} B.t.u.'s				
1958	496.3	127.1[2]	40.2	72.0	735.6
1960	541.2	78.1	44.8	81.5	745.6
1965	694.7	85.9	55.4	102.4	938.4
1970	920.5	85.0	97.4	105.7	1,208.6
1973	1,120.1	95.5	119.9	125.4	1,460.9

[1] These data reflect the use of energy by the various modes and should not be viewed as a measure of efficiency.
[2] Steam locomotives comprised a sizeable proportion of total railroad motive power. Their energy consumption per unit was significantly greater than that for a diesel electric locomotive.

Source: Catalogue 57-207, *Detailed Energy Supply and Demand in Canada* (1970 and 1973); Catalogue 57-505, *Detailed Energy Supply and Demand in Canada, 1958 - 1969.*

CHAPTER VI

MANUFACTURING

LIST OF CONTENTS

This chapter focuses on that activity of the economy organized to transform materials (originally extracted from the environment) into most of the tangible commodities of our society. The environmental perspective of the chapter is obtained by reorganizing Statistics Canada's manufacturing data to highlight certain aspects of environmental stress. It is clearly a very partial and selective view of the problem and is not intended, except in a highly indirect manner, to contribute to the information base on the impact of industrial activity on the environment.

Three approaches were employed in organizing the data. Tables 6.1 to 6.5 classify manufacturing activity into three process types which are distinguished by the degree of stress they impose on the environment. (See below for a description of these classes.) This information is presented by province, metropolitan area and watershed.

Tables 6.8 to 6.11 are derived from the applications for Accelerated Capital Cost Allowance approved by Environment Canada in late 1975. These data show the accumulated (1969 - 75) expenditure on pollution abatement equipment by broad categories of industry. The data highlight the different levels of expenditure by object of expenditure, i.e., water, air, type of pollutant and type of equipment, as well as by province. Time series have been omitted because of the lack of knowledge of the extent of coverage, specifically, what proportion of industries that incurred expenditure on pollution abatement equipment applied for Accelerated Capital Cost Allowances. This is the first time that tables in this form have been published in Canada.

Finally, a rather eclectic selection of historical data covering various aspects of "high environment impact" materials and consumer goods are displayed in Tables 6.12 to 6.21.

An Explanation of the Stressor Groups

High Stressor

This group is associated with the initial stages of manufacturing, characterized by large-scale bulk refinement and concentration processes of raw materials drawn from the environment. These industries typically require high-energy input per unit of output and are generally identified as the "high polluters", although this may in part be due to the scale of the activity rather than the nature of the process employed. The statistics provide a striking picture of the average scale of activity; although these industries accounted for less than 3% of the establishments and employed 12% of the production workers, they accounted for 61% of the fossil fuels consumed, 60% of the electricity used and 76% of the water intake of all manufacturing in 1973.

Medium Stressor

Industries in this group are largely associated with the second level of processing where materials undergo a transformation for specialized purposes required for the next and final stage, although some finished-goods manufacturing activity is included because of special polluting problems.[1] The use of complex technologies associated with specific products is characteristic of this group. The "medium stressor" manufacturing activity accounted for about 20% of the establishments, 20% of the production workers and 15% of the fossil fuel inputs in 1973.

Low Stressor

This group contains the remaining industries and in this sense can be considered as a residual category. Nevertheless, it accounts for a large part of the industries which produce final goods. These goods are distinguished by their design and functional purpose rather than basic physical-chemical transformation. In terms of process activity, they tend to fall under the headings of assembly, construction, or packaging. They are characterized by high labour input per unit of output with relatively low energy and material inputs. Although this group accounted for 78% of the establishments and 68% of the production workers, their fossil fuel input was only 23% of the total of all manufacturing in 1973.

The figures displayed in the "stressor type" tables are intended as indicators of the order of magnitude of potential stress by manufacturing activity on a geographical basis, i.e., by watershed, metropolitan area and province, and these figures should be used with caution for other analytical purposes.

---

[1] These industries include mainly food processing and certain light chemical manufacturing, such as pharmaceuticals, medicines and soaps. These were identified from the list of "priority industries" for the purpose of preparing pollution abatement guidelines by the Environmental Protection Service of the Department of Fisheries and the Environment.

Industries by Stressor Type – Industries Defined by the Standard Industrial Classification (S.I.C.)

	S.I.C.
High stressor:	
Pulp and paper mills	271
Iron and steel mills	291
Smelting and refining	295
Cement manufacturers	352
Ready-mix concrete manufacturers	355
Lime manufacturers	358
Petroleum refining	3651
Industrial chemicals	378
Medium stressor:	
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 stamping, pressing and coating	304
Clay products manufacturers	351
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
Medium stressor – Concluded:	
Manufacturers of pharmaceuticals and medicines	374
Paint and varnish	375
Soap and cleaning compounds	376
Miscellaneous chemicals	379
Low stressor:	
Bakery products	107
Miscellaneous food industries	108
Tobacco products	151 and 153
Rubber footwear	1624
Miscellaneous rubber products	1629
Plastic fabricating, n.e.s.	165
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
Metal fabricating	301 - 309 except 304
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

TABLE 6.1. Industrial Activity by Stressor Type[1]

Stressor type and year	Establishments		Workers		Manufacturing value added	
	number	per cent	thousands	per cent	millions of current dollars	per cent
High:						
1961	557	1.7	129.9	13.8	2,194.5	21.0
1971	783	2.4	153.2	13.1	3,801.2	17.5
1973	788	2.5	155.4	12.2	5,084.0	17.7
Medium:						
1961	[2]	[2]	[2]	[2]	[2]	[2]
1971	6,466	20.3	234.9	20.1	5,015.0	23.1
1973	6,073	19.5	253.7	19.9	6,408.5	22.2
Low:						
1961	32,800	98.3	809.5	86.2	8,240.3	79.0
1971	24,659	77.3	779.7	66.8	12,921.4	59.4
1973	24,284	78.0	866.9	67.9	17,332.5	60.1
Total manufacturing industries:						
1961	33,357	100.0	939.4	100.0	10,434.8	100.0
1971	31,908	100.0	1,167.8	100.0	21,737.6	100.0
1973	31,145	100.0	1,276.0	100.0	28,825.0	100.0

	Purchased fuel				Water intake[4]	
	Fossil		Electricity[3]			
	10^{12} B.t.u.'s	per cent	10^{12} B.t.u.'s	per cent	millions of gallons per day	per cent
High:						
1961	186.3	49.5	51.2	38.0	..	..
1971	536.5	64.8	159.0	71.2	..	..
1973	576.3	61.2	171.3	69.1	4,339	76.2
Medium:						
1961	[2]	[2]	[2]	[2]	..	..
1971	[2]	[2]	[2]	[2]	..	..
1973	143.7	15.3	[2]	[2]	528	9.3
Low:						
1961	189.8	50.5	83.4	62.0	..	..
1971	291.9	35.2	64.3	28.8	..	..
1973	221.7	23.5	76.7	30.9	824	14.5
Total manufacturing industries:						
1961	376.1	100.0	134.6	100.0	..	..
1971	828.4	100.0	223.3	100.0	..	..
1973	941.7	100.0	248.0	100.0	5,691	100.0

[1] For the definition of which manufacturing industries are included in the "high, medium and low" categories, see text.

[2] Due to technical difficulties it was not possible to separate out the medium and low groups, therefore, they have been combined and listed under low for that year.

[3] In 1973 the following amounts were generated for the companies' own use: High stressor-hydro (66.2 x 10^{12} B.t.u.'s), thermal (15 x 10^{12} B.t.u.'s); other manufacturing and mining-hydro (1.6 x 10^{12} B.t.u.'s); thermal (4.4 x 10^{12} B.t.u.'s).

[4] Estimates apply to 1972 and are based on a survey of 4,437 plants accounting for approximately 95% of the total water withdrawals by all manufacturing establishments in that year.

Source: Special tabluations from the Manufacturing and Primary Industries Division, Statistics Canada; Catalogue 31-201, *General Review of the Manufacturing Industries* (1961); Catalogue 57-002, *Energy Statistics*, Service Bulletin (June 1974 and February 1976); Tabulations from the Industrial Water Use Survey, Water Planning and Management Branch, Fisheries and Environment Canada.

TABLE 6.2. Industrial Activity by Stressor Type,[1] by Province, 1973

Province and stressor type	Establishments		Workers		Purchased fossil fuel		Water intake[2]
	number	per cent	thousands	per cent	10^{12} B.t.u.'s	per cent	millions of gallons per day
Newfoundland:							
High	12	4.9	3.3	28.4	11.8	84.3	..
Medium	84	34.3	6.0	52.7	1.6	11.4	..
Low	149	60.8	2.2	18.9	0.6	4.3	..
Total	**245**	**100.0**	**11.5**	**100.0**	**14.0**	**100.0**	**247.1**
Prince Edward Island:							
High	–	...	–	...	–	...	..
Medium	72	55.0	1.5	76.7	0.4	93.0	..
Low	59	45.0	0.4	23.3	0.03	7.0	..
Total	**131**	**100.0**	**1.9**	**100.0**	**0.43**	**100.0**	**6.8**
Nova Scotia:							
High	29	3.9	5.9	21.3	17.9	76.2	..
Medium	195	26.1	8.6	31.3	3.0	12.8	..
Low	522	70.0	13.1	47.4	2.6	11.0	..
Total	**746**	**100.0**	**27.6**	**100.0**	**23.5**	**100.0**	**211.6**
New Brunswick:							
High	27	4.6	5.2	22.1	30.8	81.9	..
Medium	160	27.4	6.1	26.1	2.4	6.4	..
Low	398	68.0	12.1	51.8	4.4	11.7	..
Total	**585**	**100.0**	**23.4**	**100.0**	**37.6**	**100.0**	**230.7**
Quebec:							
High	188	1.9	42.8	10.9	133.1	61.6	..
Medium	1,770	17.8	75.9	19.4	45.3	21.0	..
Low	7,989	80.3	272.8	69.7	37.6	17.4	..
Total	**9,947**	**100.0**	**391.5**	**100.0**	**216.0**	**100.0**	**1,132.7**
Ontario:							
High	256	2.1	69.0	11.2	235.5	53.1	..
Medium	2,493	20.1	117.9	19.1	64.3	14.5	..
Low	9,648	77.8	430.0	69.7	144.1	32.4	..
Total	**12,397**	**100.0**	**616.9**	**100.0**	**443.9**	**100.0**	**2,646.3**
Manitoba:							
High	29	2.2	3.4	8.7	10.5	53.8	..
Medium	276	21.3	7.9	20.0	4.3	22.1	..
Low	990	76.5	28.1	71.3	4.7	24.1	..
Total	**1,295**	**100.0**	**39.4**	**100.0**	**19.5**	**100.0**	**82.2**
Saskatchewan:							
High	37	5.5	1.2	9.6	8.6	61.9	..
Medium	147	21.8	4.9	40.2	3.1	22.3	..
Low	491	72.7	6.1	50.2	2.2	15.8	..
Total	**675**	**100.0**	**12.2**	**100.0**	**13.9**	**100.0**	**33.5**
Alberta:							
High	80	4.4	4.6	11.5	52.6	70.5	..
Medium	400	22.0	10.9	27.1	13.6	18.2	..
Low	1,336	73.6	24.6	61.4	8.4	11.3	..
Total	**1,816**	**100.0**	**40.1**	**100.0**	**74.6**	**100.0**	**156.9**
British Columbia:							
High	128	3.9	20.0	18.0	75.3	76.9	..
Medium	471	14.3	14.0	12.6	5.7	5.8	..
Low	2,689	81.8	77.3	69.4	16.9	17.3	..
Total	**3,288**	**100.0**	**111.3**	**100.0**	**97.9**	**100.0**	**943.0**

[1,2] See footnotes 1 and 4, Table 6.1.

Source: Special tabulations from the Manufacturing and Primary Industry Division, Statistics Canada; tabulations from the Industrial Water Use Survey, Water Planning and Management Branch, Fisheries and Environment Canada.

TABLE 6.3. Industrial Activity by Stressor Type,[1] by Census Metropolitan Area (CMA), 1973

CMA (ranked by number of production workers) and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	thousands	per cent	10^{12} B.t.u.'s	per cent
Toronto:						
High	47	0.8	3.6	1.6	12.2	10.4
Medium	980	16.6	43.9	18.6	22.5	19.2
Low	4,868	82.6	188.2	79.8	82.3	70.4
Total	**5,895**	**100.0**	**235.8**	**100.0**	**117.0**	**100.0**
Montréal:						
High	52	1.0	7.2	3.5	20.3	31.9
Medium	777	14.6	33.7	16.2	18.7	29.4
Low	4,500	84.4	167.4	80.3	24.6	38.7
Total	**5,329**	**100.0**	**208.3**	**100.0**	**63.6**	**100.0**
Vancouver:						
High	38	2.0	2.5	4.6	8.2	45.1
Medium	296	15.1	9.6	17.4	3.5	19.2
Low	1,623	82.9	42.9	78.0	6.5	35.7
Total	**1,957**	**100.0**	**54.9**	**100.0**	**18.2**	**100.0**
Hamilton:						
High	15	2.3	21.3	40.2	29.2	67.8
Medium	147	22.4	10.2	19.2	6.0	13.9
Low	495	75.3	21.6	40.6	7.9	18.3
Total	**657**	**100.0**	**53.1**	**100.0**	**43.1**	**100.0**
Kitchener-Waterloo:						
High	4	0.8	0.1	0.4	0.1	1.2
Medium	105	20.5	9.9	26.4	3.5	43.8
Low	402	78.7	27.6	73.2	4.4	55.0
Total	**511**	**100.0**	**37.6**	**100.0**	**8.0**	**100.0**
St. Catharines-Niagara:						
High	23	5.5	7.3	22.9	15.3	60.0
Medium	90	21.5	4.9	15.2	2.9	11.4
Low	306	73.0	19.9	61.9	7.3	28.6
Total	**419**	**100.0**	**32.1**	**100.0**	**25.5**	**100.0**
Winnipeg:						
High	11	1.2	0.6	2.0	3.3	30.8
Medium	166	18.2	6.2	19.7	3.1	29.0
Low	734	80.6	24.8	78.3	4.3	40.2
Total	**911**	**100.0**	**31.6**	**100.0**	**10.7**	**100.0**
Windsor:						
High	4	1.0	0.5	1.8	5.4	39.1
Medium	73	18.8	5.1	17.3	3.3	23.9
Low	311	80.2	24.0	80.9	5.1	37.0
Total	**388**	**100.0**	**29.6**	**100.0**	**13.8**	**100.0**
London:						
High	7	1.8	0.1	0.5	0.1	1.8
Medium	56	14.7	2.9	12.3	1.6	28.6
Low	318	83.5	20.5	87.2	3.9	69.6
Total	**381**	**100.0**	**23.5**	**100.0**	**5.6**	**100.0**
Québec:						
High	9	1.8	1.7	9.5	7.2	76.6
Medium	75	14.5	3.1	17.7	1.1	11.7
Low	432	83.7	12.7	72.8	1.1	11.7
Total	**516**	**100.0**	**17.4**	**100.0**	**9.4**	**100.0**
Edmonton:						
High	23	3.7	2.3	14.1	24.9	68.8
Medium	116	18.8	4.8	29.4	8.8	24.3
Low	479	77.5	9.3	56.5	2.5	6.9
Total	**618**	**100.0**	**16.4**	**100.0**	**36.2**	**100.0**

See footnote(s) at end of table.

TABLE 6.3. Industrial Activity by Stressor Type,[1] by Census Metropolitan Area (CMA), 1973 – Concluded

CMA (ranked by number of production workers) and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	thousands	per cent	10^{12} B.t.u.'s	per cent
Ottawa-Hull:						
High	17	4.7	4.3	31.5	10.9	86.5
Medium	52	14.4	1.1	8.0	0.6	4.8
Low	292	80.9	8.2	60.5	1.1	8.7
Total	**361**	**100.0**	**13.6**	**100.0**	**12.6**	**100.0**
Calgary:						
High	11	2.1	1.0	8.6	3.7	43.5
Medium	81	15.4	2.9	24.2	2.5	29.4
Low	435	82.5	8.0	67.2	2.3	27.1
Total	**527**	**100.0**	**11.9**	**100.0**	**8.5**	**100.0**
Chicoutimi-Jonquière:						
High	7	7.5	6.0	80.7	11.7	95.1
Medium	17	18.3	0.3	4.6	0.5	4.1
Low	69	74.2	1.1	14.7	0.1	0.8
Total	**93**	**100.0**	**7.5**	**100.0**	**12.3**	**100.0**
Thunder Bay:						
High	8	8.1	3.3	56.3	10.0	84.8
Medium	21	21.2	0.2	4.2	0.1	0.8
Low	70	70.7	2.3	39.5	1.7	14.4
Total	**99**	**100.0**	**5.9**	**100.0**	**11.8**	**100.0**
Sudbury:						
High	8	11.3	5.0	88.4	25.6	98.4
Medium	15	21.1	0.2	3.3	0.2	0.8
Low	48	67.6	0.5	8.3	0.2	0.8
Total	**71**	**100.0**	**5.6**	**100.0**	**26.0**	**100.0**
Saint John:						
High	6	7.1	1.4	25.1	6.2	73.0
Medium	13	15.3	0.4	7.4	0.3	3.5
Low	66	77.6	3.6	67.5	2.0	23.5
Total	**85**	**100.0**	**5.4**	**100.0**	**8.5**	**100.0**
Halifax:						
High	7	4.9	0.3	7.1	0.1	5.7
Medium	18	12.6	0.9	18.5	0.4	37.7
Low	118	82.5	3.6	74.4	0.6	56.6
Total	**143**	**100.0**	**4.8**	**100.0**	**1.1**	**100.0**
Regina:						
High	7	5.1	0.3	8.8	1.5	48.4
Medium	31	22.6	2.0	50.2	1.2	38.7
Low	99	72.3	1.6	41.0	0.4	12.9
Total	**137**	**100.0**	**3.9**	**100.0**	**3.1**	**100.0**
Victoria:						
High	6	2.9	0.1	2.5	0.1	20.0
Medium	33	15.9	0.7	17.6	0.2	40.0
Low	169	81.2	3.1	79.9	0.2	40.0
Total	**208**	**100.0**	**3.9**	**100.0**	**0.5**	**100.0**
Saskatoon:						
High	5	3.7	0.2	4.9	0.3	20.0
Medium	26	19.1	1.5	46.1	0.7	46.7
Low	105	77.2	1.6	49.0	0.5	33.3
Total	**136**	**100.0**	**3.3**	**100.0**	**1.5**	**100.0**
St. John's:						
High	3	4.2	0.1	5.4	0.1	12.3
Medium	18	25.0	0.8	37.1	0.3	52.6
Low	51	70.8	1.3	57.5	0.2	35.1
Total	**72**	**100.0**	**2.2**	**100.0**	**0.6**	**100.0**

[1] See footnote 1, Table 6.1.

Source: Special tabulations from the Manufacturing and Primary Industries Division, Statistics Canada.

TABLE 6.4. Industrial Activity by Stressor Type, by Primary Watershed Division, 1973

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	10^{12} B.t.u.'s	per cent
10. Atlantic Ocean:						
High	16	2.9	2,352	14.2	5.6	65.9
Medium	150	27.2	6,976	42.1	1.7	20.0
Low	386	69.9	7,255	43.7	1.2	14.1
Total	552	100.0	16,583	100.0	8.5	100.0
11. Gulf of St. Lawrence:						
High	45	5.3	12,663	38.6	51.1	90.0
Medium	283	32.9	11,032	33.7	3.4	6.0
Low	531	61.8	9,061	27.7	2.3	4.0
Total	859	100.0	32,756	100.0	56.8	100.0
12. Bay of Fundy:						
High	9	2.6	694	6.3	2.9	46.1
Medium	102	29.7	3,707	33.7	1.3	20.6
Low	232	67.7	6,597	60.0	2.1	33.3
Total	343	100.0	10,998	100.0	6.3	100.0
13. Saint John River:						
High	11	3.4	2,139	16.2	13.3	75.6
Medium	53	16.4	2,108	16.0	1.6	9.1
Low	260	80.2	8,934	67.8	2.7	15.3
Total	324	100.0	13,181	100.0	17.6	100.0
14. St. Lawrence River:						
High	167	1.8	34,617	9.2	100.6	53.5
Medium	1,682	18.0	77,472	20.5	49.5	26.3
Low	7,497	80.2	265,671	70.3	37.9	20.2
Total	9,346	100.0	377,760	100.0	188.0	100.0
15. Ottawa River:						
High	33	3.1	7,874	20.3	30.1	81.1
Medium	214	20.2	7,151	18.4	3.0	8.1
Low	814	76.7	23,754	61.3	4.0	10.8
Total	1,061	100.0	38,779	100.0	37.1	100.0
16. Lake Ontario:						
High	107	1.4	34,405	9.5	68.2	32.5
Medium	1,392	18.1	66,084	18.2	35.4	16.8
Low	6,181	80.5	262,960	72.3	106.5	50.7
Total	7,680	100.0	363,449	100.0	210.1	100.0
17. Lake Erie and Lake St. Clair:						
High	51	2.0	2,693	1.8	19.8	32.9
Medium	594	23.7	33,399	22.1	17.0	28.3
Low	1,859	74.3	114,939	76.1	23.3	38.8
Total	2,504	100.0	151,031	100.0	60.1	100.0
18. Lake Huron:						
High	45	4.3	18,498	37.0	99.3	91.0
Medium	248	23.4	7,687	15.4	3.9	3.6
Low	765	72.3	23,813	47.6	5.9	5.4
Total	1,058	100.0	49,998	100.0	109.1	100.0
19. Lake Superior:						
High	11	9.7	4,729	63.4	19.6	91.1
Medium	22	19.5	246	3.3	0.1	0.4
Low	80	70.8	2,484	33.3	1.8	8.5
Total	113	100.0	7,459	100.0	21.5	100.0
20. East Hudson Bay and Ungava:						
High	3	27.3	400	53.1	3.0	97.7
Medium	–	–	–	–	–	–
Low	8	72.7	354	46.9	0.1	2.3
Total	11	100.0	754	100.0	3.1	100.0

TABLE 6.4. Industrial Activity by Stressor Type, by Primary Watershed Division, 1973 – Concluded

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	10^{12} B.t.u.'s	per cent
21. South and Southwest Hudson Bay:						
High	10	5.4	3,048	39.3	8.5	85.0
Medium	40	21.5	249	3.2	0.1	1.0
Low	136	73.1	4,468	57.5	1.4	14.0
Total	**186**	**100.0**	**7,765**	**100.0**	**10.0**	**100.0**
22. Nelson River:						
Total	**12**	**100.0**	**879**	**100.0**	**0.7**	**100.0**
23. Lake Winnipeg:						
High	24	2.0	3,851	9.7	13.5	59.2
Medium	244	19.9	7,487	18.9	4.0	17.5
Low	958	78.1	28,236	71.4	5.3	23.3
Total	**1,226**	**100.0**	**39,574**	**100.0**	**22.8**	**100.0**
24. Assiniboine River:						
High	25	5.6	642	8.6	2.5	46.3
Medium	113	25.2	3,040	40.9	2.1	38.9
Low	310	69.2	3,758	50.5	0.8	14.8
Total	**448**	**100.0**	**7,440**	**100.0**	**5.4**	**100.0**
25. Saskatchewan River:						
High	89	4.5	5,536	12.7	59.1	71.8
Medium	438	22.0	12,883	29.7	14.8	18.0
Low	1,460	73.5	25,006	57.6	8.4	10.2
Total	**1,987**	**100.0**	**43,425**	**100.0**	**82.3**	**100.0**
30. Mackenzie River:						
Total	**12**	**100.0**	**109**	**100.0**	**0.3**	**100.0**
31. Athabasca River:						
High	6	7.7	371	25.4	2.8	87.5
Medium	11	14.1	72	4.9	--	--
Low	61	78.2	1,019	69.7	0.4	12.5
Total	**78**	**100.0**	**1,462**	**100.0**	**3.2**	**100.0**
32. Peace River:						
High	8	9.3	156	6.3	0.2	8.0
Medium	11	12.8	116	4.7	0.1	3.3
Low	67	77.9	2,196	89.0	1.7	88.7
Total	**86**	**100.0**	**2,468**	**100.0**	**2.0**	**100.0**
40. Columbia River:						
High	21	5.5	3,456	25.7	7.8	67.8
Medium	51	13.5	1,083	8.1	1.0	8.7
Low	307	81.0	8,891	66.2	2.7	23.5
Total	**379**	**100.0**	**13,430**	**100.0**	**11.5**	**100.0**
41. Fraser River:						
High	59	2.7	4,624	6.9	22.2	58.9
Medium	330	15.0	10,404	15.6	4.0	10.6
Low	1,815	82.3	51,651	77.5	11.5	30.5
Total	**2,204**	**100.0**	**66,679**	**100.0**	**37.7**	**100.0**
42. Yukon River:						
Total	**6**	**100.0**	**23**	**100.0**	**0.005**	**100.0**
43. West Coast:						
High	43	6.5	11,776	39.6	45.1	95.6
Medium	88	13.2	2,492	8.4	0.6	1.3
Low	533	80.3	15,439	52.0	1.5	3.1
Total	**664**	**100.0**	**29,707**	**100.0**	**47.2**	**100.0**

Source: Unpublished data prepared by Statistics Canada.

TABLE 6.5. Water Use in the Manufacturing Industries by Stressor Type, 1972

	Stressor type			Total manufacturing industries
	High	Medium	Low	
Number of establishments surveyed[1]	519	1,944	1,974	4,437
Gross water use (millions of gallons per day)[2]	10,926	927	1,215	13,068
Use rate = gross water use / water intake	2.5	1.8	1.5	2.3
Water intake by use:		millions of gallons per day		
Process	2,146	209	412	2,767
Cooling, condensing and steam	2,069	272	335	2,676
Sanitary	31	26	38	96
Other	93	21	39	152
Total	**4,339**	**528**	**824**	**5,691**
Intake source:				
Fresh water	4,122	480	771	5,373
Public water system	242	228	506	976
Company surface system	3,838	214	250	4,302
Company ground water system	42	38	15	95
Brackish water	177	47	52	276
Company surface system	...	4	7	11
Company ground water system	1	3	1	5
Other company source	176	40	44	260
Adjusting entry[3]	40	1	1	42
Total	**4,339**	**528**	**824**	**5,691**
Water discharge by point of discharge:				
Public sewer	135	218	169	522
Fresh water body	3,112	192	521	3,825
Tide water body	905	78	63	1,047
Ground	7	12	12	31
Other	10	1	3	15
Total	**4,169**	**501**	**768**	**5,440**
Water treated before discharge	1,417	63	80	1,560
Percentage of water treated before discharge	34.0	12.6	10.4	28.7

[1] The survey accounts for approximately 95% of total water intake by all manufacturing industries in that year. Firms indicating a total water withdrawal of 10 million gallons or more automatically received the water use questionnaire. Other firms were added to this list on the basis of special water use characteristics despite the fact that quantities of water intake may have been small.

