Land Use in Intermountain Conservation District: Interactions between Forestry and Agriculture

by

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A Thesis
Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the Requirements
for the Degree of

Master of Natural Resources Management

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Abstract

The landscape of the Intermountain Conservation District (IMCD) supports both agriculture and forestry activities. Recognizing the potential impact that can arise from these activities, the study was initiated to assess local impacts of forestry and agriculture on lands within the IMCD, illustrating the interaction of these activities on the landscape.

Through interviews, local landowners identified land use impacts arising from forestry and agriculture, expressing opinion regarding the use of mitigative techniques and the effectiveness of regulation that directs forestry and agriculture on private and public lands. A watershed analysis of harvest and harvest mapping provided an illustration of where and what areas are being harvested. Land use mapping identified current trends in land use activity, particularly agriculture.

The impact of water was the prominent impact of concern to residents. While acknowledging that agriculture does impact local water, public perception is that the expanding forestry occurring in the area will accentuate water-related problems that plague the area. Public concern regarding regulation of forestry on Crown land illustrates a need for improvement in local forest management by the government and Louisiana-Pacific Canada Limited. Increased education and regulation is needed to promote the protection of the local aquatic and terrestrial environments on private agricultural lands.

The study recommends that water quality and flow be used as indicators of land use impacts. A joint framework to assess the use soil and water conservation techniques is advocated, providing the Intermountain Conservation District and Louisiana-Pacific Canada Limited with a mechanism to work together to ensure the sustainability of local soil and water.

Acknowledgments

This study would not have been possible without the Intermountain Conservation District, who provided initial funding and expressed a desire to be proactive and develop avenues to address land use impacts and promote the sustainable management of all land use activities within the District. My thanks to Louisiana-Pacific Canada Limited for financial and data support of the study, in addition to their interest to participate in a study that in part, addresses local opinion in forest management.

Thanks to my committee Professor Thomas Henley, Natural Resources Institute, University of Manitoba; Dr. John Sinclair, Natural Resources Institute, University of Manitoba; Dr. Peter Miller, University of Winnipeg; Ms. Margaret Donnelly, LP-Canada Regional Biologist; and Mr. Ron Kostyshyn, IMCD Board Member. Your guidance and comments were greatly appreciated.

I am extremely grateful to the landowners who contributed their time and local knowledge to complete my questionnaire. Thanks are also extended to Department of Conservation, Forestry Branch for additional data sources, to the Department of Conservation, through the Natural Resources Institute, for their financial support, and to all other individuals that have contributed to this document.

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Chapter 1.0 Introduction

1.1 Preamble

Agriculture and forestry are the two prominent land use activities on which the economy and well-being of residents of the Intermountain Conservation District (IMCD) is based. Both activities have impacted and have the continued potential to impact the landscape, particularly soil and water, on which the activities are dependent. Past impacts, including soil erosion, flooding, and increased sedimentation have been well documented in upstream and downstream areas– the Manitoba Escarpment and Lake Dauphin respectively- of the IMCD (Carlyle, 1980). As both activities continue, it is essential that resource managers address the potential impacts of their activities on the landscape. The Intermountain Conservation District Board, representative of agricultural resource managers, and Louisiana-Pacific Canada Limited, representative of the forestry resource managers, must work together to manage and mitigate the impacts of individual and cumulative resource activity to promote the sustainable land use in the Intermountain Conservation District. Ensuring the long-term viability of soil and water will protect the livelihood and well being of the residents of the IMCD.

1.2 Background

The diversity of Manitoba's natural landscape has supported and continues to support a wide array of resource related activities including agriculture and forestry, contributing significantly to the economy of Manitoba. In 1997, agriculture and agricultural related business provided one in every nine jobs or 62,000 jobs in Manitoba, producing 2.4 billion dollars in exports (Department of Agriculture Web Site, 1999). In

the same year, the forest products industry contributed $418 million dollars to the Manitoba's economy, providing 9000 direct jobs. The primary wood sector employed 2,200 workers from 140 operations including 125 rural based sawmills (Department of Forestry Web Site, 1999). As these two industries contribute significantly to the economy of the Province and local areas, it is essential that the land base that supports these activities be managed in an appropriate manner, ensuring that development does not occur at the expense of the environment and that industries remain prosperous.

Recognizing that the application of sustainable development practices has the potential to resolve the conflict between human prosperity and sustaining the natural world (Manitoba Sustainable Development Coordination Unit, Undated), the need to manage resources in a sustainable manner has been accepted by the United Nations, Canada, and Manitoba. The most commonly accepted definition of sustainable development, as provided by the Brundtland Commission in Our Common Future (1987), defines sustainable development " as development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The State of the Environment Report for Manitoba (1997) indicates that sustainable development can be seen as a general philosophy to guide progress with regard to the environment, the economy, and the well being of communities.

Manitoba's commitment to sustainable development is illustrated in the Sustainable Development Strategy for Manitoba (Manitoba Sustainable Development Coordination Unit, Undated), recognizing the use of sustainable development practices provides the Province with the opportunity to pursue economic development and wealth generation in an environmentally sound manner within the bounds of the earth's life

sustaining processes. The strategy acknowledges that sustainable development is a grass roots concept, which requires the active involvement of all segments of society, business, environmental representatives, labor, educators, citizens, and government, since the environment and economy are fundamental to how we live and the quality of life we have.

1.3 Intermountain Conservation District

Eleven Conservation Districts (Figure 1), Provincial-Municipal partnerships created to promote the sustainable and cooperative use of local natural resources, cover over 50% of agro-Manitoba (Department of Rural Development, 1998). The Intermountain Conservation District, Manitoba's largest conservation district, encompasses over 1.8 million acres (over 7200 km^2), and six rural municipalities and five communities – the Rural Municipalities of Dauphin, Grandview, Gilbert Plains, Ethelbert, Mossey River and Mountain South, and the communities of Winnipegosis, Ethelbert, Gilbert Plains, Grandview and Dauphin (Figure 2). From west to east, the landscape ranges from the forested Manitoba Escarpment, to agricultural land and to boreal lakes. Riding Mountain National Park to the south, Duck Mountain Provincial Forest to the west, 'unorganized crown land' to the north, and Lake Winnipegosis and Lake Dauphin to the east provide the boundaries of the district

The IMCD is composed of two watersheds (fifth level watersheds as defined by the Department of Conservation- Water Resources Branch) - the Duck Mountain East Watershed and the Valley River Watershed. Seven sub-district watersheds - the Upper Valley River Watershed, the Lower Valley River/Mink Creek Watershed, the Vermillion

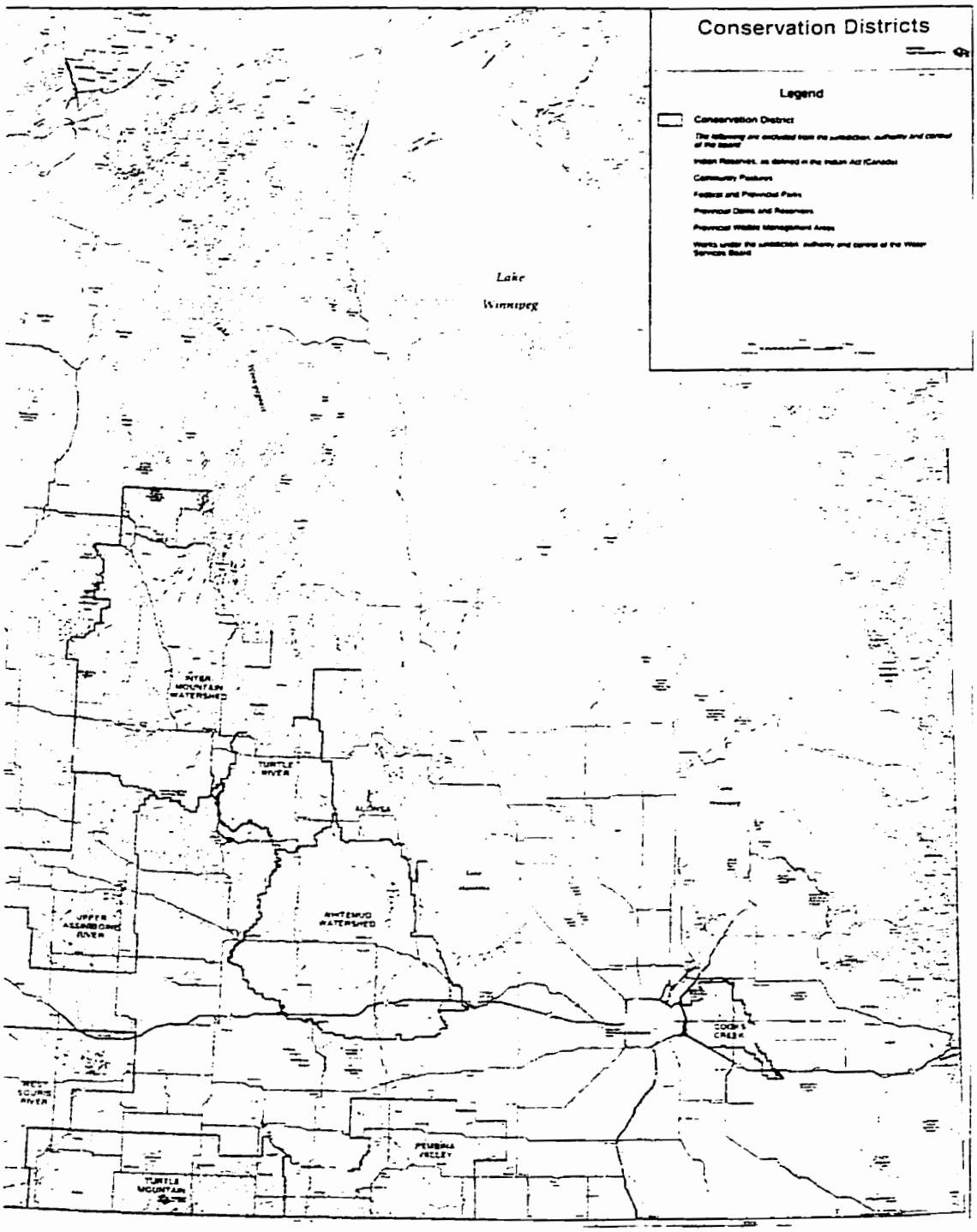

Figure 1: Manitoba Conservation Districts (Kelsey and Little Saskatchewan River are not pictured) *Manitoba Department of Rural Development

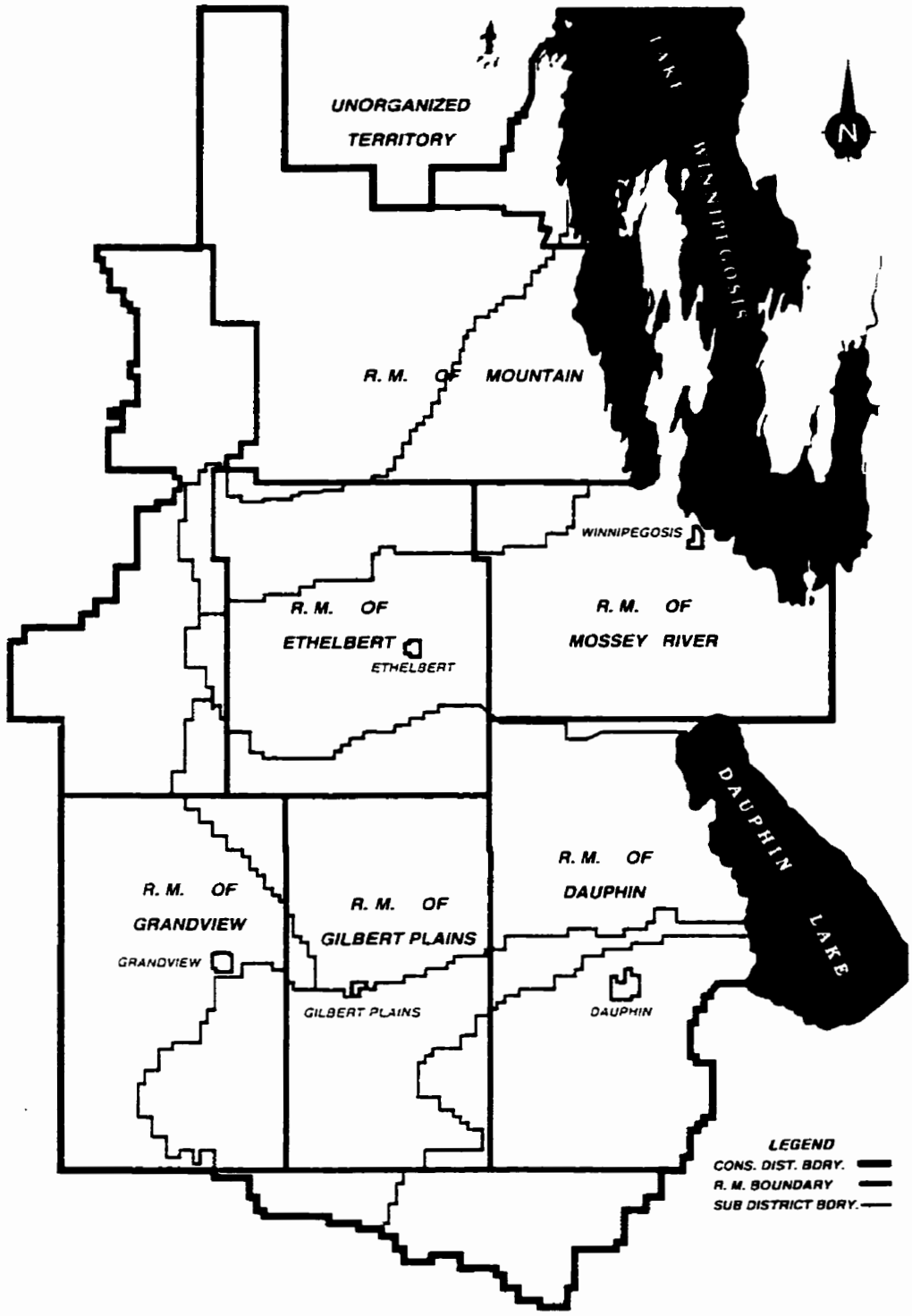

Figure 2: The Intermountain Conservation District *Manitoba Department of Rural Development

River Watershed, the Fishing/Fork/Mossey Rivers Watershed, the Garland/Point Rivers, the Pine/Scalter/Duck Rivers Watershed, and the Wilson River Watershed – compose the management units for the District.

The vision of the IMCD is to incrementally improve the environmental health of the region by focusing on natural resource issues and opportunities within the district (Manitoba's Conservation Districts, 1998). These improvements can be made by the implementation of numerous programs offered by the IMCD including, streambank stabilization, creek rehabilitation, shelterbelts, forage seed programs, and grassed runways. The Intermountain Conservation District Board is developing a Master Management Plan for region, which will provide direction for the sustainable management of the land and natural resources of the watershed, to ensure soil and water management objectives are achieved. The IMCD Board also has an interest in the development of partnerships that encourage the sustainable management of the lands in the local area between and among resource user groups.

1.4 Louisiana-Pacific Canada Limited

Louisiana-Pacific is a major, publicly owned, international forest products company, with operations in the United States, Canada and Mexico. Louisiana-Pacific Canada Limited is a subsidiary of the United States based company, producing oriented strand board from hardwood in Mountain Forest Section of Manitoba. In September 1994, Louisiana-Pacific Canada Ltd. (LP-Canada Ltd.) was granted a Forest Management License by Manitoba Natural Resources to harvest 1,100,000 cubic meters of hardwood per annum within Forestry Management License Area # 3 (Figure 3). The license was issued to ensure a

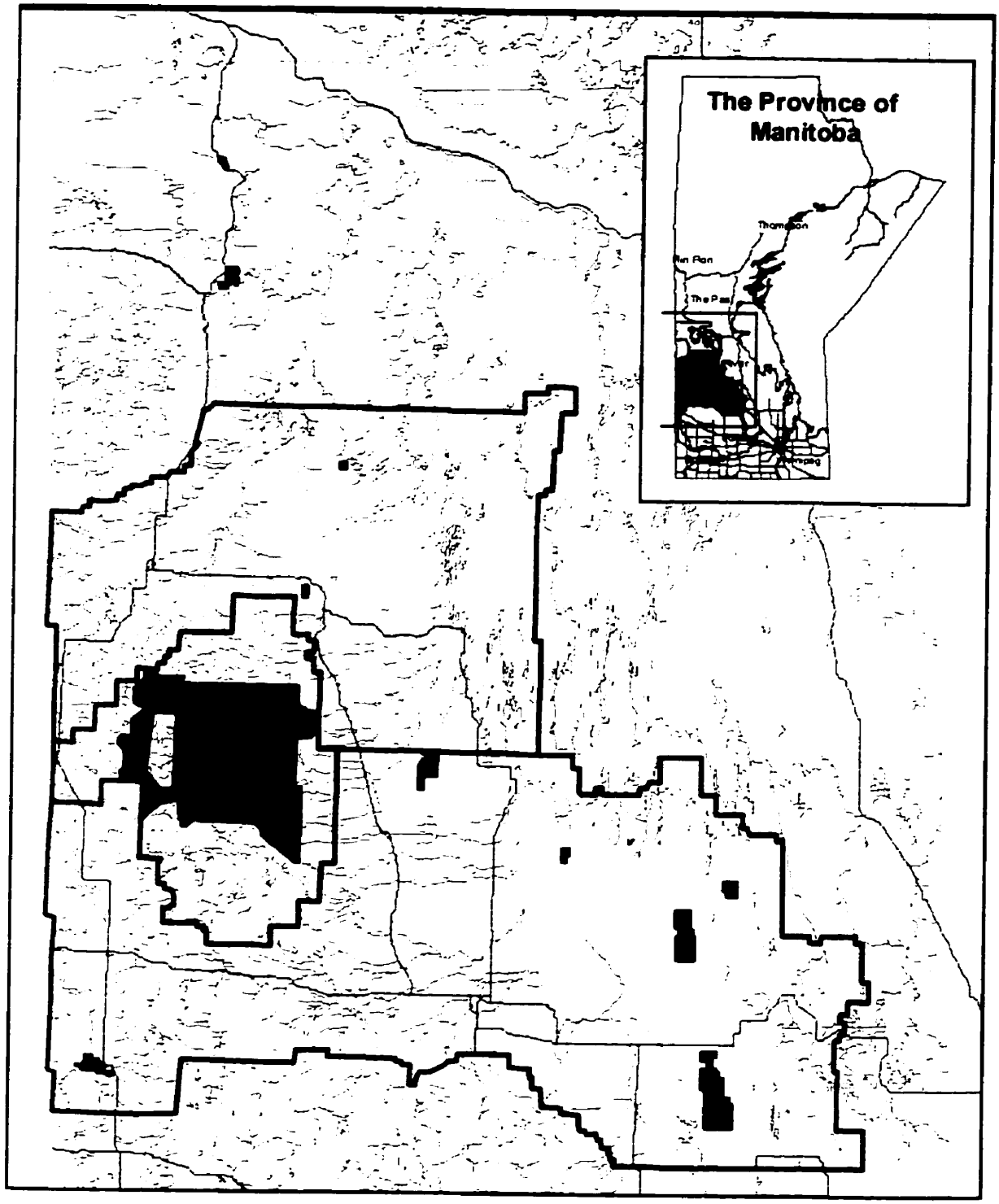

Figure 3: Forest Management License Area # 3 (Forest Management Units 10, 11 and 13)
*LP-Canada Limited

supply of the necessary hardwood timber for the Company's Oriented Strand Board (O.S.B) Mill located near Minitonas, Manitoba, northwest of the Intermountain Conservation District.

Recognizing that the maintenance of the forest environment is essential to the maintenance of the forest industry and forest ecosystem, LP- Canada Ltd. has developed five key environmental objectives for forest use (Tetres Consultants Inc., 1995):

1. Meeting and when possible surpassing local environmental laws, regulations and requirements
2. Promoting the wise use of energy.
3. Maintaining a responsible role in managing natural resources.
4. Minimize pollution.
5. Full accountability for all environmental considerations in corporate planning and decision-making.

LP-Canada Ltd.'s commitment to practicing sustainable forest management and to implementing sustainable forestry practices, which conform to Manitoba's forest policies, is illustrated in Louisiana-Pacific's Ten-Year Forest Management Plan (1996). Company policies include the inclusion of public involvement in forest management, which resulted in the formation of the Stakeholder Advisor Committee (SAC) to ensure appropriate public review of forest management plans. Standard operating procedures (SOPs) developed by SAC and LP-Canada Ltd. outline acceptable harvest procedures, which are a component of sustainable forest management. The SOPs are developed with reference to federal and provincial legislation, regulation and guidelines, and license agreement requirements and are seen as a dynamic plan that will adapt as determined by legislation or societal attitudes, interests or concerns (LP-Canada, 1999). In addition, LP-

Canada Ltd. supports the implementation of the Manitoba Agri-Woodlot Program to assist the management of local private forests (Bauman, 2000) and promote regeneration of forests on private land.

1.5 Problem Statement

With the exception of District land located within Riding Mountain National Park, the majority of the Intermountain Conservation District is located within LP-Canada Ltd's Forest Management License Area No.03 (Figure 4). With numerous land uses occurring within the IMCD, the Intermountain Conservation District Board recognizes the need to address the sustainable management of all land use activities in the District and to ensure that one land use activity does not impair the landscape and thus impact another land use activities.

Agriculture, the prominent land use activity of the area, has been practiced in the IMCD since the settlement of the area, evolving from subsistence farming to farming that maximizes production. Modern practices have a variety of potential land use impacts including soil degradation and erosion, the loss of biological diversity, and the disruption of water flow and water quality (McGarry, 1987).

Harvesting of timber in and adjacent to the IMCD has also occurred since the settlement of the area. Much of the forest that remains in the area is located in Duck Mountain Provincial Forest, which supports commercial and private timber harvests. The

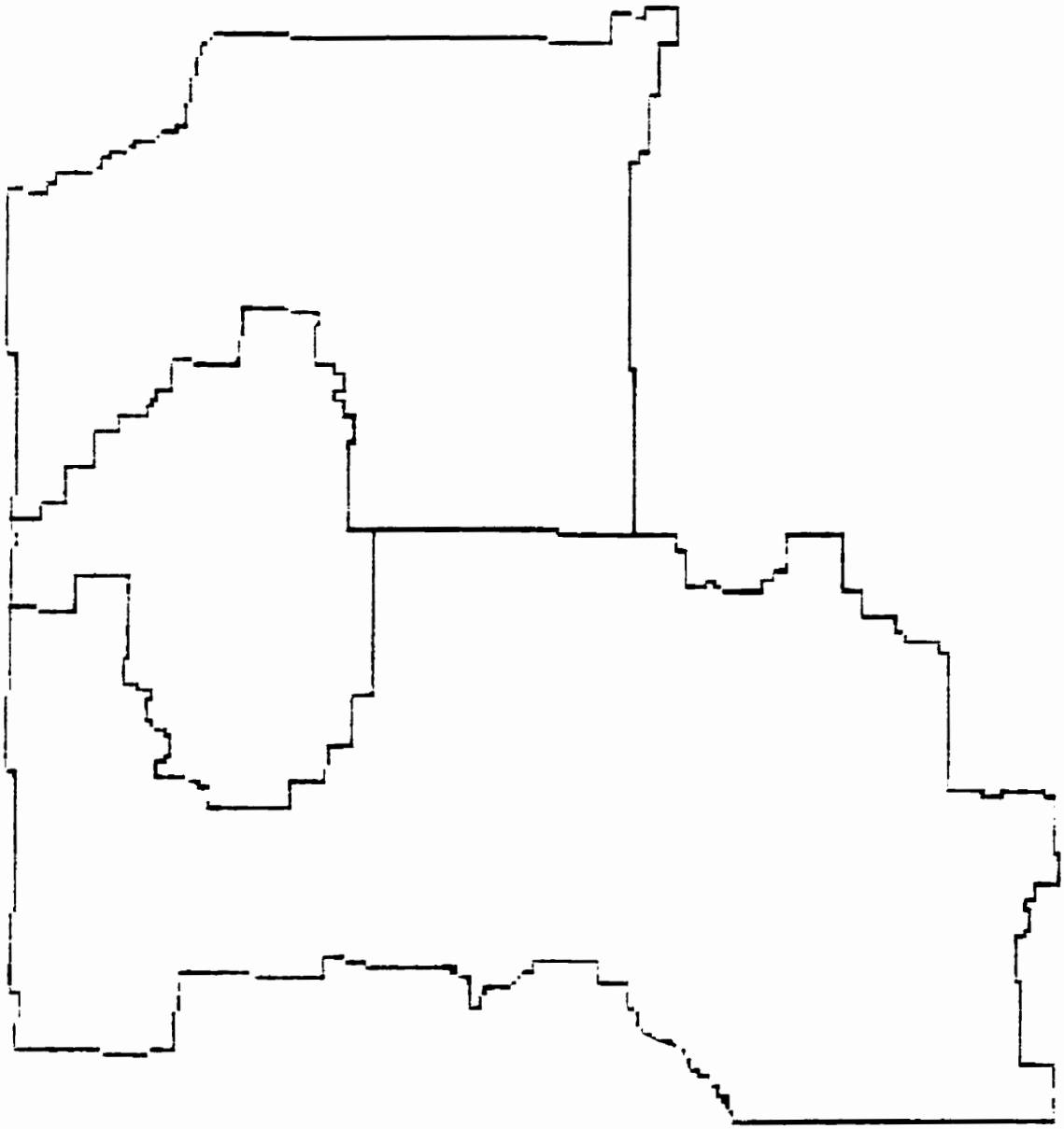

Figure 4: The Intermountain Conservation District in reference to FML # 3.

magnitude of forestry in the IMCD has been altered with LP Canada Ltd.'s acquisition of hardwood harvesting rights, in an area that historically has been dominated by predominately softwood harvest. With increased harvest, the potential for impacts arising from forestry has also increased.

The cumulative impact of various land use activities within the local area has been well documented, exemplified by the water quality problems arising in Lake Dauphin such as increased sedimentation and a diminished commercial fishery. Agricultural development including land clearing for cultivation, the installation of drains, and stream channelization have all contributed to alterations in the hydrologic regime, soil erosion and soil loss, increased sediment load and delivery and water quality (McGarry, 1982). In addition, Carlyle (1980) illustrates that mismanagement and inappropriate land use in the slopes of the Manitoba Escarpment have been the cause of the severe environmental problems, including runoff and resulting erosion, and siltation, that plaque the Escarpment area and adjacent lowlands.

With increased forestry activity and continued agricultural activity occurring on the Manitoba Escarpment and adjacent lowlands, the potential for single and cumulative impacts on water and soil and biodiversity in the IMCD has been heightened. As both activities are dependent on a healthy land base to ensure their future, it is necessary to address impacts of forestry and agriculture, which if managed inappropriately can be detrimental to environment, economics, and social interests of the IMCD. Both LP-Canada Ltd. and the Intermountain Conservation District are new to community, creating a timely opportunity for the development of a long-term relationship that promotes the sustainable management of the resources of Intermountain Conservation District.

1.6 Research Objectives

The purpose of the study is to examine the impacts of both agriculture and forestry land use activities on soil and water in the Intermountain Conservation District, and illustrate how these activities interact to impact the local landscape.

The specific objectives of the study include:

1. to identify the practices and policies used by decision-makers to ensure that sustainable agriculture and sustainable forestry is practiced in Intermountain Conservation District, with emphasis on soil and water conservation;
2. to compare and contrast the agriculture and forestry practices and policies used in Intermountain Conservation District;
3. to identify the impacts arising from agriculture and forestry activity in the Intermountain Conservation District;
4. to develop a framework to assess the current state of soil and water conservation in the IMCD, encompassing both forest and agricultural lands; and
5. to make recommendations detailing approaches to address and promote effective sustainable management of lands within the Intermountain Conservation District.

1.7 Organization of Study

The study has been organized in the following manner. Chapter 1.0 provides background information relevant to the study including the relevant decision-makers in the area, the need for the study, and the objectives of the study. Chapter 2.0 reviews the literature relevant to the study. Topics include ecosystem management, soil and water conservation, sustainable agriculture and sustainable forestry, and the regulatory

frameworks that direct land use activity. Methodologies used to achieve the objectives of the study are discussed in Chapter 3.0. Results of the methodologies are presented and discussed in Chapter 4.0. A summary, conclusions, and recommendations regarding forestry and agriculture are presented in Chapter 5.0.

1.8 Limitations of Study

The information in this study provides a foundation on which to examine the sustainability of agriculture and forestry activities on the land of the Intermountain Conservation District. To further this foundation, the study could be broadened in three areas. First, the interview sample should be enhanced both in number and the diversity of landowners to include other residents involved in trapping, tourism or other activities who affect and are affected by the health of the landscape. A larger, more diverse sample would provide a wider view of the impacts of land use activity on the landscape. As many of the impacts identified by landowners are the perceptions of individual, a second improvement in the study would be the collection of quantifiable biophysical data to examine the perceived impacts. Quantifiable data could be used to determine if the impacts are occurring on the landscape, as well, as provide baseline information to measure future impacts. A third improvement would be to assess land use or land cover change from an earlier time period to provide a clearer picture of the historic impacts of land use activity on the landscape.

Chapter 2.0 Literature Review

2.1 Introduction

Land use activities, including forestry and agriculture, have the potential to impact the land, specifically the soil and water, and the associated terrestrial and aquatic ecosystems on which the activities occur. To achieve sustainable agriculture and sustainable forestry, it is essential that decision-makers and resource managers address these potential impacts of the resource activity. The following literature review will examine how forestry decision-makers and agricultural decision-makers manage resources and address the impacts of their activity on soil and water. Ecosystem-based management, soil and water conservation in the Intermountain Conservation District, and various practices and policies that promote and direct sustainable agriculture and sustainable forestry in Canada and Manitoba are all discussed.

2.2 Ecosystem and Watershed Management

Traditionally, natural resource management has referred to the management of a single resource over a specific area, focusing on the production of that resource. While sustainability has recently become a management objective, management schemes have often focused on maximizing short-term yield and economic gain rather than long-term sustainability (Ecological Society of America, 1995). This shortsightedness has been based on inadequate information on the biological diversity of environments, ignorance regarding ecosystem function and dynamics, scales of ecosystems that exceed management boundaries, and the perception that short-term economic and social benefits outweigh the risk of future ecosystem damage (Ecological Society of America, 1995).

Ecosystem-based approaches have evolved to meet the increasing and often conflicting demands on natural resources (Minnesota Department of Natural Resources (MNDR) Web Site, 2000).

Ecosystem-based management is "a management practice and philosophy aimed at selecting, maintaining, and/or enhancing the ecological integrity of an ecosystem in order to ensure continued ecosystem health while providing resources, products or non-consumptive values for humans" (Dunster and Dunster, 1996). Common to the many definitions of ecosystem management are elements of ecosystem health and integrity, the integration of ecological, economic and social values and goals of the ecosystem, management at a regional or multiple scales, and management for the long-term. Ecosystem-based management integrates scientific knowledge of ecological relationships within a complex sociopolitical and values framework towards the general goal of protecting native ecosystem integrity over the long term (Grumbine, 1994 and KPMG Management Consulting, 1995). As a collaborative process of sustaining the integrity of ecosystems through partnership and interdisciplinary teamwork, ecosystem-based management relies on partnerships and public participation, a science-based approach, a long-term plan, and a comprehensive perspective that finds solutions to balance environmental, social and, economic components (MDNR Web Site, 2000). Advantages of ecosystem based management are the inclusion of people in the management of economic, social, and ecological factors; an emphasis on the need to maintain or enhance natural systems; the use of adaptive management and; the recognition of the importance of natural ecosystems for the long-term viability of the land (Team EBM Web Site, 2000).

In order to implement an ecosystem management approach, it is essential to define the ecosystem or "the spatially explicit unit of the Earth that includes all of the organisms, along with all components of the abiotic environment within its boundaries" (Likens, 1992) which is to be managed. Ecosystems are defined on different scales and sizes, from small as a puddle to as large as a whole forest or the entire planet. For management purposes, the boundaries are assigned dependent upon the resource to be managed (University of Illinois at Urbana-Champaign, Department of Natural Resource and Environmental Sciences Web Site, 2000).

Ecosystem-based management established at a watershed scale is an appropriate management approach for the Intermountain Conservation District, as the IMCD Board attempts to implement soil and water conservation programs throughout the local area. Ecosystem-based management encourages landowners to be an integral part of land use and planning (DMNR, 2000), as the IMCD attempts to influence the management of individual landowners and agricultural producers. Watersheds are appropriate ecosystem boundaries for the study of water and nutrient fluxes driven by hydrology and stream water quality (National Research Council, 1999). The watershed approach acknowledges the linkages between upland and downstream areas, between surface and groundwater, and reduces the chances that attempts to solve problems in one realm will cause problems in others (National Research Council, 1999). All Manitoban Conservation Districts, Conservation Authorities in Ontario, similar organizations in Minnesota and Illinois, and other local conservation groups including the Deerwood Soil and Water Management Association, have implemented practical watershed management techniques. These soil

and water management programs have revealed the benefits of investing in watershed management (Weiss, 1999).

Ecosystem based forest management refers to "the development of management systems that attempt to simulate ecological processes with the goal of maintaining a satisfactory level of diversity in natural landscapes and their pattern of distribution in order to ensure the sustainability of forest ecosystems and forest ecosystem processes" (Canadian Council of Forest Ministers, 1997). Manitoba has adopted the ecosystem approach in the management of provincial forests, as outlined in Manitoba's Forest Plan ...Towards Ecosystems Based Management (KPMG, 1995). The focus of forest management has been redirected from products of the forest to an understanding of how forests function and what processes contribute to forest health and integrity (KPMG, 1995).

2.3 Soil and Water Conservation in IMCD

The Intermountain Conservation District encompasses a wide range of topographies and soil types. This area receives, on average, the largest volume of water to move off the landscape in Manitoba (Prairie Farm Rehabilitation Association, Dauphin District, 1998). The broad landscape supports a variety of activities that drive the economy of the local area including livestock, cropping, and forestry activities, each activity with its own potential impact on the soil and water regime of the local area.

2.3.1. Agricultural Lands

Historic agricultural activity, including land clearing and the alteration of natural drainage, has exposed much of the soil of the area to the impacts of water and wind erosion. Agricultural practices used to maximize production including increased tillage and burning, have also contributed to soil erosion and resulting sedimentation. Conservation practices such as reduced tillage systems and the decrease of summer fallow have been developed to limit the impact of agricultural activity on soil and water (Theile, 1999).

With regard to the environment, agriculture remains for the most part largely unregulated (McRae et al., 2000). Little regulation directs soil and water conservation on agricultural land. Leased agricultural land may have specific requirements directing agricultural activity. Few regulations that effectively influence soil and water conservation on private agricultural land exist. However, the need for conservation techniques has been recognized through the establishment of numerous federal programs, such as the National Soil and Water Conservation Program. The development of local conservation organizations including the Dauphin Lake Advisory Board, the Duck Mountain Agriculture Sustainability Association, and the Intermountain Conservation District, represents a local conservation ethic to protect the water and soil resource (McGarry, 1999). Despite the availability of programs and a local conservation ethic, the use of conservation techniques remains inconsistent. Be it weather conditions, low commodity prices, or other events out of the control of land owners, conservation techniques are easily replaced by traditional techniques, such as increased tillage and the

use of chemicals, in order for the landowner to attempt to increase production and remain economically viable (Theile, 1999).

2.3.2 Forest Lands

Forest harvest has the potential to impact sub-surface water levels, water quality ,and run off rates. Increased soil erosion, soil compaction, or soil displacement are also potential impacts of forestry (Canadian Council of Forest Ministers (CCFM), 1997). The duration of impacts arising from forest harvest is dependent upon the harvest conducted, volume of wood removed, and size of the disturbance area. Impacts arising from permanent one-time removal of stands are longer lasting than operations in areas where regeneration is required. The duration of impacts arising from regenerating areas varies depending upon the specific impact. For example, loss of habitat for cavity nesters could last more than seventy years, while impacts on water quality including increased nutrient levels can last three to five years (CCFM, 1997) and return to steam flow near background levels can take twenty years (CCFM, 1997). While forestry practices have been developed to minimize the impact of harvest on soil and water, depending on land ownership, techniques may or may not required or used.

Forestry operations that occur on Crown forest land are required to implement soil and water conservation techniques in day-to-day forest operations. Harvest plans, which include riparian buffers, the retention of seed and wildlife tress and residual structure, and the type of stream crossings implemented, are reviewed to limit impact of operations on the landscape. Environmental licensing insures that watersheds are not completely in a harvested state. (The Forest Act, 1987, Forest Use and Regulations, 1988, and Manitoba

Environmental License 2191 E., 1996). In contrast, forestry operations occurring on private land do not have these requirements. Protecting the soil and water resource on these lands is at the discretion of landowners.

2.3.3 Impact of the Manitoba Escarpment

Implementing soil and water conservation practices in the IMCD is further complicated by the Manitoba Escarpment (Photograph 1), which receives 20 to 40 percent more rain than the surrounding plains (Planning Branch, Water Resources Branch, 1978). Two sections of the Manitoba Escarpment, Riding Mountain and Duck Mountain form the western and southern borders of the IMCD. With similar topography, a rolling upper region, a relatively steep escarpment face and a relatively flat area below, management issues arising from these two sections of the escarpment are similar. Rapid, sediment filled runoff from snowmelt or heavy rainstorms results in flooding and erosion along the base of the escarpment, causing significant damage to farmlands and municipal works (The Steering Committee of The Manitoba Headwater Storage Study (SCMHSS), 1988). Water flow and water level monitoring stations have been established throughout the area at various times and locations. Outputs from these various stations reveal that water flow rates are at a peak during spring melt, but can also be large during summer months in times of heavy precipitation (Manitoba Hydat Data CD, undated).

Inappropriate land use and management has only enhanced the impacts of natural runoff from the escarpment (Carlyle, 1980). Prior to settlement, beach ridges, alluvial fans, heavy brush, and wetland areas all controlled the runoff. In many areas, these lands were cleared for agriculture, drains were lengthened through swampy areas up into the

Photograph 1: The Manitoba Escarpment from PTH#10, north of Ethelbert

lower slopes of the escarpment, and wetland areas were drained. Water that was previously controlled flowed unrestrained onto low-lying flat areas of cultivated land (S.C.M.H.S.S., 1988). Partial deforestation of scarp slopes for timber and agriculture also increased the frequency and amount of flooding and shale deposition on the lowlands (Carlyle, 1980).

Numerous studies have been conducted to address the impacts arising from runoff and flooding from the Manitoba Escarpment, starting in 1921 with the examination of drainage in the Pembina Hills. The Northwest Escarpment and Interlake Region Agreement was signed in 1949, resulting in the construction of several floodways, the enlargement of natural channels, and the development of headwater storage sites in the Duck Mountains. (S.C.M.H.S.S., 1988).

The Wilson Creek Watershed, on the northern slope of Riding Mountain National Park, was selected to study the contribution of headwaters to the flooding and erosion problems of the escarpment, to determine how the alteration of vegetation was contributing to runoff and to obtain hydro-meteorological data for the headwater areas. Studies carried out on Wilson Creek identified that headwater dams were the best technique to use to reduce runoff and erosion in that area. Meteorological data collected indicated higher than annual provincial average precipitation and severe rainstorms are more frequent on the elevated parts of the escarpment than the surrounding plains (Carlyle, 1980 and Committee on Headwater Flood and Erosion Control, 1983).

Further studies carried out on the Manitoba Escarpment include river channel erosion and headwater storage investigations that examined techniques that could be used to limit the impacts of runoff and sedimentation arising from the Escarpment

(S.C.M.H.S.S., 1988). These studies confirmed the impact of inappropriate land use on the Escarpment and illustrated the need to develop conservation techniques that serve to reverse the impact of previous practices on the Manitoba Escarpment.

Numerous groups and organizations work to minimize the impacts of runoff from the escarpment on the landscape and develop initiatives and techniques that serve to mitigate potential future impact. Rosedale farm, a demonstration site, in Whitemud Conservation District, on the eastern slopes of Riding Mountain National Park, illustrates appropriate soil and water conservation practices for land use activities along the escarpment. Historic clearing and land use has left the slopes of the escarpment prone to soil erosion. Increased runoff and siltation due to the removal of upland vegetation resulted in flooding downstream destroying farmland and infrastructure. Today, two headwater dams have been created, and cultivated land has been converted to permanent forage and forest, stabilizing the slopes of the escarpment, reducing runoff and sedimentation (Manitoba Department of Mines, Natural Resources and Environment, undated).

Tobacco Creek, located in the Pembina Hills area, has been subject of much study regarding the impact of agricultural activities on the Manitoba Escarpment lowlands and the viability of headwater storage sites by the Deerwood Soil and Water Management Association. The Twin Watershed Study examines the impact of different agricultural practices such as zero-tillage and conventional tillage on the watershed, specifically runoff and water flow. (Deerwood Soil and Water Association Web Site, 2000). Monitoring of water quality, runoff volumes, and land use activities provide the

Association with a real picture of what is occurring on the landscape and how activities are changing over time.

The Turtle River Conservation District played a critical role in the restoration of Crawford Creek, whose headwaters are located on the northern slopes of Riding Mountain. The project included the restoration of the creek's original channel, which had been altered by past agricultural activities, and the protection of the last, intact alluvial fan along the Manitoba Escarpment (Agriculture and Agri-Food Canada, 1999). Other programs offered by the District to reduce potential impacts from land use activities include shale traps, escarpment erosion control structures, and stream bank rehabilitation to address the impact of runoff from the Manitoba Escarpment.

2.4 Agriculture

2.4.1 Sustainable Agriculture

"To meet the world's demand for food, protein and environmental protection, the global food system in 2040 will have to produce three times as much as it does now – much of it from the same farmland and water used today" (Anderson, 1994). As food demand increases so does the pressure on the land base used to produce food. In 1992, a United Nations Environment Program Study indicated that 12 billion km^2 or 10.5% of the planet's fertile land base is degraded from overgrazing by livestock, farming inefficiency and deforestation (Standing Committee on Agriculture, 1992). A 1984 report by the Senate Standing Committee on Agriculture indicated that between 1961 and 1971, Canada lost more than 3.5 million acres of farmland to soil loss and loss of agricultural land to urban sprawl.

As the broader impacts of agriculture become well known, the need to achieve sustainable agriculture has reached the forefront. As is the case for sustainable development, numerous definitions for sustainable agriculture have been proposed as sustainable agriculture means different things to different people (Pretty, 1995). Common to all definitions is the conservation of the natural resource base, the economic viability of agriculture, and the need for safe and nutritious food (Standing Committee on Agriculture (SAC), 1992). Goals of sustainable agriculture include increased incorporation of natural processes; the reduction in the use of off-farm, external and non-renewable inputs; an increase in self-reliance among farmers and rural people; an improvement in the match between cropping patterns and environmental constraints of climate and landscape; a greater productive use of the biological and genetic potential of plants and animals; and, a greater productive use of local knowledge and practices, including innovative approaches not yet fully understood by scientists or widely adapted by farmers (Pretty, 1995).

Sustainable agriculture is often equated as a component of rural development, as agricultural productivity and sustainability are intimately connected with the social state of the rural community. Sustainable agriculture and rural development are defined as "... the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically

appropriate, economically viable and socially acceptable." (The Food and Agricultural Organization of the United Nations (FAO), 1994).

One of the strongest impediments to sustainable agriculture has often been that government policies are either misconceived or carried out for other reasons, including economic development (Markandya, 1994). Government policies have not reflected the long-term social costs of resource use and the external costs of farming, such as soil erosion or polluted ecosystems, which are not incorporated into individual decision-making (Pretty, 1995). Until prices are more closely aligned with true costs and markets, and incentives are created that encourage the conservation of environmental goods and services, environmental problems arising from agriculture will persist (McRae et al., 2000).

2.4.1.1 Canadian Agriculture

Agriculture is fundamental to Canada's economy and social identity. The agri-food industry contributed approximately nine per cent of Canada's Gross Domestic Product in 1995 (Agriculture and Agri-Food Canada, 1997.). Agriculture is especially fundamental to the three Prairie Provinces, which contain only 17% of the country's population and accounts for 50% of the farms in Canada and 67% of total farm earnings (Science Research Council of Canada, 1992).

Canadian agriculture is at a pivotal juncture. The changing global markets and trans-national ecological issues have placed pressure on Canadians to develop an agricultural system that will respond to the numerous challenges facing sustainable agriculture. These changes include the broader impacts of agriculture, such as declining

water quality, soil degradation, loss of wildlife habitat, and reduced biodiversity (Agriculture and Agri-food Canada, 1997 and McRae et al, 2000). "Sustainable agri-food systems are those that are economically viable and meets society's need for safe and nutritious food, while conserving or enhancing Canada's natural resources and the quality of the environment for future generations" (Federal-Provincial Committee on Environmental Sustainability, 1990).

Achieving sustainable agriculture is an on going challenge that the agricultural industry must strive to achieve if the sector is to survive. The well-being of the farm community depends upon the preservation of land, water, and genetic resources, and the global recognition and acceptance of Canada's environmental practices. Policy initiatives must strive to create "agriculture that works with nature to maintain essential ecological processes, guards the wholesome quality and security of the food supply, and maintains economically and socially viable farms and farm communities" (Science Council of Canada, 1992).

While agriculture has been largely unregulated, there is a trend towards increased government intervention, specifically at the provincial or municipal levels, to influence agricultural practices and limit environmental impacts (McRae et al., 2000). Present policy initiatives such as the Agri-Environmental Indicator project are contributing toward the government's goal of increased understanding between the environment and the agricultural economy (Vanclief, 2000). A federal strategy, Agriculture in Harmony with Nature has been designed to provide decision-makers with the means to integrate environmental considerations into their day-to-day management on a proactive rather than reactive basis (Agriculture and Agri-Food Canada, 1995). An

action plan to address biodiversity in agriculture has also been developed. Programming such as the now defunct Green Plan and the National Soil and Water Conservation Program (NSWCP) illustrates Canada's recognition of the importance of soil and water conservation. NSWCP "supports projects that target economic, environmental and social issues affecting land and water resources, engage local leadership and community involvement and form partnerships essential to the development of effective solutions." (Prairie Farm Rehabilitation Administration (PFRA), Undated).

2.4.1.2 Manitoba Agriculture

"To sustain and enhance the economic and personal well-being of participants within the agriculture and food chain" is the mission statement of the Manitoba Department of Agriculture (Department of Agriculture Web Site 1999), illustrating the importance of agriculture to the economy of the Province. While farmers account for only three per cent of the population of Manitoba, the impact of this three percent is significant. Manitoba agricultural production contributes 2.4 billion dollars to Canadian exports (Manitoba Department of Agriculture Web Site, 1999).

With a fundamental link between agriculture and the economic livelihood of Manitoba, the need to sustain the agricultural resource land base has become a prominent land management objective of the Province and individual Manitoban farmers (Manitoba Department of Agriculture Web Site, 1999). Programs and services associated with soil management such as reduced tillage crop production, soil management and conservation, irrigation, soil and water sustainability, and precision farming systems are available to private farmers and rural and community organizations.

The basis for achieving sustainable agriculture in Manitoba is ensuring the sustainability of the rural lifestyle. If farmers and rural communities cannot sustain themselves, the implementation of often costly, environmentally sound practices is not viable and unsustainable agricultural practices will continue (Theile, 1999). Numerous policies and programs promoting rural development are directed at creating partnerships with and within communities. These partnerships address particular needs for training, on-going advice, technical analysis and funding related to community development, land and resource management, and local governance and leadership (Department of Rural Development Web Site, 1999). Conservation Districts are one of these partnerships.

2.4.1.3 IMCD Agriculture

The present day landscape of the IMCD is dominated by agricultural activity. Both cropping and livestock activities are economic drivers of the local area (PFRA 1998). Annual cropping practices have changed and will continue to change due to increasing transportation costs, the shift from cereal to forage crops, and increasing acreage of higher priced oil seed (Photograph 2). Future development of niche products is expected as producers compete in the agricultural market (PFRA, 1998). The IMCD is ideal for livestock production (Photograph 3) as the area has relatively low population and much of the land is inexpensive. With recent expansion in the hog industry and the increased costs in cereal cropping, increased livestock production is expected (PFRA, 1998).

Potential processing facilities for products produced through agriculture including food, hemp, and straw processing may develop into an economic driver for the local area.

Photograph 2: Canola Field in the IMCD

Photograph 3: Cattle Pasture in the IMCD

Further diversification in this direction continues to illustrate the economic importance of agriculture in the IMCD. The challenge is to ensure that technologies and land use practices protect the soil and water on which agriculture is dependent (PFRA, 1998).

2.4.2 Agricultural Legislation and Regulation

Agriculture predominately occurs on private lands in Manitoba. With private ownership, landowners make decisions based on their own individual values and interests. Unlike privately owned land, agricultural activities occurring on leased crown lands often have specific management objectives that leases or renters must satisfy. For the purpose of this discussion, the management and regulatory framework of private lands will be examined, as the majority of the agricultural land in the IMCD is private. Despite management authority, private landowners cannot simply disregard the environmental impacts of agricultural activities beyond their property lines. The regulation of these potential impacts falls under numerous acts and regulations, primarily under provincial and municipal jurisdiction.

2.4.2.1 The Environment Act

"The intent of the Environment Act is to develop and maintain an environmental management system in Manitoba which will ensure that the environment is maintained in such a manner as to sustain a high quality of life, including social and economic development, recreation and leisure for this and future generations" (The Environment Act 1(1), 1987). The Act is complementary to, and support for, existing and future provincial planning and policy mechanisms (" (The Environment Act 1(1) a, 1987).

Many of the potential impacts of agricultural operations can lead to air or water pollution. Pollution is an illegal offense under the Environment Act. The Department of Conservation, Environment Branch is responsible for preventing water pollution and other offenses through regulation and licensing and developing environmental quality standards and objectives. Legal action required to alleviate these offenses is the responsibility of the Environment Branch (The Agricultural Guidelines Development Committee, 1994). Specific regulations made under the Environment Act addressing agricultural activities, in whole or in part, directed at protecting the soil and water regimes, include Litter Regulation, Disposal of Whey Regulation, Pesticides Regulation, the Storage and handling of Gasoline and Associated Products Regulations, and the Livestock Manure and Moralities Regulation. These regulations direct the appropriate management of materials that have a potential to negatively impact the environment.

2.4.2.2 The Farm Practices Protection Act

All agricultural practices, whether managed appropriately or inappropriately, have some degree of impact on the local environment. The Farm Practices Protection Act (1992) provides protection to agricultural operators from unwarranted nuisance claims regarding impacts arising from normal farm practices. Neighbors are protected from nuisance arising from unacceptable farm practices.

Under the Act, the Farm Practices Review Board is established to review and mediate nuisance complaints regarding odor, noise, dust, smoke and other similar disturbances. The intention of The Act is to provide a quicker, less expensive, and more effective method to resolve conflicts, which can potentially create an understanding of

the nature and circumstances of the agricultural operation, without the confrontation and the expense of the courts (The Agriculture Guidelines Committee, 1994). However, non-nuisance complaints such as pollution issues, erosion problems, or inhumane treatment of animals are not regulated under this Act.

2.4.2.3 The Planning Act

The Planning Act (1980) is the main mechanism used by local municipal governments to enact municipal by-laws, development plans and zoning by-laws. The Provincial Land Use Policies Regulation, adopted under the Planning Act, promotes sustainable development and guides provincial and local authorities for local land use plans. Specific policies address agricultural activity indicating areas that should be preserved for a full range of agricultural activities or areas that should be preserved for limited agricultural use (Manitoba Regulation 217, 1980). Local land use policies, based upon those developed under The Planning Act, are used to develop municipal or planning district development plans. Zoning by-laws can be created under these development plans creating various land use zones, regulating the type of land use and agricultural operations, such as livestock operations, occurring in the specific zones (The Agricultural Guideline Committee, 1998).

2.4.2.5 Other Legislation

Numerous other acts and regulations pertain to agricultural activity occurring in Manitoba. The Department of Agriculture administers over forty acts and numerous regulations including The Crown Lands Act, The Land Rehabilitation Act, pertinent

sections of The Wildlife Act, The Pesticides and Fertilizer Control Act, and the Livestock and Livestock Products Act (Manitoba Agriculture Web site, 1999). The Water Rights Act, The Municipal Act and The Public Health Act can also be used to regulate agricultural activities.

Increasingly, global policy initiatives are being created that have implications for agricultural production. The United Nations Convention on Biological Diversity has resulted in the development of a Canadian Biodiversity Strategy that promotes the conservation of crop and livestock diversity, habitat, and the pending federal legislation on endangered species. Conventions on climate change and ozone have limited the use of specific agricultural chemicals. Regional agreements, such as the North American Agreement on Environmental Cooperation, also limit the use of chemicals that have transboundary effects (McRae et al., 2000).

While the majority of legislation affecting Manitoba producers is provincial or municipal in nature, federal legislation also has environmental implications relating to agricultural production. The federal Fisheries Act (1985) prohibits the "deposit of a deleterious substance" (The Fisheries Act (34), 1985) and " any work or undertaking" (The Fisheries Act (36), 1985) that impacts waters inhabited by fish. Implications regarding irrigation, drainage and waste disposal activities of producers arise from this act. The Pest Control Act regulates the use of pesticides that have environmental or human health impacts. The Canadian Environmental Protection Act (1996) further regulates chemicals and particulates that are used in or arise from agricultural operations (Lawrence and Bainbridge, 1998).

2.5 Forestry

2.5.1 Sustainable Forestry

"The practice of forestry ... is currently undergoing the most profound and rapid change since its establishment a century ago. The evolution from sustained yield management of a relatively small number of commercial tree species to the protection and sustainable management of forest ecosystems is changing some of the fundamental premises of forest management" (Sample et al., 1993). With the recognition of the importance of the forest ecosystem, sustainable forestry has evolved to refer to the conservation and the sustainability of the biological wealth of the forests, as well as to the maintenance of the environmental role of forests (Salleh, 1997).

Mok and Poore (1991) define sustainable forest management as the process of managing forest land to achieve one or more clearly specified objectives of management without undue reduction of its inherent values and future productivity or undesirable effects on the physical and social environment. The United Nations Conference on Environment and Development (1992) indicated that sustainable forest management addresses the policies, methods, and mechanisms adopted to support and develop the multiple ecological, economic, social and cultural roles of trees, forests, and forestlands. The underlying objective of sustainable forest management is the management of the forest ecosystem balancing the environmental, economic, and social needs of the stakeholders of the forest resource. As stated in the National Forest Strategy (1999), "the goal of sustainable forestry is to maintain and enhance the long-term health of our forest ecosystems, for the benefit of all living things both nationally and globally, while

providing environmental, economic, social and cultural opportunities for the benefit of present and future generations."

2.5.1.1 Canadian Forestry

With 10% of the world's forest, Canadian forest policy is reflective of and influences international forest policy (Natural Resources Canada, 1997). Over the last 300 years, forest management in Canada has reflected the social, economic and cultural changes that have occurred at home and abroad. Evolving from unregulated exploitation to regulation for revenue, from regulation for revenue to conservation, from conservation to timber management, and from timber management to sustainable forest management, forest management in Canada is reflective of the present day values and needs of society (Hardy, 1997).

Canada has embraced the ideal of sustainable forest management. In 1992, recognizing the importance of the ecological aspects of the forest and social, cultural, and economic values of the forest, the first national forest strategy, Sustainable Forests: A Canadian Commitment, was created. The objective of the strategy was to ensure that Canada's approach to forest management included a range of both timber and non-timber values, while protecting the integrity, health, and diversity of our forest ecosystems (Canadian Council of Forest Ministers (CCFM), 1992). The Canada Environmental Assessment Act (1995) reflects the revision of forest polices to better reflect the principles of sustainable management. Under that Act, forest industry operations are assessed for potential adverse environmental impacts prior to granting access to harvest timber (Natural Resources Canada, 1997).

A national framework of criteria and indicators guiding the sustainable development of forests solidifies Canada's commitment to sustainable forestry. Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators (CCFM, 1995) defines sustainable forest management and provides guidance for the development of related policies and business activities reliant on the forests. Six criteria: the conservation of biological diversity, ecosystem condition and productivity, soil and water conservation, contributions to global ecological cycles, multiple benefits to society and society's responsibility for management, and eight-three indicators serve as a basis on which to report on progress towards sustainable forest management in Canada. The criteria and indicators, developed in 1995, reflect current public values, and with the continued acquisition of knowledge and changes in societal values, the criteria and indicators will require continuous refinement. Still, the criteria and indicator process is viewed as an important policy tool that will help guide and assess Canada's progress towards sustainable forest management (Canadian Council of Forest Ministers, 1997).

Management responsibilities for Canada's forest resource fall under one of three jurisdictions, federal, provincial, or private, with the majority (71%) of the forests falling under provincial ownership and thus management. The federal and territorial governments manage 23% of Canada's forests, with the remaining 6% owned privately (Natural Resources Canada, 1997). While the majority of forests fall under some aspect of provincial management, national policy initiatives are reflected throughout provincial management agendas.

2.5.1.2 Manitoban Forestry

As forest policy has evolved in Canada, forest policy and practice has evolved in Manitoba. Previous policies addressed forest management in terms of sustained timber yield, resulting in a prosperous forest industry. The wood product industry creates 1.3 billion dollars in sales annually and employs 9 800 people (Manitoba Industry Trade and Manufacturing Web Site, 1999). As the spectrum of forest values widened to address non-timber values and ecological goods and services, Manitoba initiated a sustainable development strategy for the management of the Province's forests. The strategy recognizes forest management in its broadest terms, managing all values in the forest – resources such as water, wildlife and soils; as well as cultural, historical and recreational assets – in an integrated, equitable manner (Manitoba Sustainable Development Coordination Unit, undated). Manitoba's forest policies, which address environmental protection, supply and allocation, fire, insects and disease, growth and development, agro-forest development, urban forests, planning and integrated management and public awareness, reflect those supported in the National Forest Strategy.

Manitoba's Forest Plan ...Towards Ecosystem Based Management (KPMG, 1995) details Manitoba's commitment to fulfill the goal of the National Forest Strategy "to maintain and enhance the long-term health of our forest ecosystems, for the benefit of all living things both nationally and globally, while providing environmental, economic, social and cultural opportunities for the benefit of present and future generations." The plan advocates integrated management of the forest ecosystem to achieve sustainable forest management. Appropriate practices, procedures, and partnerships addressing

issues ranging from forest tenure and economics to scientific needs are detailed to promote ecosystem-based management on a provincial scale.

2.5.1.3 IMCD Forestry

Since settlement, harvest activities have occurred in the IMCD area. During settlement, many of the local forests were cleared for agricultural activities. Based on recommendations from early settlers, timber reserves in Duck Mountain and Riding Mountain were developed between 1896 and 1906. Reserves were managed primarily for forestry but also for wildlife and for water supply and control (Somers, undated). Today, the majority of local harvest is conducted in Duck Mountain Provincial Forest (Photograph 4). Traditionally an area of predominately softwood harvest, the hardwood operations of LP-Canada Ltd. have added another component to forestry activities in the IMCD.

Throughout the last hundred years, harvest volumes of mainly softwood in the local area, primarily FMU 13 or Duck Mountain Provincial Forest and Park, have slowly increased. During settlement, 100,000 m^3 were harvested annually for saw logs. Local saw mills developed in the area and provided additional employment to residents in winter months. By the 1970's harvest volumes reached between 250,000 and 300,000 m^3 per year. From 1986 until 1991 harvest volumes reached 35,607 m^3 per year (LP-Canada Ltd. Environmental Impact Statement, 1994). Today, annual harvest volume from FMU #13 is projected as 446,180 m^3 for hardwood and 198,820 m^3 for softwood (LP-Canada Ltd, 1996).

Photograph 4: Duck Mountain Provincial Forest looking south from Baldy Mountain

Photograph 5: Forest harvest at Upper Creek Dam in Duck Mountain Provincial Forest illustrating the maintenance of wildlife trees, snags and patches to provide residual cover.

Numerous quota holders carry out harvest activities in FML # 3, including other forest companies, local forest operators and local residents (Table 2.1 and Table 2.2). With various operations occurring within the local forests, management responsibility for the forests have been placed with LP-Canada Ltd. The Company is to ensure that quota holders maintain access to the forests and that the harvest conducted by quota holders meets licensing requirements.

Table 2.1: Timber Sale Holders and their associated volume quotas in FMU 13

QUOTA HOLDER	QUOTA #	QUOTA VOLUME (M3)	
		Softwood	Hardwood
Angus Len & Bill	156	167.4	0.0
Basaraba, Les	269	0.0	1000.0
Bielek, Peter	154	0.0	191.4
Bresky, Herb & Sons	185	1819.2	10000.0
Cords, Tom & Don	158	104.9	0.0
Delamare, Ron	164	342.2	1299.9
Dubek, Metro	159	232.2	0.0
Dudar Forest Products	281	0.0	1000.0
Dudar, Harold	160	630.1	0.0
Eagle, Stuart	163	0.0	1004.3
Fullerton, William	165	329.8	1355.2
Gurica, Ernie	267	0.0	1000.0
Halabisky, Walter	167	197.8	0.0
Harapiak, Stanley	169	407.9	0.0
Hay, Robert	171	1898.1	36.4
Intermountain Logging	202	84.1	3923.1
Kotyk Lumber	152	3879.4	2152.3
Pachkowski, Ted	186	113.9	0.0
Penner Bros. Logging	272	0.0	3000.0
Perchaluk, John & Sons	188	637.1	29.3
Pine Falls Paper Company(W-1492-D)	149	10108.4	303.2
Pine Falls Paper Company(W-1540-D)	149	20000.0	0.0
Poyser, David	191	498.5	201.2
Puchailo, Danny (Mike)	194	497.4	0.0
Riehl Lumber and Logging INC	198	0.0	10288.4
Roblin Forest Products Ltd.	199	24153.9	2039.5
Soloway, Harvey Lee	175	0.0	140.6
Spruce Products Ltd. (W-1525-D)	206	96188.6	488.3
Spruce Products Ltd. (W-1541-D)	206	1415.0	29432.0
Stratuliak, Nestor	211	4.2	31.4
Thomas, Robert	271	0.0	2000.0
Trembach, Gerald	212	0.0	63.3
Zander, Brian (Rune)	218	75.1	39.3
TOTAL		163785.1	71018.9

*Louisiana Pacific Canada Limited, 1999

Table 2.2: Timber Sale Holders and their associated volume quotas in FMU 11

QUOTA HOLDER	QUOTA #	QUOTA VOLUME (M3)	
		Softwood	Hardwood
Burke, Frank	9	62.5	0.0
Cocks, Earl	11	80.0	0.0
Graham, Malcolm	N/A	0.0	1000.0
Prairie Forest Products Ltd.	182	210.0	0.0
Pine Falls Paper Company	149	848.5	0.0
Spruce Products Ltd.	206	833.3	0.0
Spruce Products Ltd.	206w	141.5	0.0
Zander, Stuart	217	36.1	16.8
TOTAL		2211.9	1016.8

* Louisiana Pacific Canada Limited, 1999

2.5.2 Legislation and Regulation

Private, provincial, and federal ownership of forests occurs in the Intermountain Conservation District. The forested land located within Riding Mountain National Park is owned federally and timber harvest is prohibited. Smaller forest stands are found on private lands on which property owners have discretion over the harvest of these trees. The majority of the timber resource in the IMCD falls under provincial ownership. As such, the following discussion will focus on legislation and regulation directing the use of provincially owned forests.

2.5.2.1 The Forest Act

The Forest Act (1987) permits the minister to regulate and administer forest activity occurring on crown timber. "The minister with respect to Crown timber...shall regulate and administer

a) all rights, properties, interests, claims and demands of the Crown in timber

b) subject to *The Financial Administration Act*, all revenues and money of the Crown arising from forestry;

c) management, utilization and conservation of Crown forest ands, and timber;

d) afforestation, reforestation, tree preservation and tree improvement;

e) the disposition of timber;

f) the cutting and production of primary forest products and products of the forest;

g) the enforcement of statutes, rules and regulations relating to forestry and provincial forests" (The Forest Act (2), 1987).

Disposition of cutting rights to crown timber occurs through forest management licenses, timber sales and timber permits offered by public competition or with approval of the Lieutenant Governor in Council. Approval arises from negotiations between a company and government or approval is granted to organizations that will provide employment opportunities and enhance the well being of the area. Smaller volumes of timber are available by permit or timber sale agreement or by permit to cut wood for the permittee's own use (The Forest Act (11(1), 1987)

Forest management licenses are granted if "a wood-using industry established in Manitoba is sufficient to require the security of a continuous timber supply" (18(1)) for no more than twenty years without renewal of the license. Specified in the license is the species, size, quality and quantity of timber to be taken (18(3) in the forest management license area. The license grants the licensee "all rights of property whatsoever in all trees, timber, lumber or other product of timber, that he is entitled by the license to cut..." (18(4)).

Payments to the Crown for the use of timber is based on the volume of wood cut or manufactured or as a percentage of the revenue derived annually from the forest operation (18(8)). The Company, when acquiring a license through negotiation, may be required to compensate the department for costs arising from legal surveys, timber estimates, mapping and advertising the proposed forest area (18(7)). Other crown charges are detailed in the Forest Use and Management Regulations.

2.5.2.2 Forest Use and Management Regulations

The Forest Use and Management Regulations (1988) outline specific responsibilities of individuals or companies harvesting crown timber. The licensee, authorized to cut timber, shall cut timber in an acceptable manner, remove the timber cut within such time, avoid unnecessarily disturbing the land surface of trees preserved from the cutting license, and cut all trees to a stump height of no more than thirty centimeters. All authorized personnel are to cut and remove merchantable fire killed or dead timber, and obtain approval from an officer concerning the location of storage yards, access roads, milling yards, gravel pits, sand pits, and other plans and activities (Forest Regulations 5b(i-ix), 1988).

Specific regulations detail the responsibilities of companies holding forest management licenses. With guaranteed long-term access to timber resources, the licensee is required to produce a forest management plan based on sound forest management, within three years of license acquisition, for approval by the minister (16(1)). Annual plans detailing harvest are required and must receive director approval. Annual plans are to include the legal description of the area to be cut during the timber year, a map

detailing the area, and the estimated quantity of timber, by species and product, intended to be cut on that area during the year (19). Similar information detailing the area and trees to be cut during a harvested year (20) are also required.

Charges and fees arise from the use of Crown timber. Dues for permits and licenses including timber permits, scaler's license fee' hay cutting permit and a forest management license range from five to thirty dollars as indicated in Schedule E in the regulations. Charges based on the volume of trees cut are also required. An annual $0.17 per cubic meter fire protection fee for Crown forestlands is required (Schedule E). A forest renewal charge per cubic meter of $4.58 for softwood and $1.30 for hardwood is required (Schedule I). Dues for cubic meter of roundwood harvested vary based upon forest regions and between species. Aspen poplar dues per cubic meter vary from $0.35 to $0.40 and all other wood dues per cubic meter range from $0.40 to $1.80. Dues in the Mountain forest region or IMCD area are $0.40 for aspen and poplar and $1.70 for all other wood (Schedule H). Under these regulations, total dues for a cubic meter of hardwood is $1.87 and $6.45 per cubic meter of softwood.

These dues are subject to change in the negotiation of a forest license agreement, as is the case for Louisiana-Pacific Canada Ltd. LP-Canada Ltd. currently pays $0.55 per cubic meter of hardwood used in the O.S.B. mill and $0.45 per cubic meter hardwood and $4.63 per cubic meter softwood for forest renewal, as well as the standard $0.17 per cubic meter fire protection fee. Annual dues for each cubic meter of hardwood total $1.17, $0.80 per cubic meter less than provincial regulation standards. These dues are subject to change on December 31, 2000 and will be set by Manitoba (Forest Management License No. 03, 1994).

2.5.2.3 The Environment Act

The potential impact of forest operations, harvest, and processing, on the local environment are addressed through the Environment Act. Large-scale forestry operations are ranked as a class two development under the Environment Act 11(2), requiring environmental assessment of projects. Environmental assessments of processing facilities such as LP-Canada Ltd.'s O.S.B. Mill arise from this classification. Environmental assessments are also conducted to evaluate the implications of long-term management plans, as was the case for Louisiana-Pacific Canada Limited's Ten-Year Forest Management Plan. Environmental licenses provide standards and regulations that processing facility and harvesting operations are to meet for operating approval. Regulations under the Environment Act, including the Storage and Handling of Gasoline and Associates Products Regulation and, the Pesticides Regulation impact forest activities.

Manitoba Conservation, Forestry Branch is responsible to address the landscape impacts of forestry to a larger degree that the Environment Branch. Approvals of cutting plans, cut sites, and regeneration success are administered through Forestry Branch. Monitoring by the Environment Branch addresses smaller specific areas, such as stream crossings.

2.5.2.4 Other Legislation

Forestry operations are addressed in numerous other provincial legislative instruments including the Wildlife Act, the Ecological Reserves Act, the Endangered

Species Act, the Heritage Resources Act, the Provincial Parks Act, the Planning Act, the Workplace Safety and Health Act, and the Mines and Minerals Act. In the IMCD, the Cowan Bog is protected under the Ecological Reserves Acts. Manitoba protected species occurring in the area include Baird's Sparrow, the Burrowing Owl, the Perigan Falcon, the Piping Plover, Small White Lady Slipper, and the Loggerhead are protected under the Endangered Species Act. Two wildlife management areas are also located in IMCD-Weiden and Pine River. (LP-Canada Ltd., 1995).

Forty-one Public Forest Policies have been developed in consultation with Manitobans to address the sustainable development and use of the forests of Manitoba. The polices are a statement of collective societal values for managing, protecting and developing Manitoba's forest resources (Manitoba Sustainable Development Coordination Unit, undated). Policies address eight separate objectives- environmental protection, supply and allocation, fire, insects and disease, growth and development, agro-forests development, urban forests, planning and integrated management, and public awareness- many of which are incorporated into provincial and federal acts and regulations.

While forestry in the IMCD is regulated provincially, the influence of federal regulatory instruments can be seen. The Canadian Environmental Assessment Act, the Navigable Waters Protection Act, the Migratory Birds Convention Act, the Federal Fisheries Act, the Indian Act, and the Forest Act in terms of Federal-Provincial Agreements are all part of the regulatory framework addressing forestry. Federal policies and principles such as the Forest Accord, the Rio Conference and International

Agreements, and Fisheries and Wildlife policies also contribute to forest regulation (LP-Canada Ltd., 1995).

2.6 Lessons from Literature

As illustrated by the literature, the principles of sustainable development have been and continue to be implemented into the management frameworks created by government that direct forestry and agriculture land use activity to protect the resource base and to promote the long-term viability of both activities. While both forestry and agricultural regulators have advocated sustainable development principles and practices, the degree of regulatory instruments that influence management is not equivalent. Numerous regulatory instruments are available to promote the sustainability of forests on Crown land. Conversely, on private land, no regulatory instruments direct the sustainable use of forests on private land. Few regulations have a direct impact on the sustainable development of agriculture on individual operators. Indirectly, many government policies, such as the tax assessment process and subsides, regarding agriculture activity have inhibited conservation practices leading to inappropriate activity, including cropping marginal land.

With these different regulatory instruments, achieving sustainability in forestry and in agriculture land use activities requires separate but coordinated initiatives. Currently,many separate initiatives of the Department of Agriculture and the Department of Conservation contradict the separate goals of each Department, as illustrated in the Department of Agriculture policy to remove timber from leased crown land and the public forest policy of retaining tress and shelterbelts on agricultural land. Sustainability

of Crown forests requires the effective use of regulatory instruments that direct the sustainable objectives of governing bodies. In contrast, agriculture and forestry that occurs on private land requires the further development of legislation, the education of landowners, and incentives to promote the sustainability of agriculture and private forests. Local organizations such as the IMCD and LP-Canada Ltd. can identify and address areas where policies contradict and work together on individual management plans to reduce areas where policy and practices counteract, protecting aquatic and terrestrial ecosystems, and soil and water.

Chapter 3.0 Methods

3.1 Introduction

The following discussion details the methods that were used to examine the impact of forestry and agricultural activities in the Intermountain Conservation District. Attention was focused on acquiring information regarding soil and water conservation policies and practices. Both forestry and agriculture have the potential to impact soil and water and therefore mitigative methods to protect soil and water resources are necessary to conserve the natural landscape on which these activities are dependent.

3.2 Jurisdiction, Rights and Responsibilities of Resources Review

Lands within the Intermountain Conservation District are owned privately, provincially, or federally. These three forms of ownership result in three distinct jurisdictions directing resource use and land use. A review of these jurisdictions was carried out to reveal the rights and responsibilities of individuals and groups as they conduct agriculture or forestry operations in the IMCD. In addition, the review revealed areas in which decision frameworks regarding forestry and agriculture are similar, different, and overlap, illustrating where and how jurisdictions interact.

The review consisted of an examination of the relevant literature addressing forestry and agriculture and discussions with officials involved in forestry and agricultural activities. The literature review entailed an examination of relevant federal, provincial and, municipal acts and regulations regarding agriculture and forestry. Also included in the literature review was information addressing resource users' licenses and agreements, and public policy objectives and guidelines.

Discussions regarding forestry activities were conducted with members of the Manitoba Department of Conservation Forestry Branch, the Manitoba Department of Conservation Environment Branch, and various officials from LP-Canada Ltd. including biologists, planners and harvesters. Officials involved in the agricultural arena that contributed to the review included representatives from the Prairie Farm Rehabilitation Administration, IMCD representatives, representatives from the Manitoba Conservation Districts Association, and local agricultural producers.

3.3 On Site Visits

3.3.1 Forestry

The objectives of sustainable forest management incorporate more than the successful regeneration of timber. Sustainable forest management now includes the management of the entire forest ecosystem including aspects such as biodiversity, soil and water conservation, ecological goods and services, and non-timer values. A site visit to a cut block was conducted to observe the harvest techniques and operations used to harvest timber and address other aspects of forest sustainability, specifically soil and water conservation.

The visit involved a of tour a cut block located in the southern portion of Duck Mountain Provincial Forest, in the Upper Dam area, conducted by a local forest contractor harvesting for LP-Canada Ltd.. This site was selected because the cut block area contained current and past harvest activity. With future harvest activity planned for the area, road construction was also underway. As a result, the visit provided an illustration of how harvests are planned and scheduled over more than one year to

minimize the impact of forest operation on the landscape and the entire forest ecosystem. Specific illustrations included the techniques used to minimize runoff resulting from road construction, the size and shape of a cut block, and specific harvest techniques including the retention of seed and wildlife trees, the retention of slash, and the degree of regeneration occurring in sites recently harvested. No formal assessment of regeneration was conducted, as provincial licensing requirements designate regeneration standards to be met and such an assessment is beyond the scope of this study. Rather, the site visit illustrated the application of forest management and policies in the field and identified how some of the potential impacts of harvest activities are mitigated.

3.3.2 Agricultural

A variety of agricultural activities occur in the IMCD, including cereal cropping, forage production, and livestock operations, each with its own potential impacts. The IMCD has a variety of programs including grassed runways, forage seeding, streambank stabilization and, shelterbelts to address common agricultural land use impacts. Using the site-specific application of these programs, common water and soil impacts were identified. In addition, site visits illustrated techniques that can be implemented to reduce agricultural impact on soil and water.

Site visits were conducted to three of these sites, revealing where streambank stabilization techniques and shelterbelt development have been applied. During interview visits (see section 3.4.5), two landowners provided tours of their land illustrating the impacts that arise from the natural water regime of the area, as the degree of streambank erosion over the landowner's lifetimes were explained. Despite the

seasonal impediments of a winter visit, land use impacts, such as river erosion were still visible. Additional visits to local rivers, indicated by landowners, such as Silver Creek and the Valley River, were conducted in the spring, following the interviews, further illustrating land use impacts arising from agricultural activity.

3.4 Land Use Mapping and Analysis

3.4.1 Intermountain Conservation District Land Use

The land base of the Intermountain Conservation District supports a variety of land types including, agricultural, pasture, rough graze, woodland, wetland, lakes, and urban (McGarry, 1987). As well, numerous land use activities occur within the lands of the District. Traditionally, agriculture and forestry have been practiced within and adjacent to the Intermountain Conservation District. However, over time the magnitude and methods of these activities have changed. With this long history of land use and with recent changes in forestry activity in the area, the potential for continued land use impacts exists.

With the use of remote sensing data, land use in the IMCD was identified for two time periods. Using orthophotography, land use in the early 1980's was mapped. Land use for 1994 was mapped using Landsat satellite imagery. A more detailed description of the data sources is found in Appendix One. Due to the differences in data sources, the maps could not be directly overlaid and compared. Instead, visual comparisons of the maps from these two time frames were used to observe land use changes that have occurred in the last ten years in the IMCD. Land use or land cover changes provided insight into the potential impacts the continued agricultural and forestry activity have had

on the landscape in the decade. Examining land use changes revealed trends in land use activity that need to be monitored to address future impacts of continued agriculture and forestry activity.

3.4.2 Harvest Site Mapping

Mapping of past, present, and proposed harvest blocks provided an illustration of where and when timber was and will be harvested in and adjacent to the Intermountain Conservation District by LP-Canada Limited and other quota holders in FML #3. The maps illustrated where land is in a harvested or regenerating state, identifying potential areas where forestry activities can impact the landscape (Appendix One describes the maps and data sources).

The distribution of harvest activity was also examined in reference to the percent of a watershed that is in a harvested state. As stated in the Environment Act License (1996), the licensee is to consult with Fisheries and Oceans Canada, Manitoba Natural Resources, Manitoba Environment and other organizations with expertise "to determine what percent of a forested watershed may be harvested without affecting streamflows, and what level of regeneration is needed on harvested blocks before additional harvesting may occur in the watershed" (17(i)). As a planning tool, this watershed analysis ensures that no one watershed is severely affected by harvest operations (LP-Canada Limited, 1999). Watershed analysis identified the degree to which each watershed is harvested and provided insight into potential areas where water resources may be impacted.

3.5 Landowner Interviews

Soil and water is impacted, to varying degrees, by both forestry and agricultural activities occurring in the IMCD. Some potential impacts arising from these activities can be similar including increased runoff and loss of habitat. Yet, because of time scale, magnitude, location, and, public awareness, the impacts arising from forestry can be viewed differently than the impacts of agriculture. To examine the impact of agriculture and forestry on the soil and water resources of the local area, an interview with local landowners throughout the ICMD was conducted.

A personally administered questionnaire, as used by Bruce (1983) and O'Grady (1990) in previous studies to assess local opinions and attitudes, formed the basis of the interview. Advantages of the personal interview were that the technique allowed for a high response rate and respondents had the ability to express their own understanding in their own terms (Patton, 1980). While the use of the personal interview technique limited the number of landowners that could be interviewed in the four-week interview period, the reliability of responses (O'Grady, 1980) obtained in personal interviews ensured that the information provided by the smaller sample was accurate and was reflective of local agricultural land user's opinion.

A standard open-ended questionnaire, created in consultation with representatives from the IMCD and LP-Canada Ltd., was used to interview landowners. This format allowed questions to be asked in a systematic way and reduced interview bias and effect. Interviews of this manner are highly focused so that the interviewee's time was carefully used. Respondents answered the same questions allowing for comparisons between responses, facilitating data organization and analysis (Patton, 1980).

The questionnaire (Appendix Two) was composed of three parts. Part one examined the background of the landowner determining the amount of land used, activities conducted on the land and the interviewee's involvement with forestry. Part two examined agriculture in three separate sections. Section one addressed the impacts of agriculture on the landscape, section two examined the mitigative techniques used by landowners and section three examined the impact of legislation and regulation on agricultural activity. Part three examined forestry in the same sections as agriculture – impacts, mitigation, and legislation and regulation- regarding both private and crown forest operations occurring in the local area.

3.5.1 Interviewee Selection

A modified snowball sampling method was used to obtain the interview sample. Snowball sampling is a non-probability sampling method often employed in field research with each person interviewed may be asked to suggest additional people for interviewing (Babbie, 1998). In this sample, only certain interviewees were asked to suggest other landowners to interview. Seven sub-districts compose the Intermountain Conservation District. A chairperson from each sub-district sits on the main board of the District. Each of these board members was interviewed, with the exception of the Garland/Point Sub-district. Each sub-district chair provided a list of landowners from that sub-district to be interviewed. To obtain an accurate representation of the various landowners of the IMCD and the activities that occur in the District, board members were directed to ensure that sub-district landowner lists were composed of landowners conducting different agricultural and forestry activities.

A total of 41 potential interview candidates were identified. Due to the willingness of landowners to participate and the availability of landowners thirty-eight landowners were interviewed. Eighteen grain producers, six livestock producers, twelve mixed producers, and two other landowners involved in other agricultural activities were interviewed. Fewer landowners in the IMCD are involved in commercial forest operations (less than two percent) and as such, only two landowners directly involved in commercial forest operations were interviewed. A minimum of three landowners and a maximum of six landowners from each sub-district were interviewed. Despite the unequal representation from each district in numbers, representation across the IMCD landscape itself was achieved, as number of landowners in upstream and downstream areas was equivalent.

3.5.2 Pre-test

Prior to the interview process, a pre-test of the interview was administered to ensure that questions were clear and concise, and that all respondents understood the question in the same context. Participants in the pre-test included a representative from the Intermountain Conservation District, a representative from Louisiana-Pacific Canada Limited, and two additional landowners. Representatives from the IMCD and LP-Canada Ltd. were included in the pre-test to ensure that questionnaire addressed the specific interests of each organization. As a result, minor adjustments were made in the questionnaire to clarify question meanings.

3.5.3 Data Analysis

With the small sample of landowners interviewed, the reliability of statistical tests such as independence could be questioned (Aaker et al, 1998) and therefore statistical tests were not used in the analysis of this data. Rather, the raw tabulated data was evaluated to reveal trends in the respondents' answers, illustrating common local opinion regarding forestry and agricultural land use activities occurring in the Intermountain Conservation District.

3.6 Expert Interviews

Informal interviews were also held with professionals involved in forestry and agricultural management. These interviews provided additional information regarding current forest and agricultural policies, practices, and management objectives, further clarifying the framework in which management decisions are made. Specifically, professionals were asked to provide insight into the application of policies addressing soil and water conservation in the respective land use activities. Forestry professionals interviewed included local contractors, LP-Canada Ltd. representatives including forest planners and the head regional biologist, and provincial government officials including members from the Forest Branch and the Environment Branch of the Department of Conservation. Agricultural professionals interviewed included regional and local representatives from the Prairie Farm Rehabilitation Administration, representatives from the IMCD and the Manitoba Conservation Districts Association, and local agricultural representatives.

Chapter 4.0 Results and Discussion

4.1 Introduction

The potential impacts of agriculture and forestry on the landscape are well documented (Carlyle, 1980, McGarry, 1987 and CCFM, 1997). Numerous steps can be taken to minimize this potential. The following provides insight into the jurisdictional rights and responsibilities of land users and how resource users manage forestry and agriculture activity. In addition, local insight into forestry and agricultural activities occurring in the area, obtained through personal interviews, is presented providing an "on the land" perspective of the activities. Forestry is also assessed through a watershed analysis and mapping of harvest sites. Finally, a picture of past and present land use activities occurring in IMCD is provided.

4.2 Rights, Jurisdiction and Legislation

Ownership outlines the rights and responsibilities of land and natural resource users. Depending upon the resource to be used, developed and or managed, specific instruments may or may not be in place to address the sustainable development of the resource and protect the landscape. The following examines how the rights and responsibilities of decision-makers affect how issues of sustainability are addressed.

4.2.1 Forestry

4.2.1.1 Provincially Owned Forests

Forestry conducted on provincial crown forests, such as that carried out by LP-Canada Ltd., has specific policies and practices that address environmental, economic, and, social aspects of forestry. Environmental impact assessment hearings, licensing

requirements, and the approval of annual or long-term cutting plans, all address the environmental impacts of forestry. Environmental licensing and forest use and management regulations outline specific standards that licensee must adhere to in their use and management of timber. SOPs, developed by LP-Canada Ltd., use techniques to meet license requirements, including soil and water conservation objectives.

Economic issues regarding provincial forest operations involve costs and benefits to the licensee and potential benefits and costs to the local areas. Basic costs to the licensee paid to the Crown are outlined in the forest management guidelines and regulations and can often be negotiated within forest management agreements. While no regulation specifically addresses the impact of forestry on the economics of the local area, these economic issues are often discussed in the environmental assessment hearings.

Similarly the social implications of forestry are often addressed in environmental assessment hearings. As commercial harvest continues, society's interest in forestry operations can be addressed through the local Stakeholder Advisory Committee (SAC), as required in LP-Canada Ltd.'s forest agreement, which has input into forest harvest management plans. Public forums are continually held to inform the public of forest operations and seek public input into management. In addition, the Company is pursing forest certification under a sustainable forest management system, such as that outlined by the Canadian Standards Association. This process will incorporate public involvement in decision-making and lead to the development of local level indicators with public consultation (see section 2.5.1.1), to assess the sustainability of local forest operations.

4.2.1.2. Private Forestry

The harvest of timber on private lands is at the discretion of individual landowners as no regulatory instruments direct the use or maintenance of forest stands on private land. Rather, how forests on private land are used is a reflection of individual values and interests. These interests can range from viewing forest stands as critical wildlife habitat, to an economic interest in the forest, to seeing the trees as a nuisance. As values vary between landowners, the use of trees on private land in one location can vary between owners over time.

Outside practices and policies that influence individual values and interests can affect forest use and management. Newly established local markets provide landowners with economic incentives to remove timber from the land to create additional pasture or productive land. To address the environmental impacts of these private land harvests, LP-Canada Ltd. has committed to visit private land sites from which timber is purchased. However, visiting all sites has proven difficult, many sites are visited after timber is purchased, while others are not visited at all (Bauman, 2000). In addition, the tax assessment policy for native brush actually promotes additional development of agriculture in these areas, further reducing natural biodiversity (PFRA, 1998).

The Manitoba Agri-Woodlot program, advocated by LP-Canada Ltd., provides landowners with an avenue to manage their timber on a sustained yield basis, protecting the forest resource and landscape, in addition to providing the landowner with economic benefit. The influence of this program has been limited because of the low economic value that landowners recognize in hardwood stands (Bauman, 2000). In order to

promote a more sustainable use of these forests, a change in values of these private timer stands is needed.

As is the case for the use of the Agri-Woodlot programs, a change in values regarding the impact that remaining forests have for habitat and environmental protection is needed to encourage landowners to retain forests and place more than ecological value in these forests. Until individual landowners place broader values on local forests and effective policies are developed, by companies or government, to encourage a broader scope of values, the sustainable use of forests on private land is at the sole discretion of landowners.

4.2.2 Agriculture

With the majority of agricultural lands privately owned, decisions regarding agriculture lands are made on an acre-by-acre basis by individual landowners. Despite the management authority that comes with ownership, activities on private land are becoming increasingly regulated to limit affects of activities on the surrounding area, as illustrated by stubble burning and drainage regulations now in place. To date, the influence of these regulations has been limited as little enforcement of these regulations occurs. Nuisance complaints provide an additional avenue for individuals to address impacts arising from other landowners. However, nuisance complaints cannot be used to address many of the impacts of agricultural activity on water flow and quality that affect landowners in IMCD.

As environmental regulations exist and are continually evolving, instruments that address social and economic aspects of agriculture need to be refocused or created to

assist producers to conform to environmental regulations. Even with conservation farming techniques, provincial and federal programs and, organizations like Conservation Districts, the application of soil and water conservation practices on the land varies. As revealed by the Standing Senate Committee on Agriculture (1992), "we have taken our ability to produce food for granted and until recently have no questioned the pressure we place on natural resources.... Farmers find themselves caught in the crossfire of consumer demands... and quality of the environment ... Farmers are being asked to respond to these challenges in a time of economic duress." When landowners face tough economic times due to commodity prices, weather, or other negative factors, conservation techniques are often removed and traditional techniques implemented to attempt to sustain the livelihood of landowners (Thiele, 1999). Individual interests of economic survival become the focus of landowners.

A broader impact of society into the agricultural arena is the purchasing power of consumers. Global markets can influence the type of crop grown and the techniques used, such as the use of chemicals, in agricultural operations (McRae et al., 2000). Addressing these changes in markets involves addition investment, often too expensive for local producers to implement. Unless producers react to these global requests, the viability of their individual operatios is questionable.

With the increase in environmental regulations and global market pressure individual farmers must begin to incorporate water and soil conservation techniques into their operations. Organization such as the IMCD provide avenues for assistance, recognizing that the sustainablity of agriculture is fundamental to the viability of rural livelihoods and Canada's economy.

4.3 Interrview Results

4.3.1 Introduction

During January and February 2000, thirty-eight landowners from the Intermountain Conservation District were interviewed, representing three agricultural land use activities. Acres of land used varied between 120 acres and 8640 acres with an average size of 1444 acres. Twenty-six landowners used and managed 1440 acres or less and fifteen landowners used less than 800 acres. Areas of land owned and land rented also varied, with an average of 841 acres owned and an average of 603 acres rented.

Landowners varied in their involvement in forestry activities on their own land or in the IMCD. Twenty-one landowners (55%) had no significant involvement in forestry operations and ten landowners (26%) were involved forestry activities on their land, cutting firewood or rails. Five landowners (13%) were familiar with commercial activities. Two landowners (5.3%) were involved in commercial operations, with one landowner owning and operating a small local sawmill and the other landowner harvesting softwood and hardwood in the Duck Mountain Provincial Forest (FMU 13).

4.3.2 Agriculture

4.3.2.1 Impacts

Table 4.1 provides a complete summary of impacts arising from agricultural activities as identified by interviewed landowners. The impact of water on the landscape is highlighted, as the top five impacts identified by landowners are a result of water flow on the landscape. These agricultural impacts also influence agriculture land use and management. Twenty-eight landowners (66%) indicated that at least one of the impacts

arising from agriculture is affecting the use and management of an their land. Table 4.2 provides a summary of these influences, highlighting the impact that water has on management.

Table 4.1: Identified Impacts Arising from Agriculture

Technique	Landowners
Soil Erosion	28 (74%)
Streambank deterioration	20 (54 %)
Increased runoff rates	20 (54 %)
Increased sedimentation downstream	17 (45%)
Non-point source pollution	13 (34%)
Soil Degradation	12 (32%)
Change in soil chemistry	12 (32%)
Decrease in air quality	12 (32 %)
Disruption, degradation or destruction of aquatic habitat	10 (26%)
Loss or removal of natural habitat	9 (24 %)
Odor	4 (11 %)
Point source pollution	3 (8%)
Other	
Beavers	3 (8%)
Alter grazing pattern of wildlife	2 (5%)
Historic clearing and use	1 (3%)
Maximization of yield and large machinery impact	1 (3%)
Water peaks affected	1 (3%)

Total respondents or n = 38

Table 4.2: Agricultural Impacts that Influence Land Use and Management

Impact	Landowners
Increased runoff	17 (61%)
Soil Erosion	13 (47%)
Streambank Deterioration	4 (14%)
Sedimentation downstream	3 (11%)
Beavers	1 (4%)
Pollution	1 (4%)

n = 28

The agricultural impacts identified were not all localized. Table 4.3 provides a summary of the downstream impacts of agricultural activity. While twenty-one landowners (56%) indicating that there are downstream impacts arising from agriculture,

only six landowners acknowledged their individual contribution to landscape scale impacts.

Table 4.3: Perceived Downstream Impacts of Agricultural Activity

Impact	Landowners
Increased runoff	9 (43%)
Sedimentation downstream	5 (24%)
Water quality	4 (19%)
Streambank deterioration	2 (10%)
Odor	2 (10%)
Chemical use	1 (5%)

n = 21

Twenty-five landowners (66%) are concerned about future impacts of agricultural activity. Concern is again focused on the potential future impacts of water on the landscape, including increased runoff and drainage requirements (Table 4.4). The future concern for pollution addresses both chemical pollution and the potential impact of regulations regarding livestock pollution directed at protecting the water resource.

Table 4.4: Future Agricultural Impacts that Landowners are Concerned of

Impact	Landowner
Increased runoff	14 (56 %)
Drainage	7 (28 %)
Pollution	6 (24 %)
Beavers	5 (20 %)
Increased sedimentation downstream	4 (16%)
Habitat removal	4 (16 %)

n = 25

Historically, agricultural activities, including drainage and the removal of natural vegetation, have significantly altered the landscape of the IMCD. Twenty-nine landowners (76%) have conducted one or more of these types of activities in the past ten years (Table 4.5). These operations were used to bring land in production (24%), to facilitate fieldwork (24%), to maintain land already in production (20 %), to reduce crop damage (7%), or a combination of these (24%). Twenty-four landowners (63%) plan to

conduct one or more of these activities in the future, further changing the natural landscape (Table 4.5).

Table 4.5: Past and Future Agricultural Activities

	Past	*Future*
Activity	**Landowners**	**Landowners**
Drainage	24 (83%)	14 (59%)
Brush cleared	11 (38%)	5 (21%)
Trees cleared	18 (62%)	11 (46%)
Break native pasture	6 (21%)	4 (17%)
	n = 29	n = 24

4.3.2.2 Mitigation

Table 4.6 illustrates landowner use of the available mitigative or soil and water conservation techniques in the IMCD.

Table 4.6: Mitigation Techniques used by Landowners

Technique	Landowner Use
Crop rotation	33 (88%)
Retention of cover for habitat	31 (82%)
Forage seeding	29 (77%)
Grassed runways	28 (74 %)
Maintain vegetated buffer zones	28 (74%)
Reduce tillage	27 (71%)
Shelterbelts	20 (53%)
Retention of wetlands	20 (53%)
Restoration of marginal land for habitat	15 (40%)
Streambank stabilization	12 (32%)
Conservation Fencing	8 (21%)
Water control structures	5 (13%)
Winter crops	4 (11%)
Other	
Maintenance of beavers on property	1 (3%)
No burning of straw	1 (3%)
Minimal use of chemicals	1 (3%)
Clean creek for fish habitat	1 (3%)
Minimize clearing	1 (3%)
Maintenance of timber on crown land	1 (3%)
Maintain drains	1 (3%)
Maintenance of trees	1 (3%)
	n = 38

For easier discussion, the mitigative techniques are examined in four separate categories - residue management, soil loss, riparian management and habitat management.

In reference to residue management, of the twenty-one landowners that inconsistently apply one or more residue management techniques (crop rotation, reduced tillage and winter crops), 10 landowners (48%) identified rotational schemes as the cause of inconsistency. Six landowners identified economic costs as the cause, and two landowners indicated skepticism toward technique effectiveness. Confidence in traditional techniques, weather, equipment needs, and the present control of erosion were each identified by one landowner, as a source of inconsistency in residue management.

Two specific techniques address soil loss, shelterbelts and grassed runways. Of the twenty landowners that maintain shelterbelts, nine landowners (24%) plan an expansion of shelterbelts, while no landowner plans any removal of shelterbelts. Of the eleven landowners not utilizing grassed runways, the majority (nine landowners (82%)) indicated that the technique is use because it is not needed.

Five specific techniques that mitigate agricultural impacts on riparian areas were examined, conservation fencing, streambank stabilization techniques, buffer zones, wetland retention, and water control structures. Conservation fencing is a technique specific to livestock producers. Eight landowners (42% of livestock owners) used conservation fencing. Of the eleven other livestock owners not using conservation fencing, nine (82%) felt that livestock did minimal damage to waterways and two provided alternative water sources for livestock, illustrating local landowner opinion that livestock does not impact water quality.

Streambank stabilization techniques are not used by 26 landowners (68%). Of these landowners, two landowners had no watercourses on their property. Of the remaining twenty-four landowners, eighteen landowners (75%) indicated that these techniques are not needed. Cost was cited by four landowners (15%), one landowner cited damage to the natural buffer and one landowner cited procrastination as reasons for not using these techniques.

Buffers are maintained by all but nine landowners (24%). Two of these landowners do not have waterways. Of the remaining seven landowners, the most common reason for removal of buffers, cited by three landowners, was that buffers are not necessary. Land is required for production, buffers are not effective, beaver impacts, and the elimination of potential weed species were each cited by one landowner as reasoning.

Twenty landowners maintain wetland areas, while thirteen landowners do not have wetland areas to preserve. Of the five landowners (13%) removing wetlands, two landowners indicated that the land is required for production. One landowner is restoring a previously drained wetland, one landowner indicated that the removal of small wetland areas facilitates fieldwork and one landowner indicated the wetlands that are removed are the result of beavers. Increasingly, wetlands are being conserved.

Only five landowners (13%) use water control structures. Twenty-one landowners (55%) indicated that techniques are not required. Four landowners indicated that structures are too costly, three landowners cited the effectiveness of the structures and two landowners cited beaver impacts as reasons for not using control structures. One

landowner was not aware of the options available, one landowner cited the water flow problem is temporary and one landowner has future plans for water control structures.

Only five landowners (13%) do not maintain habitat in some form. Thirty-one landowners (82%) have specifically left habitat for wildlife, with fifteen landowners (39%) letting marginal land return to natural state for wildlife. Reasons for not maintaining habitat included the need of productive land (three landowners), it facilitates field work (one landowner), and maintenance of previously cleared land (one landowner).

Conservation techniques, such as those indicated above, are not uniformly applied, in similar circumstances, by all landowners. The use of techniques is a personal decision. Five landowners (13%) expressed that no incentive would promote the additional use of techniques, as problems are out of the control of landowners and only "large scale government planning and government assistance" will alleviate the impacts of water on the landscape (Table 4.7). Twenty-six landowners (79%) identified more than one incentive, illustrating that implementing additional techniques is a complicated decision, requiring adequate personal incentive.

Table 4.7: Incentives for Conservation Techniques

Incentive	Landowners
Cost shared programs	21 (64%)
Tax incentives	9 (24%)
Program availability	9 (24%)
Education	9 (24%)
Own conservation ethic	4 (11%)
Direct need	3 (8%)
Economic benefit	3 (8%)

n = 33

Local organizations have been developed to address soil and water conservation. The majority of the organizations involve citizens from various towns and municipalities,

illustrating the recognition of the need to collectively manage the landscape on a larger scale. Table 4.8 illustrates interviewee' familiarity of the local conservation organizations.

Table 4.8: Familiarity of Local Conservation Organizations

Organization	Landowner
Intermountain Conservation District	32 (84%)
Dauphin Lake Advisory Board	23 (61%)
Duck Mountain Conservation Group	20 (53%)
Northwest Soil Management Association	1 (2.6%)
Lake Dauphin Fishery Enhancement Group	1 (2.6%)
Grandview Game and Fish	1 (2.6%)
Rocky Mountain Elk Foundation	1 (2.6%)
Lake Winnipegosis Advisory Board	1 (2.6%)
Swan Valley Soils and Management Co-op	1 (2.6%)

n = 38

4.2.2.3 Legislation and Regulation

Nineteen landowners (50%) indicated that legislative instruments have no impact on their operations. "Ignorance of regulations", "lack of enforcement", and "impatience with red tape" were cited as reasons for the limited effectiveness of regulations. Of the eleven landowners (29%) currently affected by regulation, eight landowners identified the Water Rights Act and drainage regulations as the current source of influence. Three landowners identified stubble-burning regulations and one landowner cited keeping up with regulation changes an impact. Eight landowners (21%) are concerned with potential impacts of future regulation. The potential requirement for conservation fencing was cited by seven of the eight landowners. One landowner is concerned of endangered species legislation and the impacts that this may have on cover management.

While all thirty-eight landowners were familiar with the land assessment process, only four (11%) indicated the process affected land use. Two landowners indicated that

all marginal land was used for pasture. One landowner indicated that land is not "improved" due to tax differences and one landowner indicated that since all land taxed, all acres are used.

4.3.3 Forestry Impacts

4.3.3.1 Impacts

Table 4.9 provides a summary of forestry impacts identified and perceived by local landowners. Only 37 landowners chose to answer questions regarding forestry impacts, as one landowner, new to the area, felt unable to make valid observations.

Table 4.9: Perceived Forestry Impacts identified by Landowners

Impact	Landowners
Disruption, degradation or destruction of habitat	31 (84%)
Disruption or loss of wildlife dependent upon forest habitat	29 (78%)
Increased runoff rates	27 (73%)
Soil erosion	24 (65%)
Increased sedimentation downstream	24 (65%)
Reduction in absorptive capacity of soil	22 (60%)
Reduction in water quality arising from sediment load	19 (51%)
Disruption, degradation or destruction of aquatic habitat	18 (49%)
Organic matter loss	14 (37%)
Soil compaction	2 (5%)
Other	
Increased habitat for some species	5 (14%)
Beaver forestry	1 (3%)
Mill impacts	1 (3%)
Wind impacts	2 (3%)
Renewable resource quality	1 (3%)
Renewable resource species composition	1 (3%)
Employment benefit	1 (3%)
Control of poplar	1 (3%)
Runoff impact on rural roads and infrastructure	1 (3%)

n = 37

Landowners were also asked to identify impacts on forestry on Crown land and on private land downstream (Table 4.10). As forestry continues in the area, twenty-one

landowners (57%) are concerned about future forestry impacts, as one landowner indicated "only time will tell if and how forestry will impact the local landscape". Table 4.10 illustrates concern for future impacts.

Table 4.10: Perceived Forestry Impacts on Provincial Lands, Downstream and in the Future identified by Landowners

Impacts	Landowners		
	Provincial Land Impacts	***Downstream Impacts***	***Future Impacts***
Increased runoff rates	20 (54%)	18 (49%)	21 (57%)
Disruption, degradation or destruction of habitat	27 (73%)	10 (27%)	15 (41%)
Soil erosion	19 (51%)	11 (30%)	13 (35%)
Reduction in absorptive capacity of soil	19 (51%)	11 (30%)	9 (24%)
Increased sedimentation downstream	19 (51%)	14 (38%)	6 (16%)
Reduction in water quality arising from sediment load	26 (70%)	9 (24%)	5 (14%)
Disruption or loss of wildlife dependent upon forest habitat	16 (43%)	8 (22%)	15 (41%)
Disruption, degradation or destruction of aquatic habitat	17 (46%)	7 (19%)	5 (14%)
Organic matter loss	7 (19%)	3 (8%)	3 (8%)
Soil compaction	2 (5%)	1 (3%)	0

n = 37

4.3.3.2 Mitigation

Table 4.11 illustrates landowner familiarity with techniques that can be used to mitigate impacts arising from forestry. All thirty-eight landowners were aware of the regeneration of cut sites through natural regeneration and tree planting. Thirty-two landowners (84%) were familiar with harvesting sites in appropriate seasons as dictated by the sensitivity of terrain. Of the remaining mitigative techniques, at least twenty-two landowners (58%) were familiar with each technique except for landscaping and the re-vegetation of newly constructed roads. Twenty-seven landowners (71%) were familiar

with seven or more techniques, and only four landowners were familiar with less than four techniques, illustrating a relatively strong local knowledge of techniques used to mitigate forest impacts.

Table 4.11: Landowner Familiarity with Forestry Mitigation Techniques

Technique	Landowners
Regeneration through natural growth and or tree planting	38 (100%)
Harvest in appropriate seasons	32 (84%)
Cutting and other activities follow provincial guidelines	31 (82%)
Retention of non-commercially useful trees	30 (79%)
Decommissioning of roads no longer needed	29 (76%)
Maintenance of understory on harvesting sites	28 (74%)
Buffer zones around riparian areas and nesting sites	28 (74%)
Pre-harvest surveys	23 (61%)
Mimicking fire by making cuts irregular and leaving debris	22 (58%)
Designated pathways for machinery in sensitive areas	22 (58%)
Landscaping and vegetation of constructed roads	15 (40%)
Other	
Protection of unharvested trees	1 (3%)
Selective cutting	1 (3%)
Oil and gas handling and storage	1 (3%)
Limited area cut in watershed	1 (3%)

n = 38

Twenty-eight landowners (74%) felt that mitigative techniques used by foresters on public forested lands are effective, minimizing impacts arising from forestry when techniques are used appropriately. The actual application of techniques, the rate of cut, waterflow impacts, long-term impacts and, the perception of forestry companies were concerns identified by the ten landowners (26%) not confident in the mitigative techniques. "Techniques can only be effective if they are used" was a common sentiment shared between landowners confident and not confident in the techniques.

LP- Canada Ltd. has developed a Stakeholder Advisory Committee to address local interests in the local forests. Twenty-seven landowners (71%) were unaware of the

committee, but 96% of these landowners felt that such a committee would be effective. Of the eleven landowners familiar with the stakeholder advisory committee, three landowners (27%) found the committee effective, and seven landowners (64%) were unsure. One landowner found the committee ineffective as all the information that the Committee is to comment on comes from LP-Canada Ltd themselves, rather than neutral third parties.

4.3.3.3 Legislation and Regulation

The use of Crown timber falls under a variety of regulatory instruments. Table 4.12 describes landowner familiarity or rather lack of familiarity with these instruments. Only two interviewees (5%) were familiar with all five instruments, twelve landowners (32%) were familiar with only one technique, and sixteen landowners (42%) were not familiar with any one of the legislative instruments.

Table 4.12: Landowner Familiarity of the Regulatory Instruments regarding Forest Operations on Crown Land

Regulatory Instrument	Landowners
Forest Management Agreements and Licenses	19 (50%)
Environmental Licenses	10 (26%)
Environmental Assessment	8 (21%)
Forest Use and Management Guidelines	7 (18%)
The Forest Act	3 (5%)

n = 38

Environmental assessment hearings were held to examine the impact of forestry operations and mill operations. Thirty-four landowners (90%) were familiar the hearings, with six landowners of these landowners participating in the hearings. Of the thirty-two landowners (84%) not participating, no interest was the most common reason for not

participating cited by ten landowners. