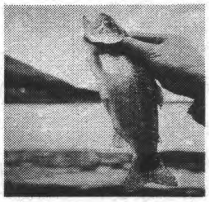
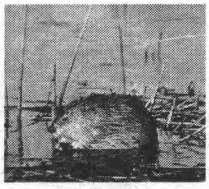
Canada Alberta Northwest Territories

Northern River Basins Study



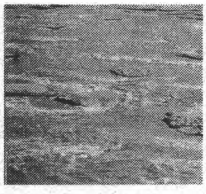


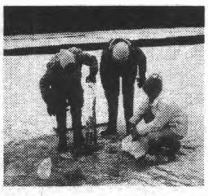





NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 73

FACTORS AFFECTING FUTURE DEVELOPMENT IN KEY ECONOMIC SECTORS IN THE PEACE, ATHABASCA AND SLAVE RIVER BASINS






Prepared for the
Northern River Basins Study
under Project 4111-C1

by

Nichols Applied Management

NORTHERN RIVER BASINS STUDY PROJECT REPORT NO. 73

FACTORS AFFECTING FUTURE DEVELOPMENT IN KEY ECONOMIC SECTORS IN THE PEACE, ATHABASCA AND SLAVE RIVER BASINS

Published by the
Northern River Basins Study
Edmonton, Alberta
January, 1996

CANADIAN CATALOGUING IN PUBLICATION DATA

Main entry under title :

Factors affecting future development in key economic sectors in the Peace, Athabasca and Slave River Basins

(Northern River Basins Study project report, ISSN 1192-3571 ; no. 73)
Includes bibliographical references.
ISBN 0-662-24358-7
Cat. no. R71-49/3-73E

1. Athabasca River Watershed (Alta.) -- Environmental conditions.
2. Peace River Watershed (B.C. and Alta.) -- Environmental conditions.
3. Slave River Watershed (Alta. And N.W.T.) -- Environmental conditions.
I. Nichols Applied Management.
II. Northern River Basins Study (Canada)

HC79.E5F32 1996 338.9'7123'1 C96-980125-4

PREFACE:

The Northern River Basins Study was initiated through the "Canada-Alberta-Northwest Territories Agreement Respecting the Peace-Athabasca-Slave River Basin Study, Phase II - Technical Studies" which was signed September 27, 1991. The purpose of the Study is to understand and characterize the cumulative effects of development on the water and aquatic environment of the Study Area by coordinating with existing programs and undertaking appropriate new technical studies.

This publication reports the method and findings of particular work conducted as part of the Northern River Basins Study. As such, the work was governed by a specific terms of reference and is expected to contribute information about the Study Area within the context of the overall study as described by the Study Final Report. This report has been reviewed by the Study Science Advisory Committee in regards to scientific content and has been approved by the Study Board of Directors for public release.

It is explicit in the objectives of the Study to report the results of technical work regularly to the public. This objective is served by distributing project reports to an extensive network of libraries, agencies, organizations and interested individuals and by granting universal permission to reproduce the material.

NORTHERN RIVER BASINS STUDY
PROJECT REPORT RELEASE FORM

This publication may be cited as:

Nichols Applied Management. 1996. ***Northern River Basins Study Project Report No. 73, Factors Affecting Future Development in Key Economic Sectors in the Peace, Athabasca and Slave River Basins,*** **Northern River Basins Study, Edmonton, Alberta.**

Whereas the above publication is the result of a project conducted under the Northern River Basins Study and the terms of reference for that project are deemed to be fulfilled,
IT IS THEREFORE REQUESTED BY THE STUDY OFFICE THAT;
this publication be subjected to proper and responsible review and be considered for release to the public.

F. Wrona — 9 Jan 96

(Dr. Fred J. Wrona, Science Director) (Date)

Whereas it is an explicit term of reference of the Science Advisory Committee "to review, for scientific content, material for publication by the Board",
IT IS HERE ADVISED BY THE SCIENCE ADVISORY COMMITTEE THAT;
this publication has been reviewed for scientific content and that the scientific practices represented in the report are acceptable given the specific purposes of the project and subject to the field conditions encountered.
SUPPLEMENTAL COMMENTARY HAS BEEN ADDED TO THIS PUBLICATION: [ ] Yes [ ] No

P. A. Larkin — Jan 9/96

(Dr. P. A. Larkin, Ph.D., Chair) (Date)

Whereas the Study Board is satisfied that this publication has been reviewed for scientific content and for immediate health implications,
IT IS HERE APPROVED BY THE BOARD OF DIRECTORS THAT;
this publication be released to the public, and that this publication be designated for: **[ ] STANDARD AVAILABILITY [ ] EXPANDED AVAILABILITY**

Lucille Partington — Jan. 11/96

(Lucille Partington, Co-chair) (Date)

Robert McLeod — 11/01/96

(Robert McLeod, Co-chair) (Date)

STUDY PERSPECTIVE

> ***Related Study Questions***
>
> 3. *Who are the stakeholders and what are the consumptive and non consumptive uses of the water resources in the river basins?*

Development within the Peace, Athabasca and Slave River basins has affected and is affecting the aquatic environment and its users. A projection of the likely kind and extent of development to occur in the basins can assist in the assessment of probable future environmental impacts. For these reasons, the Board requested an examination of likely development scenarios. Knowledge of potential future developments would be used to assist the Board in assessing the potential future impacts and guide the formation of recommendations.

Any initiative to project future economic development reflects the knowledge and opinion of the author and the accuracy of the available data. This report represents an opinion of likely future development for the next twenty-five years within the study area assuming relatively stable economic conditions. The conventional and non-conventional oil and gas industry (particularly the oilsands) and the forest industry (using presently unallocated forest and value-added processing) appears to offer the greatest opportunities for economic growth in the study area over the next twenty-five years. Potential impacts from economic growth on the water resource can take the form of direct impacts on water quality and quantity, and also the indirect impacts of inducing growth of other industries and services that exist to service the primary industries and the resulting larger population base. Any future scenarios document is only as good as its assumptions and it is possible that unforeseen changes will occur in the economy, technology and peoples' attitudes that may alter the significance of the findings of this report.

REPORT SUMMARY

This report provides an initial overview of the key economic sectors that may have a particularly significant impact on the Northern River Basin study area over the next two decades. These sectors, agriculture, energy, forestry and manufacturing, form the current foundation of the northern economy. For the most part these industries operate in markets that are globally rather than locally driven and are thus very dependant on international commodity pricing factors. Agriculture is expected to maintain its regional importance although management practices, production patterns, farm consolidation and demographics are anticipated to change. Similarly, manufacturing is expected to remain relatively stable except for value-added processing in the forest industry. The conventional and non-conventional oil and gas industry (particularly the oilsands) and the forest industry (using presently unallocated forest and value-added processing) appears to offer the greatest opportunities for economic growth in the study area over the next twenty-five years, assuming relatively stable economic conditions.

ACKNOWLEDGMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The Northern River Basins Study is a four and one-half year research program initiated by the Canada, Alberta and Northwest Territories governments to examine the basins of the Peace, Athabasca, and Slave rivers with a view to assessing the cumulative effects of development on the water and aquatic environment.

The study program has now reached the halfway point, to date having been focused primarily on scientific matters including water quality, fish and fish habitat, and hydrology. The scientific research is ongoing, but other issues now require examination, including the nature and extent of new development that may occur in the future that could affect the water supply in the basin.

This study provides an initial examination of the key economic sectors that might affect the northern river basin region over the next two decades and, more specifically, it reviews those broad, industry-wide and extra-regional factors that will drive new development. Subsequent investigations are proposed that will formulate region-specific projections of industry development.

The study presents a sector-by-sector analysis of key global, national, and extra-regional trends and factors that may influence development in those economic sectors of particular relevance to the northern river basin: agriculture, energy, forestry, and manufacturing.

2.0 METHODOLOGICAL APPROACH

The study focuses on an examination of those extra-regional factors that may affect development in key economic sectors in the NRBS area. It was necessary, however, as a first step in the research, to develop some background understanding of the historical growth and current status of the relevant industries and of development factors that have affected those industries in recent years. This background examination involved a review of economic reports and statistical data relating to northern Alberta and to the NRBS region more specifically, a review of industry-specific reports concerning especially the oil and gas, forestry, and agriculture industries, and selected interviews with knowledgeable industry representatives. That initial research provided a sense of the forces shaping the growth of the industries and of the general prospects for the further development of those industries in the region.

The discussion of the extra-regional factors that affect the various industries was based on a review of industry publications, research reports, and industry conference proceedings, and on the experience of the consultants in relation to the industries. The purpose of the discussion is not to provide an exhaustive assessment of the many global factors that have an important bearing on the development and processing of the region's resource sectors, but more to demonstrate that factors beyond those of a local or regional nature will have a critical role in determining the scale and nature of future development in the study area.

3.0 ECONOMIC OVERVIEW

The economy of the Northern River Basins Study area encompasses a range of goods- and services-producing industries that are a strongly interrelated. Figure 1 provides a picture of the overall distribution by major sector of employment in the study area. The major goods-producing sectors, agriculture, oil and gas, logging and forestry, and manufacturing account for roughly one-third of total employment and a yet larger share of the economic output of the region. Commercial hunting and trapping and non-commercial hunting, fishing and trapping account for a very small share of the regional economy, although these economic activities can be significant on a sub-regional and localized basis to the smaller and predominantly native communities.

Services -- broadly defined to include non-market services such as education, health, and administration functions provided by governmental organizations and commercial services that include retail and wholesale trade, business services, and construction, transportation and communication activities -- account for two-thirds of employment in the region. These service activities are predominantly centered in the region's larger urban centres. The growth and development of services in the region are subject to a number of factors, including technological and demographic factors and structural changes in preferred methods of delivery, but they are tied particularly closely to activity levels in the goods-producing sectors that form the basic foundation of the region.

Tourism is an industry of some importance to the study area but the employment and income that accrue from tourism activities are reflected in defined service industries such as the food and beverage and accommodation services, and the retail sector. A significant share of the region's tourism activity -- almost 95% of visitor-trips and 84% of expenditures -- is related to in-region travel by residents. The remaining share is associated with non-resident travel in the region. In 1990, an estimated $83 million was spent in the NRBS area by non-residents.[1] Visitors come to the study area to visit friends and relatives; for business purposes; to shop; and for vacations, which include hunting, fishing, camping and other outdoor pursuits. The tourism industry is considered to have a modest and largely indirect effect on water quality and usage in the region.

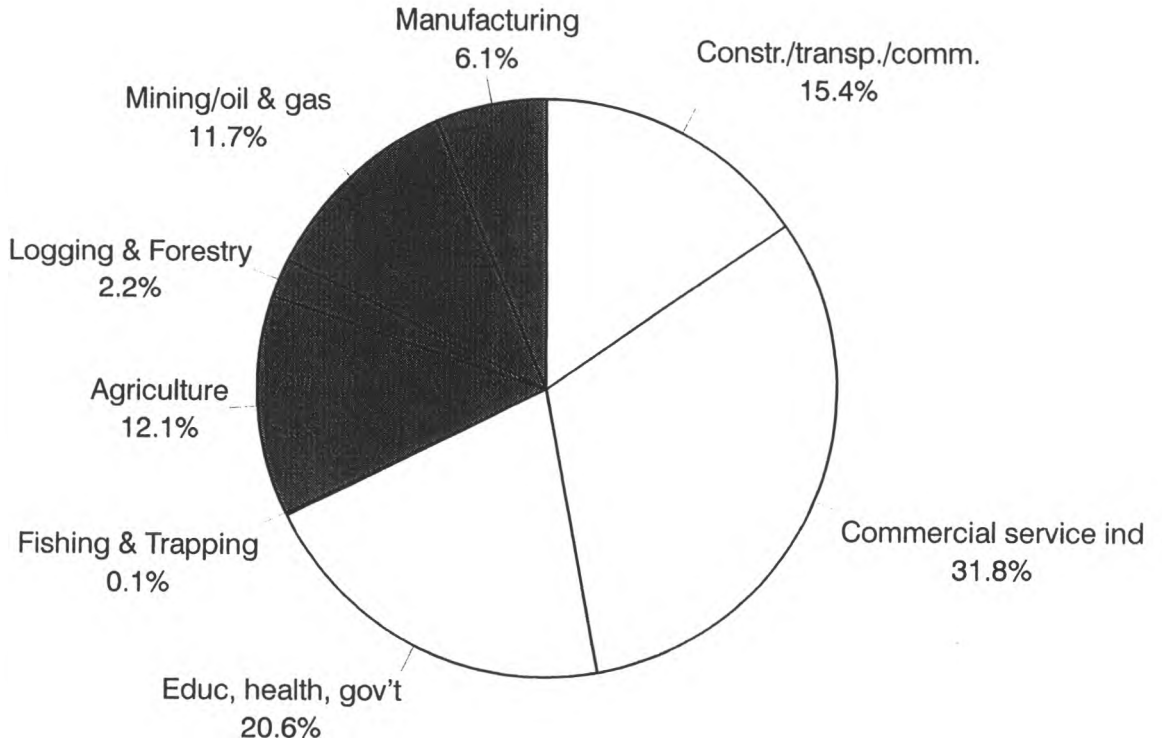
The study concentrates on the four key economic sectors -- agriculture, energy, forestry, and manufacturing -- that anchor the northern Alberta economy. In addition to their economic importance to the study area, the industries all have potential consequences to the region's water resources. Those potential impacts take two forms: the direct industry impacts on water use and water quality, and the indirect effects that the development of the industries have in terms of inducing growth in other service and support industries and fostering demands by an enlarged population base.

---

[1] Resident and non-resident travel surveys conducted by Alberta Economic Development and Tourism, 1990, 1991.

The four industries are resource-based and heavily oriented toward serving markets beyond the region, and the commodities and products produced must inevitably compete within the framework of national or international markets. The corollary of those market circumstances is that the regional development of the industries also is sensitive to the forces of supply and demand in those external markets.

FIGURE 1
Distribution of Regional Employment by Industry Grouping, 1991



Source: Statistics Canada

4.0 REVIEW OF KEY ECONOMIC SECTORS

4.1 AGRICULTURE

4.1.1 Introduction

Agriculture forms an important part of the economic base and land use in the NRBS region, and particularly in the northwestern and southeastern parts of the study area. Its significance to the water resources of the study area derives in both direct and indirect ways.

Agricultural development can directly affect water quality and use in the following ways:

- by contributing to land erosion which can add sediments and nutrients to watercourses;
- by changing natural drainage patterns and streamflow regimes;
- by polluting watercourses via agricultural chemicals and through phosphorous loading; and
- by depleting water supplies through withdrawals for agricultural uses.

The level and nature of agricultural activities in the basin can affect the water system in indirect ways as well. Agriculture supports other service and manufacturing industries and a growth or decline in agriculture will affect employment and population levels and industry activity in other sectors as well.

The relationship between agriculture and water use and quality is not well defined but some of the factors that will have a bearing on the water regime include: the amount of land in agricultural use; the mix of agricultural activities (e.g. livestock versus crop production); farm and household size; the relative use of fertilizers and other agricultural chemicals; and the adherence to proper water management practices.

4.1.2 The Agriculture Sector in the Study Area

The agriculture sector in northern Alberta is a generally mature and stable one and is relatively important to the region, accounting for roughly one-eighth of total employment. The area's agriculture industry is also significant in a provincial context, comprising one-fifth of Alberta's livestock and more than one-quarter of all farms and cropland. Roughly six million acres of land in the study area are planted to wheat, oats, barley, canola, hay, and summer fallow, and total crop production has had a value in recent years of roughly $400 million annually.

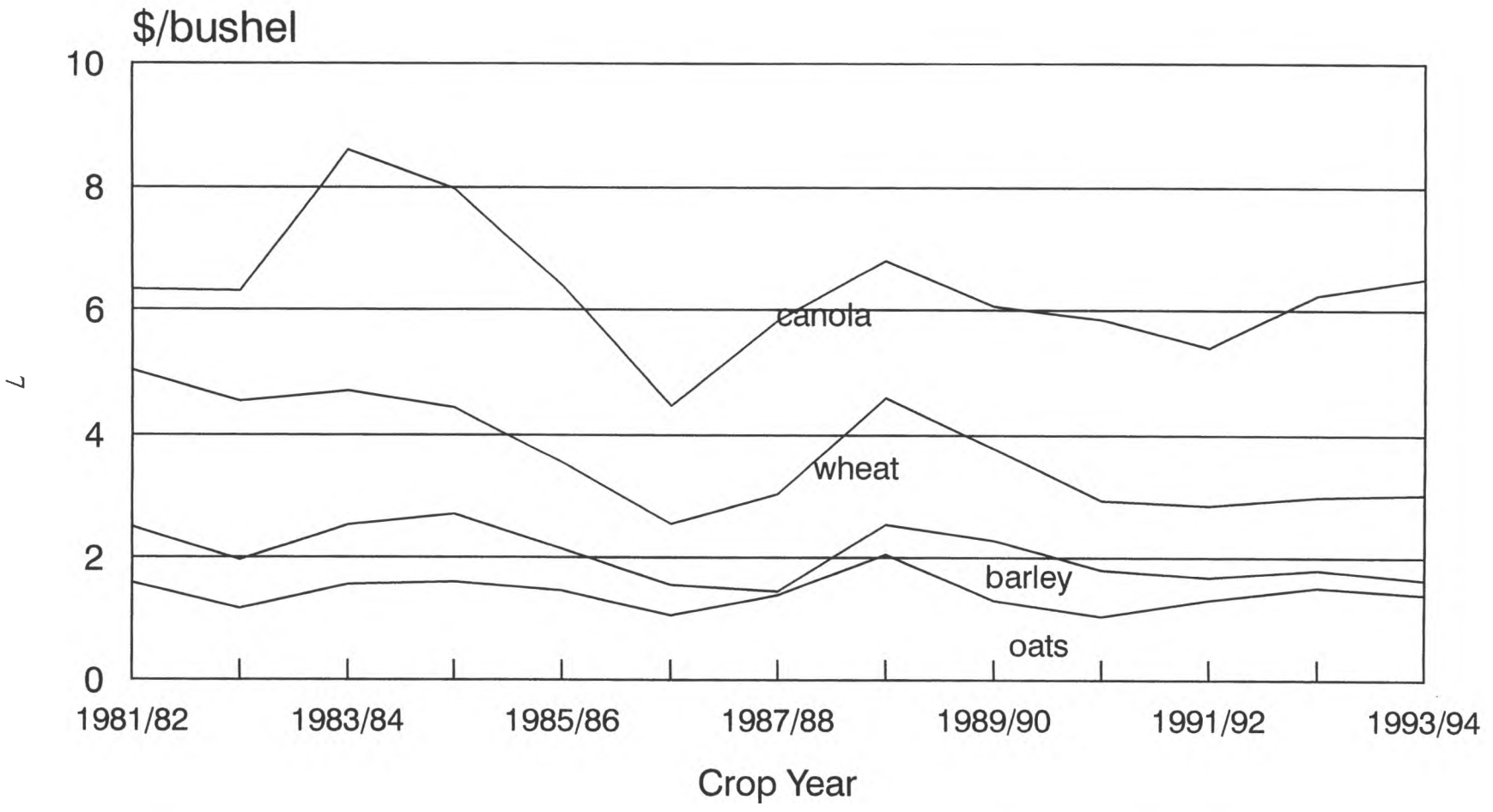
4.1.3 Development Factors

A host of regional and provincial factors will affect the level and pattern of agricultural activity in the NRBS region. These include the land disposition policies of the government in terms of the allocation of Crown lands for agricultural use, the infrastructure development and financing policies of the province and the rural northern municipalities, the attitudes of farmers toward farmland expansion and their responses to new market opportunities and threats, the returns experienced in the local agriculture sector based on commodity prices and realized production costs and yields, the availability of off-farm employment to provide supplementary income, and other factors.

The size, structure, and practices of the agricultural sector are also a function -- to some significant degree -- of other global factors. The region exports a considerable share of its agricultural output and commodity price levels -- and hence sector profitability -- are dictated by changes in international supply and demand. These, in turn, are affected, for example, by the presence of trade and regulatory barriers, the use of export subsidies (which are now widespread), and the growth in agricultural productivity and output among the major producing countries. As an illustration of the importance of these global factors, all of Canada accounts for less than 6% of world wheat supply and the prices it receives for its wheat exports are driven by fluctuations in worldwide market conditions.

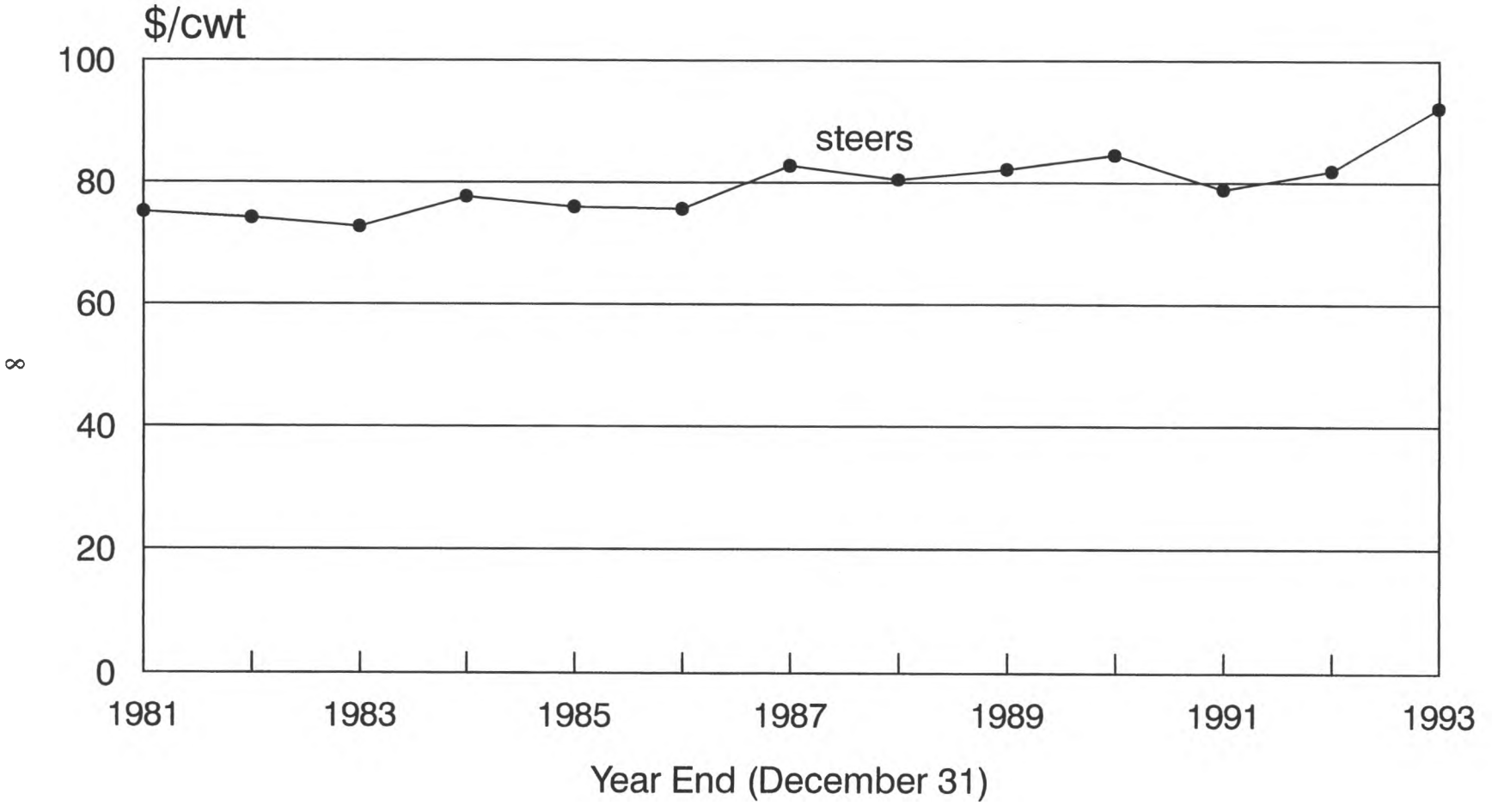
Historical price levels for a number of agricultural commodities and products that are important to the NRBS area are provided in Figures 2 and 3. In general, the prices for most crops are at historically low levels although canola prices have increased significantly over the past two years and this has prompted farmers to devote increasing acreages to the production of that crop. In contrast to the situation for most crops, livestock prices are near historically high levels.

FIGURE 2
Average Farm Values for Selected Northern Alberta Crops



Source: Alberta Agriculture

FIGURE 3
Average Live Prices for A1, A2 Slaughter Steers, Alberta



Source: Alberta Agriculture

The global factors that affect the agricultural sector in the study area appear to be generally positive. The worldwide demand for agricultural commodities is growing relatively slowly but at the same time global production capacity may become increasingly tight. The gradually reduced use of export subsidies is expected to moderate supply and to increase market prices. And trade liberalization, as promoted for example through the new GATT and NAFTA agreements, is expected to open new markets for Alberta agricultural producers.

4.1.4 Industry Outlook

Over the coming decade or more, the agricultural sector in the NRBS area is expected to experience some continuing structural change and modest growth, but those changes will reflect the relatively mature nature of the industry.

The amount of farmland cultivated in the region is likely to remain relatively stable over the coming years. Some expansion may occur in relation to the new cultivation of private lands. As well, additional Crown lands also may be sold and converted into agricultural use but the levels of land disposition likely will be modest in relation to historical levels. The total amount of farmland in the region may not increase by as much as 5% over the next decade. During the six-year period 1988 to 1993, the land planted to crops in the NRBS area ranged from 5.7 to 6.3 million acres, fluctuating narrowly within a band of 8%.

The past trend toward farm consolidation is expected to continue: farm sizes in the region remain relatively small by provincial standards.

The mix of agricultural land use as between crops and livestock has not changed significantly over the years, but relatively high beef prices and the comparatively low land prices in the north may tend to favor some shift toward cattle from crop production. That shift might be accelerated with the elimination of the Crow Rate, which in the past has favored the extraprovincial shipment of grain versus in-province livestock production.

Continuing advances in farm management practices can be expected; farmers in the north are increasingly responsive to the adoption of marketing and business management practices and new technologies that enhance productivity and profit. They also are more knowledgeable and sensitive as well to the environmental effects of their activities. The use of fertilizers in the north -- now oriented more heavily to nitrogen fertilizers versus phosphorus-based fertilizers -- is expected to increase but the level of use will be strongly affected by government support programs and higher crop prices, both of which encourage greater fertilizer demands.

Notwithstanding these various factors, the agricultural sector in the NRBS area is not expected to evidence any dramatic growth in its absolute size, scale, or regional significance over the next decade or more.

4.2 ENERGY RESOURCES

4.2.1 Introduction

The geographic area embraced by the NRBS study area has significant oil, natural gas, coal, and hydro-electric potential and the development of these resources has implications to the regional water regime. Water quality and water use can be affected in many ways by energy resource development: through erosion, water consumption (for example, in oil well drilling, synthetic crude oil refining, and steam injection in *in situ* operations), emissions of water and air pollutants (for example, from pipeline spills and processing facilities), water discharge and disposal systems, and from changes in water flow characteristics, as might result from hydro-electric developments.

Energy resource development can also, of course, generate growth in other economic sectors and provide direct, indirect, and induced employment and population effects that have consequences to the region's water resources. For example, the development of two commercial oil sands plants near Fort McMurray over the past three decades has spawned a broad expansion in that city's economic base and population, which has grown from approximately 1,000 people in 1961 to about 35,000 today. With that growth, of course, has come as well a considerable increase in the city's need for water and in its wastewater output, as generated by local residential, commercial and industrial activities.

4.2.2 The Energy Sector in the Study Area

The energy sector, dominated by oil and natural gas, represents a major source of economic activity in the NRBS area.

The conventional oil and gas industry of the region is distributed widely across the westernmost two-thirds of the study area and many of the largest oil and gas fields in the province (for example, the Pembina, Redwater, Swan Hills, Judy Creek, Rainbow, Fox Creek/Kaybob and Nipisi fields) are located there. Ongoing exploration, development, production, and transportation activities in the region support a wide range of businesses and employ many people. Statistics Canada census figures for 1991 suggest that one-eighth of the employed labor force in the region is directly attached to the industry but that estimate excludes jobs in directly associated pipeline, oilfield services, and other industries.

The NRBS region has large deposits of oil sands, and there are several in-situ and mining project operating in the area. These include, most prominently, the Syncrude and Suncor projects near Fort McMurray, and the Shell Canada and Esso Resources projects near the towns of Peace River and Cold Lake, respectively. The commercial oil sands mines and associated upgrading facilities near Fort McMurray are particularly significant to the region in terms of employment and economic activity. In 1992, the Suncor and Syncrude projects produced synthetic crude oil (SCO) equivalent to one-quarter of Alberta's production of conventional crude oil.

Coal production in the NRBS region is concentrated in the southwest foothills and mountain areas; at Grande Cache, in the Edson-Hinton vicinity, and east of Edmonton in the Wabamun-Sheerness area. Significant coal reserves are known to exist in those areas and also near Lesser Slave Lake and Fox Creek. The region's coal industry has not expanded in recent years because of the relatively poor international market conditions and the reduced growth in domestic demand for thermal coal.

Historically, virtually all electric power in the NRBS area has been generated with non-renewable resources: coal, oil, and natural gas. The region does have untapped hydroelectric potential and a potential dam on the Slave River near the NWT-Alberta border has received the greatest scrutiny over the years. The possible development of that project will be tied to a number of factors, including environmental issues, the demand for electrical power, and the relative costs of development vis-à-vis alternative thermal electric projects.

4.2.3 Development Factors

The development of energy resources in the NRBS area will be conditioned by a number of regional and extra-regional factors. The region has significant proven reserves of coal, natural gas, crude oil, and bitumen as well as untapped hydro-electric potential. The further exploration and development of conventional oil and gas reserves will be a function of the economics of finding and producing oil and gas in the region. The development of additional bitumen and synthetic crude oil from the Peace River, Fort McMurray, Cold Lake and other areas will be affected by the production experience and demonstrated viability of existing facilities and the development of technological improvements which improve productivity and reduce costs. And, of course, environmental factors will have an important bearing on the development of new large-scale energy projects that might have significant bio-physical or socio-economic impacts. It can be expected that new hydro-electric projects, such as the Slave River dam that was investigated extensively some years ago, and commercial oil sands mining and upgrading facilities will be subject to the greatest environmental scrutiny because of the scale of those projects.

Beyond these and other regional factors, which are not the primary focus of this report, are a range of extra-regional and international variables that will influence the levels of energy resource activity in the NRBS area.

Crude and Synthetic Oil and Natural Gas

Prices for natural gas and oil are established through international supply and demand and they will have an important bearing on the exploration for and development of energy resources in the study area. The development of new oil sands projects in particular is contingent upon some assurance of relatively high oil prices because of the large capital investments required and the generally high cost of production of these non-conventional energy sources. During the past decade, real oil prices declined relative to input costs and no new commercial oil sands projects were initiated, although production from existing facilities continued to expand through improved efficiencies and incremental capital enhancements and debottlenecking programs.

Exploration and development activities as they relate to conventional oil and natural gas have been shown, in both a national and international context, to have a relatively close relationship to industry cash flows, which are considerably influenced by international price levels. Figure 4 provides an historical overview of crude oil and natural gas prices received by Alberta producers. The prices shown are provided in current Canadian dollars; they understate the decline that has occurred in oil and natural gas prices since the early 1980's as expressed in U.S. constant dollar terms. International levels of investment in oil and gas exploration, development, and transportation facilities have paralleled those energy pricing patterns.

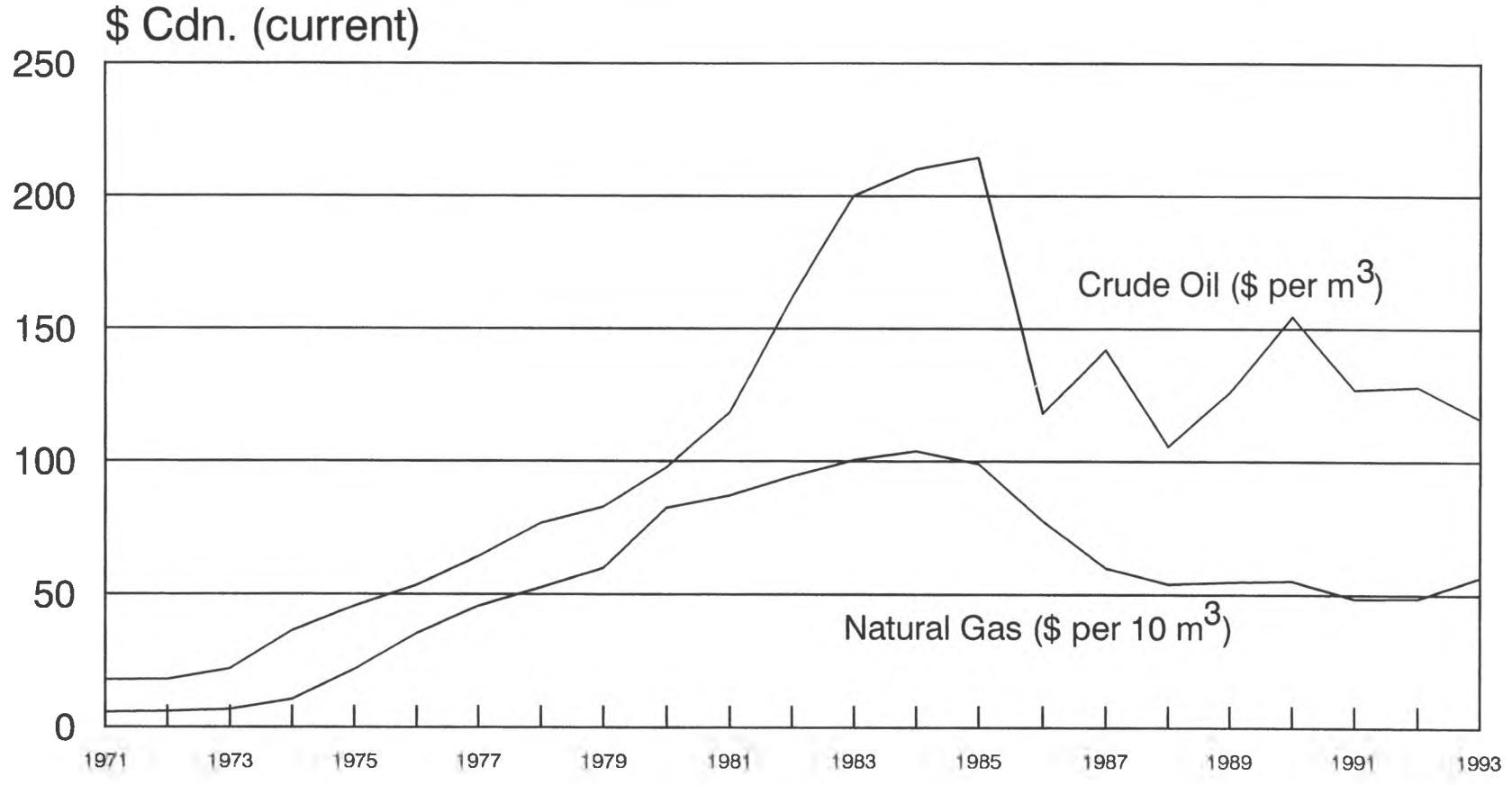
Domestic cash flows in the oil industry are also affected by other factors such as the relative strength of the Canadian dollar (energy prices are benchmarked in U.S. dollars) and by royalties and other taxes to government. Many oil and gas companies view exploration and development prospects within a national or international perspective and will allocate cash flows on the basis of anticipated returns that can be realized in different geographic areas, for example, exploring in those areas with the lowest finding costs or with the greatest potential to locate new reserves. To some degree, then, the NRBS study area must compete for exploration and development activity with other oil and gas areas elsewhere in Canada and abroad.

Energy prices, which as indicated above are closely linked to industry cash flows and investment activity, are governed by international supply and demand factors. Canada has a relatively small influence in all of this as it does roughly 3% and 6%, respectively, of global oil and gas production and roughly 3% of oil and gas consumption.

The supply side of the oil market is affected to a significant degree by the production and marketing policies and delivery capability of the major producing countries, particularly the members of OPEC (Organization of Petroleum Exporting Countries). Disruptions to supply through production and transportation facility breakdowns or political hostilities can affect price levels as can the relative effectiveness of OPEC to enforce the production quotas of its various members. The production output of the former Soviet Bloc countries has been adversely affected in recent years by poor economic conditions and by political change and uncertainties and that also has had an effect on supply conditions.

Supply itself is also affected by price levels, with high prices encouraging the search for and development of new energy resources. Notwithstanding the reduced costs that are being achieved through production efficiencies and improved exploration and development technology, the relatively low oil prices of the past decade have discouraged exploration and the expansion of industry supply.

FIGURE 4
Average Prices of Crude Oil and Natural Gas, Alberta [1]



1. One cubic meter of oil = 6.29 barrels; one cubic meter of gas = 35.49 cubic feet.
   Prices are average wellhead (crude oi) or average wellhead/plant gate prices (natural gas).

Source: Canadian Association of Petroleum Producers Statistical Handbook.

The demand side of the oil market is similarly affected by a number of factors, including most prominently oil consumption in the major industrialized countries. Oil consumption is strongly related to economic activity and in recent years the recessionary conditions in the OECD countries and in the former Soviet Union have restrained demand and have offset the rapid growth in oil consumption in the burgeoning countries of Asia. Over time, a global shift in economic activities toward sectors that consume fewer raw materials and less energy and the adoption of more energy-efficient processes and technologies are expected to continue to reduce the relationship between economic growth and oil consumption. However, the factor likely to have the greatest effect on future oil demand -- and more generally on future oil prices -- is the growth in energy consumption of the developing countries, particularly in Asia and Latin America. Population growth, urbanization, and industrialization in these areas is expected to have an increasingly significant impact on oil demand patterns, and the developing countries likely will account for more than one-half of incremental global oil consumption.

Oil demand is also affected, of course, by oil prices. The relatively low oil prices that have prevailed in recent years have had the effect, on the one hand, of encouraging demand and, on the other, of reducing conservation incentives. They also have served to discourage the development of alternate, higher-cost energy sources, for example wind and solar energy.

Natural gas prices also are set through various extra-regional supply and demand factors, but because of transportation and storage considerations, it is the market factors in North America that largely establish prices. Natural gas has a number of environmental benefits vis-à-vis other fossil fuels and this, together with industry deregulations in the U.S., has stimulated demand for the fuel in recent years, although prices still remain well below levels achieved in the early 1980's. The general view in the industry is that the development of new reserves and the level of gas *supply* in the U.S. and Canada will have the greatest effect on longer-term gas prices. With much of the market for Alberta's natural gas derived from other parts of Canada and, particularly, the U.S., the ability to supply to that market will be dependent not only on reserves and production capability but also on the availability of adequate natural gas pipeline delivery capacity.

Coal

The coal industry in the NRBS area is small in relation to the oil and gas sector and is confined to the southwest part of the study area. The existing coal mines provide both thermal coal used for electric power generation and metallurgical coals used to produce coke for the steel industry. Much of the coal produced in the area is shipped away for consumption elsewhere.

The markets for coal are highly competitive. The demand for metallurgical coals is depressed because of relatively low worldwide steel production and the introduction of less coal-dependent steel processes and there are a number of alternative and very cost-competitive coal suppliers in Australia, the U.S. and other countries. The demand for sub-bituminous coal is dependent both on export markets and on the consumption needs of domestic coal-fired power producers. The domestic

demand for thermal coal is subject to competition with other forms of energy in new power generating facilities.

The general view of the industry today is that the growth in demand that may occur in coming years will relate to the use of thermal coal in domestic power facilities. However, the growth rate in demand for electric power has declined significantly through a combination of factors including the relatively slow growth performance of the Alberta economy.

The NRBS area has substantial reserves of low-sulphur coal that can be produced at relatively low cost, but a major development constraint relates to the high cost of transport to Pacific coast export ports or to power and steel plants in central Canada.

Hydroelectric

A number of extra-regional factors suggest that the potential hydroelectric resources in the study area may not be exploited in the foreseeable future. Lower growth rates in electrical power demand in the province are reducing required increments in new capacity, and other scheduled thermal generating facilities in central Alberta will accommodate growth requirements for some time. At the same time, the relative economics of coal and gas-fired facilities favour those kinds of development vis-à-vis the construction of more remote and relatively high cost hydroelectric facilities, as for example, on the Slave River.

4.2.4 Industry Outlook

Having regard both to extra-regional factors and to the known resource base of the region, the outlook for the energy sector in the NRBS study area suggests the likelihood of continued development over the next 10 to 20-year period. There is, of course, no unanimity of view regarding future price levels. The Alberta Energy Resources Conservation Board (ERCB) forecasts that over the fifteen-year period to 2008, oil prices in real terms will remain relatively flat or decline slightly, while natural gas prices will climb modestly.[2] These projections are based on the view that oil will remain inherently abundant in the foreseeable future while environmental considerations will boost the relative demand for natural gas. The ERCB anticipates that synthetic crude production from integrated mining operations will rise somewhat in relation to the existing operations but that no new "green-field" facilities will be built during the fifteen-year forecast period. On the other hand, the board expects the production of non-upgraded bitumen from *in situ* schemes, many of which are located in the NRBS area, to increase by 60% between 1994 and 2008.

The National Task Force on Oil Sands Strategies has recently prepared reports suggesting that over the next quarter century, direct investment in the oil sands regions of northern Alberta could amount to $20 to $25 billion and bitumen and upgraded crude oil production might double or triple, from 400,000 barrels per day to between 800,000 and 1.2 million barrels per day. The Task Force has

---

[2] Energy Requirements in Alberta. Supplementary Report, 1994-2008 (Report 94-A).

assumed as a basis for its study that the commodity price of conventional crude oil will remain generally flat at about Cdn. $25 per barrel in the years to come.[3]

A number of recent energy forecasts prepared by other organizations are more strongly of the view that oil and gas prices will climb significantly over the next decade or more. That conclusion is attributed to the increasing demands of the developing countries in Asia combined with the relatively low worldwide levels of investment in energy infrastructure. One source, the International Energy Agency (IEA), estimates that oil prices may increase to U.S. $28 per barrel by 2005, expressed in 1993 constant dollars. That would represent an increase of roughly 50%-60% over recent price levels.

At the same time that the longer-term pricing prospects for the energy industry may be improving, technological and other operational and development efficiencies are continuing to increase the relative cost-competitiveness of the industry.

With these factors in mind, the underlying economies of both non-conventional oil production from the oil sands and conventional oil and gas development appear likely to improve and the prospects for additional development in the NRBS area are promising.

With specific regard to oil sands development, the growth is likely to focus on progressive incremental growth based on quality improvements and supply cost reductions driven by enhanced productivity and reduced capital costs. In addition, new technological developments and permanent improvements in oil prices could induce new "grass roots" industry development.[4]

The generally positive outlook for increased oil and gas exploration and development in the region, and in Canada more generally, could be substantially affected through the adoption of fossil fuel taxes aimed at reducing energy consumption and atmospheric emissions of carbon dioxide, nitric oxide, and other greenhouse gases and pollutants. New environmental conditions placed on oil sands developments could affect the prospects for expanded synthetic crude oil production from the region. And, finally, government-imposed changes to royalty and taxation regimes as they apply to the energy sector would also have important effects on industry activities and investment plans.

Coal production and hydro-electric development in the region is not expected to increase significantly in the foreseeable future. In the case of the coal sector, this conclusion is based on the underlying market conditions. During the fifteen-year period 1993-2008, the ERCB forecasts that Alberta coal production will rise from 33 million tonnes to 38 million tonnes, with the modest

---

3 Comprehensive Report. The Oil Sands: A New Energy Vision for Canada. National Task Force on Oil Sands Strategies of the Alberta Chamber of Resources. Spring, 1995.

4 National Task Force on Oil Sands Strategies of the Alberta Chamber of Resources. Spring, 1995.

growth attributable to increased thermal electricity production. The limited hydroelectric prospects are based on the competition from lower-cost and less environmentally contentious energy alternatives.

4.3 FORESTRY

4.3.1 Introduction

A substantial part of the study area is forested and over the years logging and value-added wood processing has constituted a large and increasingly significant source of regional economic activity.

The development of the forest resources of the region can affect water resources directly in a number of ways: through erosion and changes in drainage patterns caused by woodlands operations, through the water withdrawals of secondary processing operations, and via water pollutants contributed as outflows from those facilities. In addition to these direct impacts, the forest industry provides employment to many people in the region and supports other industries and their workers; those spin-off relationships also affect the use of water in the study area.

In looking toward the future development of the forestry sector in the study area, a number of factors will have an impact on the NRBS water resources: the level, geographic pattern, and type of development in the industry; the operational and management practices adopted by the industry; and the development and application of processing technologies which reduce negative impacts on water use and quality.

4.3.2 The Forestry Sector in the Study Area

Alberta's forest industry is largely concentrated within the NRBS area. The province's six pulp mills, its first paper mill, four of its five panelboard mills, and more than 25% of its major sawmills are located in the area and virtually all of the growth occurring in the industry is focused in the region.

The forest industry has grown remarkably over the past decade. At the beginning of the 1980's the region's aspen and poplar resources were largely ignored and there remained significant tracts of unallocated spruce and pine forests. The industry was marked by depressed lumber and pulp and paper markets and capital investment was low. The high cost of shipping wood products from northern Alberta to export markets served as a further impediment to regional development.

During the past decade, improvements in pulp prices -- which increased significantly until 1989, when they began to fall back again -- and rising lumber prices (until 1989), an increasing scarcity of quality wood supplies, new environmental constraints on production from some traditional supply sources, and other factors, such as the increased awareness of the untapped forest potential in northern Alberta, combined to stimulate development in the northern Alberta forest industry. During

the six years to 1993, new investment in the forest industry was reported to be $3.7 billion.[5] Major projects that have evolved in recent years include new pulp mills in the Peace River, Slave Lake, Whitecourt, and Athabasca areas, a newsprint operation at Whitecourt, new oriented strandboard (OSB) plants at Edson and Drayton Valley, and a medium density fibreboard mill (MDF) at Blue Ridge.

The importance of the forest industry within the NRBS area has increased significantly in recent years and the industry is poised for continued development with a number of additional projects planned in the region. Those projects likely will involve the allocation of new timber areas and, more significantly, the potential expansion and development of value-added processing operations including a fine paper project (Manning), two OSB facilities (High Prairie, Grande Prairie), and possibly, increased pulp and other papermaking capacity.

The Alberta forest industry is estimated to employ roughly 10,000 persons directly and another 5,000 indirectly in supplier and support sectors.4 With perhaps 80% or more of the industry located in the study area, it is estimated that roughly 12,000 workers, or 8% of the regional work force, owe their jobs directly and indirectly to forestry.

4.3.3 Development Factors

The further development of the forest industry in the NRBS area will be governed by a number of regional and extra-regional considerations. The regional factors include the availability and quality of unallocated timber resources, reforestation activity and supply regeneration, the timber rights disposition policies of the province, and imposed environment and regulatory conditions.

Most forest products output from the region is exported and sold internationally, primarily in the U.S. As with other natural and processed resources, international supply, demand, and pricing factors will have a major bearing on industry viability and new development. Price signals emanating from the market are, of course, a key guide to new development. These signals can result in recurring cycles of industry investment and non-investment which can accentuate supply conditions. For example, the high pulp prices in the late 1980's precipitated a significant investment in new capacity, which added supply at a time when market conditions subsequently had deteriorated, thus exacerbating the supply-demand imbalances and low price levels. Figures 5, 6, and 7 track historical price movements for three important industry products: lumber, oriented strand board, and pulp. The price levels shown are expressed in U.S. dollars and do not reflect the positive effects to Canadian producers of the falling value of the Canadian dollar.

Some of the key extra-regional factors that will affect forestry development in the region are summarized in Table 1. The interplay of the various supply and demand factors is complex and evolving and changing constantly. The primary point, however, is this: the future development of

---

[5] Proceedings of Forest Industry Outlook Conference, October 22, 1993.

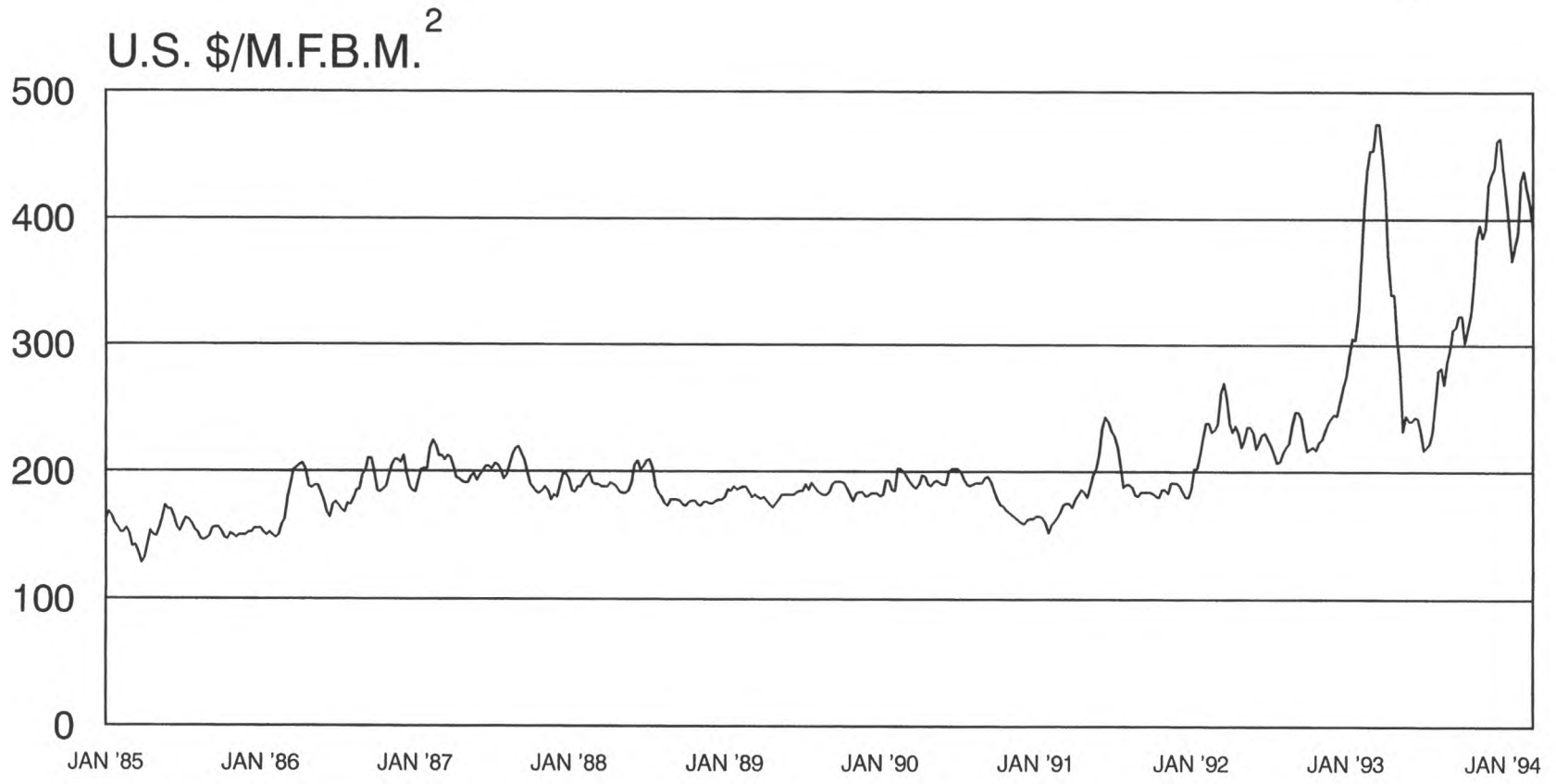
the forestry and forest products industry in the NRBS area will be dependent to a very significant degree on conditions and prospects that exist within the international marketplace.

4.3.4 Industry Outlook

The general outlook for the forest industry in northern Alberta is one of continued growth, with the greatest opportunities relating to the use of unallocated hardwood forests (much of the area's coniferous or softwood resources are allocated to existing sawmills and pulp mill operations) and to the development of further value-added or secondary processing facilities. The development that occurs will be conditioned of course by a host of regional and extra-regional factors but over the next decade or more, the NRBS area might attract two or more OSB plants, new paper-making facilities, additional pulp capacity, and a variety of manufactured wood products operations, producing, for example, laminated veneer lumber, pre-fabricated housing components, wooden I-beams, furniture, and other products. There is likely to be a considerably improved utilization of waste products -- currently burned in many cases -- in further-processing facilities. In the short-term, the strongest component of the industry is expected to remain the wood products sector. On the other hand, global pulp and newsprint market conditions are depressed and very competitive and this may adversely affect new developments in the areas in the short-to-medium terms.

Some of the major issues that will affect forestry development include the "greening" of the industry, which has implications in terms of recycling, the pollution standards and processes of production facilities, the adequacy of reforestation activities and the level of resource sustainability, and a respect for and sensitivity to aboriginal rights.

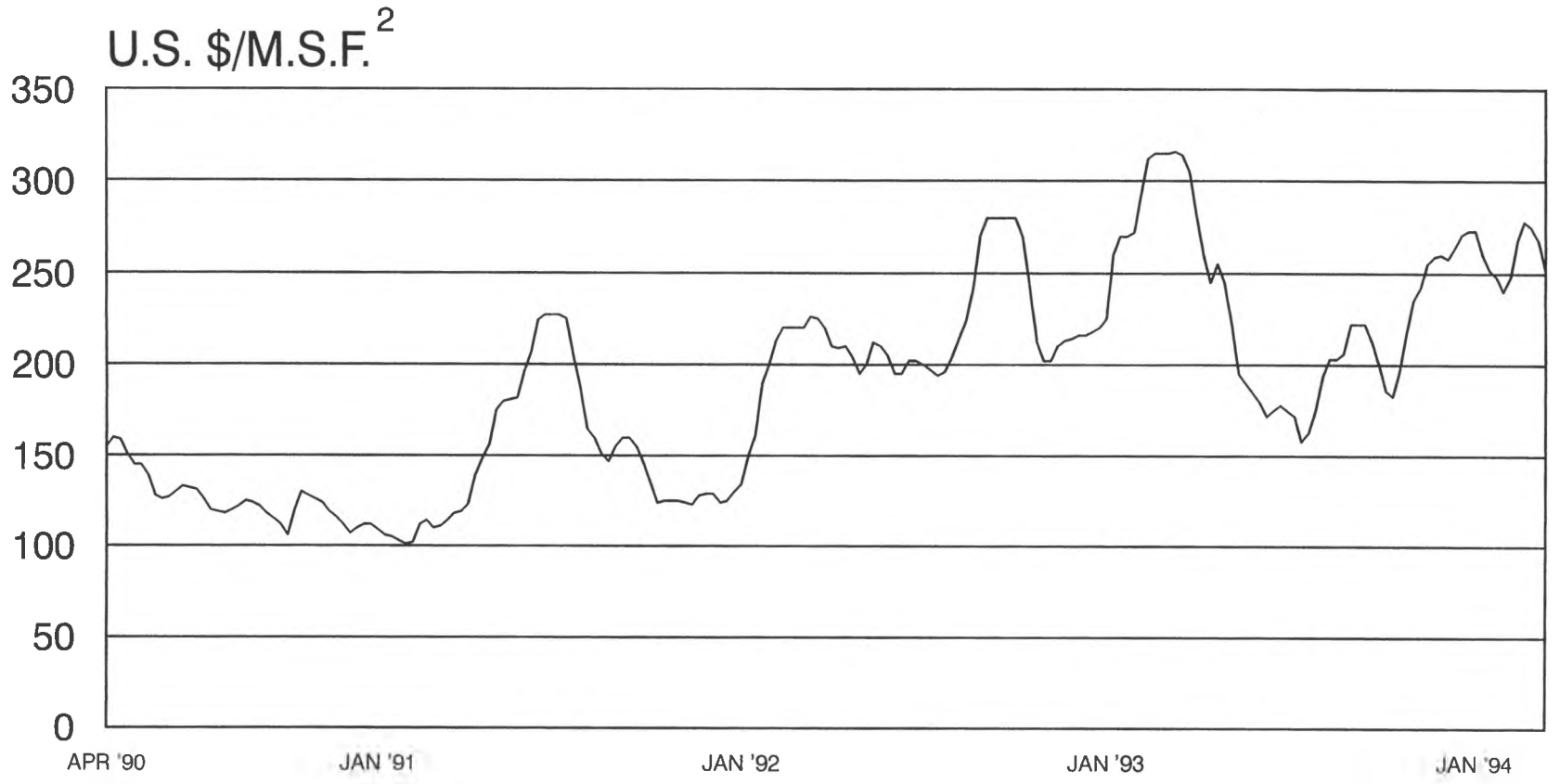
FIGURE 5
Historical Lumber Prices [1]



1. K.D., 2x4, Std. & Btr., Random 8/20', Net F.O.B. Mill.
2. Thousand feet board measure.

Source: Random Lengths; Forest Industry Development, Alberta Economic Development and Tourism.

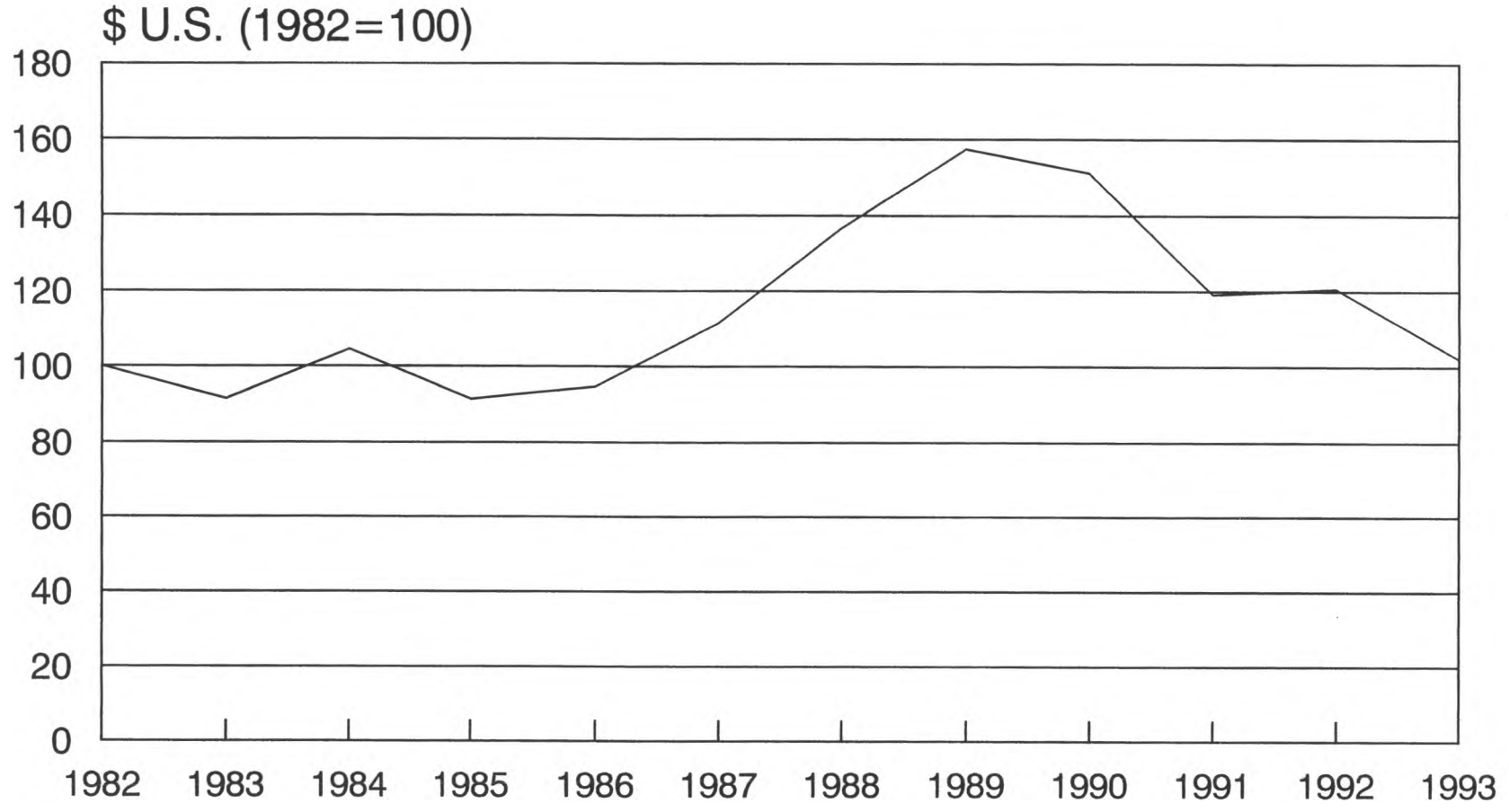
FIGURE 6
Oriented Strand Board Prices[1]



1. 7/16 inch, delivered to north cewntral U.S.A., F.O.B. mill.
2. Thousand feet board measure.

Source: Random Lengths; Forest Industry Development, Alberta Economic Development and Tourism.

FIGURE 7
Price Index for Woodpulp ($ U.S.)[1]



1. End of year, except 1993 which uses September data.

Source: Pulp and Paper 1994 North American Factbook.

TABLE 1

Global Market Factors Affecting Forest Industry Development

A.	**DEMAND**	Lumber/Panelboard	Residential construction, repair and renovation
			Mortgage interest rates
			Competitiveness of non-wood substitutes (e.g.. steel)
			Consumer confidence levels
			Household formation
			GDP growth
			Consumer income growth/affordability
		Pulp and Paper	General economic/business activity
			Recycling requirements and consumer preferences
			Coated papers and newsprint -- magazine/newspaper circulation and advertising expenditures
			Uncoated papers -- publishing, writing, business activity; copying and computer applications; introduction of electronic communications
			Paperboard -- consumer spending, packaging developments/innovations
			Linerboard -- industrial production
			Kraft paper -- grocery expenditures; competition with plastic bags
B.	**SUPPLY**		Price levels
			Labor disputes
			Foreign exchange levels of major producing countries
			Capacity growth (including plantation expansion) in non-traditional wood exporting countries
			Environmental regulatory constraints on older facilities
			Government forest management policies
			Environmental impacts of existing/proposed activities
			Consumer/government requirements for recycling
			Reforestation activities/regeneration success
			Economic access to waste paper/containers etc. for recycling

Potential environmental impacts will be given increasing scrutiny in relation to proposed forestry projects and will have a significant bearing on the level and form of new development in the industry.

The industry is under significant public and consumer pressure, particularly in North America and Europe, to reduce or eliminate toxic air and water discharges from production facilities. As a result, operators are pursuing a number of alternatives in response to those pressures, including the adoption of new processes, changing the ways in which chlorine is introduced to the production process, using different chemicals, and improving the treatment of emissions. An increasing number of new facilities rely on processes that are chlorine or elemental chlorine-free and are shifting away from the use of chlorine as a primary bleaching agent. Irrespective of those ongoing developments, the forestry industry in Alberta must comply with the provincial standards for effluent discharges.

4.4 MANUFACTURING

4.4.1 Introduction

Manufacturing represents a relatively modest part of the economic base of the region except as the sector involves the value-added processing of natural resources, particularly wood and wood products. Those manufacturing activities are discussed as part of the earlier sectoral reviews.

Manufacturing activities can of course affect the region's water resources through water usage required in the upgrading process and through the release of pollutants into streams and rivers. Numerous examples can be seen in other parts of the world of the impacts of various types of manufacturing operations on downstream water quality.

4.4.2 The Manufacturing Sector in the Study Area

The manufacturing base of the study area accounts for 6% of total employment and is dominated by the processing of natural resources for export from the region. Lumber, panelboard, paper and newsprint, and pulp manufacturing account for a large share of manufacturing activity and have been discussed as part of the forestry industry in Section 4.3. Some chemical and petrochemical operations exist in the Redwater area which lies just outside the southeast boundary of the study area. A small number of food and beverage plants also ship product from the region.

Much of the remaining part of the manufacturing sector in the study area is devoted to supplying needs within the region. These operations include printing and newspaper plants, meat processing and bakery facilities, machine shops, ready-mix concrete plants, and so forth. Most of these are located in the larger urban centres of the region and are of relatively small scale. Their implications for water use and water quality likely should be considered within the wider context of urban residential, commercial and industrial use in the region.

4.4.3 Development Factors

The development factors that underlie the major resource-based industries of the NRBS area have been discussed earlier in the report. The growth of the more locally-oriented manufacturing operations is tied largely to the expansion of the resident population. Indeed, manufacturing in the region has been constrained historically by the relatively small and dispersed population base of the area.

The population in the NRBS area will be a function of natural population growth factors (i.e. birth and mortality rates) and in-migration and out-migration patterns. Levels of migration to the area have historically been driven by levels of resource development. For example, the construction of the Suncor and Syncrude oil sands projects spawned a significant growth in direct and indirectly-associated employment -- a sizeable share of that technically-oriented and requiring relatively high skill and education levels -- and much of that labor demand was met by an in-migration of people from other parts of Alberta and from other provinces.

A preliminary examination of the kinds of resource development and the likely scale of those activities that may occur in the next decade or more suggests that much of that development -- particularly in respect of the forestry and conventional oil and gas industries -- is likely to be accommodated through the resident population base in the area. The need for in-migrant workers is likely to be related primarily to the potential construction and operation of new commercial oil sands projects but, given the lead times necessary to plan and design those and to secure the necessary regulatory approvals, no significant in-migration needs are expected before the turn of the century.

4.4.3 Industry Outlook

Apart from the potential development of value-added processing in the forest products industries -- discussed as part of the forestry sector -- a review of past trends and current industry prospects suggests that the growth in the region's manufacturing sector will continue to be largely confined to smaller-scale, urban-oriented facilities that serve a primarily local market. The growth in the sector will be primarily tied to the expansion in the region's other resource-based industries and in the size of the regional population base.

5.0 SUMMARY AND CONCLUSIONS

The Northern River Basins Study is charged with the task of assessing the cumulative effects of development on the water and aquatic environment of the study area. To date, the emphasis of the research has been on defining the current state of the water resources and water quality in the region. The research program is now turning as well to the examination of the future prospects for the region's water resources. This requires a view of the potential development that may occur in the region in the future.

This study provides an initial examination of the key economic sectors that may have a particularly significant effect on the northern river basin region over the next two decades. These sectors -- agriculture, energy, forestry, and manufacturing -- broadly anchor the northern economy.

The future development of the four resource industries will be governed by regional and extra-regional, indeed global factors. In a regional sense, the availability of the resources, supply and processing costs, environmental considerations, and other factors will affect the future pattern and level of development.

At the same time, most of the output of these industries is exported from the study area and the industries operate in markets that are externally driven. Competitive forces and supply-demand conditions that operate in these national and international environments will have an important bearing on the development that occurs within the region. It is these external factors that are the primary focus of this study although some discussion is included of significant regional factors.

Having general regard for the considerations that may affect development of the key economic sectors of the region, the broad outlook for those industries is as summarized below:

- **Agriculture.** This industry is a mature one and no dramatic change is expected in its absolute size, scale, or regional importance. However, the sector is likely to experience significant change in terms of farm management practices, production patterns, continued farm consolidation, employed population, and farm demographic characteristics.

- **Energy.** Coal production and hydroelectric development in the region is not expected to increase significantly in the foreseeable future. However, the regional outlook is for increasing development of both conventional and non-conventional oil and natural gas. The single most significant area of potential growth in the NRBS area pertains to the oil sands sector which with a favorable economic climate could attract $20 to $25 billion in investment and double or triple in output over the next twenty-five years.

- **Forestry.** The general outlook for the forest industry is one of continued expansion, with the greatest developments occurring in relation to the use of the remaining unallocated hardwood forests and, more significantly, to the development of further value-added secondary processing facilities, including oriented strandboard operations, paper-making facilities, additional pulp capacity, and other manufactured wood products operations. The short-term outlook is particularly strong in relation to wood products development, while difficult market conditions in relation to pulp and newsprint may adversely affect expansion in these areas in the short-to-medium terms.

- **Manufacturing.** The manufacturing sector in the region is not expected to increase significantly, except in relation to the prospects for new value-added processing in the forest and wood products sector.

The conventional and non-conventional oil and gas industry and the forest industry appear to offer the greatest opportunities for economic growth in the NRBS region over the next two decades or more. The development rates of these industries will be influenced of course by international commodity pricing factors but, with relatively stable economic conditions, the respective resource supply and competitive positions of these regional industries suggest that a continued expansion of the sectors is likely.

APPENDIX A: TERMS OF REFERENCE

NORTHERN RIVER BASINS STUDY

SCHEDULE A - TERMS OF REFERENCE

Project 4111-C1: Scenarios for Future Development in the Northern River Basins

Description

The purpose of this project is to prepare a discussion paper that outlines the international and national factors that are likely to affect future economic development in the northern river basins. This study is not meant to be prescriptive, but will instead serve to focus potential future discussions between the Study Board, the provincial and/or territorial governments, and private industry and assets in the future development of economic scenarios.

Study Requirements

1. The consultant will identify the main economic sectors in the northern basins, including the Northwest Territories, and will quantify the extent of current development in each sector. These sectors are expected to include, but need not be limited to:

    1) forestry, including pulp production, newsprint, logging and lumber production;
    2) agriculture, including livestock and crop production;
    3) energy, including non-conventional oil, conventional oil and gas, and possibly hydro-electric power; and,
    4) manufacturing.

2. The consultant will undertake a sector-by-sector analysis of key global and national trends and factors that may determine future development opportunities in each sector. Factors to be considered would include:

    1) geographic supply and demand patterns;
    2) demand forecasts (economic growth, population, income);
    3) supply forecasts (resources, costs, productivity, technology);
    4) environmental policies and practices (conservation, recycling);
    5) process;
    6) trade factors;
    7) industry structure; and,
    8) "trigger points" that may stimulate investment.

    Background information on each of these factors is to be drawn from existing data sources such as trade publications and government reports. No primary data collection is to be undertaken.

3. The consultant will work with the Chairman of the Other Uses Working Group to determine a strategy for contacting key representatives of various provincial and territorial government departments, including Alberta Economic Development and Tourism and the Northern Alberta Development Council for subsequent development of economic scenarios. Such a strategy is required for both phases of the work program.

4. All sampling locations presented in the report and in electronic format should be geo-referenced. This is to include decimal latitudes and longitudes (to six decimal places) and UTM coordinates. The first field for decimal latitudes/longitudes should be latitudes (10 spaces wide). The second field should be longitude (11 spaces wide).

5. Prepare a brief report that summarizes the key global and national factors that might be expected to affect economic development in the northern river basins in the near future. This report should be suitable for distribution to any basin stakeholders.

Schedule and Budget

The study must be completed by March 31, 1994 and will commence once a contract has been signed. A budget of $20,000.00 would be available for this project, including professional time and disbursements.

All reports are to be prepared in accordance with the Data and Reports: Policies and Guidelines document prepared by the Study Board.