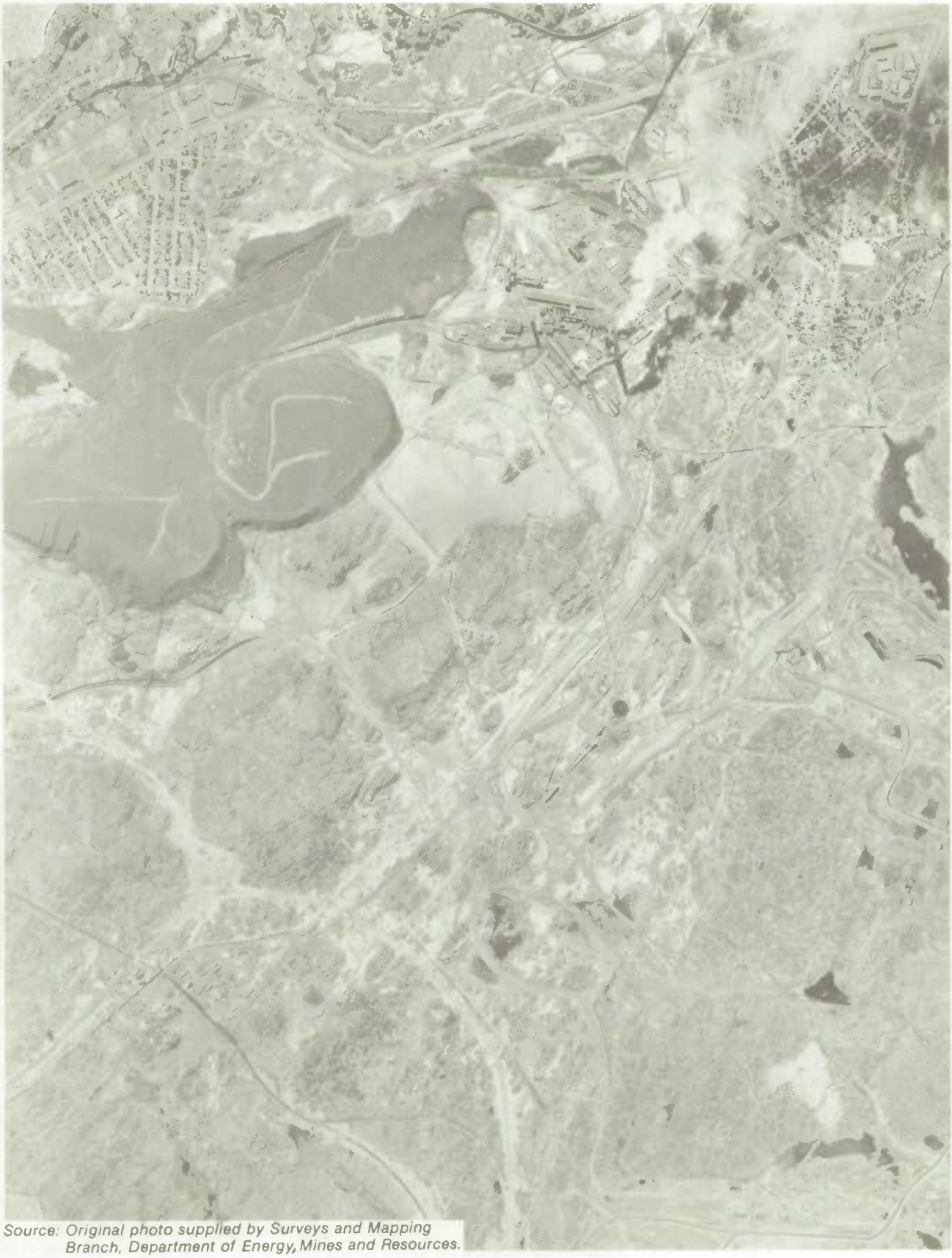
[2] Gross water use is the total amount of water used in the production of a product; it is the sum of the total water intake and water recirculation.

[3] An adjusting entry was necessary due to rounding in the imputation program.

Source: Unpublished data from the Economic Analysis Section, Water Planning and Management Branch, Fisheries and Environment Canada.

Airphoto — 6.6

A High Stressor Industry: Smelter, Sudbury, Ontario



Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources.

Airphoto — 6.7

Open Pit Mine: Asbestos, Quebec

Source: Original photo supplied by Surveys and Mapping Branch, Department of Energy, Mines and Resources

TABLE 6.8. Expenditures[1] on Pollution Abatement Equipment and Installation, by Industry, Accumulated Value 1969 - 75[2]

Industry	Type of pollution abatement equipment							
	Water				Air			
	End of line treatment[3]	Conversion of production process[4]	Combination of treatments and other expenditures[5]	All types	End of line treatment[3]	Conversion of production process[4]	Combination of treatments and other expenditures[5]	All types
	per cent							
Agriculture	0.3	...	...	0.2	...	...	...	...
Mining:								
Metal mines	1.6	...	0.3	1.3	...	...	...	...
Mineral fuels	4.8	...	9.6	5.7	17.4	3.0	33.4	16.6
Non-metal	...	...	...	...	4.5	0.4	0.2	4.1
Other mining	0.7	...	0.6	0.7	4.3	...	0.2	3.9
Total	7.1	...	10.5	7.7	26.2	3.4	33.8	24.6
Manufacturing:								
Food and beverage	3.5	...	0.2	2.8	4.0	10.8	3.7	4.5
Wood industries	...	...	...	...	6.2	1.6	6.8	5.9
Pulp and paper mills	53.2	86.4	2.3	42.8	10.8	10.1	4.9	10.6
Iron and steel mills	13.5	3.8	0.4	10.4	12.3	19.4	6.9	12.7
Other primary metal industries	...	...	...	...	8.4	14.2	3.4	8.7
Cement manufacturers	...	...	...	...	7.7	1.4	...	7.1
Other non-metallic	...	...	...	...	2.1	1.1	...	2.0
Petroleum refineries	3.9	...	1.5	3.3	1.6	0.2	3.8	1.5
Industrial chemicals	5.0	6.8	79.6	21.3	...	...	...	...
Chemical industries	...	...	...	...	3.8	6.7	12.1	4.2
Other manufacturing	9.0	3.0	2.2	7.4	11.4	27.9	21.4	12.9
Total	88.1	100.0	86.2	88.0	68.3	93.4	63.0	70.1
All other industries	4.5	...	3.3	4.1	5.5	3.2	3.2	5.3
Total industries	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1 Includes only expenditures approved by the Department of Fisheries and the Environment.
2 Preliminary data only, figures for these years are not yet complete. For further information contact the Business Finance Division, Statistics Canada.
3 Includes abatements at the point of discharge, for example, primary water treatment and treatment of air emissions.
4 Includes either a change of inputs (for example, low sulphur fuel) or a change to a "less polluting process".
5 Includes combined expenditures of end of line and process change, monitoring equipment and protection against accidental spillages.

Source: Unpublished data from Financial Taxation and General Research Section, Business Finance Division, Statistics Canada.

TABLE 6.9. Distribution of Expenditures on Air Pollution Abatement Equipment and Installation, Accumulated Value 1969-75,[1] by Region

Industry	Atlantic provinces	Quebec	Ontario	Prairie provinces	British Columbia	Canada
	per cent					
Agriculture	...	...	...	...	...	...
Mining:						
Mineral fuels	...	...	...	72.6	...	16.6
Non-metal mines	...	28.1	0.3	...	1.8	4.1
Other mining	...	4.1	7.3	...	...	3.9
Total	...	32.2	7.6	72.6	1.8	24.6
Manufacturing:						
Food and beverage	5.2	10.9	4.0	5.1	0.8	4.5
Wood industries	18.3	1.1	0.4	0.6	30.1	5.9
Pulp and paper mills	12.8	0.2	1.8	6.7	46.0	10.6
Iron and steel industries	...	2.6	26.2	0.7	0.4	12.7
Other primary metal industries	...	21.1	10.6	0.4	5.9	8.7
Cement manufacturers	32.3	8.1	12.4	0.9	...	7.1
Other non-metallic products	...	5.4	2.5	0.1	0.6	2.0
Petroleum refineries	12.2	0.9	1.3	0.8	3.4	1.5
Chemical industry	...	10.8	4.9	0.3	2.7	4.2
Other manufacturing	9.6	3.2	26.5	0.6	0.4	12.9
Total	90.4	64.3	90.6	16.2	90.3	70.1
All other industries	9.6	3.5	1.8	11.2	7.9	5.3
Total industries	100.0	100.0	100.0	100.0	100.0	100.0

[1] Preliminary data only.

Source: Same as in Table 6.8.

TABLE 6.10. Distribution of Expenditures on Water Pollution Abatement Equipment and Installation, Accumulated Value 1969-75,[1] by Region

Industry	Atlantic provinces	Quebec	Ontario	Prairie provinces	British Columbia	Canada[2]
	per cent					
Agriculture	...	...	0.3	0.1	...	0.2
Mining:						
Metal mines	...	...	2.4	...	...	1.3
Mineral fuels	[3]	...	...	33.1	0.2	5.7
Other mining	...	0.3	0.1	2.6	...	0.7
Total	...	0.3	2.5	35.7	0.2	7.7
Manufacturing:						
Food and beverage	1.3	8.8	2.3	1.6	1.6	2.8
Pulp and paper mills	95.7	68.1	23.9	41.5	87.8	42.8
Iron and steel mills	...	...	19.0	...	[4]	10.4
Petroleum refining	2.1	1.6	3.6	2.9	4.4	3.3
Industrial chemicals	[5]	13.5	35.9	0.5	0.2	21.3
Other manufacturing	0.5	7.1	11.1	0.6	3.1	7.4
Total	99.6	99.1	95.8	47.1	97.1	88.0
All other industries	0.4	0.6	1.4	17.1	2.7	4.1
Total industries	100.0	100.0	100.0	100.0	100.0	100.0

[1] Preliminary data only.
[2] Includes data for the Yukon and Northwest Territories.
[3] Confidential, included in the Prairie provinces.
[4] Confidential, included in Ontario.
[5] Confidential, included in Quebec.

Source: Same as in Table 6.8.

TABLE 6.11. Expenditures on Pollution Abatement Equipment and Installation by Type of Pollutant Abated, by Industry, Accumulated Value 1969 - 75[1]

Industry	Type of pollutant abated								
	Water					Air			
	Settleable and floating material[2]	Oxygen demanding material[3]	Selected chemical compounds[4]	Other and not specified	All water pollutants	Selected gases[5]	Particulates[6]	Other and not specified	All air pollutants
	per cent								
Agriculture	0.1	0.6	0.1	1.2	0.2	...	...	0.1	..
Mining:									
Metal mines	1.7	0.7	...	3.6	1.3	...	...	...	...
Mineral fuels	5.0	1.0	10.4	1.2	5.7	46.7	2.5	6.4	16.6
Non-metal	...	...	...	...	...	0.1	6.8	2.1	4.1
Other mining	0.3	...	1.6	1.2	0.7	0.6	6.4	1.1	3.9
Total	**7.0**	**1.7**	**12.0**	**6.0**	**7.7**	**47.4**	**15.7**	**9.6**	**24.6**
Manufacturing:									
Food and beverage	0.9	16.8	0.4	4.7	2.8	1.1	3.6	15.8	4.5
Wood industries	...	...	...	...	...	...	10.6	...	5.9
Pulp and paper mills	58.3	77.3	3.6	7.4	42.8	8.6	9.8	17.9	10.6
Iron and steel mills	11.4	...	11.6	14.3	10.4	18.9	10.0	9.7	12.7
Other primary metal industries	...	...	...	...	...	8.1	5.2	24.0	8.7
Cement manufacturers	...	...	...	...	...	...	12.8	...	7.1
Other non-metallic	...	...	...	...	...	0.7	3.2	...	2.0
Petroleum refineries	1.8	2.4	0.7	27.6	3.3	2.2	1.2	1.1	1.5
Industrial chemicals	3.7	0.1	69.7	18.5	21.3	...	...	...	...
Chemical industries	...	...	...	...	...	5.5	3.7	3.7	4.2
Other manufacturing	9.6	0.9	1.9	19.7	7.4	4.4	19.9	4.2	12.9
Total	**85.7**	**97.5**	**87.9**	**92.2**	**88.0**	**49.5**	**80.0**	**76.4**	**70.1**
All other industries	7.2	0.2	...	0.6	4.1	3.1	4.3	13.9	5.3
Total industries	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

[1] Preliminary data only.
[2] Settleable includes wood fibres, sludge and raw sewage; floating includes galley wastes, oil and grain.
[3] Includes vegetable matter and biological and chemical oxygen demanding materials.
[4] Includes sulphur, nitrogen and chlorine compounds and special toxic substances such as mercury and organic-mercury compounds.
[5] Includes sulphur oxides, nitrogen oxides, hydrocarbon vapours and carbon monoxide.
[6] Particulates include soot, oil mist, dusts and asbestos fibers.

Source: Same as in Table 6.8.

TABLE 6.12. Heavy Metals: Inputs in Manufacturing

	Metallic cadmium	Metallic mercury	Tellurium	Selenium	Nickel	Lead	Zinc
	pounds				tons		
1960	190,416	139,627	4,238	14,461	4,861	67,065	59,147
1961	170,976	150,588	4,843	13,160	4,935	72,187	63,754
1962	216,836	135,291	4,306	12,587	5,322	78,111	68,860
1963	208,596	147,396	1,853	14,281	5,866	79,192	75,591
1964	178,128	208,304	1,473	13,968	6,899	85,751	91,048
1965	171,558	415,996	1,870	15,888	8,924	96,483	96,792
1966	170,605	171,588	862	20,533	8,558	101,487	109,746
1967	156,761	245,121	981	21,017	8,767	91,688	110,487
1968	125,564	327,939	645	21,440	11,233	96,400	117,880
1969	132,136	258,814	3,532	15,572	12,094	98,227	120,697
1970	124,959	340,558	880	15,730	11,794	89,061	108,300
1971	117,395	193,968	1,178	15,686	8,583	88,450	120,572
1972	123,395	114,636	1,419	20,677	10,187	103,411	137,810
1973	120,958	72,663	1,222	22,435	11,862	104,574	128,294
1974	105,548	103,204	981	30,479	12,750	116,045	129,653
1975	84,234	72,467	1,354	21,900	12,465	95,343	108,335

Source: Catalogue 41-010, *Metals and Minerals*, Service Bulletin.

TABLE 6.13. Heavy Metals: Major End Use by Manufacturing Industries

	1961	1966	1971	1974
	per cent			
Lead:[1]				
Production of:				
Batteries and battery oxides	39.0	38.7	39.7	45.4
Chemicals	20.6	16.5	19.3	16.4
Other	40.4	44.8	41.0	38.2
Total	**100.0**	**100.0**	**100.0**	**100.0**
Total production tons	72,187	101,487	88,450	116,045
Metallic cadmium:				
Production of:				
Plating	86.2	78.8	74.0	71.9
Solders	10.8	8.5	3.7	2.3
Other	3.0	12.7	22.3	25.8
Total	**100.0**	**100.0**	**100.0**	**100.0**
Total production pounds	170,976	170,605	117,395	105,548
Metallic mercury:				
Production of:				
Heavy chemicals (electrolytic cells)	64.0	85.1	93.8	58.5
Electrical apparatus	2.1	12.9	5.4	31.2
Gold recovery	2.7	1.3	0.5	0.4
Other	31.2	0.7	0.3	9.9
Total	**100.0**	**100.0**	**100.0**	**100.0**
Total production pounds	150,588	171,588	193,968	103,204

[1] Includes white lead, red lead, litharge and tetra ethyl lead.

Source: Catalogue 41-010, *Metals and Minerals*, Service Bulletin (1961, 1966, 1971 and 1974).

TABLE 6.14. Vinyl Chloride Moxomer Used by Manufacturers of Plastics and Synthetic Resins

	Thousands of tons		Thousands of tons
1962	14.2	1968	29.4
1963	17.3	1969	36.1
1964	22.9	1970	39.4
1965	21.2	1971	40.1
1966	26.5	1972	55.5
1967	27.6	1973	72.3
		1974	77.3

Source: Unpublished data from Manufacturing and Primary Industry Division, Statistics Canada.

TABLE 6.15. Packaging Costs by Industry

Industry	1962[1]	1966	1973
	millions of current dollars		
Food and beverage	393	514	864
Chemical and chemical products	100	133	210
Paper and allied products	32	47	80
Tobacco products	29	36	44
Electrical products	15	24	43
Metal fabricating	16	21	40
Non-metallic mineral products	16	19	37
Textile	12	19	35
Rubber and plastic products	5	6	29
All other industries	69	109	181
Total manufacturing	**687**	**928**	**1,563**

[1] Data for 1962 are from a "Special Enquiry Into the Use of Containers and Other Packaging Materials and Supplies for 1962" and covered only those industries where their use was considered to be significant. Later data are from the Annual Census of Manufactures in which the coverage is more complete.

Source: Catalogues 31-502 and 31-212, *Consumption of Containers and Other Packaging Materials and Supplies by the Manufacturing Industries* (1962, 1966 and 1973).

TABLE 6.16. Packaging Costs by Type of Material

Material	1966	1972	1973
	millions of current dollars		
Paper[1]	402.7	625.8	708.2
Metal[2]	171.0	322.6	361.1
Glass	81.1	144.8	156.9
Plastic[3]	54.6	120.3	130.4
Wood[4]	28.8	44.5	54.3
Other	187.9	125.5	152.3
Total	**926.1**	**1,383.5**	**1,563.2**

[1] Includes folding and rigid boxes, paperboard, corrugated boxes and cartons, paper or fiber cans and drums, paper bags, and paper labels, tags and wrappers.
[2] Includes cans, barrels, drums, staples, strapping wire, and lead, tin and aluminum foil lids.
[3] Includes bottles and carboys, transparent film bags, transparent film, containers and lids.
[4] Includes boxes, crates, barrels, kegs, crating lumber, pallets and skids.

Source: Catalogue 31-212, *Consumption of Containers and Other Packaging Supplies by the Manufacturing Industries* (1966, 1972 and 1973).

TABLE 6.17. Paper and Plastic Bags Produced and Shipped by Canadian Manufacturers

	Paper bags	Plastic bags	Bags used per household		Number of households
			Paper bags	Plastic bags	
	thousands of tons		pounds		thousands
1964	177	..	73	..	4,872
1965	186	..	74	..	5,000
1966	194	..	76	..	5,126
1967	202	34	76	13	5,293
1968	197	41	72	15	5,458
1969	210	51	75	18	5,616
1970	217	59	75	20	5,784
1971	223	69	75	23	5,933
1972	226	73	74	24	6,108
1973	237	95	76	30	6,266

Source: Catalogue 36-207, *Paper and Plastic Bag Manufacturers*, Catalogue 64-202, *Household Facilities and Equipment Survey*.

TABLE 6.18. Bottles and Cans Used in the Soft Drink and Breweries Industries

	Soft drink			Breweries			Number of households
	Non-returnable bottles	Cans	Returnable[1] bottles	Non-returnable bottles	Cans	Returnable[1] bottles	
	thousands of dozens						thousands
1965	..	..	..	1,434	5,389	9,922	...
1966	..	..	..	926	5,601	12,930	...
1967	..	..	..	1,281	6,627	14,259	...
1968	..	49,297	12,599	1,431	10,029	15,691	...
1969	24,691	70,323	14,245	1,511	10,665	18,727	...
1970	31,121	80,703	14,581	1,302	11,056	20,605	...
1971	32,272	95,345	15,872	2,129	10,370	24,015	...
1972	32,336	91,420	18,194	2,120	10,294	26,288	...
1973	30,446	109,555	13,313	2,329	11,758	26,600	...
1974	28,315	126,142	13,729	4,954	16,976	30,612	...
	dozens per household						
1965	..	..	..	0.3	1.1	2.0	5,000
1966	..	..	..	0.2	1.1	2.5	5,126
1967	..	..	..	0.2	1.3	2.7	5,293
1968	..	9.0	2.3	0.3	1.8	2.9	5,458
1969	4.4	12.8	2.5	0.3	1.9	3.3	5,616
1970	5.4	14.0	2.5	0.2	1.9	3.6	5,784
1971	5.4	16.1	2.7	0.4	1.7	4.0	5,933
1972	5.3	15.0	3.0	0.3	1.7	4.3	6,108
1973	4.9	17.5	2.1	0.4	1.9	4.2	6,266
1974	4.4	19.4	2.1	0.8	2.6	4.7	6,493

[1] Bought to replace broken bottles and to make up inventory shortages.

Source: Catalogue 32-208, *Soft Drink Manufacturers;* Catalogue 32-205, *Breweries;* Catalogue 64-202, *Household Facilities and Equipment Survey.*

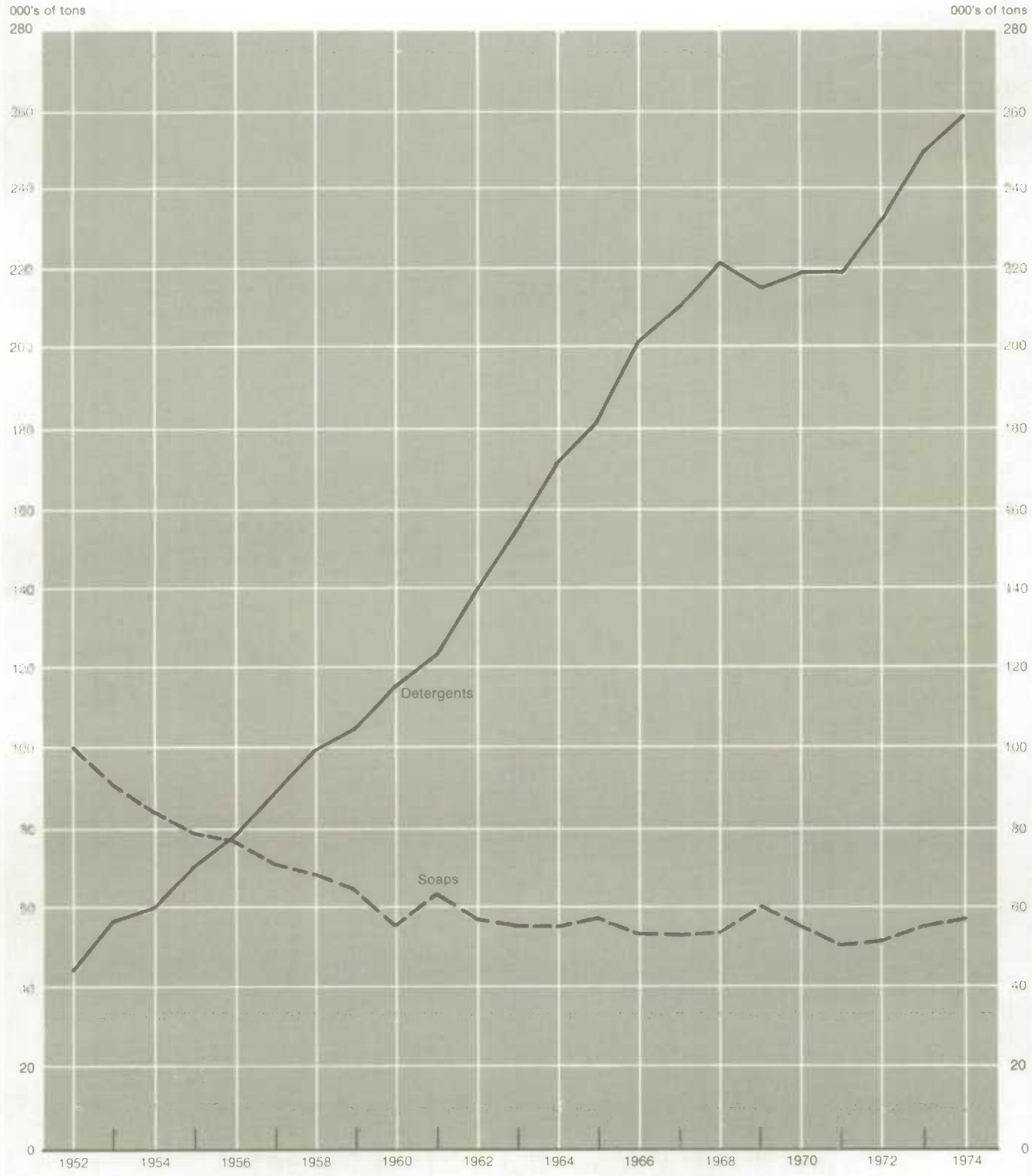
TABLE 6.19. Soaps and Synthetic Detergents Shipped by Canadian Manufacturers

	Shipments			Percentage of total shipments			Soap and detergents used per household		Number of households
	Soap	Detergent	Total	Soap	Detergent	Total	Soap	Detergent	
	thousands of tons						pounds		thousands
1953	91	57	148	61.5	38.5	100.0	49.9	31.3	3,641
1956	77	78	155	49.8	50.2	100.0	39.0	39.5	3,948
1961	63	123	186	33.9	66.1	100.0	27.7	54.0	4,555
1966	53	201	254	20.9	79.1	100.0	20.7	78.4	5,126
1971	50	219	269	18.6	81.4	100.0	16.9	73.8	5,933
1973	55	250	305	18.1	81.9	100.0	17.6	79.8	6,266
1974	57	259	316	18.0	82.0	100.0	17.6	79.8	6,493

Source: Catalogue 46-214, *Manufacturers of Soap and Cleaning Compounds;* Catalogue 64-202, *Household Facilities and Equipment Survey.*

Chart – 6.20

Soaps and Synthetic Detergents: Shipments by Canadian Manufacturers



Source: Catalogue 46-214, MANUFACTURERS OF SOAP AND CLEANING COMPOUNDS.

TABLE 6.21. Household Ownership of Consumer Products with High Energy Demands and Environmental Impacts

	Clothes dryers		Air conditioners		Dish-washers	Outboard motors		Snowmobiles		Number of house-holds
	Electric	Gas	Window	Central		One	Two or more	One	Two or more	
	per cent of households owning									thousands
1960	11.4	0.7	..	..	..	7.2	..	..	..	4,404
1961	13.7	0.9	..	..	1.5	..	..	..	..	4,489
1962	17.3	1.2	1.7	..	1.7	8.2	..	..	..	4,592
1963	20.0	1.6	1.9	..	2.1	..	..	..	..	4,671
1964	22.2	1.7	2.1	..	2.2	8.6	..	..	..	4,872
1965	25.2	2.2	2.2	..	2.7	..	..	..	..	5,000
1966	27.4	2.6	2.6	..	3.2	9.4	..	..	..	5,126
1967	31.7	2.7	3.2	..	4.4	..	..	..	..	5,293
1968	33.9	2.9	3.2	..	5.1	8.1	1.5	..	..	5,458
1969	37.3	3.2	3.9	..	6.5	..	..	..	..	5,616
1970	40.8	3.5	4.3	..	7.5	8.8	1.7	..	..	5,784
1971	40.7	3.4	5.3	..	8.6	..	..	6.3	1.1	5,933
1972	42.1	3.5	5.8	..	9.2	9.3	1.6	6.7	1.6	6,108
1973	44.3	3.4	6.7	..	10.7	..	..	7.3	1.8	6,266
1974	44.6	3.7	7.6	2.6	12.9	8.7	1.6	7.1	2.2	6,493
1975	48.1	3.6	9.2	3.2	15.2	..	..	7.4	2.6	6,703

Source: Catalogue 64-202, *Household Facilities and Equipment Survey* (1960-1965 and 1972-1975); unpublished revised estimates by the Consumer Income and Expenditure Division, Statistics Canada.

CHAPTER VII

ENERGY

LIST OF CONTENTS

ENERGY

Energy in the Economy

It was once sufficient for the statistician documenting the role of energy in a nation's economy to compile the price and quantity of various fuels produced and the amount of capital invested in the energy-producing industry. During recent years, however, the critical importance of energy in the total economic system has become clear. Besides the large amounts of energy consumed in the energy-production process, there is energy content in the production of all goods and services produced by the economy. For this reason, the demand for energy is determined not only by its price in comparison with that of other goods, but by the level of total activity in the economy.

To assess the economics of energy, it is necessary to look at the processes that determine its supply. Most energy sources currently exploited are finite in nature. They are different, however, from other so-called exhaustible natural resources whose scarcity is usually due to the growth of population or change in technology. Through recycling, resources such as land, diamonds and copper can be made to serve one generation after another. This, however, is not the case with most current sources of energy. The stocks of most available energy sources are diminishing constantly and cannot be recycled, since the properties of the substance serving as the energy source are changed to result in heat and light. Indeed, its supply is made even scarcer through the recycling of all other resources, a process that consumes large amounts of energy.

The Concept and Measurement of Energy

Mankind uses energy in two ways: first, to provide heat and second, to move material objects and to transmit electromagnetic signals. While the precise terms for this second form are kinetic energy and electromagnetic energy, they will be referred to in this chapter as work.

Heat transfer is seen in the burning of fuel oil in a furnace to heat a house. Application of energy in the form of work occurs when fuel is burned to make an object, such as a car, assume a desired state of motion. While the same quantities of energy may be absorbed in each of the two instances, the minimum amounts of energy that must be withdrawn from the fuels to ensure the transfers are different.

Energy in the form of work can always be converted to an equal amount of heat, but only a fraction of energy available as heat can be converted to work. It should therefore be noted that the best equivalent figures for all energy shown in this chapter are the theoretically measurable amounts available.

Furthermore, the figures contained here are the gross constant volume heating value of 25°C of all the fossil fuels involved and the B.t.u. heat equivalents of all the primary electricity generated.

Classification of Energy Sources

All energy available for human use may be placed in one of two categories: renewable and non-renewable.

1. Energy in the first category is obtained by diverting a part of the many energy flows that continuously take place among various systems of the natural environment. Most of these natural processes are cyclical in nature with varying periodicities; by far the most important ones are those based on absorption of radiation originating in the sun. Examples of this are the daily cycle, the cyclical storage of potential energy in river systems, the annual vegetation cycle and the still longer forest regeneration cycle. Since energy flows in this category are more or less steady state, they can provide energy sources that may be utilized on a permanent basis. These are renewable sources.
2. In the natural state, part of the available energy flow is often trapped in various subsystems of the physical environment. In this manner, enormous amounts of available energy may accumulate in highly concentrated and stable forms over a period of time. From an economic perspective, the various deposits of fossil fuels are the most important examples of energy available in this category. When assessing quantities of energy available from this type of source, the most significant criterion to keep in mind is the comparison of the time it takes the various organic materials involved to become fuels with that of their rate of depletion. Typically, the accumulation process of coal or petroleum takes place over millions of years, while the same energy source may be exhausted during one human lifetime. Resources in this category are, for man's purposes, non-renewable.

In an economic context, energy can be classified by the degree of processing or transformation it undergoes before its final application. In this distinction there are primary and secondary energies. Primary forms of energy are determined by adding the heating value of all fuels and electricity at the first stage where they become a source of energy. Energy from nuclear and hydraulic sources are included as measured by the value of the B.t.u heating equivalents of the electricity generated from them. Crude petroleum is included at the nominal conversion rate of 5.8 x 10 B.t.u. heat equivalent per barrel. Energy derived from fossil fuels and applied as electricity is counted as the heat equivalent of the fuels consumed in its generation and not as the heating value of the electricity generated. This also applies to primary stage measurements in refined products.

Secondary sources of energy, as the term implies, take into account processing, refinement or transformation. For example, the heating value of motor gasoline may be determined in its refined form and the heating value of electricity generated from fossil fuels is measured as the B.t.u. heating equivalent of the electricity generated; not as the heating value of the fossil fuels consumed during generation.

Definition of Technical Terms

Heat content of fuels and electricity denotes the quantity of energy in British Thermal Units. This quantity may be taken as the gross constant volume heating value of 25°C of all the fossil fuels involved. The conversion factors linking the heat content with the mass units of the various fuels are listed. The estimate used for wood was 20 million B.t.u.'s/cord. The heating value of electricity was set through the conversion factor of 3,412 B.t.u.'s per 1,000 kilowatt hours.

Primary energy consists of energy of coal, liquefied petroleum gas, natural gas, wood and crude petroleum as measured by the heat content defined above. For crude petroleum the conversion factor used was 5.8 million B.t.u.'s per barrel of 35 Canadian gallons. Hydraulic, nuclear and wood-generated electricity was measured by the B.t.u. equivalent of the electricity generated. For water and nuclear power, it would be technically difficult to determine a scaled energy conversion factor.

Secondary energy consists of energy in the form of fuel or electricity that is in turn derived from one or more primary energy sources through a process of refining, conversion or transformation. Such energy is measured as the heat content of the final secondary product. Examples are coke, diesel fuel oil, or electricity generated from fossil fuels.

Domestic availability of fuels and electricity is a measure of energy supply computed as follows: in any one year, take the heat content of all energy produced domestically in primary forms. Account for the change in stocks. Add the imports in both primary and secondary forms. Subtract the heat content of energy exports in both primary and secondary forms. The resulting figure is a good measure of the maximum potential heat content of all fuels available domestically. Traditionally, except in 1973, Canada has been a net importer of energy in secondary forms.

Renewable source energy is derived from wood or hydro power. Electricity from the combustion of wood is included, but is measured as the B.t.u. equivalent of the electricity generated, since no precise figures are available for the amount of wood used.

Non-renewable source energy is derived from all sources not included among renewable sources.

Energy consumption – While domestic availability measures the supply of energy as closely as possible to the primary stage, energy consumption attempts to measure the heat content of fuels and electricity in the form in which they are actually consumed. For example, only that part of the coal supply that is burned as coal is counted at the rate of primary heat content of coal. Energy orginally derived from coal that can be traced as being applied in the form of electricity in final use is counted as heat content of the electricity consumed. It should be noted, too, that transmission losses of electricity are included in total consumption, in the category of the energy supply industry.

Energy conversion describes the process of changing a primary source of energy such as coal into secondary energy forms.

Energy transformation refers to the process of changing secondary energy sources into other secondary energy sources; for example, obtaining electricity from fuel-oil-fired generating stations.

Net electrical generating capability measures the expected power of all available generating facilities of the nation, or a province, at the time of one hour firm peak load for each of the respondents. Generating capability is different from generating capacity, which refers to the theoretical capacity of the equipment, while the former takes into account factors such as the water level of the flow feeding the turbines, ice conditions, or the impossibility of placing all equipment in an installation on line at the same time. The category "net" excludes power used in station service.

Firm power peak load – Firm refers to power under firm contract or the best estimate of firm obligations in the absence of contracts. Peak loads include line losses and the manufacturing plant's own consumption, but do not include generating station service. Also excluded is secondary or surplus power to the ultimate customers on an interruptive basis.

Indicated shortage is a measure of firm power commitments a system was unable to meet at the time of its peak load.

Total indicated firm power peak load is the sum of firm power peak load and indicated shortage.

Total net capability includes total net generating capability along with total receipts of power from outside, less total deliveries of power to outside the geographical area concerned. Receipts and deliveries are counted at the time of one hour firm power peak load of the exporting or importing grid. Since there may be several grids within a province, the components contributing to the provincial or national total may not be synchronously defined. Receipts and deliveries may refer to electricity crossing either provincial or international boundaries.

Net generation refers to electricity generated and available at the generating station gate after electricity used in station service has been deducted. Line losses occurring subsequently are included. Generation is measured in units of energy such as kilowatt hours while

generating capability involves quantities of power (that is, rate of energy transfer with respect to time) measured in units such as kilowatts.

The Data and Their Sources

The data in this chapter highlight the use of energy in the economy. Information on production of energy is presented in exhibits 7.1 to 7.7. Energy consumption is examined in the section from Tables 7.8 to 7.25. In several cases, data are disaggregated to the industrial group level, as in Tables 7.20 to 7.23. These tables present an accurate picture of energy needs by industry as well as giving an indication of activities potentially most severely affected by periods of energy shortage.

Tables 7.26 to 7.28 deal with efficiency of energy conversion. Some specific energy sources are examined in the remaining tables. It will be noted that these are presently commercially exploited sources as opposed to those with future potential. An energy source such as the sun, given the necessary technology, would provide an essentially inexhaustible power supply for much of man's future energy requirements.

In selecting the energy-related statistics for this volume, the guiding principle has been to place into long-term perspective the current trends in availability and consumption of energy. This has necessitated using some data not originating with Statistics Canada and compiling some historical series despite some gaps.

Most of the data before 1926 came from Urquhart and Buckley's *Historical Statistics of Canada,* while much of the data on the use of wood came from the publication, *Canadian Energy Prospects.*

All data from 1926 - 52 were selected from two special papers issued by the Dominion Bureau of Statistics in 1956 and 1957. Most of the aggregate data in the long-term historical series relating to 1958 and later were taken from *Detailed Energy Supply and Demand in Canada.* Some historical series and information on petroleum and natural gas were obtained from provincial government sources. Data on oil and gas reserves came from the Canadian Petroleum Association.

Consumption of energy by various levels of government is included in the commercial sector. Estimates for the domestic sector are based on the number of households using various types of fuel or electricity as their main source of heat. In the case of wood, consumption of 150 million B.t.u.'s per year per household was assumed.

Losses and Adjustments

Detailed Energy Supply and Demand in Canada identifies a balancing entry to make figures for the total supply of energy conform with the totals on known consumption. This information has been omitted from the tables, except in Table 7.16, where it is shown to provide some measure of the data's precision.

Conversion of Mass Units of Fuel to B.t.u.'s

While there may be differences between the conversion factors shown in this publication and those used elsewhere to convert data from earlier time periods, we believe any discrepancies to be insignificant when considered in relation to the precision of the aggregate statistics available.

Major References

Historical Statistics of Canada, M.C. Urquhart and K.A.H. Buckley, Editors, Cambridge University Press, 1965.

John Davis, *Canadian Energy Prospects,* Royal Commission on Canada's Economic Prospects (W. L. Gordon, Chairman), 1957.

Energy Sources in Canada, Commodity Accounts for 1948 and 1952, Reference Paper No. 69, Dominion Bureau of Statistics, 1956, Catalogue 13-506.

Energy Sources in Canada, Commodity Statements for 1926, 1929, 1933 and 1939, Reference Paper No. 74, Dominion Bureau of Statistics, 1957, Catalogue 13-507.

Detailed Energy Supply and Demand in Canada, Statistics Canada, Catalogues 57-505 and 57-207.

Fuel Conversion Factors, Internal Report, FMP 62/28 (1962), Fuels and Mining Practice Division, Department of Energy, Mines and Resources.

Natural Units and the B.t.u. Conversion Factors for Fuel Types

Fuel type	Natural unit	Conversion factor
		millions of B.t.u.'s
Coal:		
Anthracite	short tons of 2,000 pounds	25.40
Imported bituminous	" " " " "	25.80
Canadian bituminous	" " " " "	25.20
Sub-bituminous	" " " " "	17.00
Lignite	" " " " "	13.20
Coke	" " " " "	24.80
Coke oven gas	thousands of cubic feet	0.50
Liquefied petroleum gas	barrels of 35 Canadian gallons	4.10
Crude oil	" " " " "	5.80
Still gas	" " " " "	6.29
Motor gasoline	" " " " "	5.22
Kerosene	" " " " "	5.68
Diesel fuel	" " " " "	5.83
Light fuel oil	" " " " "	5.83
Heavy fuel oil	" " " " "	6.29
Petroleum coke	" " " " "	6.39
Aviation gasoline	" " " " "	5.05
Aviation turbo fuel	" " " " "	5.41
Natural gas	thousands of cubic feet	1.00
Electricity	thousands of kilowatt hours	3.41

TABLE 7.1. Heat Content of Domestically Available Fuels and Electricity[1]

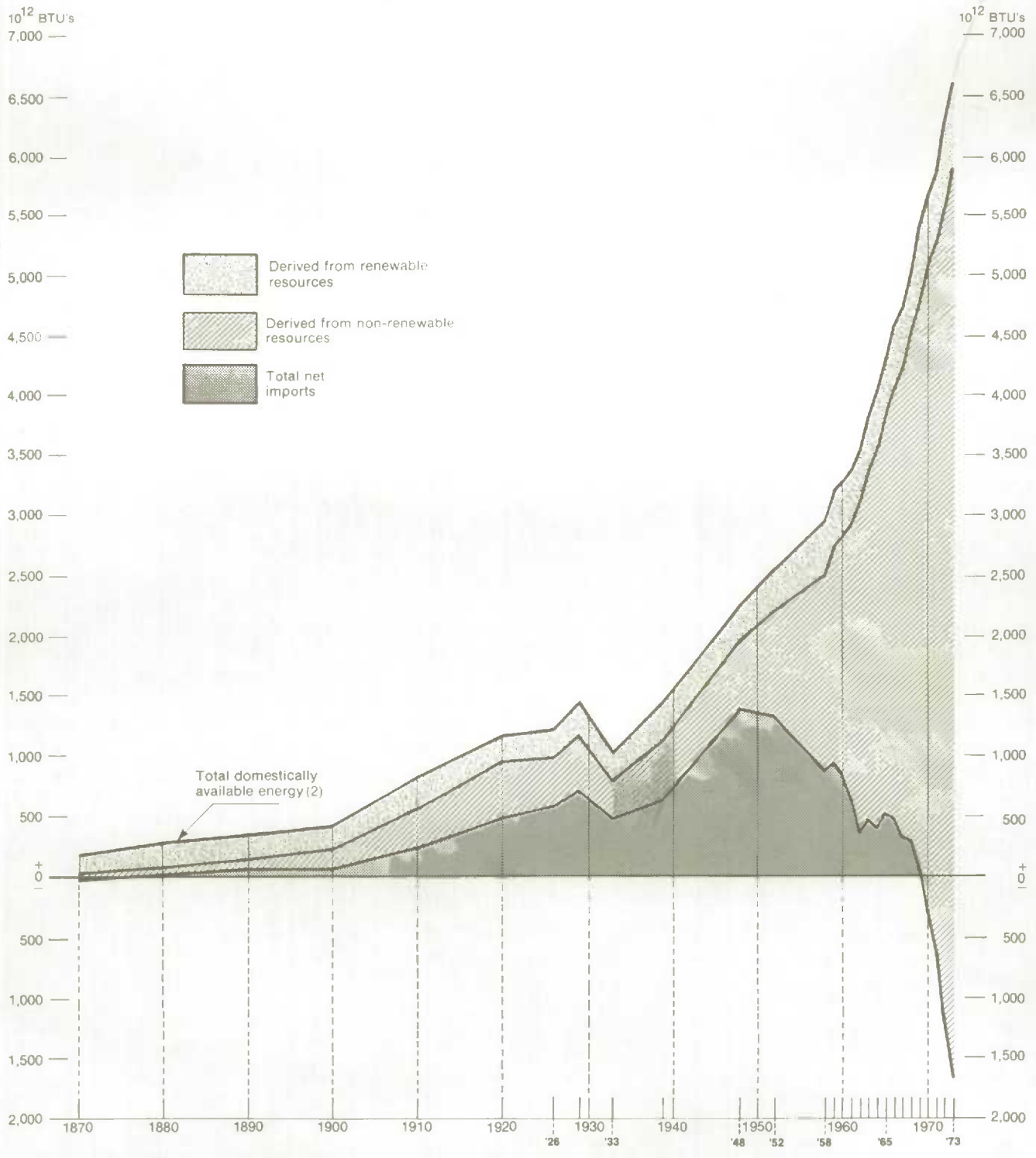
	Domestic production of primary energy	Total exports of primary and secondary energy	Total imports of primary and secondary energy	Imports less exports	Heat content of domestically available fuels and electricity
	10^{12} B.t.u.'s				
1870	195	7	–	– 7	188
1880	258	8	26	18	276
1890	290	18	72	54	344
1900	334	44	119	75	409
1910	578	58	293	235	813
1920	635	63	555	491	1,126
1926	616	39	635	596	1,212
1929	716	35	754	719	1,435
1933	546	12	504	492	1,038
1939	810	22	638	616	1,426
1948	863	59	1,448	1,389	2,252
1952	1,252	50	1,359	1,309	2,561
1958	2,087	307	1,167	860	2,947
1959	2,285	334	1,260	926	3,211
1960	2,426	418	1,265	847	3,273
1961	2,754	624	1,263	639	3,393
1962	3,198	927	1,290	363	3,561
1963	3,339	972	1,437	465	3,804
1964	3,634	1,085	1,494	409	4,043
1965	3,818	1,126	1,641	515	4,333
1966	4,112	1,272	1,755	483	4,595
1967	4,405	1,504	1,835	331	4,736
1968	4,796	1,715	2,018	303	5,099
1969	5,308	1,998	2,028	30	5,338
1970	5,998	2,453	2,151	– 302	5,696
1971	6,549	2,884	2,231	– 653	5,896
1972	7,391	3,632	2,476	– 1,156	6,235
1973	8,270	4,158	2,494	– 1,664	6,606
1974P	8,156	3,550	2,264	– 1,242	6,761
1975P	7,539	2,936	2,191	– 795	6,744

[1] Maximum potential heat content of domestically available energy is defined as the simple thermal equivalents of the total production of primary energy (including those of coal, liquified petroleum gases, natural gas, wood, hydro and nuclear electricity and of crude oil, the latter counted at 5,803 million B.t.u's per barrel) plus the thermal equivalent of total primary and secondary energy imports less the thermal equivalent of total primary and secondary energy exports.

Source: Urquhart and Buckley, eds., *Historical Statistics of Canada*, Toronto, MacMillan Company of Canada, 1965; Catalogue 26-501, *Canadian Mineral Statistics, 1886 - 1956* (1957); Catalogue 26-201, *General Review of the Mining Industry;* Catalogue 65-004 *Exports by Commodities;* Catalogue 65-007, *Imports by Commodities;* Catalogues 57-505 and 57-207, *Detailed Energy Supply and Demand in Canada;* Catalogue 13-506, *Energy Sources in Canada, Commodity Accounts for 1948 and 1952,* Reference Paper No. 69 (1956); Catalogue 13-507, *Energy Sources in Canada, Commodity Statements for 1926, 1929, 1933 and 1939,* Reference Paper No. 74 (1957.

Chart — 7.2

Heat Content of Domestically Available Fuels and Electricity (1)



(1) See footnote (1), Table 7.1.

(2) The top line shows Total Domestically Available Energy, always measured from the zero base line. The distance between the top line and the Total Net Imports line represents Domestic Production and is further subdivided into renewable and non-renewable sources, a distinction not made for imported energy. Since exports have exceeded imports between 1970 and 1975, Net Imports are negative during this period; however, the difference between the top line and the Net Imports line still denotes a positive quantity. The region of the chart representing domestic production derived from non-renewable sources and extending below the zero base line is not meant to indicate a negative sign.

Source: Same as in Table 7.1.

TABLE 7.3. Average Heat Content Per Person[1] of Domestically Available Fuels and Electricity

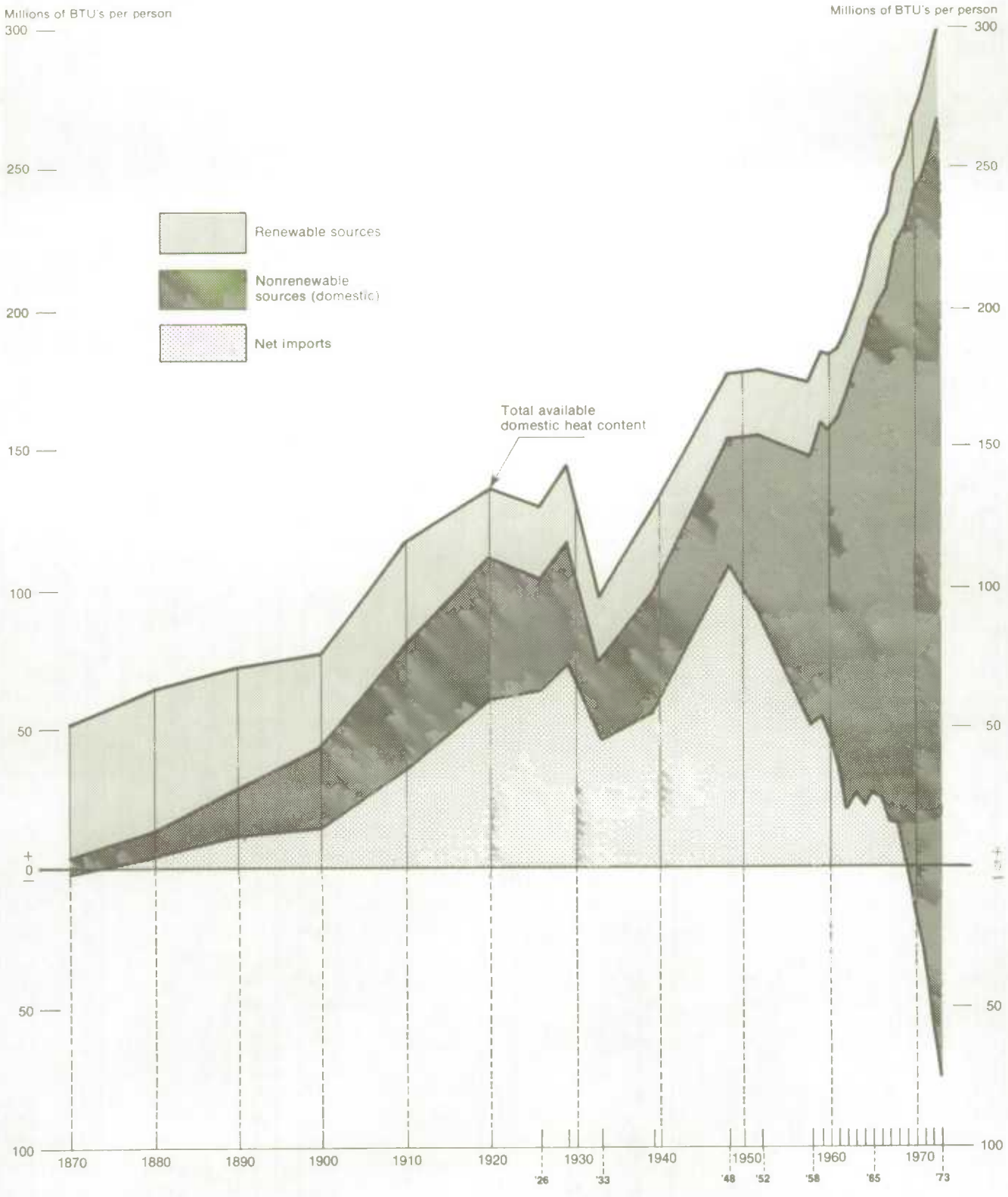
	Domestic production of primary energy	Domestic production of energy derived from renewable sources	Imports less exports	Heat content of domestically available fuel and electricity
	millions of B.t.u.'s per person			
1870	54	48	– 2	52
1880	61	52	4	65
1890	61	44	11	72
1900	63	35	14	77
1910	82	36	34	116
1920	75	24	60	135
1926	65	25	63	128
1929	71	27	72	143
1933	51	23	46	97
1939	72	28	55	127
1948	67	23	108	175
1952	87	23	90	177
1958	122	26	50	172
1959	131	26	53	184
1960	136	27	47	183
1961	151	26	35	186
1962	172	25	20	192
1963	176	24	25	201
1964	188	25	21	209
1965	194	24	26	220
1966	205	26	24	229
1967	216	25	16	232
1968	232	25	15	247
1969	253	27	1	254
1970	282	28	– 14	268
1971	304	28	– 30	274
1972	339	30	– 53	286
1973	374	32	– 75	299
1974p	363	..	– 55	308
1975p	331	..	– 35	296

[1] All quantities in this table are defined as those in Table 7.1, except they are divided by the total population for the appropriate year.

Source: Same as in Table 7.1.

Chart — 7.4

Average Heat Content per Person of Domestically Available Fuels and Electricity



Source: Same as in Table 7.1.

TABLE 7.5. Percentage of Domestically Available Energy Derived from Renewable and Non-renewable Sources and from Trade With the Rest of the World

	Domestic production from renewable sources[1]	Domestic production from non-renewable sources	Imports less exports	Total
	per cent[2]			
1870	93.2	10.5	– 3.7	100.0
1880	79.7	13.8	6.5	100.0
1890	61.1	23.1	15.8	100.0
1900	45.9	35.9	18.2	100.0
1910	31.3	39.8	28.9	100.0
1920	18.2	38.2	43.6	100.0
1926	19.2	31.6	49.2	100.0
1929	18.8	31.1	50.1	100.0
1933	23.4	29.2	47.4	100.0
1939	22.1	34.7	43.2	100.0
1948	13.0	25.3	61.7	100.0
1952	13.1	35.8	51.1	100.0
1958	14.9	55.9	29.2	100.0
1959	14.2	57.0	28.8	100.0
1960	14.4	59.7	25.9	100.0
1961	13.8	67.4	18.8	100.0
1962	12.8	77.0	10.2	100.0
1963	11.8	76.0	12.2	100.0
1964	11.8	78.1	10.1	100.0
1965	11.1	77.0	11.9	100.0
1966	11.2	78.3	10.5	100.0
1967	10.9	82.1	7.0	100.0
1968	10.3	83.8	5.9	100.0
1969	10.6	88.8	0.6	100.0
1970	10.3	95.0	– 5.3	100.0
1971	10.3	100.8	– 11.1	100.0
1972	10.6	107.9	– 18.5	100.0
1973	10.6	114.6	– 25.2	100.0

[1] Consists of energy derived from wood and hydro-electricity.
[2] All percentages are calculated on the basis of heat content of domestically available fuels and electricity in the appropriate year. Negative figures indicate exports exceeding imports.

Source: Same as in Table 7.1.

TABLE 7.6. Average Heat Content Per Person of Domestically Available Energy by Fuel Type

	Wood	Coal and its derivatives	Hydro-electricity	Petroleum fuels	Natural gas	Nuclear electricity
	millions of B.t.u.'s per person					
1870	48.3	3.1	–	0.4	–	–
1880	51.7	12.7	–	0.5	–	–
1890	43.9	26.9	0.1	1.2	–	–
1900	35.1	40.5	0.3	0.8	0.5	–
1910	35.3	77.3	1.1	1.6	1.1	–
1920	21.7	95.9	2.3	5.9	2.0	–
1926	20.3	88.9	3.8	13.1	2.0	–
1929	20.2	91.6	6.1	22.4	2.8	–
1933	16.9	55.1	5.9	17.5	2.2	–
1939	18.7	69.5	8.6	26.5	3.1	–
1948	11.3	97.5	11.4	50.3	5.1	–
1952	8.4	77.5	14.1	70.2	6.9	–
1958	7.7	35.7	17.3	92.0	19.9	–
1960	6.2	29.9	19.2	101.9	25.8	–
1962	5.4	28.6	18.9	105.9	32.9	–
1964	4.6	30.8	19.9	116.0	38.3	–
1966	3.7	30.7	21.9	128.8	44.4	–
1968	3.0	31.4	22.3	138.6	50.8	0.1
1970	2.4	31.7	24.7	147.5	61.0	0.2
1972	2.1	28.1	26.8	156.2	71.4	1.1
1973	2.0	28.5	27.6	163.8	75.0	2.2

Source: Same as in Table 7.1.

TABLE 7.7. Balance of Trade in Energy by Average Heat Content Per Person and by Fuel Type

	Coal and its derivatives	Petroleum fuels	Electricity	Natural gas
	millions of B.t.u.'s per person			
1870	1.9	–	–	–
1880	- 4.2	--	–	–
1890	- 11.3	- 0.2	–	–
1900	- 14.0	--	–	–
1910	- 32.4	- 1.3	–	–
1920	- 51.8	- 5.7	–	–
1926	- 50.7	- 12.9	0.5	–
1929	- 50.5	- 21.7	0.5	–
1933	- 29.4	- 16.9	--	–
1939	- 33.0	- 22.3	0.6	–
1948	- 63.3	- 45.4	0.4	–
1952	- 45.3	- 45.9	0.6	0.1
1958	- 19.9	- 34.9	0.8	3.6
1960	- 16.7	- 37.9	1.0	6.2
1962	- 16.0	- 23.0	0.2	19.2
1964	- 18.4	- 23.5	0.2	20.5
1966	- 20.2	- 23.6	0.2	19.5
1968	- 20.2	- 19.6	- 0.1	25.3
1970	- 18.2	- 4.1	0.4	36.1
1972	- 10.8	16.9	1.4	45.5
1973	- 6.9	34.0	2.2	45.8

Source: Same as in Table 7.1.

TABLE 7.8. Consumption of Fuel and Electricity by Source of Supply

	Directly from primary sources	From excess of imports over exports of secondary fuel and electricity	From domestic conversion and transformation of primary and secondary fuel and electricity	Total	Total heat content of fuel and electricity consumed[1]
	per cent				10^{12} B.t.u.'s
1926	85.0	4.1	10.9	100.0	1,143
1929	79.4	4.9	15.7	100.0	1,349
1933	76.3	3.0	20.7	100.0	987
1939	76.7	2.2	21.1	100.0	1,330
1948	70.5	5.6	23.9	100.0	2,027
1952	58.5	7.8	33.7	100.0	2,302
1958	42.8	5.7	51.5	100.0	2,747
1959	41.3	7.0	51.7	100.0	2,933
1960	40.9	6.3	52.8	100.0	2,998
1961	41.4	5.1	53.5	100.0	3,088
1962	40.7	4.6	54.7	100.0	3,258
1963	39.9	4.8	55.3	100.0	3,429
1964	39.9	6.3	53.8	100.0	3,652
1965	39.3	8.6	52.1	100.0	3,883
1966	39.7	8.4	51.9	100.0	4,074
1967	38.7	9.0	52.3	100.0	4,252
1968	38.0	9.1	52.9	100.0	4,518
1969	39.1	8.5	52.4	100.0	4,756
1970	38.5	7.7	53.8	100.0	5,061
1971	38.8	4.9	56.3	100.0	5,215
1972	39.1	2.0	58.9	100.0	5,518
1973	39.5	[2]	60.5	100.0	5,779

[1] For distinction between energy consumed and energy available domestically, see text.
[2] In 1973 exports of secondary fuels exceeded imports.

Source: Same as in Table 7.1.

TABLE 7.9. Relationship Between Economic Activity and Consumption of Energy

	Real Domestic Product at factor cost	Heat content of domestically available fuel and electricity divided by Real Domestic Product at factor cost	Heat content of fuel and electricity consumed divided by Real Domestic Product at factor cost
	millions of 1961 dollars	thousands of B.t.u.'s per 1961 dollars	
1939	12,421	114.7	107.1
1948	20,065	112.2	101.0
1952	25,656	99.8	89.7
1958	32,203	91.5	85.3
1959	33,866	94.8	86.6
1960	34,680	94.4	86.5
1961	35,388	95.9	87.3
1962	37,865	94.0	86.0
1963	40,059	95.0	85.6
1964	42,926	94.2	85.1
1965	46,004	94.2	84.4
1966	49,331	93.1	82.6
1967	50,994	92.9	83.4
1968	53,967	94.5	83.7
1969	57,187	93.4	83.2
1970	58,603	97.2	86.4
1971	62,071	95.0	84.0
1972	65,291	95.5	84.5
1973	69,785	94.7	82.8
1974	72,333	95.6p	...

Source: Same as in Table 7.1.

TABLE 7.10. Percentage of Energy Consumed in Various Forms[1]

	1870	1900	1926	1948	1958	1972
	per cent					
Aviation gasoline	...	..	...	...	0.7	0.1
Aviation turbo fuel	...	...	...	...	0.8	1.8
Still gas	...	...	...	0.3	2.0	1.9
Liquefied petroleum gases	...	...	...	0.2	0.6	1.3
Coke oven gas	...	...	1.4	1.8	0.9	0.7
Coke	...	...	4.1	2.5	3.2	2.6
Petroleum coke	...	...	0.1	0.1	0.7	0.3
Motor gasoline	...	...	4.0[2]	10.9[2]	17.7	17.8
Electricity	...	0.3	3.2	7.7	11.6	14.3
Natural gas	...	0.6	1.6[3]	3.1	11.1	25.6
Light fuel oil	...	...	...	...	11.1	11.9
Heavy fuel oil	...	...	...	...	11.1	12.3
Diesel oil	...	...	5.4	14.0	4.6	5.8
Kerosene	0.8[4]	1.1[4]	...	...	3.6	1.9
Coal and coal briquettes	6.0[5]	52.5[5]	63.4	52.4	15.8	1.1
Wood	93.2	45.5	16.8	7.0	4.5	0.6
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

[1] Based on heat content of fuel or electricity actually consumed. 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 the fractions of total available domestic heat content derived from the primary sources of wood, coal, crude oil, hydro power and natural gas and should be regarded as the limits set for the heat content of various possible derivatives.

[2] Includes naptha.

[3] Includes manufactured gas.

[4] Based on heat content of domestic supply of crude oil. However, it is known that all crude oil prior to about 1910 was refined into kerosene, with other distallates rejected. (See Davis Commission Report on Canadian Energy Prospects, 1957.)

[5] A substantial portion of early use of coal involved production of coal oil and gas for street lighting. (See Davis Commission Report.)

Source: Catalogue 13-506, *Energy Services in Canada, Commodity Accounts for 1948 and 1952*, Reference Paper No. 69; Catalogue 13-507, *Energy Sources in Canada, Commodity Statements for 1926, 1929, 1933 and 1939*, Reference Paper No. 74; Catalogue 57-207, *Detailed Energy Supply and Demand in Canada, 1958-1969*; Urquhart and Buckley; eds., *Historical Statistics of Canada*, Toronto, MacMillan Company of Canada, 1965.

TABLE 7.11. Consumption of Energy in Various Sectors of the Economy by Fuel Type, 1973

	Coal and its derivatives[1]	Motor gasoline	Diesel fuel oil	Light fuel oil	Heavy fuel oil
	10^{12} B.t.u.'s				
Energy supply industry	0.4	1.1	2.6	0.8	102.8
Transportation:					
Road	–	1,048.8	71.4	–	–
Rail	1.3	–	79.1	6.0	7.9
Air	–	–	–	–	–
Marine[2]	3.3	–	40.0	0.6	81.2
Total	**4.6**	**1,048.8**	**190.5**	**6.6**	**89.1**
Domestic and farm	7.8	–	41.3	437.4	20.5
Commercial[3]	1.5	–	23.7	97.1	142.5
Industrial	235.0	–	101.3	84.8	316.5
Losses and adjustments	24.4	15.5	4.0	5.9	– 0.3
Total	**273.7**	**1,065.4**	**363.4**	**632.6**	**671.1**

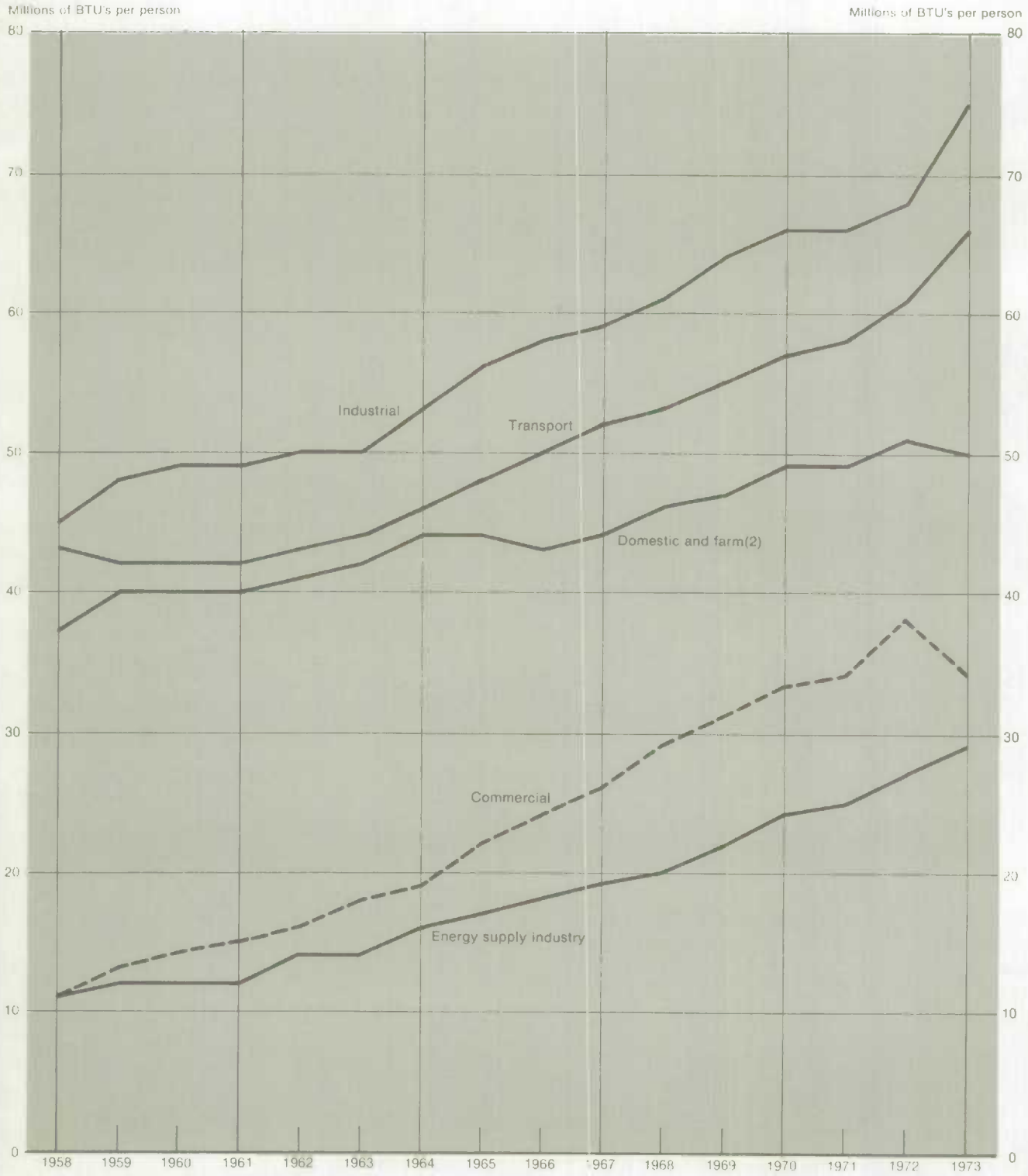
	Aviation gasoline and turbo fuel	Other petroleum derivatives[4]	Natural gas	Electricity	Total
	10^{12} B.t.u.'s				
Energy supply industry	0.1	129.6	326.5	76.5	640.4
Transportation:					
Road	–	–	–	–	1,120.2
Rail	–	1.3	–	–	95.6
Air	119.9	–	–	–	119.9
Marine[2]	–	0.3	–	–	125.4
Total	**119.9**	**1.6**	**–**	**–**	**1,461.1**
Domestic and farm	–	162.3[5]	271.8	184.3	1,125.4
Commercial[3]	–	13.5	255.2	210.7	744.2
Industrial	–	21.5	527.6	379.1	1,665.8
Losses and adjustments	0.6	5.1	87.0	–	142.2
Total	**120.6**	**333.6**	**1,468.1**	**850.6**	**5,779.1**

[1] Includes coal, coke and coke oven gas.
[2] Does not include Canadian Armed Forces' equipment.
[3] Includes government.
[4] Includes liquified petroleum gases, crude oil, still gas, kerosene and petroleum coke.
[5] Includes an estimate of 30.8 x 10^{12} B.t.u.'s generated from wood.

Source: Catalogue 57-207, *Detailed Energy Supply and Demand in Canada* (1973).

Chart — 7.12

Average Consumption of Energy per Person by Sector (1) of the Economy

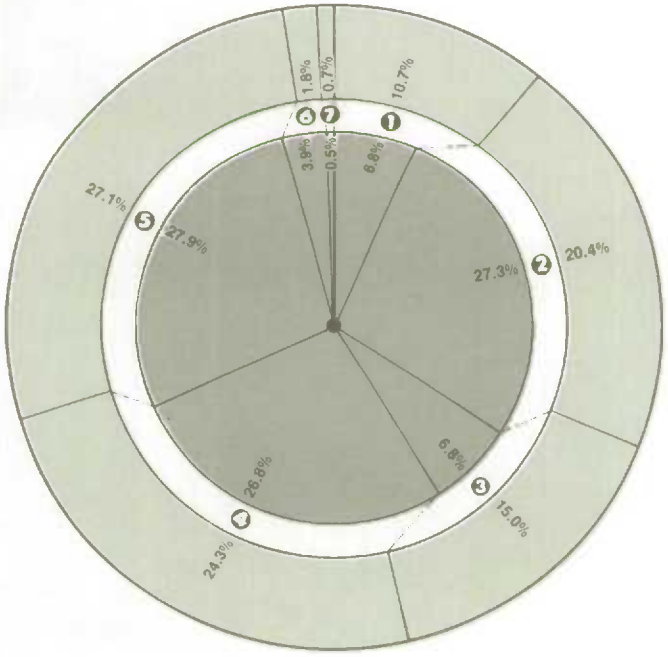


(1) Sector allocations are Statistics Canada estimates.
(2) Excludes diesel oil.

Source: Catalogue 57-207, DETAILED ENERGY SUPPLY AND DEMAND IN CANADA;
Catalogue 57-505, DETAILED ENERGY SUPPLY AND DEMAND IN CANADA, 1958-1969.

Chart — 7.13

Percentage of Energy Consumed in Various Sectors (1) of the Economy, 1958 and 1972 (2)

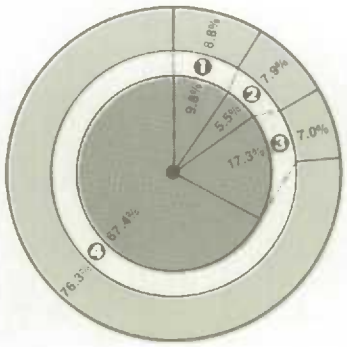


(1) Sector allocations are Statistics Canada estimates.
(2) The areas of the inner and outer circles are proportional to total consumption of energy in the years 1958 and 1972, respectively.
(3) A residual entry to ensure agreement with accounting on the supply side.

Source: Same as in chart 7.12.

Chart — 7.14

Percentage Distribution of Energy Consumed in the Transportation Sector by Mode of Transport, 1958 and 1972 (1)



(1) The areas of the inner and outer circles are drawn to the same scale as those in chart 7.13.
(2) Excludes Canadian Armed Forces equipment.

Source: Same as in chart 7.12.

TABLE 7.15. Share Index of Energy Consumption Per Person by Type of Fuel, by Province, 1972[1]

	Coal and its derivatives[2]	Motor gasoline	Diesel oil	Light fuel oil	Heavy fuel oil
Atlantic provinces	0.83	0.89	1.37	1.61	1.76
Quebec	0.32	0.86	0.65	1.32	1.62
Ontario	2.08	1.03	0.63	1.03	0.79
Manitoba	0.59	1.02	1.48	0.36	0.24
Saskatchewan	0.23	1.37	1.85	0.35	0.18
Alberta	0.24	1.30	1.71	0.11	0.15
British Columbia, Yukon and Northwest Territories	0.31	0.99	1.77	0.68	0.65
	millions of B.t.u.'s per person				
Total consumption	11.4	45.0	14.7	30.2	31.1

	Aviation gasoline and turbo fuel	Other petroleum fuels[3]	Wood[4]	Natural gas	Electricity	Total
Atlantic provinces	1.17	1.91	2.56	–	0.70	0.92
Quebec	1.05	1.00	1.47	0.15	1.19	0.85
Ontario	0.74	0.60	0.39	1.06	0.95	0.99
Manitoba	1.21	1.46	0.81	1.18	0.95	0.91
Saskatchewan	0.45	0.54	0.71	2.07	0.65	1.09
Alberta	1.41	1.92	0.39	4.18	0.70	1.67
British Columbia, Yukon and Northwest Territories	1.44	0.86	1.05	1.16	1.32	1.02
	millions of B.t.u.'s per person					
Total consumption	4.9	12.8	1.5	65.0	36.2	252.8

[1] Includes consumption in all sectors of the economy. The breakdown into various energy types is done as close to the final step in consumption as they can be traced; electricity derived from all sources is shown as simple heat equivalent of electricity generated. The relative share is based on the average for Canada: thus if 20% of all Canadians were located in a certain province in which 30% of all diesel oil were consumed, the corresponding index would be 1.5: thus a number greater than 1 indicates relatively heavy use of energy.

[2] Includes coal, coke and coke oven gas.

[3] Includes crude oil, still gas, kerosene and petroleum coke.

[4] Wood equivalent to 32.7×10^{12} B.t.u.'s of heat was estimated to have been consumed in residential use in Canada in 1972 and was apportioned among the various provinces on the basis of the number of households using wood as principal heating fuel in the respective provinces.

Source: Catalogue 57-207, *Detailed Energy Supply and Demand in Canada* (1972); Catalogue 64-202, *Household Facilities and Equipment* (1972).

TABLE 7.16. Share Index of Consumption of Energy Per Person by Sector[1] of the Economy, by Province, 1972[2]

	Energy supply industry[3]	Transport			
		Road	Rail	Air	Marine[4]
Atlantic provinces	0.57	0.87	1.18	1.16	4.04
Quebec	0.61	0.86	0.78	1.05	1.22
Ontario	0.54	1.03	0.64	0.74	0.45
Manitoba	0.86	1.02	2.45	1.20	0.05
Saskatchewan	1.65	1.37	1.22	0.45	0.03
Alberta	4.43	1.32	2.15	1.41	0.06
British Columbia, Yukon and Northwest Territories	1.31	1.01	1.10	1.44	1.02
	millions of B.t.u.'s per person				
Total consumption	27.0	46.9	4.3	4.8	5.4

	Domestic and farm[5]	Diesel fuel used on farms	Commercial	Industrial	Losses and adjustments[6]	Total[7]
Atlantic provinces	1.20	0.60	0.80	0.66	1.06	0.92
Quebec	0.94	0.24	0.97	0.82	0.35	0.85
Ontario	0.98	0.45	1.04	1.26	0.38	0.99
Manitoba	1.03	2.80	1.02	0.61	0.70	0.91
Saskatchewan	1.03	7.34	0.67	0.79	2.98	1.09
Alberta	1.20	3.08	1.67	1.00	5.63	1.67
British Columbia, Yukon and Northwest Territories	0.89	0.50	0.75	1.16	0.77	1.02
	millions of B.t.u.'s per person					
Total consumption	51.6	1.7	38.0	68.4	4.7	252.8

1 Since data are submitted to Statistics Canada by the energy supply industries on a non-coordinated basis the sector allocations are estimates only.
2 For a definition of share index see Table 7.15.
3 Includes transportation of energy products, for example, by pipeline and power line losses.
4 Excludes Canadian Armed Forces' equipment.
5 Excludes diesel fuel consumption.
6 The same definition of share index applies to this column as for other columns, expressing losses and adjustments for all fuels consumed in a province as a fraction of the same quantity computed Canada-wide.
7 Excludes non-energy use of various potential fuels, such as lubricants.

Source: Catalogue 57-207, *Detailed Energy Supply and Demand in Canada* (1972).

TABLE 7.17. Total Energy Consumption[1] by Province

	Total energy consumed			Average total energy consumed per person		
	1958	1964	1973	1958	1964	1973
	10^{12} B.t.u.'s			millions of B.t.u.'s per person		
Atlantic provinces	237	309	497	131	158	236
Quebec	674	903	1,391	137	162	229
Ontario	993	1,336	2,020	171	202	254
Manitoba	296[2]	156	231	167[2]	163	232
Saskatchewan		195	252		207	277
Alberta	307	418	758	255	293	450
British Columbia, Yukon and Northwest Territories	240	335	630	153	187	266
Canada	**2,747**	**3,652**	**5,779**	**161**	**189**	**262**

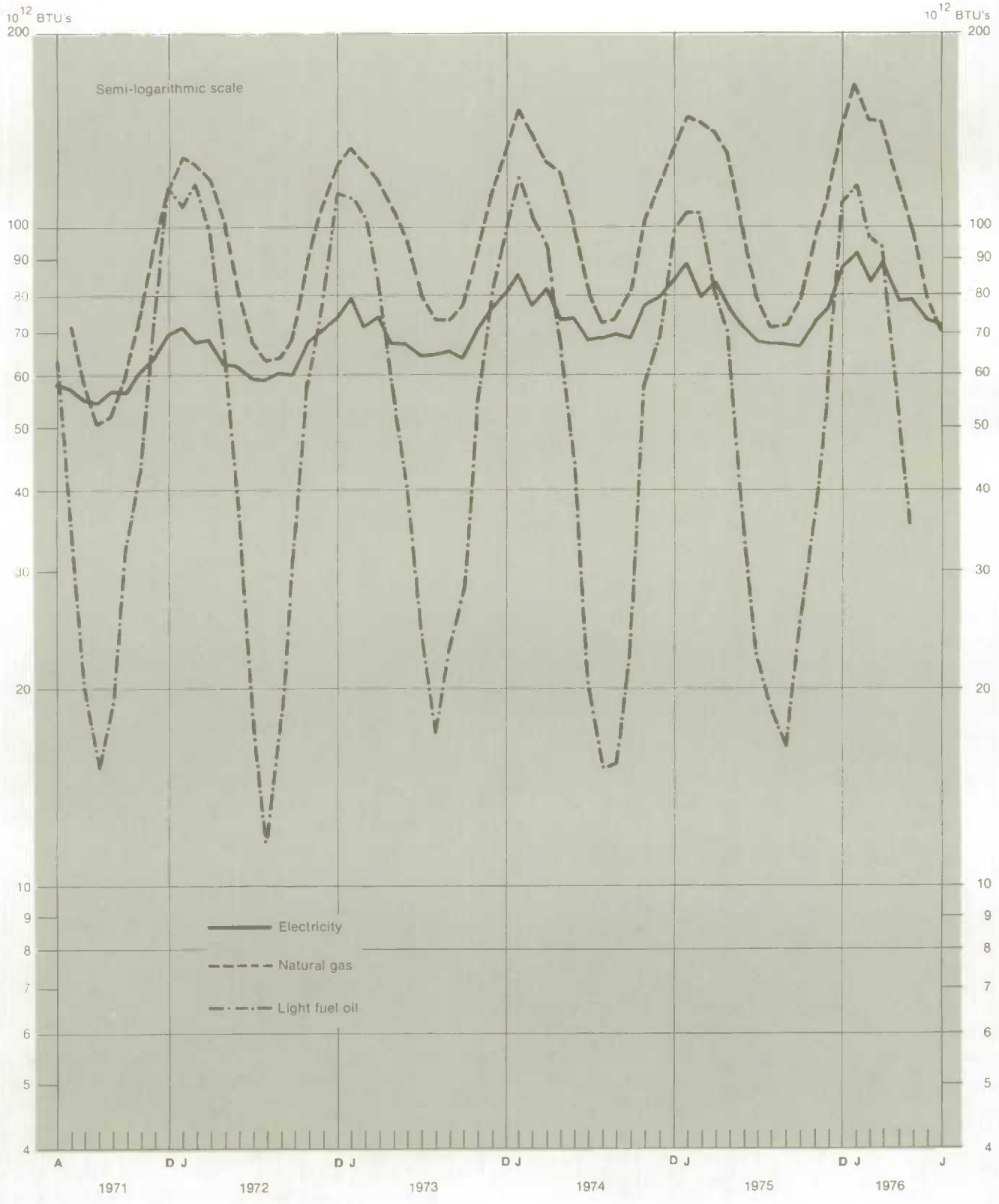
[1] Also referred to as final energy consumption.
[2] No separate figures available for Saskatchewan and Manitoba.

Source: Catalogue 57-207, *Detailed Energy Supply and Demand in Canada;* Catalogue 57-505, *Detailed Energy Supply and Demand in Canada, 1958-1969;* unpublished data, Energy and Minerals Section, Statistics Canada.

Sawmill dam, Fundy National Park, New Brunswick (photo by Bruce Mitchell)

Chart — 7.18

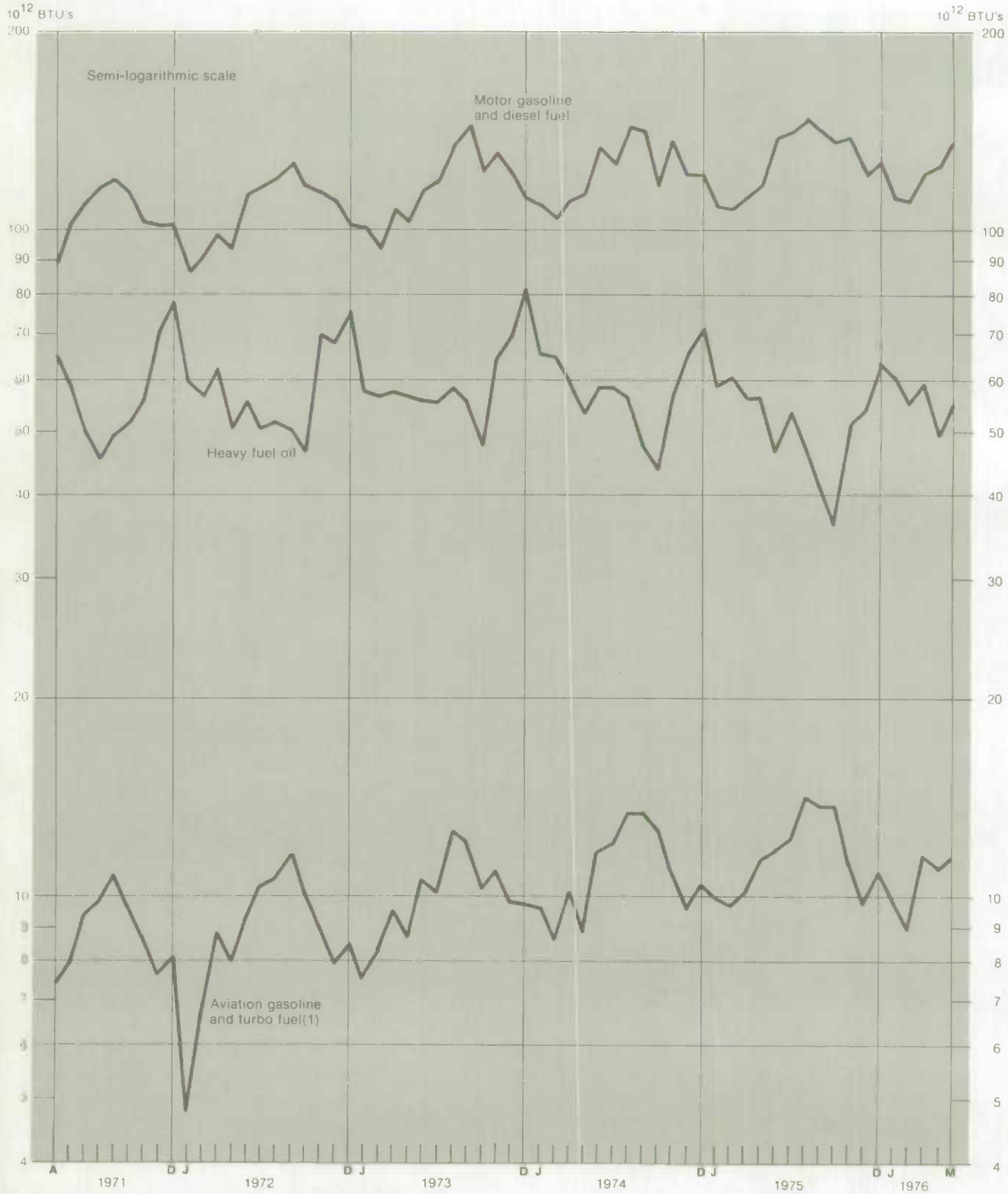
Monthly Net Sales of Electricity and Selected Fuels



Source: Catalogue 11-003, CANADIAN STATISTICAL REVIEW.

Chart — 7.19

Monthly Net Sales of Selected Fuels



(1) The average weighted conversion factor of 5.389 million BTU's per barrel of 35 Canadian gallons is used in the conversion.

Source: Same as in Table 7.18.

TABLE 7.20. Energy Consumed in the Manufacturing Industries

Industrial group[2]	Heat content consumed by type of energy used[1]					
	Coal and its derivatives		Petroleum products		Natural gas	
	1962	1972	1962	1972	1962	1972
	billions of B.t.u.'s					
Paper and allied	56,772	12,197	59,903	163,304	25,255	68,438
Primary metal	28,856	26,952	39,512	54,163	22,953	68,281
Chemical and chemical products	26,459	938	11,741	42,323	24,474	61,341
Non-metallic products	22,632	5,883	23,256	44,902	24,192	57,148
Food and beverage	12,550	294	32,823	47,261	17,860	39,711
Transportation and equipment	10,256	3,671	4,767	12,613	2,143	14,409
Textile	5,226	91	10,552	18,432	1,157	6,437
Wood	544	145	5,017	12,814	1,011	8,620
Petroleum and coal products	25	26	346	882	7,727	16,569
Metal fabricating	1,461	26	4,369	7,152	3,984	14,097
Rubber and plastics products	3,573	47	1,269	7,572	387	4,376
Electrical products	2,555	355	4,484	4,969	1,251	5,619
Machinery (except electrical machinery)	1,600	276	2,258	3,271	1,414	5,562
Miscellaneous manufacturing	1,145	63	1,589	3,286	508	2,196
Printing, publishing and allied	311	–	1,620	1,740	401	1,766
Furniture and fixture	628	184	713	1,722	221	1,542
Knitting mills	853	–	788	1,833	67	737
Leather	1,250	2	654	1,199	110	689
Clothing	212	2	627	818	92	717
Tobacco products	135	3	840	714	125	334
Total manufacturing	**177,043**	**51,155**	**207,128**	**430,970**	**135,332**	**378,589**

Industrial group[2]	Heat content consumed by type of energy used[1]		Total energy consumed[5]		Average annual compound rate of growth of consumption of energy 1962 - 72
	Electricity[3] and other[4]				
	1962	1972	1962	1972	
	billions of B.t.u.'s				per cent
Paper and allied	66,790	94,865	208,720	338,804	5.0
Primary metal	72,630	107,299	163,951	256,695	4.6
Chemical and chemical products	20,010	29,331	82,684	133,933	5.0
Non-metallic products	7,960	12,125	78,040	120,058	4.4
Food and beverage	5,723	10,786	68,956	98,052	3.6
Transportation and equipment	2,865	8,357	20,031	39,050	6.9
Textile	3,012	5,405	19,947	30,365	4.2
Wood	2,966	7,347	9,538	28,926	11.8
Petroleum and coal products	4,265	8,453	12,363	25,930	7.6
Metal fabricating	1,869	4,639	11,683	25,914	8.2
Rubber and plastics products	1,117	3,746	6,346	15,741	9.5
Electrical products	2,311	3,845	10,601	14,788	3.4
Machinery (except electrical machinery)	930	2,407	6,202	11,516	6.4
Miscellaneous manufacturing	760	1,492	4,002	7,037	5.8
Printing, publishing and allied	753	1,766	3,085	5,272	5.5
Furniture and fixture	284	825	1,846	4,273	8.7
Knitting mills	196	464	1,904	3,034	4.7
Leather	234	376	2,248	2,266	0.1
Clothing	190	668	1,121	2,205	7.0
Tobacco products	200	409	1,300	1,460	1.2
Total manufacturing	**195,065**	**304,605**	**714,568**	**1,165,319**	**5.1**

[1] Calculated on the basis of simple heat equivalence contributed by each fuel and by electricity to total.
[2] Listed in descending order of total energy consumed in 1972. The 20 major industrial groups include all manufacturing industries.
[3] Includes electricity purchased and also electricity generated by hydro power for own use, but does not include electricity generated from fossil fuels for own use. This latter is included with the appropriate types of fossil fuel shown, with heat content calculated as that of the fuel consumed in generation. The electricity generated by hydro power is estimated for 1962.
[4] Includes wood, steam, other manufactured gas and all fuel types used by those smaller establishments which are not required to give breakdowns. The heat content in this category was estimated on the basis of cost incurred by it, the conversion factor being the average cost of energy for all other types of fuel purchased in the appropriate year. The heat contents in this category do not exceed 0.01% of the total energy consumed in any of the industrial groups.
[5] Includes electricity thermally generated and sold to others, but assumed to be less than 0.1% of all electricity consumed in the entire manufacturing industry.

Source: Catalogue 57-002, *Energy Statistics*, VIII (46) and X (7); unpublished data from the Energy and Minerals Section, Statistics Canada.

TABLE 7.21. Energy Consumed in the Mineral Industries

	Heat content consumed by type of energy used[1]					
	Coal and its derivatives		Petroleum products		Natural gas	
	1962	1972	1962	1972	1962	1972
	billions of B.t.u.'s					
Metal mines:						
Placer gold and gold quartz	250	9	749	558	226	616
Iron	129	41	5,951	20,894	–	9,019
Other	2,656	1,105	4,659	12,645	460	3,489
Non-metal mines:						
Asbestos	118	89	3,853	7,553	247	–
Other	943	250	2,695	3,003	1,775	18,992
Mineral fuels:						
Coal	2,009	472	373	2,037	–	3,153
Petroleum and natural gas	–	–	5,956	6,353	55,718	185,027
Structural materials:						
Sand and gravel	4	–	1,651	1,670	255	11
Stone	772	2	941	1,640	8	29
Total mineral industries	6,881	1,968	26,828	56,353	58,689	220,336

	Heat content consumed by type of energy used[1]		Total energy consumed[4]		Average annual compound rate of growth of consumption of energy, 1962 - 72
	Electricity[2] and other[3]				
	1962	1972	1962	1972	
	billions of B.t.u.'s				per cent
Metal mines:					
Placer gold and gold quartz	3,488	1,752	4,713	2,935	- 4.6
Iron	2,507	10,855	8,587	40,809	16.9
Other	7,063	17,309	14,838	34,548	8.8
Non-metal mines:					
Asbestos	1,665	2,296	5,883	9,938	5.4
Other	370	2,778	5,783	25,023	15.8
Mineral fuels:					
Coal	704	1,487	3,086	7,149	8.7
Petroleum and natural gas	2,370	7,147	64,044	198,527	12.0
Structural materials:					
Sand and gravel	101	156	2,011	1,837	- 0.9
Stone	347	387	2,068	2,058	- 0.1
Total mineral industries	18,615	44,167	111,013	322,824	11.3

[1] Calculated on the basis of simple heat equivalence contributed by each fuel type and electricity to total.

[2] Does not include electricity generated from fossil fuels for own use. For 1962, the amount of electricity generated for own use that is generated by hydro power is estimated to be the same fraction as the known proportion for 1972.

[3] Includes wood and steam for 1972, as well as other fuels unspecified, whose heat content was estimated from expenditure data on the basis of average purchase price of energy in the entire minerals industry for the appropriate year. The fraction of energy not specifically identified as electricity amounts to about 4% for 1962 and about 0.7% for 1972 for the entire minerals industry.

[4] For metal mines, this includes electricity generated from fossil fuels and sold to others, but this is assumed to be less than 0.1% of all electricity consumed in the entire metal mines industry.

Source: Catalogue 26-201, *General Review of the Mineral Industries* (1962 and 1972); Catalogue 26-213 *The Crude Petroleum and Natural Gas Industry* (1965 and 1972); Catalogue 26-201, *The Coal Mining Industry* (1962 and 1972); unpublished data from the Energy and Minerals Section, Statistics Canada.

TABLE 7.22. Energy Intensities in the Manufacturing Industries

Industrial group[1]	Ratio of energy consumed to Real Domestic Product		Energy consumed per employee	
	1962	1972	1962	1972
	thousands of B.t.u.'s per 1961 dollar		billions of B.t.u.'s per person	
Paper and allied	218	232	2.07	2.80
Primary metal	198	186	1.78	2.25
Chemical and chemical products	122	198	1.29	1.79
Non-metallic mineral products	217	217	1.73	2.27
Food and beverage	51	48	0.33	0.45
Transportation equipment	24	16	0.19	0.25
Textile	55	46	0.29	0.41
Wood	22	40	0.11	0.28
Petroleum and coal products	44	53	0.77	1.73
Metal fabricating	16	20	0.11	0.18
Rubber and plastics products	33	53	0.28	0.32
Electrical products	16	12	0.11	0.12
Machinery (except electrical machinery)	16	14	0.08	0.15
Miscellaneous manufacturing	12	10	0.07	0.12
Printing, publishing and allied	6	8	0.04	0.06
Furniture and fixture	11	13	0.05	0.09
Knitting mills	22	19	0.08	0.12
Leather	20	22	0.07	0.08
Clothing	4	5	0.01	0.02
Tobacco products	16	14	0.12	0.15
Total manufacturing	74	67	0.53	0.70

[1] Listed in descending order of total energy consumed in 1972.

Source: Catalogue 31-203, *Manufacturing Industries of Canada, National and Provincial Areas* (1962 and 1972); unpublished data from the Industry Product Division, Statistics Canada.

TABLE 7.23. Energy Intensities in the Mineral Industries

	Ratio of energy consumed to Real Domestic Product		Energy consumed per employee[1]	
	1962	1972	1962	1972
	thousands of B.t.u.'s per 1961 dollar		billions of B.t.u.'s per person	
Metal mines:				
Placer gold and gold quartz	44	52	0.31	0.53
Iron	59	140	0.94	3.76
Other	23	38	0.44	0.76
Non-metal mines:				
Asbestos	57	68	0.85	1.27
Other	136	180	1.29	3.56
Mineral fuels:				
Coal	45	50	0.31	0.82
Petroleum and natural gas	142	161	5.70	11.96
Structural materials:				
Sand and gravel	2	2	0.84	0.78
Stone	2	2	0.64	0.73
Total mineral industries	65	104	1.15	3.01

[1] Includes employees employed in all activities of establishments involved.
[2] Not separately calculated but included in totals where applicable.

Source: Catalogue 26-601, *General Review of the Mineral Industries* (1964, 1965 and 1972); unpublished data from the Industry Product Division, Statistics Canada.

TABLE 7.24. Relative Share Indexes[1] of Average Consumption of Energy Per Employee and Per Value of Output[2] in the Manufacturing Industries, by Province

	Relative share index of energy per employee			Relative share index of energy per dollar of output		
	1953	1961	1971	1953	1961	1971
Newfoundland	1.94	2.11	1.83	2.14	2.38	2.42
Prince Edward Island	0.32	0.32	0.36	0.59	0.50	0.53
Nova Scotia	1.30	0.83	1.16	1.96	1.13	1.69
New Brunswick	1.63	1.90	1.96	1.99	2.18	1.68
Quebec	0.98	0.95	0.96	1.08	1.05	1.08
Ontario	0.93	0.86	0.82	0.86	0.81	0.75
Manitoba	0.78	0.82	0.79	0.89	0.94	0.98
Saskatchewan	1.75	1.33	1.40	1.53	1.24	1.33
Alberta	1.64	2.16	1.89	1.63	1.95	1.78
British Columbia	0.99	1.35	1.63	0.91	1.27	1.57
Canada	1.00	1.00	1.00	1.00	1.00	1.00

[1] For the definition of relative share index see Table 5.15.
[2] Output defined in terms of value added.

Source: Same as in Table 7.20.

TABLE 7.25. Energy Consumption, Employment and Real Domestic Product in the Manufacturing Industry

	1953	1961	1971
Total employment	1,399[1]	1,353	1,628
Total energy consumed in manufacturing (10^{12} B.t.u.'s)	649	766	1,136
Real Domestic Product originating in manufacturing (millions of 1961 dollars)	6,761	8,827	16,180
Average energy consumed per employee (millions of B.t.u.'s per person)	464	566	698
Average energy consumed per dollar of Real Domestic Product originating in manufacturing (thousands of B.t.u.'s per 1961 dollar)	96	87	70
Average value of Real Domestic Product per employee (1961 dollars per person)	4,833	6,526	9,936

[1] Estimated.

Source: Unpublished data from Input-Output Division, Statistics Canada; Catalogue 31-201, *General Review of the Manufacturing Industries of Canada;* (1953, 1961, 1969 and 1971); unpublished data from the Primary Industries Division, Energy and Minerals Section, Statistics Canada.

TABLE 7.26. Potential Heat Content of Fuel and Electricity Lost in Conversion and Transformation Processes[1] and in Consumption by the Energy Supply Industry[2]

	Percentage of total potential heat content of domestically available energy		
	Lost in transformation and conversion[3]	Consumed by energy supply industry	Consumed outside of energy supply industry
1958	7.4	6.3	86.3
1959	8.2	6.4	85.4
1960	8.5	6.6	84.9
1961	8.5	6.7	84.8
1962	8.8	7.1	84.1
1963	9.5	7.3	83.2
1964	9.9	7.5	82.6
1965	10.4	7.7	81.9
1966	10.8	7.9	81.3
1967	10.8	8.1	81.1
1968	11.0	8.3	80.7
1969	11.1	8.5	80.4
1970	11.2	8.9	79.9
1971	11.4	9.2	79.4
1972	11.7	9.4	78.9
1973	12.2	9.6	78.2

[1] See text for definitions.
[2] All series of percentages are smoothed by applying three-year moving averages according to the formula $(f(t-1) + 2f(t) + f(t+1))/4$.
[3] Not all reduction in heat content of the energy stream at this stage can be properly regarded as "loss" in the absolute sense. Much of the primary hydrocarbons under refining is diverted to become raw materials for the chemical industry. A great deal also goes into the production of lubricants. In 1973, out of some 616 million barrels of crude oil available domestically, approximately 41 million barrels of non-energy hydrocarbons were produced. See also "Source of Data" and *Detailed Energy Supply and Demand in Canada* for further comments on non-energy use of fuels.

Source: Same as in Chart 7.12.

TABLE 7.27. Average Efficiency of Conversion of Fossil Fuels Into Electricity, by Utilities and by Fuel Type

Fuel type	Efficiency of conversion[1]					
	1956	1957	1958	1972	1973	1974
	per cent					
Coal:						
Canadian bituminous	21.7	22.3	22.5	25.6	25.8	24.8
Imported bituminous	27.6	27.9	26.2	36.1	34.7	36.1
Sub-bituminous	19.9	21.8	22.7	30.7	30.7	31.4
Saskatchewan lignite	21.0	19.2	20.1	26.9	27.6	26.7
Other	37.8	34.8	18.6	...	...	...
Heavy fuel oil	21.0	23.0	22.3	25.7	28.3	26.7
Diesel fuel oil	28.6	31.2	29.0	27.8	27.4	28.9
Natural gas	24.2	24.3	23.3	27.8	28.7	27.6
Other fuels, n.e.s.	26.8	23.5	...	7.7	5.1	..
All fossil fuels	23.9	24.3	23.1	31.1	30.5	30.7

[1] Defined as the simple heat equivalent of electricity generated expressed as a percentage of heat equivalent of fossil fuel used in generation.

Source: Catalogue 57-202, *Electric Power Statistics* (II); Catalogue 57-002, *Energy Statistics*, Service Bulletin (November 1975); unpublished data from the Energy and Minerals Section, Statistics Canada.

TABLE 7.28. Average Efficiency of Conversion of Fossil Fuels Into Electricity, by Industries and Utilities[1]

	Heat equivalent of fossil fuel converted[2]	Efficiency of conversion
	10^{12} B.t.u.'s	per cent
1958	97.9	23.1
1960	119.0	23.3
1962	171.6	25.9
1964	253.7	28.3
1966	336.6	28.2
1968	469.0	29.0
1970	528.6	29.8
1972	600.4	29.9
1074	628.1	29.6

[1] Establishments surveyed include both utilities and industrial generators of electricity with capacity of at least 500 kilowatts.

[2] Excludes heat derived for generation of electricity from wood, pitch, petroleum, coke and fuels unspecified. This amounted to about 16.4 x 10^{12} B.t.u.'s of heat converted in 1974.

Source: Catalogue 57-207, *Detailed Energy Supply and Demand, 1958-1972;* Catalogue 57-002, *Energy Statistics*, Service Bulletin (November 1975).

TABLE 7.29. Net Electrical Generating Capability, by Type and by Province

	Hydro		Fossil fuel		Nuclear		Total[1]		Average annual compound rate of growth, 1954 - 74
	1954	1974	1954	1974	1954	1974	1954	1974	
	thousands of kilowatts								per cent
Newfoundland	207	5,919	16	392	–	–	223	6,311	18.2
Prince Edward Island	–	–	18	114	–	–	18	114	9.6
Nova Scotia	130	159	188	995	–	–	318	1,154	6.7
New Brunswick	112	683	132	642	–	–	244	1,325	8.8
Quebec	5,378	13,793	35	704	–	–	5,413	14,497	5.1
Ontario	3,481	6,855	607	6,634	–	1,775	4,088	15,264	6.8
Manitoba	522	2,209	46	461	–	–	568	2,670	8.0
Saskatchewan	85	582	243	1,131	–	–	328	1,713	8.6
Alberta	202	801	194	2,612	–	–	396	3,413	11.4
British Columbia	1,578	5,561	130	1,472	–	–	1,708	7,033	7.4
Yukon	24[2]	27	–	38	–	–	24[2]	65	9.5[2]
Northwest Territories		35		48		–		83	
Canada	11,719	36,624	1,609	15,243	–	1,775	13,328	53,642	7.2

[1] Because of the gradually extended coverage of establishments surveyed, the figures for 1954 and 1974 include establishments producing about 93% and 98.8% of all electricity generated for these years, respectively.
[2] No separate data available for the Yukon and Northwest Territories.

Source: Catalogue 57-204, *Annual Electric Power Survey of Capability and Load* (1957 and 1974).

TABLE 7.30. Utilization of Electrical Generating Capability by Type of Installation[1]

	Total of generating capability as a percentage of total net generating capability[2]				Utilization of generating capability by type[3]				Ratio of firm peak load to total net generating capability[5]	Total net generating capability
	Hydro	Thermal	Nuclear	Total	Hydro[4]	Thermal	Nuclear	Total		
	per cent									thousands of kilowatts
1920	92.7	7.3	–	100.0	48.0	17.4	–	45.7	..	..
1923	94.2	5.8	–	100.0	48.9	15.7	–	47.0	..	..
1926	95.8	4.2	–	100.0	46.8	15.4	–	45.5	..	..
1929	95.9	4.1	–	100.0	51.2	19.4	–	50.0	..	..
1933	95.3	4.7	–	100.0	37.0	14.7	–	35.9	..	..
1936	95.7	4.3	–	100.0	48.6	20.1	–	47.4	..	..
1939	95.3	4.7	–	100.0	51.2	19.8	–	49.8	..	..
1942	95.6	4.4	–	100.0	60.8	25.2	–	59.2	..	..
1945	95.3	4.7	–	100.0	57.6	27.0	–	56.1	..	..
1948	94.2	5.8	–	100.0	58.7	28.0	–	56.9	..	..
1950	91.6	8.4	–	100.0	..	..	–	..	92.6	9,363
1952	87.9[6]	12.1	–	100.0	..	..	–	..	91.9	11,004
1955	86.3	13.7	–	100.0	..	..	–	..	89.6	14,147
1958	85.4	14.6	–	100.0	64.7	27.4	–	59.3	84.3	18,628
1961	80.8	19.2	–	100.0	64.4	25.1	–	56.8	81.2	22,753
1964	76.3	23.7	–	100.0	66.3	39.6	–	60.0	88.5	25,554
1967	71.4	28.1	0.5	100.0	67.4	42.0	9.8	60.0	88.4	31,370
1970	66.3	33.2	0.5	100.0	65.1	38.6	57.0	56.3	83.9	41,322
1973	64.7	31.1	4.2	100.0	63.2	37.7	71.3	55.7	80.0	53,807
1974	68.3	28.4	3.3	100.0	65.4	41.2	89.2	59.3	79.9	53,642

[1] Because of the extension of the class of producers of electricity surveyed, the data provided for the years 1920 - 48 is not exactly comparable with those for later years. The earlier series are based on the annual Census of Central Electric Stations and do not include industrial installations producing for their own use. From 1950 onwards, a wider range of producers were surveyed and, by 1958, about 99% of all electric generation in Canada was covered, including that by industry for its own use.
[2] For the years 1920 - 48 apportionment is based on kilovolt-ampere rating of dynamos; starting in 1950, it is based on net generating capability.
[3] For the years 1920 - 48 figures shown were reported as "ratio of output to maximum capacity". Starting in 1950, utilization is calculated by expressing "net generation" as a percentage of "net generating capability multiplied by the number of hours in a year".
[4] Figures in this category include, up until 1948, a small amount of electricity generated by non-hydro, auxilliary equipment. This typically amounted to no more than about 0.1% of all hydro generation for any one year.
[5] Calculated by expressing "total indicated firm power peak load within Canada" as a percentage of "total net generating capability".
[6] Because of the smaller class of establishments surveyed, overlaps with the earlier series do not agree exactly. For 1952, using the earlier, more restricted class of installations, 94.3% of capacity was hydraulic.

Source: Catalogue 57-202, *Central Electric Stations*; Catalogue 57-204, *Annual Electric Power Survey of Capability and Load*.

TABLE 7.31. Utilization of Electrical Generating Capability, by Type of Installation and by Province, 1974

	Utilization of net generating capability[1]				Annual generating capability (assuming continuous operation at total net generating capability)		Total indicated reserve as a percentage of total net capability[2]
	Hydro	Fossil fuels	Nuclear	Total			
	per cent				millions of kilowatt hours	billions of B.t.u.'s	
Newfoundland	54.6	12.1	–	52.0	55,284	188,629	53.3
Prince Edward Island	–	38.3	–	38.3	999	3,409	30.7
Nova Scotia	52.3	53.6	–	53.4	10,109	34,492	17.1
New Brunswick	42.8	53.1	–	47.8	11,607	39,603	7.7
Quebec	69.1	3.8	–	66.0	126,994	433,304	16.6
Ontario	68.9	46.8	89.2	61.7	133,713	456,229	17.5
Manitoba	73.7	6.8	–	62.1	23,389	79,803	24.2
Saskatchewan	61.3	42.8	–	49.1	15,006	51,200	21.8
Alberta	24.5	54.7	–	47.6	29,898	102,012	26.1
British Columbia	69.3	15.2	–	58.0	61,609	210,210	22.5
Yukon	82.3	32.8	–	53.4	569	1,941	13.9
Northwest Territories	85.0	18.6	–	46.6	727	2,481	31.3
Canada	65.4	41.2	89.2	59.3	469,904	1,603,313	20.1

[1] Calculated by expressing "total net generation" as a percentage of "total net generating capability", the latter being calculated by assuming continuous year-round operation at "annual generating capability", that is by multiplying "net generating capability", when expressed in kilowatts, by 8,760 (the number of hours in a year).

[2] "Total net capability" is distinct from "total net generating capability". It is equal to the latter quantity, plus firm power committed for receipt from outside the province, less firm power committed for delivery to outside the province. "Net capability" is in a sense a measure of guaranteed availability. "Indicated reserve" is defined as the difference between "total net capability" and "total indicated firm power peak load".

Source: Catalogue 57-204, *Electric Power Statistics* (Vol. 1, 1974).

TABLE 7.32. Electricity as a Percentage of Total Energy Consumed in the Commercial and Industrial Sectors[1] and the Whole Economy by Region

	Heat equivalent of electricity consumed as a percentage of total energy consumed								
	Commercial sector			Industrial sector[2]			Whole economy		
	1958	1964	1973	1958	1964	1973	1958	1964	1973
	per cent								
Atlantic provinces	13.6	11.5	24.0	17.6	22.7	23.8	6.5	8.0	11.7
Quebec	23.6	20.6	35.7	44.0	40.8	32.1	18.8	18.8	20.2
Ontario	22.5	21.1	27.6	14.7	14.6	15.8	11.0	11.6	14.2
Manitoba	16.5[3]	23.4	32.5	22.5[3]	27.8	25.1	6.0[3]	12.2	16.2
Saskatchewan		18.7	26.6		12.3	16.4		5.2	9.6
Alberta	6.6	11.0	17.2	7.5	8.2	12.1	3.1	4.1	6.1
British Columbia, Yukon and Northwest Territories	23.2	28.1	27.9	41.3	39.3	34.6	17.1	18.1	18.5
Canada	19.4	19.5	28.3	25.3	24.1	22.8	11.6	12.5	14.7

[1] Since data are submitted to Statistics Canada by the energy supply industries on a non-coordinated basis, the sector allocations are estimates only.
[2] Does not include the energy supply industry.
[3] Figures include both Manitoba and Saskatchewan.

Source: Same as in Table 7.17.

TABLE 7.33. Use of Electricity in Households[1]

	Percentage of households with		Electricity as a percentage of all energy consumed in the residential and farm sectors[2]
	Electric water heaters	Electric heating	
1961	45.9	0.7[3]	9.2
1966	51.6	1.7	12.1
1971	48.8	4.9	15.0
1973	48.1	7.0	17.0
1974	49.2	8.6	..
1975	49.4	10.5	..

[1] See footnote 1, Table 7.32.
[2] Excludes consumption of diesel fuel on farms.
[3] This figure is from the 1961 Census of Canada; others are from the annual Survey of Household Facilities and Equipment.

Source: Catalogue 64-202, *Household Facilities and Equipment*, revised figures; Catalogue 57-505 (1958-1969), Catalogue 57-207 (1970-1971, 1973), *Detailed Energy Supply and Demand in Canada.*

TABLE 7.34. Ratio of Price of Electricity Purchased to Average Wages of Production Workers in the Manufacturing Industries

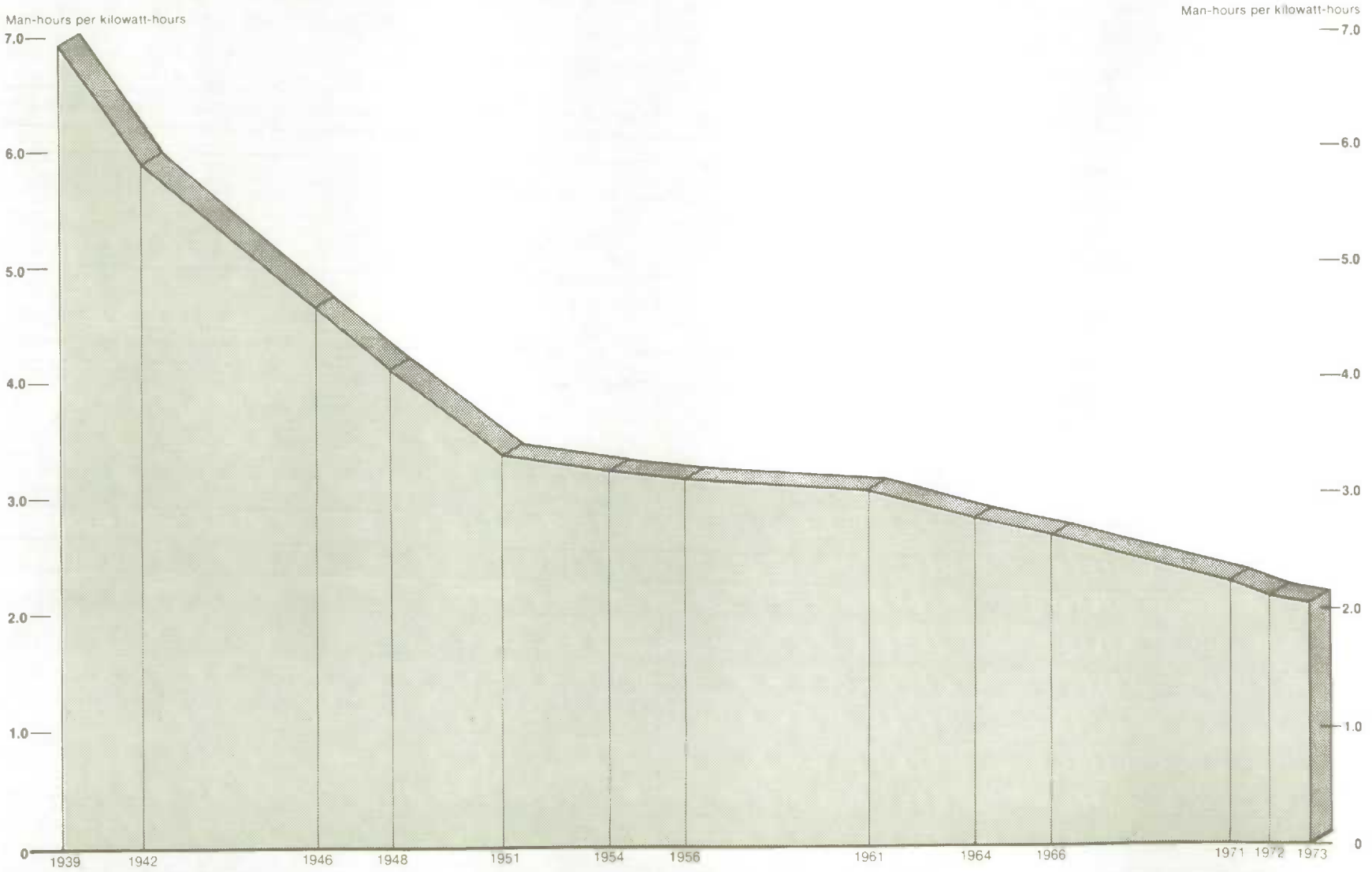
	Average price of purchased electricity[1]	Average hourly earnings	Ratio of price of electricity to wages
	dollars per thousand kilowatt hours	dollars per man hour	
1939	2.96	0.43[2]	6.93
1946	3.30	0.71	4.65
1951	3.97	1.18	3.36
1956	4.74	1.52	3.12
1961	5.55	1.83	3.03
1966	6.03	2.25	2.68
1971	7.26	3.28	2.21
1972	7.46	3.54	2.11
1973	7.91	3.85	2.06

[1] The average prices shown were obtained by dividing total value of electricity purchased by the manufacturing industry by the total quantity expressed in kilowatt hours.
[2] The figure for 1939 is based on results derived from annual census of manufacturing industries, while the later data are based on monthly surveys.

Source: Catalogue 31-201, *General Review of Manufacturing Industries in Canada* (1948, 1951, and 1961); Catalogue 57-002, *Energy Statistics*, Service Bulletin (Vol. 5, No. 41, Vol. 9, No. 48, Vol. 10, No. 7 and Vol. 11, No. 2); Catalogue 72-002, *Employment Earnings and Hours.*

Chart — 7.35

Ratio of Average Price of Purchased Electricity to Average Hourly Earnings of Production Workers in the Manufacturing Industry



Source: Same as in Table 7.34.

TABLE 7.36. Proven Reserves, Production and Domestic Use of Canadian Crude Oil

	Proven reserves[1] as of January 1	Percentage change	Annual production	Percentage change	Domestic use[2]	Percentage change
	millions of barrels		millions of barrels		millions of barrels	
1951	1,203	..	47	..	130	..
1956	2,510	109	169	260	232	78
1961	3,679	47	221	31	294	27
1966	6,711	82	316	43	379	29
1971	8,559	28	480	52	507	34
1974	7,674	– 10	601	25	646	27

[1] Economically viable.
[2] Includes use of imported crude oil.

Source: *Canadian Petroleum Association Statistical Yearbook* (1974); Catalogue 26-213, *The Crude Petroleum and Natural Gas Industry*.

TABLE 7.37. Proven Reserves, Production and Domestic Use of Canadian Natural Gas

	Proven reserves as of January 1	Percentage change	Annual production	Percentage change	Domestic use[1]	Percentage change
	billions of cubic feet		billions of cubic feet		billions of cubic feet	
1956	14,642	..	193	..	144	..
1961	26,994	84	694	260	371	158
1966	40,355	49	1,125	62	636	71
1971	53,376	32	1,953	74	1,001	57
1974	52,457	– 2	2,393	23	1,315	31

[1] Includes use of imported natural gas.

Source: Same as in Table 7.36.

TABLE 7.38. Proven Reserves, Production and Domestic Use of Canadian Crude Oil and Natural Gas in B.t.u. Equivalents[1]

	Oil	Gas	Total	Percentage change
	10^{15} B.t.u.'s			
Proven reserves:				
1951	7.0	..	..	...
1956	14.6	15.7	30.3	...
1961	21.3	28.9	50.2	66
1966	38.9	43.2	82.1	64
1971	49.6	57.1	106.7	30
1974	44.5	56.1	100.6	– 6
Production:				
1951	0.27	..	..	...
1956	0.98	0.21	1.19	...
1961	1.28	0.74	2.02	70
1966	1.83	1.20	3.03	50
1971	2.78	2.09	4.87	61
1974	3.49	2.56	6.05	24
Domestic use:				
1951	0.76	..	..	...
1956	1.35	0.15	1.50	...
1961	1.71	0.40	2.11	41
1966	2.20	0.68	2.88	36
1971	2.94	1.07	4.01	39
1974	3.75	1.41	5.16	29

[1] One barrel (35 Canadian gallons) of crude oil = 5.8×10^6 B.t.u.'s. One thousand cubic feet of natural gas = 1.07×10^6 B.t.u.'s.

Source: Same as in Table 7.36.

TABLE 7.39. Supply of Canadian Crude Oil and Equivalents[1] by Source, 1974

Province	Production	Production as a percentage of	
		Domestic production	Total supply
	thousands of barrels		
New Brunswick	8	--	--
Ontario	734	0.1	--
Manitoba	4,749	0.7	0.5
Saskatchewan	74,142	11.0	7.6
Alberta	572,150	85.0	58.9
British Columbia	20,071	3.0	2.1
Northwest Territories	954	0.2	0.1
Total domestic supply	**672,808**	**100.0**	**69.2**
Imports	299,239	...	30.8
Total supply	**972,047**	...	**100.0**

[1] Includes synthetic crude oil, condensate and pentanes plus.

Source: Catalogue 26-213, *The Crude Petroleum and Natural Gas Industry* (1974).

TABLE 7.40. Canadian Crude Oil Use, 1974

Province	Use	As a percentage of	
		Domestic supply	Total supply
	thousands of barrels		
Disposition of domestic supply:			
Atlantic provinces	3,837	0.6	0.4
Quebec	23,085	3.4	2.4
Ontario	166,124	24.5	17.0
Manitoba	17,430	2.6	1.8
Saskatchewan	19,516	2.9	2.0
Alberta	63,364	9.4	6.5
British Columbia	52,217	7.7	5.3
Northwest Territories	975	0.1	0.1
Total domestic supply used in Canada	**346,548**	**51.2**	**35.5**
Exports	330,583	48.8	33.9
Total domestic supply	**677,131**	**100.0**	**69.4**
Disposition of imports:			
Atlantic provinces	127,095	...	13.0
Quebec	172,114	...	17.6
Total supply	**976,340**	...	**100.0**

Source: Same as in Table 7.39.

TABLE 7.41. Canadian Marketable Gas Supply by Source, 1974

	Source of supply[1]	Percentage of total supply
	millions of cubic feet	
New Brunswick	88	--
Quebec	183	--
Ontario	7,404	0.3
Saskatchewan	51,467	2.0
Alberta	1,993,935	78.1
British Columbia	366,082	14.3
Yukon and Northwest Territories	979	--
Other[2]	121,342	4.8
Imports	13,408	0.5
Total supply	**2,554,888**	**100.0**

[1] Total supply of marketable gas.
[2] Receipts from distribution storage and temporary supply.

Source: Same as in Table 7.39.

TABLE 7.42. Canadian Natural Gas Use, 1974

	Use	Percentage of total supply
	millions of cubic feet	
New Brunswick	66	--
Quebec	80,171	3.2
Ontario	651,200	25.5
Manitoba	63,885	2.5
Saskatchewan	92,670	3.6
Alberta	297,397	11.7
British Columbia	128,932	5.0
Northwest Territories	979	--
Total used in Canada	**1,315,300**	**51.5**
Exports	959,187	37.5
Other[1]	280,401	11.0
Total supply	**2,554,888**	**100.0**

[1] Direct deliveries for industrial consumption and miscellaneous utility deliveries; deliveries to distributor storage; line pack fluctuation; pipeline fuel and pipeline losses.

Source: Same as in Table 7.39.

TABLE 7.43. Selected Indicators of Crude Oil and Natural Gas Use

	Depletion rate[1]		Self-sufficiency rate[2]		Use per household
	Crude oil life index	Natural gas life index	Crude oil	Natural gas	
	years				millions of B.t.u.'s per year
1951	26	..	9	..	..
1956	15	76	11	102	382
1961	17	39	13	73	463
1966	21	36	18	63	556
1971	18	27	17	53	664
1974	13	22	12	40	794

[1] $\frac{\text{Reserves}}{\text{Production}}$ = life index (in years).

[2] $\frac{\text{Reserves}}{\text{Domestic use}}$ = self-sufficiency rate (in years).

Source: Data used in Tables 7.36 - 7.38, 7.40 and 7.42.

APPENDICES

APPENDIX 1

Watersheds

Delineating the Watersheds

The basis for the system used here is the Hydrometric Map Series (scale 1:2,500,000) used by the Water Survey of Canada Division of Environment Canada. The watersheds on these maps were aggregated into a manageable number and each was given a unique code. The boundaries of these areas were then transferred to National Topographic System (NTS) maps of 1:250,000 or 1:500,000 scale, depending on the density of settlement in the region.

Retrieving Census of Population Data

Using the NTS maps, Census Field geocoded the boundaries and the census data within these areas were retrieved. Geocoding involves giving the Universal Transverse Mercator (UTM) coordinates to points along the boundary line. The number of points coded varies directly with the density of settlements and the sinuosity of the boundary line. The coordinates of the boundary line points are stored in the system.

The census data are collected according to Enumeration Areas (EA's) and stored at the UTM coordinates of the population centroid of the EA. Therefore, data for all the centroids which are located within the watershed boundaries are retrieved for that watershed. This means, however, that if an EA is divided between two watersheds, all the data will be placed in the watershed in which the centroid is located. There is no proportional division of the data into the other watershed.

The total area measurement for EA's is not available, therefore, the areas of the watersheds were calculated using a Hewlett-Packard digitizer. The boundary lines of the sheds were traced with an electronic sensor and the area within the boundaries automatically calculated using the 1:2,500,000 scale hydrometric maps. The areas of the large lakes enclosed in the sheds were subtracted from the shed areas. The area of the islands of the Arctic Archipelago were not calculated.

Retrieving Census of Manufactures Data

Data on manufacturing establishments are collected and compiled by the Standard Geographical Code of the municipality in which the establishment is located. The municipalities were allocated to the appropriate watershed and tabulations on manufacturing data by watershed were generated. Due to confidentiality requirements, data for some of the watersheds could not be published.

APPENDIX 2

Watershed Code and Provincial Code

1. Atlantic Basin
   - 10. Atlantic Ocean
     - 100 - 10 Labrador
     - 101 - 10 North Coast Newfoundland
     - 102 - 10 Trinity Bay
     - 103 - 10 St. John's
     - 104 - 12 South Coast Nova Scotia
   - 11. Gulf of St. Lawrence
     - 110 North Coast Mainland:
     - 110 - 10 Labrador
     - 110 - 24 Quebec
     - 111 - 10 West and South Coast Newfoundland
     - 112 - 24 North Gaspé Peninsula
     - 113 West Coast Mainland:
     - 113 - 12 Nova Scotia
     - 113 - 13 New Brunswick
     - 113 - 24 Quebec
     - 114 - 11 Prince Edward Island
     - 115 - 12 Cape Breton Island
   - 12. Bay of Fundy
     - 120 - 12 Nova Scotia part
     - 121 - 13 New Brunswick part
   - 13. Saint John River
     - 130 Saint John River:
     - 130 - 13 New Brunswick part
     - 130 - 24 Quebec part
   - 14. St. Lawrence River
     - 140 - 24 Saguenay River
     - 141 - 24 Québec City
     - 142 - 24 Chaudière River
     - 143 - 24 St. Maurice River
     - 144 - 24 Eastern Townships
     - 145 - 24 Eastern Laurentians
     - 146 - 24 Montréal
     - 147 West St. Lawrence:
     - 147 - 24 Quebec part
     - 147 - 35 Ontario part
   - 15. Ottawa River
     - 150 Lower Ottawa:
     - 150 - 24 Quebec part
     - 150 - 35 Ontario part
     - 151 Upper Ottawa:
     - 151 - 24 Quebec part
     - 151 - 35 Ontario part
   - 16. Lake Ontario
     - 160 - 35 Belleville
     - 161 - 35 Trent System
     - 162 - 35 Oshawa-Colborne
     - 163 - 35 Toronto
     - 164 - 35 Hamilton
     - 165 - 35 Niagara Peninsula
   - 17. Lake Erie and Lake St. Clair
     - 170 - 35 Grand River
     - 171 - 35 Erie Shoreline
     - 172 - 35 Thames River
     - 173 - 35 Sydenham River
   - 18. Lake Huron
     - 180 - 35 South Huron
     - 181 - 35 Georgian Bay-Lake Simcoe
     - 182 - 35 North Huron
   - 19. Lake Superior
     - 190 - 35 Lake Superior

2. Hudson Bay and Ungava Basin
   - 20. East plus Ungava
     - 200 - 24 East plus Ungava
   - 21. South and West
     - 210 South and Southwest:
     - 210 - 24 Quebec part
     - 210 - 35 Ontario part
     - 210 - 46 Manitoba part
     - 211 North of Nelson River:
     - 211 - 46 Manitoba part including Churchill
     - 211 - 47 Saskatchewan part
     - 211 - 48 Alberta part
     - 211 - 61 Northwest Territories
   - 22. Nelson River
     - 220 - 46 Nelson River
   - 23. Lake Winnipeg
     - 230 Lake Winnipeg:
     - 230 - 35 Lake of the Woods (Ontario)
     - 230 - 46 Lake Winnipeg Shoreline (Manitoba)
     - 231 - 46 Red River
     - 232 Dauphin:
     - 232 - 46 Manitoba part
     - 232 - 47 Saskatchewan part
   - 24. Assiniboine River
     - 240 Assiniboine and Souris:
     - 240 - 46 Manitoba part
     - 240 - 47 Saskatchewan part
     - 241 Qu'Appelle River:
     - 241 - 46 Manitoba part
     - 241 - 47 Saskatchewan part
   - 25. Saskatchewan River
     - 250 Saskatchewan River:
     - 250 - 46 Manitoba part
     - 250 - 47 Saskatchewan part
     - 251 - 48 Upper North Saskatchewan (above Edmonton)
     - 252 Lower North Saskatchewan:
     - 252 - 47 Saskatchewan part
     - 252 - 48 Alberta part
     - 253 South Saskatchewan and Red Deer:
     - 253 - 47 Saskatchewan part
     - 253 - 48 Alberta part
     - 254 - 48 Bow River

3. Arctic Basin
   - 30. Mackenzie River
     - 300 Mackenzie River:
     - 300 - 47 Saskatchewan part

Watershed Code and Provincial Code – Concluded

3. Arctic Basin – Concluded:
   30. Mackenzie River – Concluded:
      300 - 48 Alberta part
      300 - 59 British Columbia part
      300 - 60 Yukon part
      300 - 61 Northwest Territories part
   31. Athabasca River
      310 Athabasca River:
      310 - 47 Saskatchewan part
      310 - 59 Alberta part
   32. Peace River
      320 Peace River:
      320 - 48 Alberta part
      320 - 59 British Columbia part
   33. Arctic Ocean
      330 - 61 Arctic Ocean (Arctic Islands and North Shore Northwest Territories)

4. Pacific Basin
   40. Columbia River
      400 - 59 Columbia River
      401 - 59 Okanagan River
      402 - 59 Similkameen River
   41. Fraser River
      410 - 59 Upper Fraser River
      411 - 59 Thompson River
      412 - 59 Lower Fraser River (Vancouver)
   42. Yukon River
      420 Yukon River:
      420 - 59 British Columbia part
      420 - 60 Yukon part
   43. West Coast
      430 Alsek River:
      430 - 59 British Columbia part
      430 - 60 Yukon part
      431 - 59 Northern Coast
      432 - 59 Southern Coast
      433 - 59 South Vancouver Island (Victoria)
      434 - 59 Skagit River

5. Gulf of Mexico Basin
   50. Gulf of Mexico Basin:
      500 Gulf of Mexico Basin:
      500 - 47 Saskatchewan part
      500 - 48 Alberta part

APPENDIX 3

Population and Dwelling Characteristics by Watershed, 1971

Watershed code and provincial code	Population	Area	Population density	Dwellings by source of water			Dwellings by method of sewage disposal		
				Municipal supply	Well	Other	Public sewer	Septic tank	Other
		square miles	population per square mile						
1. Atlantic Basin	15,481,700	510,994	30.3	3,431,450	712,925	111,875	3,174,115	711,650	370,400
10. Atlantic Ocean	716,275	131,628	5.4	97,925	67,675	8,775	91,095	43,405	39,885
100-10	26,185	98,528	0.3	4,055	370	750	4,010	200	970
101-10	119,565	19,331	6.2	12,545	9,395	2,775	9,520	4,770	10,420
102-10	67,760	2,936	23.1	1,945	11,800	1,805	1,590	5,895	8,065
103-10	144,955	1,164	124.5	21,780	9,455	1,055	20,585	7,740	3,965
104-12	357,810	9,669	37.0	57,600	36,655	2,390	55,390	24,800	16,465
11. Gulf of St. Lawrence	1,089,635	124,671	8.7	119,580	102,965	18,740	102,325	64,700	74,245
110	114,735	67,332	1.7	17,815	4,445	1,620	15,870	1,830	6,175
110-10	1,980	12,594	0.2	–	145	200	–	135	210
110-24	112,755	54,737	2.1	17,815	4,300	1,420	15,870	1,695	5,965
111-10	161,655	21,724	7.4	15,570	11,435	5,110	11,480	7,920	12,715
112-24	146,130	5,388	27.1	20,525	9,720	1,415	17,975	2,040	11,640
113	385,470	24,116	16.0	31,145	48,265	6,700	27,065	28,210	30,830
113-13	212,440	13,428	15.8	12,515	30,235	3,445	11,365	19,220	15,600
113-24	95,920	8,389	11.4	8,835	9,535	1,490	7,160	1,725	10,980
113-12	77,110	2,299	33.5	9,795	8,495	1,765	8,540	7,265	4,250
114-11	111,640	2,186	51.1	9,730	17,320	740	9,370	12,255	6,165
115-12	170,005	3,926	43.3	24,795	11,780	3,155	20,565	12,445	6,720
12. Bay of Fundy	313,445	10,078	31.1	39,415	39,405	6,630	35,540	32,540	17,370
120-12	184,020	5,934	31.0	18,420	27,420	4,640	15,650	22,185	12,650
121-13	129,425	4,144	31.2	20,995	11,985	1,990	19,890	10,355	4,720
13. Saint John River	337,080	14,543	23.2	49,605	27,990	8,025	45,880	19,960	19,780
130-13	292,690	11,524	25.4	45,530	23,510	7,040	42,695	19,045	14,340
130-24	44,390	3,019	14.7	4,075	4,480	985	3,185	915	5,440
14. St. Lawrence River	5,276,660	82,909	63.6	1,278,960	133,930	27,365	1,226,480	87,425	126,370
140-24	267,400	34,022	7.9	50,450	3,825	1,935	45,975	2,540	7,695
141-24	558,600	7,338	76.1	132,265	7,960	4,115	123,510	6,005	14,835
142-24	382,920	7,465	51.3	56,165	27,980	5,215	49,470	8,780	31,105
143-24	183,510	17,536	10.5	45,155	1,575	1,085	42,810	1,835	3,175
144-24	785,895	8,817	89.1	149,855	43,155	7,670	139,805	26,800	34,080
145-24	185,955	3,480	53.4	31,955	11,260	2,420	24,790	7,425	13,415
146-24	2,667,375	1,926	1,384.9	763,535	20,345	3,440	751,805	19,350	16,165
147	245,005	2,325	105.4	26,845	17,830	1,485	48,315	14,690	5,900
147-24	64,010	395	162.1	12,820	3,805	195	12,240	2,495	2,080
147-35	180,995	1,931	93.7	36,775	14,025	1,290	36,075	12,195	3,820
15. Ottawa River	1,178,150	57,977	20.3	238,140	71,320	11,445	222,480	62,470	36,230
150	802,180	21,837	36.7	170,660	44,155	7,360	159,510	39,780	22,885
150-24	323,005	18,137	17.8	61,830	15,490	5,525	55,120	12,225	15,495
150-35	479,175	3,700	129.5	108,830	28,665	1,835	104,390	27,555	7,390
151	375,970	36,139	10.4	67,480	27,165	4,085	62,970	22,690	13,345
151-24	94,410	19,955	4.7	15,005	6,670	985	13,775	4,045	4,845
151-35	281,560	16,185	17.4	52,745	20,495	3,100	49,195	18,645	8,500
16. Lake Ontario	3,981,490	12,273	324.4	1,064,550	91,645	11,455	1,002,195	145,245	20,120
160-35	159,680	3,123	51.1	27,785	15,355	2,410	24,450	15,745	5,360
161-35	193,760	5,198	37.3	31,565	22,700	2,625	26,680	24,765	5,445
162-35	173,240	485	357.2	39,975	8,980	595	36,725	11,665	1,070
163-35	2,434,505	1,203	2,023.7	703,650	16,065	2,090	682,240	34,960	4,600
164-35	630,530	996	633.1	165,485	15,030	1,105	150,735	29,430	1,455
165-35	389,775	1,268	307.4	96,090	13,515	2,630	81,365	28,680	2,190
17. Lake Erie and Lake St. Clair	1,472,295	9,395	156.7	339,355	85,285	6,390	277,800	139,700	13,510
170-35	489,875	2,999	163.3	111,250	27,745	2,205	103,040	33,560	4,595
171-35	462,590	2,984	155.0	104,555	27,485	1,915	70,755	59,140	4,050
172-35	426,045	2,318	183.8	105,520	20,725	1,415	92,110	32,545	3,005
173-35	93,785	1,094	85.7	18,030	9,330	855	11,895	14,455	1,860
18. Lake Huron	966,330	36,549	26.4	169,185	86,350	11,615	137,650	110,150	19,350
180-35	259,150	6,271	41.3	46,460	27,090	2,615	32,230	38,790	5,150
181-35	321,915	8,690	37.0	49,904	37,690	5,045	37,160	48,320	7,150
182-35	385,265	21,588	17.8	72,820	21,570	3,955	68,260	23,040	7,050
19. Lake Superior:									
190-35	150,340	30,972	4.9	34,465	6,360	1,435	32,670	6,055	3,540
2. Hudson Bay and Ungava Basin	3,669,060	1,335,649	2.7	785,175	187,025	75,855	762,395	127,175	158,490
20. East plus Ungava:									
200-24	10,305	283,218	0.04	920	15	1,085	860	50	1,115
21. South and West Hudson Bay	292,265	689,929	0.4	43,690	15,565	8,850	39,620	10,095	18,400
210	227,685	336,356	0.7	38,285	10,845	4,620	34,585	8,500	10,675
210-24	105,180	66,940	1.6	15,880	6,420	1,075	15,165	2,315	5,900
210-35	117,800	226,769	0.5	22,385	4,420	2,840	19,410	6,150	4,090
210-46	4,705	42,648	0.1	20	5	705	10	35	685
211	64,580	353,573	0.2	5,405	4,720	4,230	5,035	1,595	7,725
211-46	8,200	76,224	0.1	1,160	20	575	1,065	80	610
211-47	28,115	63,968	0.4	1,260	2,555	2,515	1,070	775	4,475
211-48	25,035	7,096	3.5	2,925	2,145	600	2,875	725	2,075
211-61	3,230	206,285	0.02	60	–	540	25	15	565

Population and Dwelling Characteristics by Watershed, 1971 – Concluded

Watershed code and provincial code	Population	Area	Population density	Dwellings by source of water			Dwellings by method of sewage disposal		
				Municipal supply	Well	Other	Public sewer	Septic tank	Other
		square miles	population per square mile						
2. Hudson Bay and Ungava Basin – Concluded:									
22. Nelson River:									
220-46	30,315	34,435	0.9	5,545	40	1,240	5,490	120	1,220
23. Lake Winnipeg	645,845	108,453	6.0	121,185	44,460	16,505	116,010	30,850	35,275
230	114,385	70,985	1.6	15,670	9,505	5,215	13,700	7,890	8,795
230-35	73,125	43,993	1.7	12,485	4,335	2,875	10,780	4,960	3,950
230-46	41,260	26,992	1.5	3,185	5,170	2,340	2,920	2,930	4,845
231-46	427,265	9,997	42.7	96,220	20,235	5,405	93,550	15,975	12,340
232	104,195	27,471	3.8	9,295	14,720	5,885	8,760	6,985	14,140
232-46	83,095	20,295	4.1	7,335	12,300	3,960	6,990	5,980	10,615
232-47	21,100	7,176	2.9	1,960	2,420	1,925	1,770	1,005	3,525
24. Assiniboine River	819,820	62,269	13.2	189,300	39,875	19,845	184,965	26,190	37,870
240	520,215	35,036	14.8	121,115	27,180	11,335	118,815	16,945	23,865
240-46	371,500	12,995	28.6	98,575	13,735	4,375	97,325	9,790	9,575
240-47	148,715	22,040	6.7	22,540	13,445	6,960	21,490	7,155	14,290
241	299,605	27,234	11.0	68,185	12,695	8,510	66,150	9,245	14,005
241-46	No pop.	33	...	...	...	...	...	...	...
241-47	299,605	27,201	11.0	68,185	12,695	8,510	66,150	9,245	14,005
25. Saskatchewan River	1,870,510	157,344	11.9	424,535	87,070	28,330	415,450	59,870	64,610
250	71,375	29,454	2.4	10,630	4,625	4,520	9,915	2,495	7,370
250-46	21,910	7,035	3.1	4,390	425	955	4,235	330	1,210
250-47	49,465	22,419	2.2	6,240	4,200	3,565	5,680	2,165	6,160
251-48	203,275	10,771	18.9	52,395	5,920	1,160	51,790	3,740	3,945
252	643,585	48,350	13.3	133,730	40,080	8,390	131,840	22,740	27,615
252-48	502,245	25,543	19.7	112,130	27,525	3,855	111,000	16,265	16,245
252-47	141,340	22,807	6.2	21,600	12,555	4,535	20,840	6,475	11,370
253	503,175	59,129	8.5	102,680	30,205	11,850	97,720	24,810	22,200
253-47	224,310	22,251	10.1	51,105	8,985	6,230	49,815	6,080	10,425
253-48	278,865	36,878	7.6	51,575	21,220	5,620	47,905	18,730	11,775
254-48	449,100	9,640	46.6	125,100	6,240	2,410	124,185	6,085	3,480
3. Arctic Basin	250,415	..	..	32,695	13,385	16,570	30,410	9,720	22,530
30. Mackenzie River:									
300	34,125	469,101	0.1	4,755	425	2,660	4,240	800	2,810
300-60 and 61	23,230	342,507	0.1	3,340	240	1,850	2,990	445	1,985
300-47	3,340	39,796	0.1	525	20	200	520	30	200
300-48	2,575	30,611	0.1	145	50	310	110	55	350
300-59	4,980	56,187	0.1	745	115	300	620	270	275
31. Athabasca River:									
310	81,440	60,605	1.3	10,380	8,510	2,690	9,915	4,095	7,575
310-47	No pop.	6,273	...	...	...	...	...	...	...
310-48	81,440	54,332	1.5	10,380	8,510	2,690	9,915	4,095	7,575
32. Peace River:									
320	125,380	120,753	1.0	17,300	4,445	9,620	16,055	4,790	10,520
320-48	81,750	72,764	1.1	10,185	3,610	6,630	9,775	3,230	7,420
320-59	43,630	47,989	0.9	7,115	835	2,990	6,280	1,560	3,100
33. Arctic Ocean:									
330-61	9,470	..	..	260	5	1,600	200	35	1,625
4. Pacific Basin	2,153,125	381,713	5.6	582,560	51,405	26,010	464,135	172,295	23,540
40. Columbia River	252,030	39,685	6.4	59,075	10,075	6,610	39,065	32,025	4,675
400-59	132,135	33,530	3.9	29,380	4,675	4,735	20,610	14,675	3,505
401-59	113,160	3,262	34.7	28,430	4,805	1,635	17,740	16,165	970
402-59	6,735	2,893	2.3	1,265	595	240	715	1,185	200
41. Fraser River	1,261,595	89,693	14.1	351,250	27,135	10,965	293,745	83,940	11,665
410-59	153,355	65,619	2.3	26,870	8,680	5,220	18,985	15,535	6,250
411-59	100,820	21,685	4.6	19,560	4,420	3,425	12,240	12,785	2,380
412-59	1,007,420	2,389	421.7	304,820	14,035	2,320	262,520	55,620	3,035
42. Yukon River:									
420	17,200	123,057	0.1	3,485	410	910	2,915	945	945
420-59	305	9,041	0.03	10	10	90	–	50	60
420-60	16,895	114,016	0.1	3,475	400	820	2,915	895	885
43. West Coast	622,300	129,278	4.8	168,750	13,785	7,525	128,410	55,385	6,255
430	375	14,508	0.03	15	35	55	10	40	55
430-59	No pop.	4,237	...	...	...	...	...	...	...
430-60	375	10,271	0.04	15	35	55	10	40	55
431-59	75,365	84,039	0.9	14,645	2,040	2,080	12,060	4,425	2,280
432-59	302,860	28,361	10.7	80,415	6,600	3,435	62,380	25,400	2,665
433-59	243,180	2,152	113.0	73,570	5,110	1,940	53,960	25,405	1,250
434-59	520	218	2.4	105	–	15	–	115	5
5. Gulf of Mexico Basin	13,825	9,905	1.4	1,395	1,710	685	1,235	1,280	1,270
500-47	10,245	7,877	1.3	995	1,335	565	865	915	1,110
500-48	3,580	2,028	1.8	400	375	120	370	365	160

Source: Special tabulation by the Census Field, Statistics Canada.

APPENDIX 4

Farms and Farmlands Fertilized, Sprayed and Irrigated by Watershed,[1] 1971

Watershed code and provincial code	Watershed area	Total farmlands	Croplands	Other improved farmlands	Area fertilized	Area sprayed for		Area irrigated	Number of farms
						Weeds	Insects		
	acres								
1. Atlantic Basin	327,036,160	29,629,333	12,936,256	821,635	7,841,153	3,384,838	865,176	196,090	170,946
10. Atlantic Ocean	84,241,920	278,500	26,654	7,165	26,267	2,432	1,920	164	1,853
101-10	12,371,984	4,138	1,113	320	5,511	196	301	35	165
102-10	1,878,786	12,427	1,877	398	6,411	355	393	66	248
103-10	744,817	20,431	2,131	539	3,947	48	123	12	232
104-12	6,188,040	241,504	21,533	5,908	10,398	1,833	1,103	51	1,208
11. Gulf of St. Lawrence	79,789,455	2,577,399	850,892	74,104	629,360	129,086	72,073	7,294	13,461
110-24	35,031,907	32,667	8,173	2,851	3,280	191	159	168	220
111-10	13,903,167	25,569	3,553	767	7,068	280	393	10	394
112-24	3,448,209	733,789	258,681	22,136	99,178	3,902	1,995	4,603	3,358
113	15,434,088	876,822	212,964	26,132	79,638	17,870	5,287	1,902	4,306
113-12	1,471,218	286,828	59,468	6,083	20,703	8,243	2,324	236	1,266
113-13	8,593,637	282,134	63,439	11,412	28,691	7,958	2,190	967	1,464
113-24	5,369,233	307,860	90,057	8,627	30,244	1,669	773	699	1,576
114-11	1,399,040	774,630	351,384	19,290	433,871	106,608	64,040	541	4,543
115-12	2,512,640	133,922	16,137	2,948	6,325	235	199	70	640
12. Bay of Fundy	6,449,464	846,353	181,693	19,919	193,429	32,315	23,155	1,723	3,599
120-12	3,797,582	666,621	145,821	14,461	182,169	28,156	21,014	1,509	2,894
121-13	2,651,882	179,732	35,872	5,458	11,260	4,159	2,141	214	705
13. Saint John River	9,307,193	1,187,969	299,924	33,432	353,780	62,679	57,530	4,075	4,605
130-13	7,375,159	877,267	222,999	24,770	335,449	60,542	56,801	1,948	3,316
130-24	1,932,034	310,702	76,925	8,662	18,331	2,137	729	2,127	1,289
14. St. Lawrence River	53,061,583	8,432,222	3,637,859	238,470	1,739,354	427,438	133,183	76,089	51,439
140-24	21,773,812	601,491	223,588	17,310	52,078	1,805	2,358	5,978	2,651
141-24	4,696,146	598,986	212,728	21,270	91,029	10,820	8,333	4,945	4,035
142-24	4,777,869	2,172,448	812,586	63,258	261,768	19,303	6,189	16,668	13,261
143-24	11,223,007	61,369	17,762	3,123	11,192	995	747	483	364
144-24	5,642,846	3,111,783	1,411,685	78,902	709,077	237,598	54,127	24,859	17,673
145-24	2,227,208	572,531	295,514	20,445	209,431	36,541	18,388	11,942	4,824
146-24	1,232,536	573,919	345,316	15,649	309,112	60,239	34,456	9,272	4,622
147	1,488,159	739,695	318,680	18,512	95,667	60,137	8,585	1,942	4,009
147-24	252,543	147,728	96,530	2,575	51,763	17,227	3,307	1,339	1,030
147-35	1,235,616	591,967	222,150	15,937	43,904	42,910	5,278	603	2,979
15. Ottawa River	37,104,976	3,898,957	1,346,801	99,099	328,242	190,822	28,115	12,434	17,035
150	13,975,814	2,144,106	823,057	57,640	234,282	150,384	22,255	8,245	10,508
150-24	11,607,867	771,656	218,109	25,662	42,128	13,000	4,159	4,819	3,218
150-35	2,367,947	1,372,450	604,948	31,978	192,154	137,384	18,096	3,426	7,290
151	23,129,162	1,754,851	523,744	41,459	93,960	40,438	5,860	4,189	6,527
151-24	12,770,935	502,018	171,827	13,319	24,432	4,802	1,350	3,244	2,004
151-35	10,358,227	1,252,833	351,917	28,140	69,528	35,636	4,510	945	4,523
16. Lake Ontario	7,854,849	3,109,607	1,377,932	93,494	819,788	373,713	101,712	13,720	21,012
160-35	1,998,782	813,488	285,557	21,352	90,087	46,557	7,583	1,881	3,767
161-35	3,326,509	1,121,242	404,280	27,464	138,008	102,495	12,396	1,827	5,808
162-35	310,247	240,523	107,318	7,318	82,341	41,121	10,164	2,162	1,681
163-35	770,048	308,710	194,846	10,678	94,078	77,811	10,579	1,600	2,425
164-35	637,567	262,459	145,275	10,421	105,073	40,501	13,448	3,707	2,375
165-35	811,696	363,185	240,656	16,261	310,201	65,228	47,542	2,543	4,956
17. Lake Erie and Lake St. Clair	6,012,404	4,477,288	3,094,351	136,733	2,543,659	1,459,106	332,163	70,065	32,544
170-35	1,919,222	1,283,300	825,273	38,658	483,903	353,023	48,283	9,464	9,232
171-35	1,909,719	1,261,273	902,751	50,551	1,121,852	392,041	151,252	55,122	10,493
172-35	1,483,244	1,210,784	879,588	31,240	613,300	463,678	84,688	3,684	8,316
173-35	700,219	721,931	486,739	16,284	324,604	250,364	47,940	1,795	4,503
18. Lake Huron	23,391,109	4,710,028	2,085,649	115,708	1,192,195	706,101	114,771	10,405	24,937
180-35	4,013,392	2,832,774	1,410,732	64,059	762,093	535,081	72,417	2,076	15,784
181-35	5,561,468	1,238,556	533,983	35,519	395,625	165,904	41,312	6,850	7,287
182-35	13,816,249	638,698	140,934	16,130	34,477	5,116	1,042	1,479	1,866
19. Lake Superior:									
190-35	19,822,068	111,010	34,501	3,561	15,079	1,146	554	121	461

See footnote(s) at end of table.

Farms and Farmlands Fertilized, Sprayed and Irrigated by Watershed,[1] 1971 – Concluded

Watershed code and provincial code	Watershed area	Total farmlands	Croplands	Other improved farmlands	Area fertilized	Area sprayed for		Area irrigated	Number of farms
						Weeds	Insects		
					acres				
2. Hudson Bay and Ungava Basin	854,815,788	119,569,487	49,860,717	1,340,601	11,505,399	16,861,516	1,245,870	589,779	160,338
21. South and West Hudson Bay	441,554,304	2,989,889	892,157	50,449	172,429	99,987	8,633	2,155	4,722
210	215,268,098	393,231	122,511	19,117	20,792	979	386	1,824	1,423
210-24	42,841,309	292,725	94,434	15,090	12,578	70	308	1,719	1,082
210-35	145,132,388	100,506	28,077	4,027	8,214	909	78	105	341
211	226,286,206	2,596,658	769,646	31,332	151,637	99,008	8,247	331	3,299
211-46	48,783,262	4	–	4	–	–	–	–	2
211-47	40,939,626	1,558,734	449,444	16,027	105,031	72,338	5,783	50	1,708
211-48	4,541,219	1,037,920	320,202	15,301	46,606	26,670	2,464	281	1,589
23. Lake Winnipeg	69,409,938	14,221,298	6,680,401	229,881	2,546,244	2,892,044	244,206	4,790	28,255
230	45,430,309	1,433,630	563,130	29,414	131,954	191,192	9,668	124	3,568
230-35	28,155,249	236,096	56,162	4,641	16,308	1,214	68	82	632
230-46	17,275,060	1,197,534	506,968	24,773	115,646	189,978	9,600	42	2,936
231-46	6,398,116	4,967,276	3,199,320	91,388	1,277,828	1,539,001	131,625	3,459	12,171
232	17,581,513	7,820,392	2,917,951	109,079	1,136,462	1,161,851	102,913	1,207	12,516
232-46	12,988,873	5,943,943	2,138,754	83,442	861,184	942,861	76,995	1,207	9,211
232-47	4,592,640	1,876,449	779,197	25,637	275,278	218,990	25,918	–	3,305
24. Assiniboine River	39,852,589	35,927,274	16,561,770	361,902	1,959,204	5,276,335	306,711	19,310	48,090
240	22,422,934	19,366,768	9,116,711	231,837	1,556,996	3,230,605	197,129	5,527	28,655
240-46	8,317,043	6,814,399	3,243,612	95,195	866,938	1,519,408	93,498	2,619	10,535
240-47	14,105,891	12,552,369	5,873,099	136,642	690,058	1,711,197	103,631	2,908	18,120
241-47	17,408,655	16,560,506	7,445,059	130,065	402,208	2,045,730	109,582	13,783	19,435
25. Saskatchewan River	100,700,497	66,431,026	25,726,389	698,369	6,827,522	8,593,150	686,320	563,524	79,271
250	18,850,456	3,381,489	1,774,617	42,725	763,328	554,840	85,367	546	5,836
250-46	4,502,397	85,103	33,820	1,016	13,526	2,610	1,057	3	126
250-47	14,348,059	3,296,386	1,740,797	41,709	749,802	552,230	84,310	543	5,710
251-48	6,893,634	1,383,012	617,410	30,110	208,141	156,147	12,036	722	3,697
252	30,944,133	26,310,642	10,695,814	328,000	2,984,712	3,127,749	235,227	5,441	34,666
252-47	14,596,309	12,247,663	4,980,803	109,454	1,044,759	1,199,977	108,611	1,777	13,637
252-48	16,347,824	14,062,979	5,715,011	218,546	1,939,953	1,927,772	126,616	3,664	21,029
253	37,842,649	32,070,757	11,536,761	265,305	2,439,404	4,376,713	320,510	430,469	31,678
253-47	14,240,743	12,767,509	5,152,475	92,985	435,551	1,901,128	145,104	30,805	13,103
253-48	23,601,906	19,303,248	6,384,286	172,320	2,003,853	2,475,585	175,406	399,664	18,575
254-48	6,169,625	3,285,126	1,101,787	32,229	431,937	377,701	33,180	126,346	3,394
3. Arctic Basin	..	10,271,496	4,221,390	164,613	1,239,332	500,677	48,643	1,588	15,672
31. Athabasca River:									
310-48	34,772,456	3,114,519	1,242,174	59,328	316,953	206,640	12,799	410	6,042
32. Peace River	77,281,858	7,156,977	2,979,216	105,285	922,379	294,037	35,844	1,178	9,630
320-48	46,568,674	5,483,964	2,459,417	79,579	796,004	220,734	32,453	865	7,882
320-59	30,713,184	1,673,013	519,799	25,706	126,375	73,303	3,391	313	1,748
4. Pacific Basin	244,296,661	4,150,218	572,794	66,268	520,339	63,129	72,369	220,674	16,652
40. Columbia River	25,398,719	903,224	157,405	11,527	215,023	29,284	36,522	78,806	4,854
400-59	21,459,293	392,271	70,665	5,234	37,456	11,410	5,975	24,353	1,432
401-59	2,087,641	287,744	71,680	5,016	163,758	16,626	27,701	44,292	3,113
402-59	1,851,785	223,209	15,060	1,277	13,809	1,248	2,846	10,161	309
41. Fraser River	57,403,802	2,869,374	357,238	44,027	260,336	30,793	33,155	125,890	9,598
410-59	41,996,419	1,275,177	157,396	22,645	66,459	6,397	9,527	42,480	2,384
411-59	13,878,133	1,390,080	109,989	9,399	27,073	3,972	1,262	64,851	1,593
412-59	1,529,250	204,117	89,853	11,983	166,804	20,424	22,366	18,559	5,621
43. West Coast	82,737,890	377,620	58,151	10,714	44,980	3,052	2,692	15,978	2,200
431-59	53,785,002	229,477	27,669	2,869	11,658	397	90	5,328	335
432-59	18,151,113	80,446	14,933	3,078	11,434	906	480	5,316	762
433-59	1,377,239	67,697	15,549	4,767	21,888	1,749	2,122	5,334	1,103
5. Gulf of Mexico Basin	6,339,199	5,998,071	1,166,286	23,485	38,310	368,830	25,218	32,937	2,431
500-47	5,041,029	4,186,322	914,029	16,768	18,071	305,653	20,650	27,568	1,937
500-48	1,298,170	1,811,749	252,257	6,717	20,239	63,177	4,568	5,369	494

[1] Watersheds without farms are excluded; the 18 farms in the Yukon and Northwest Territories are also excluded.

Source: Special tabulation by the Census Field, Statistics Canada.

APPENDIX 5

Livestock on Census Farms by Watershed, 1971

Watershed code and provincial code	Cattle	Pigs	Sheep	All poultry	Other livestock
1. Atlantic Basin	5,149,330	3,936,361	364,719	59,870,516	1,260,412
10. Atlantic Ocean	21,610	22,495	8,805	1,106,003	65,321
101-10	564	1,327	1,479	85,099	211
102-10	1,343	2,533	1,412	244,856	306
103-10	2,925	9,764	387	299,158	178
104-12	16,778	8,871	5,527	476,890	64,626
11. Gulf of St. Lawrence	306,597	181,590	60,541	1,729,197	45,761
110-24	3,567	1,085	323	26,371	149
111-10	2,295	1,015	6,106	179,806	6,188
112-24	92,674	41,577	15,605	194,258	3,684
113	91,336	35,462	23,641	828,497	6,233
113-12	27,897	12,898	9,742	215,590	1,939
113-13	26,514	16,046	4,569	459,501	2,190
113-24	36,925	6,518	9,330	153,406	2,104
114-11	106,062	100,936	8,484	268,642	11,075
115-12	10,663	1,515	6,382	231,623	18,432
12. Bay of Fundy	95,178	64,211	15,701	2,394,656	58,181
120-12	75,582	56,481	14,186	2,131,710	53,216
121-13	19,596	7,730	1,515	262,946	4,965
13. Saint John River	98,481	41,674	17,568	1,167,376	11,905
130-13	66,576	32,554	11,172	1,039,535	10,028
130-24	31,905	9,120	6,396	127,841	1,877
14. St. Lawrence River	1,526,327	1,306,245	46,791	22,449,139	220,188
140-24	106,758	27,505	8,668	504,909	13,664
141-24	93,655	61,334	2,604	1,196,715	9,660
142-24	400,420	498,122	9,548	3,612,091	37,012
143-24	6,635	1,915	601	73,939	563
144-24	570,073	450,643	13,774	8,929,534	71,441
145-24	106,308	204,706	4,078	6,290,752	48,626
146-24	97,555	38,785	2,923	771,464	20,183
147	144,923	23,235	4,595	1,069,735	19,039
147-24	35,045	3,802	59	138,657	4,950
147-35	109,878	19,433	4,536	931,078	14,089
15. Ottawa River	624,080	123,054	38,287	1,987,952	56,934
150	380,246	83,138	18,052	1,571,146	36,537
150-24	93,887	24,806	6,198	470,669	16,362
150-35	286,359	58,332	11,854	1,100,477	20,175
151	243,834	39,916	20,235	416,806	20,397
151-24	69,773	8,831	3,306	43,859	2,913
151-35	174,061	31,085	16,929	372,947	17,484
16. Lake Ontario	561,697	313,947	47,590	8,936,962	185,804
160-35	120,085	34,927	8,132	681,709	9,473
161-35	219,607	83,919	14,484	1,192,069	25,998
162-35	53,212	19,530	4,460	974,978	43,851
163-35	62,980	52,337	9,771	619,248	28,285
164-35	51,301	46,198	6,574	1,637,020	27,733
165-35	54,512	79,536	4,169	3,831,938	50,464
17. Lake Erie and Lake St. Clair	831,644	1,163,768	48,036	10,923,571	411,722
170-35	331,407	468,194	20,116	4,984,045	192,120
171-35	129,697	185,775	6,618	1,754,071	78,666
172-35	261,825	368,814	9,436	2,881,231	122,790
173-35	108,715	140,985	11,866	1,304,224	18,146
18. Lake Huron	1,071,180	766,397	80,983	9,034,515	199,937
180-35	750,958	599,314	40,875	6,826,978	103,331
181-35	256,014	158,765	28,734	2,100,899	87,453
182-35	64,208	8,318	11,374	106,638	9,153
19. Lake Superior:					
190-35	12,536	2,980	417	141,145	4,659

Livestock on Census Farms by Watershed, 1971 — Concluded

Watershed code and provincial code	Cattle	Pigs	Sheep	All poultry	Other livestock
2. Hudson Bay and Ungava Basin	6,950,511	3,691,569	394,290	18,807,380	563,855
21. South and West Hudson Bay	209,933	76,675	12,350	306,531	28,824
210	44,774	5,433	6,731	92,728	3,714
210-24	34,407	4,239	4,977	51,222	1,800
210-35	10,367	1,194	1,754	41,506	1,914
211	165,159	71,242	5,619	213,803	25,100
211-46	–	–	–	–	2,529
211-47	94,906	25,772	2,036	92,485	15,793
211-48	70,253	45,470	3,583	121,318	6,778
23. Lake Winnipeg	803,641	827,984	35,384	5,958,321	149,543
230	99,456	60,470	7,267	579,378	62,555
230-35	24,127	1,529	4,172	27,627	9,269
230-46	75,329	58,941	3,095	551,751	53,286
231-46	268,641	501,825	9,979	4,395,647	41,944
232	435,544	265,689	18,138	983,296	45,044
232-46	370,365	223,623	14,800	813,497	39,122
232-47	65,179	42,066	3,338	169,799	5,922
24. Assiniboine River	1,618,125	720,653	72,576	3,572,648	103,112
240	1,011,104	489,685	45,467	2,202,631	74,069
240-46	419,582	285,262	14,153	910,641	30,529
240-47	591,522	204,423	31,314	1,291,990	43,540
241-47	607,021	230,968	27,109	1,370,017	29,043
25. Saskatchewan River	4,318,812	2,066,257	274,070	8,969,880	282,386
250	94,890	171,721	4,621	243,936	25,775
250-46	4,158	920	473	6,279	1,438
250-47	90,732	170,801	4,148	237,657	24,337
251-48	142,328	86,162	8,757	453,633	27,307
252	1,675,048	909,136	65,730	4,007,012	90,477
252-47	568,929	224,313	29,026	900,414	16,494
252-48	1,106,119	684,823	36,704	3,106,598	73,983
253	2,061,298	814,639	171,095	3,344,503	96,499
253-47	446,209	227,008	41,526	958,669	18,530
253-48	1,615,089	587,631	129,569	2,385,834	77,969
254-48	345,248	84,599	23,867	920,796	42,328
3. Arctic Basin	372,832	331,418	40,314	946,691	150,464
31. Athabasca River:					
310-48	232,513	188,977	19,074	486,265	98,928
32. Peace River	140,319	142,441	21,240	460,426	51,536
320-48	110,914	129,682	15,568	367,795	38,264
320-59	29,405	12,759	5,672	92,631	13,272
4. Pacific Basin	543,766	65,862	47,440	7,768,857	333,545
40. Columbia River	100,306	10,631	5,578	229,684	20,650
400-59	52,885	4,116	3,038	91,707	6,537
401-59	31,529	6,354	1,907	120,117	13,131
402-59	15,892	161	633	17,860	982
41. Fraser River	393,781	49,794	28,805	6,792,573	281,375
410-59	138,032	7,571	10,753	427,645	30,660
411-59	145,478	7,064	8,258	176,424	17,349
412-59	110,271	35,159	9,794	6,188,504	233,366
43. West Coast	49,679	5,437	13,057	746,600	31,520
431-59	20,171	348	1,301	60,535	1,688
432-59	15,158	1,948	2,559	87,362	4,045
433-59	14,350	3,141	9,197	598,703	25,787
5. Gulf of Mexico Basin	257,804	27,809	13,901	141,257	5,321
500-47	180,067	19,916	6,097	60,353	3,964
500-48	77,737	7,893	7,804	80,904	1,357

Source: Special tabulation by the Census Field, Statistics Canada.

APPENDIX 6

Industrial Activity "Stressor Type" by Watershed, 1973

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	10^{12} B.t.u.'s	per cent
100:						
High	–	–	–	–	–	–
Medium	1	25.0	30	81.1	x	x
Low	3	75.0	7	18.9	x	x
Total	**4**	**100.0**	**37**	**100.0**	**0.1**	**100.0**
101:						
High	1	1.6	960	56.2	x	x
Medium	13	20.6	569	33.3	0.1	3.6
Low	49	77.8	179	10.5	x	x
Total	**63**	**100.0**	**1,708**	**100.0**	**2.9**	**100.0**
102:						
High	2	5.6	117	8.1	x	x
Medium	16	44.4	1,159	80.7	0.1	36.0
Low	18	50.0	161	11.2	x	x
Total	**36**	**100.0**	**1,437**	**100.0**	**0.4**	**100.0**
103:						
High	3	3.9	118	4.7	0.1	11.4
Medium	22	28.6	1,140	45.4	0.4	60.4
Low	52	67.5	1,252	49.9	0.2	28.1
Total	**77**	**100.0**	**2,510**	**100.0**	**0.6**	**100.0**
104:						
High	10	2.7	1,157	10.6	2.7	60.0
Medium	98	26.3	4,078	37.5	1.1	24.4
Low	264	71.0	5,656	51.9	0.7	15.6
Total	**372**	**100.0**	**10,891**	**100.0**	**4.5**	**100.0**
110:						
High	5	6.7	2,266	71.5	4.3	95.6
Medium	23	30.7	525	16.6	0.2	4.4
Low	47	62.6	376	11.9	0.1	1.2
Total	**75**	**100.0**	**3,167**	**100.0**	**4.5**	**100.0**
111:						
High	6	9.2	2,075	35.7	8.9	89.0
Medium	32	49.2	3,157	54.4	0.9	9.0
Low	27	41.6	568	9.9	0.2	2.0
Total	**65**	**100.0**	**5,800**	**100.0**	**10.0**	**100.0**
112:						
High	3	2.1	184	9.0	0.9	64.3
Medium	19	13.6	379	18.4	0.3	21.4
Low	118	84.3	1,494	72.6	0.2	14.3
Total	**140**	**100.0**	**2,057**	**100.0**	**1.4**	**100.0**
113:						
High	22	6.2	4,102	30.9	25.4	89.4
Medium	112	31.5	4,208	31.6	1.2	4.2
Low	222	62.3	4,986	37.5	1.8	6.4
Total	**356**	**100.0**	**13,296**	**100.0**	**28.4**	**100.0**
114:						
High	–	–	–	–	–	–
Medium	72	55.0	1,455	76.7	0.4	93.1
Low	59	45.0	443	23.3	–	6.9
Total	**131**	**100.0**	**1,898**	**100.0**	**0.4**	**100.0**

Industrial Activity "Stressor Type" by Watershed, 1973 – Continued

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	1012 B.t.u.'s	per cent
115:						
High	9	9.8	4,036	61.7	11.6	96.7
Medium	25	27.2	1,308	20.0	0.3	2.8
Low	58	63.0	1,194	18.3	0.1	0.5
Total	**92**	**100.0**	**6,538**	**100.0**	**12.0**	**100.0**
120:						
High	5	2.3	431	6.7	1.1	36.7
Medium	59	27.6	1,982	30.8	0.8	26.6
Low	150	70.1	4,021	62.5	1.1	36.7
Total	**214**	**100.0**	**6,434**	**100.0**	**3.0**	**100.0**
121:						
High	4	3.1	263	5.8	1.8	56.3
Medium	43	33.3	1,725	37.8	0.5	15.6
Low	82	63.6	2,576	56.4	0.9	28.1
Total	**129**	**100.0**	**4,564**	**100.0**	**3.2**	**100.0**
130:						
High	11	3.4	2,139	16.2	13.3	75.6
Medium	53	16.4	2,108	16.0	1.6	9.1
Low	260	80.2	8,934	67.8	2.7	15.3
Total	**324**	**100.0**	**13,181**	**100.0**	**17.6**	**100.0**
140:						
High	13	5.9	7,953	66.6	14.2	90.4
Medium	41	18.6	693	5.8	0.7	4.6
Low	166	75.5	3,289	27.6	0.8	5.0
Total	**220**	**100.0**	**11,935**	**100.0**	**15.7**	**100.0**
141:						
High	17	2.5	4,440	21.5	17.1	84.2
Medium	111	16.3	4,001	19.4	2.0	9.9
Low	554	81.2	12,174	59.1	1.2	5.9
Total	**682**	**100.0**	**20,615**	**100.0**	**20.3**	**100.0**
142:						
High	11	1.4	531	2.2	0.6	14.0
Medium	185	23.5	4,191	17.3	2.0	46.5
Low	592	75.1	19,503	80.5	1.7	39.5
Total	**788**	**100.0**	**24,225**	**100.0**	**4.3**	**100.0**
143:						
High	16	8.0	5,485	40.8	15.1	87.7
Medium	38	19.0	3,344	24.9	1.8	10.2
Low	146	73.0	4,619	34.3	0.4	2.1
Total	**200**	**100.0**	**13,448**	**100.0**	**17.3**	**100.0**
144:						
High	34	2.3	5,541	7.7	22.2	54.4
Medium	371	24.9	20,125	28.1	12.6	30.9
Low	1,087	72.8	45,971	64.2	6.0	14.7
Total	**1,492**	**100.0**	**71,637**	**100.0**	**40.8**	**100.0**
145:						
High	8	2.1	1,333	11.8	5.6	67.5
Medium	82	21.5	2,962	26.3	1.9	22.9
Low	291	76.4	6,991	61.9	0.8	9.6
Total	**381**	**100.0**	**11,286**	**100.0**	**8.3**	**100.0**

Industrial Activity "Stressor Type" by Watershed, 1973 – Continued

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	1012 B.t.u.'s	per cent
146:						
High	44	0.8	6,060	3.0	19.7	31.8
Medium	763	14.5	33,518	16.5	18.2	29.4
Low	4,440	84.6	164,066	80.5	24.0	38.8
Total	**5,247**	**100.0**	**203,644**	**100.0**	**61.9**	**100.0**
147:						
High	24	7.1	3,274	15.6	6.1	31.4
Medium	91	27.1	8,638	41.2	10.2	52.6
Low	221	65.8	9,058	43.2	3.1	16.0
Total	**336**	**100.0**	**20,970**	**100.0**	**19.4**	**100.0**
150:						
High	27	3.8	6,500	24.2	21.5	81.5
Medium	150	20.9	5,388	20.1	2.2	8.3
Low	541	75.3	14,936	55.7	2.7	10.2
Total	**718**	**100.0**	**26,824**	**100.0**	**26.4**	**100.0**
151:						
High	6	1.7	1,374	11.5	8.6	80.4
Medium	64	18.7	1,763	14.7	0.8	7.5
Low	273	79.6	8,818	73.8	1.3	12.1
Total	**343**	**100.0**	**11,955**	**100.0**	**10.7**	**100.0**
160:						
High	7	4.8	711	8.9	7.8	75.7
Medium	49	33.6	2,402	30.0	2.0	19.4
Low	90	61.6	4,873	61.1	0.5	4.9
Total	**146**	**100.0**	**7,986**	**100.0**	**10.3**	**100.0**
161:						
High	6	2.2	413	3.5	0.8	21.8
Medium	68	24.7	1,802	15.5	0.8	23.1
Low	201	73.1	9,420	81.0	2.0	55.1
Total	**275**	**100.0**	**11,635**	**100.0**	**3.6**	**100.0**
162:						
High	7	3.3	949	4.5	2.9	30.2
Medium	36	17.0	2,643	12.4	1.1	11.5
Low	169	79.7	17,681	83.1	5.6	58.3
Total	**212**	**100.0**	**21,273**	**100.0**	**9.6**	**100.0**
163:						
High	39	0.7	3,165	1.4	12.1	10.9
Medium	937	16.5	42,698	19.3	21.6	19.4
Low	4,687	82.8	175,637	79.3	77.6	69.7
Total	**5,663**	**100.0**	**221,500**	**100.0**	**111.3**	**100.0**
164:						
High	23	2.8	21,805	33.2	29.3	60.8
Medium	175	21.0	10,577	16.1	6.6	13.5
Low	636	76.2	33,333	50.7	12.4	25.7
Total	**834**	**100.0**	**65,715**	**100.0**	**48.3**	**100.0**
165:						
High	25	4.5	7,362	20.8	15.3	56.7
Medium	127	23.1	5,962	16.9	3.3	12.1
Low	398	72.4	22,016	62.3	8.4	31.2
Total	**550**	**100.0**	**35,340**	**100.0**	**27.0**	**100.0**

Industrial Activity "Stressor Type" by Watershed, 1973 – Continued

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	1012 B.t.u.'s	per cent
170:						
High	18	1.7	860	1.3	2.2	12.7
Medium	261	25.0	16,194	25.4	7.5	43.1
Low	767	73.3	46,820	73.3	7.7	44.2
Total	**1,046**	**100.0**	**63,874**	**100.0**	**17.5**	**100.0**
171:						
High	12	1.8	597	1.4	5.4	31.0
Medium	147	21.9	8,415	19.1	4.6	26.5
Low	512	76.3	35,015	79.5	7.4	42.5
Total	**671**	**100.0**	**44,027**	**100.0**	**17.4**	**100.0**
172:						
High	13	2.0	647	1.8	11.5	55.9
Medium	142	22.0	6,782	18.9	2.6	12.8
Low	491	76.0	28,465	79.3	6.4	31.3
Total	**646**	**100.0**	**35,894**	**100.0**	**20.5**	**100.0**
173:						
High	8	5.7	589	8.1	0.7	14.6
Medium	44	31.2	2,008	27.8	2.2	46.3
Low	89	63.1	4,639	64.1	1.9	39.1
Total	**141**	**100.0**	**7,236**	**100.0**	**4.8**	**100.0**
180:						
High	18	4.2	3,950	24.2	53.1	92.7
Medium	124	28.7	2,865	17.5	1.1	1.9
Low	290	67.1	9,535	58.3	3.1	5.4
Total	**432**	**100.0**	**16,350**	**100.0**	**57.3**	**100.0**
181:						
High	8	2.1	615	3.9	0.5	10.7
Medium	83	21.6	4,123	26.1	2.3	48.9
Low	293	76.3	11,054	70.0	1.9	40.4
Total	**384**	**100.0**	**15,792**	**100.0**	**4.7**	**100.0**
182:						
High	19	7.9	13,933	78.0	45.7	97.0
Medium	41	16.9	699	3.9	0.6	1.3
Low	182	75.2	3,224	18.1	0.8	1.7
Total	**242**	**100.0**	**17,856**	**100.0**	**47.1**	**100.0**
190:						
High	11	9.7	4,729	63.4	19.6	91.1
Medium	22	19.5	246	3.3	0.1	0.5
Low	80	70.8	2,484	33.3	1.8	8.4
Total	**113**	**100.0**	**7,459**	**100.0**	**21.5**	**100.0**
200:						
Total	**11**	**100.0**	**754**	**100.0**	**3.1**	**100.0**
210:						
High	9	6.2	3,046	41.0	8.5	85.4
Medium	28	19.3	154	2.1	0.1	0.8
Low	108	74.5	4,221	56.9	1.4	13.8
Total	**145**	**100.0**	**7,421**	**100.0**	**10.0**	**100.0**
211:						
Total	**41**	**100.0**	**344**	**100.0**	**0.1**	**100.0**
220:						
Total	**12**	**100.0**	**879**	**100.0**	**0.7**	**100.0**

Industrial Activity "Stressor Type" by Watershed, 1973 – Continued

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	1012 B.t.u.'s	per cent
230:						
High	6	6.8	2,387	66.3	x	x
Medium	17	19.3	207	5.7	0.1	1.3
Low	65	73.9	1,008	28.0	x	x
Total	**88**	**100.0**	**3,602**	**100.0**	**9.5**	**100.0**
231:						
High	17	1.6	1,435	4.1	4.1	33.4
Medium	209	19.7	6,954	19.9	3.6	29.2
Low	834	78.7	26,525	76.0	4.6	37.4
Total	**1,060**	**100.0**	**34,914**	**100.0**	**12.3**	**100.0**
232:						
High	1	1.3	29	2.8	x	x
Medium	18	23.1	326	30.8	0.3	31.4
Low	59	75.6	703	66.4	x	x
Total	**78**	**100.0**	**1,058**	**100.0**	**1.0**	**100.0**
240:						
High	15	6.8	248	9.3	0.8	44.4
Medium	60	27.3	919	34.4	0.8	44.4
Low	145	65.9	1,505	56.3	0.2	11.2
Total	**220**	**100.0**	**2,672**	**100.0**	**1.8**	**100.0**
241:						
High	10	4.4	394	8.3	1.6	44.4
Medium	53	23.2	2,121	44.5	1.3	36.1
Low	165	72.4	2,253	47.2	0.7	19.5
Total	**228**	**100.0**	**4,768**	**100.0**	**3.6**	**100.0**
250:						
High	6	10.9	819	59.8	5.0	90.9
Medium	13	23.6	112	8.2	0.2	3.6
Low	36	65.5	438	32.0	0.3	5.5
Total	**55**	**100.0**	**1,369**	**100.0**	**5.5**	**100.0**
251:						
High	5	14.7	200	31.9	3.5	93.6
Medium	7	20.6	86	13.7	0.2	5.0
Low	22	64.7	341	54.4	0.1	1.4
Total	**34**	**100.0**	**627**	**100.0**	**3.7**	**100.0**
252:						
High	35	4.2	2,798	14.9	41.3	77.5
Medium	185	22.5	5,735	30.4	9.4	17.6
Low	604	73.3	10,306	54.7	2.6	4.9
Total	**824**	**100.0**	**18,839**	**100.0**	**53.3**	**100.0**
253:						
High	26	5.2	525	5.1	1.4	20.6
Medium	139	27.8	3,998	39.2	2.6	38.2
Low	335	67.0	5,684	55.7	2.8	41.2
Total	**500**	**100.0**	**10,207**	**100.0**	**6.8**	**100.0**
254:						
High	17	3.0	1,194	9.7	7.9	61.5
Medium	94	16.4	2,952	23.8	2.5	19.3
Low	463	80.6	8,237	66.5	2.5	19.2
Total	**574**	**100.0**	**12,383**	**100.0**	**12.9**	**100.0**
300:						
High	1	8.3	40	36.7	x	x
Medium	2	16.7	24	22.0	x	x
Low	9	75.0	45	41.3	--	5.3
Total	**12**	**100.0**	**109**	**100.0**	**0.3**	**100.0**
310:						
Total	**78**	**100.0**	**1,462**	**100.0**	**3.2**	**100.0**

Industrial Activity "Stressor Type" by Watershed, 1973 – Concluded

Watershed code and stressor type	Establishments		Workers		Purchased fossil fuel	
	number	per cent	number	per cent	1012 B.t.u.'s	per cent
320:						
High	8	9.3	156	6.3	0.2	10.0
Medium	11	12.8	116	4.7	0.1	5.0
Low	67	77 9	2,196	89.0	1.7	85.0
Total	**86**	**100.0**	**2,468**	**100.0**	**2.0**	**100.0**
330:						
Total	x	...	x	...	x	...
400:						
High	13	7.3	3,371	38.1	7.8	84.8
Medium	14	7.8	189	2.2	0.1	1.1
Low	152	84.9	5,282	59.7	1.3	14.1
Total	**179**	**100.0**	**8,842**	**100.0**	**9.2**	**100.0**
401:						
High	8	4.2	85	2.0	--	2.1
Medium	37	19.4	894	21.1	1.0	44.2
Low	146	76.4	3,266	76.9	1.2	53.7
Total	**191**	**100.0**	**4,245**	**100.0**	**2.2**	**100.0**
402:						
High	–	–	–	–	–	–
Medium	–	–	–	–	–	–
Low	9	100.0	343	100.0	0.1	100.0
Total	**9**	**100.0**	**343**	**100.0**	**0.1**	**100.0**
410:						
High	17	7.7	1,795	17.2	11.1	72.4
Medium	23	10.4	485	4.6	0.2	1.0
Low	182	81.9	8,156	78.2	4.1	26.6
Total	**222**	**100.0**	**10,436**	**100.0**	**15.4**	**100.0**
411:						
High	9	8.4	597	16.1	5.1	82.3
Medium	9	8.4	57	1.5	--	0.3
Low	89	83.2	3,052	82.4	1.1	17.3
Total	**107**	**100.0**	**3,706**	**100.0**	**6.2**	**100.0**
412:						
High	33	1.8	2,232	4.2	5.9	36.8
Medium	298	15.9	9,862	18.8	3.9	23.9
Low	1,544	82.3	40,443	77.0	6.4	39.3
Total	**1,875**	**100.0**	**52,537**	**100.0**	**16.2**	**100.0**
420:						
Total	**4**	**100.0**	**19**	**100.0**	**0.005**	**100.0**
431:						
High	10	14.1	3,514	52.8	11.7	93.5
Medium	16	22.5	1,262	18.9	0.2	1.4
Low	45	63.4	1,888	28.3	0.6	5.1
Total	**71**	**100.0**	**6,664**	**100.0**	**12.5**	**100.0**
432:						
High	24	7.5	7,146	46.3	28.3	97.2
Medium	32	10.0	393	2.6	0.2	0.8
Low	264	82.5	7,885	51.1	0.6	2.0
Total	**320**	**100.0**	**15,424**	**100.0**	**29.1**	**100.0**
433:						
High	9	3.3	1,116	14.6	5.1	91.1
Medium	40	14.6	837	11.0	0.2	3.6
Low	224	82.1	5,666	74.4	0.3	5.3
Total	**273**	**100.0**	**7,619**	**100.0**	**5.6**	**100.0**
500:						
Total	x	...	x	...	x	...

Source: Special tabulation by the Census Field, Statistics Canada.

APPENDIX 7

Major Canadian Rivers
(Ordered Alphabetically)

Rivers dammed or modified for hydroelectric, irrigation or flood control purposes (as of 1975)

	Watershed code
Abitibi	210
Aguasabon	190
Ash	432
Assiniboine	240
Batiscan	141
Betsiamites	113
Bow	254
Bridge	410
Campbell	432
Canoe	400
Charlot	300
Chaudière	142
Churchill (Manitoba)	211
Churchill (Newfoundland)	100
Columbia	400
Eastmain	200
Elk	400
English	230
Exploits	101
French	182
Gaspereau	150
Gatineau	120
Grand	170
La Grande	200
Humber	111
Kaministikwia	190
Kananaskis	254
Kapuskasing	210
Kootenay	400
Lièvre	150
Madawaska	151
Magpie	110
Manicouagan	110
Mattagami	210
Mersey	104
Michipicoten	190
Mississagi	182
Mississippi	151
Montreal	190
Nechako	410
Nelson	220
Nepisiguit	113
Nipigon	190
Ottawa	150 and 151
Outardes	110
Peace	320
Péribonca	140
Powell	432
Puntledge	432

Unmodified rivers

	Watershed code
Albany	210
Anderson	330
Arctic Red	300
Arnaud	200
Athabasca	310
Attawapiskat	210
Back	330
Battle	252
Beaver	210
Berens	230
Bonnet Plume	300
Broadback	210
Bulkley	431
Chilcotin	410
Coppermine	330
Coulonge	151
Dease	300
Dubawnt	211
Dumoine	151
Eagle	100
Ekwan	210
Finlay	320
Fond du Lac	300
Fort Nelson	300
Fraser	410
Gander	101
George	200
Gods	210
Great Whale	200
Harricanaw	210
Hay	300
Hayes	210
Homathko	432
Horton	330
Kanairiktok	100
Kazan	211
Kettle	400
Kogaluc	200
Koksoak	200
Leaf	200
Liard	300
Lillooet	410
Little Whale	200
Mackenzie	300
McKeand	330
Macmillan	420
Miramichi	113
Missinaibi	210
Mistassini	210

Major Canadian Rivers – Concluded
(Ordered Alphabetically)

Rivers dammed or modified for hydroelectric, irrigation or flood control purposes (as of 1975)

	Watershed code
Qu'Appelle	241
Rainy	230
Red	231
Richelieu	144
Rideau	150
Rouge	150
Sables	140
Saguenay	140
Saint John	130
St. Croix	121
St-François	144
St. Lawrence	140 - 147
St. Maurice	143
Ste. Anne	141
Ste. Anne du Nord	141
Ste. Marguerite	110
Salmon	111
Saskatchewan	250 - 254
Seine	230
Shuswap	411
Snare	300
Souris	240
South Saskatchewan	253
Spanish	182
Spray	254
Stave	412
Sturgeon	182
Taltson	300
Thames	172
Tobique	130
Trent	161
Wanapitei	182
Winnipeg	230
Yellowknife	300
Yukon	420

Unmodified rivers

	Watershed code
Moisie	110
Naskaupi	100
Nastapoka	200
Nass	431
Natashquan	110
Nottaway	210
Oldman	253
Parsnip	320
Peel	300
Pelly	420
Petit-Mécatina	110
Petitot	300
Poplar	230
Porcupine	420
Povungnituk	200
Quesnel	410
Red Deer	253
Romaine	110
Rupert	210
St. Augustin	110
Seal	211
Severn	210
Similkameen	402
Skeena	431
Slave	300
Smoky	320
South Nahanni	300
South Thompson	411
Squamish	412
Stewart	420
Stikine	431
Stuart	410
Taku	431
Teslin	420
Thelon	211
Thlewiaza	211
Thompson	411
Wabasca	320
West Road	410
Whale	200
Winisk	210

APPENDIX 8

Regional User Advisory Services

Central Inquiries Service,
Statistics Canada,
Ottawa, Ont.
K1A 0T6
(613-992-2959;
992-4734)

St. John's
Statistics Canada,
3rd Floor, Viking Building,
Crosbie Road,
P.O. Box 8556,
St. John's, Nfld.
A1B 3P2
(709-726-0713)

Halifax
Statistics Canada,
1256 Barrington Street,
Halifax, N.S.
B3J 1Y6
(902-426-5331)

Montréal
Statistics Canada,
Alexis Nihon Plaza,
1500 Atwater Avenue,
Montréal, Que.
H3Z 1Y2
(514-283-5725)

Toronto
Statistics Canada,
25 St. Clair Avenue East,
Toronto, Ont.
M4T 1M4
(416-966-6586)

Winnipeg
Statistics Canada,
Room 500, General Post Office,
266 Graham Avenue,
Winnipeg, Man.
R3C 0K4
(204-985-4020)

Regina
Statistics Canada,
530 Midtown Centre,
Regina, Sask.
S4P 2B6
(306-569-5405)

Edmonton
Statistics Canada,
10th Floor, Baker Centre Building,
10025-106th Street,
Edmonton, Alta.
T5J 1G9
(403-425-5052)

Vancouver
Statistics Canada,
16 East Hastings Street,
Vancouver, B.C.
V6A 1N1
(604-666-3695)

Toll-free access to the regional statistical information service is provided in Charlottetown, Moncton, Saint John and Sydney by calling the operator and asking for ZENITH 22066. Throughout Saskatchewan, the Regina office can be reached by dialing 1-800-667-3524 and throughout Alberta, the Edmonton office can be reached by dialing 1-800-222-6400.

APPENDIX 9

Full Depository Libraries

Canada

Library,
Memorial University,
St. John's, Nfld.

Planning Library,
Provincial Administrative Bldg.,
Charlottetown, P.E.I.

Library,
Acadia University,
Wolfville, N.S.

Dalhousie University Library,
Studley Campus,
Halifax, N.S.

University of New Brunswick,
Harriet Irving Library,
Fredericton, N.B.

Bibliothèque,
Université de Moncton,
Moncton, N.B.

Ralph Pickard Bell Library,
Mount Allison University,
Sackville, N.B.

Bibliothèque municipale,
Rue Sherbrooke est,
Montréal, Qué.

McGill University Library,
3459 McTavish St.,
Montréal, Que.

Centrale des bibliothèques,
Ministère de l'Éducation du Québec,
1685 est, rue Fleury,
Montréal, Qué.

Serials Library,
Concordia University,
1435 Drummond St.,
Montréal, Que.

Université de Montréal,
Bibliothèque Sciences Humaines
et Sociales,
Montréal, Qué.

Bibliothèque de l'Université Laval,
Cité Universitaire,
Ste-Foy, Qué.

Université de Sherbrooke,
Bibliothèque générale,
Cité Universitaire,
Sherbrooke, Qué.

Brampton Public Library,
Chinguacousy Branch Library
and Art Gallery,
150 Central Park Drive,
Bramalea, Ont.

Documents Services,
York University Libraries,
4700 Keele St.,
Downsview, Ont.

Library,
Documentation Centre,
University of Guelph,
Guelph, Ont.

Hamilton Public Library,
Hamilton, Ont.

Documents Dept.,
Mills Memorial Library,
McMaster University,
Hamilton, Ont.

Douglas Library,
Queen's University,
Kingston, Ont.

Library,
University of Western Ontario,
London, Ont.

Laurentian University,
Library,
Sudbury, Ont.

National Library of Canada,
Government Documents,
Ottawa, Ont.

University of Ottawa,
Central Library,
165 Waller St.,
Ottawa, Ont.

Full Depository Libraries – Continued

Canada – Concluded

Metropolitan Toronto,
Central Library,
214 College St.,
Toronto, Ont.

University of Toronto Library,
Serials Dept.,
Toronto, Ont.

Lakehead University Library,
Thunder Bay, Ont.

Public Library,
216 S Brodie St.,
Thunder Bay, Ont.

Windsor Public Library,
850 Ouellette Ave.,
Windsor, Ont.

Elizabeth Dafoe Library,
University of Manitoba,
Winnipeg, Man.

University of Saskatchewan Library,
Saskatoon, Sask.

University Library,
University of Calgary,
Calgary, Alberta.

Simon Fraser University Library,
Burnaby, B.C.

University of British Columbia
Library,
Vancouver, B.C.

Vancouver Public Library,
750 Burrard St.,
Vancouver, B.C.

University of Victoria,
McPherson Library,
Victoria, B.C.

United States

New York State Library,
Albany, N.Y.

Note: Legislative Libraries are also Full Depositories.

Canadian Consulate General,
1251 Avenue of the Americas,
New York, N.Y.

New York Public Library,
New York, N.Y.

Library of Congress,
Washington, D.C.

Office of Information,
Canadian Embassy,
1771 N St., N.W.,
Washington, D.C.

Overseas

National Library of Australia,
Canberra, Australia.

Bibliothèque Royale Albert 1er,
80-84, rue des Tanneurs,
Bruxelles, Belgique.

British Museum,
Department of Printed Books,
London W.C. 1, England.

The Office of the High
Commissioner for Canada,
Canada House, Trafalgar Square,
London S.W. 1, England.

Ambassade du Canada,
Centre culturel canadien,
Bibliothèque,
5, rue de Constantine,
75 Paris 7, France.

Staatsbibliothek Pressischer
Kulturbesitz Abteilung
Amtsdruckschriften und Tausch
1 Berlin 30,
Federal Republic of Germany.

National Diet Library,
Tokyo, Japan.

Full Depository Libraries – Concluded

The following public libraries receive copies of all Statistics Canada publications and are available for reference purposes.

Newfoundland Public Library,
Allandale Road,
St. John's, Nfld.

Halifax City Regional Library,
5381 Spring Garden Road,
Halifax, N.S.

Saint John Regional Library,
20 Hazen Ave.,
Saint John, N.B.

Ottawa Public Library,
120 Metcalfe St.,
Ottawa, Ont.

Mississauga Public Library,
110 Dundas St.,
Cooksville, Ont.

Etobicoke Public Library,
1806 Islington Ave.,
Etobicoke, Ont.

Birchmount District Library,
1076 Ellesmere Rd.,
Scarborough, Ont.

St. Catharines Public Library,
59 Church St.,
St. Catharines, Ont.

Toronto Public Library,
40 Orchard View Blvd.,
Toronto, Ont.

North York Public Library,
5126 Yonge St.,
Willowdale, Ont.

Winnipeg Public Library,
380 William Ave.,
Winnipeg, Man.

Regina Public Library,
2311-12th Ave.,
Regina, Sask.

Calgary Public Library,
616 MacLeod Trail S.E.,
Calgary, Alta.

Edmonton Public Library,
Sir Winston Churchill Square,
Edmonton, Alberta.

Whalley Public Library,
10667-135A St.,
Surrey, B.C.

DATE DUE

Statistics Canada Statistique Canada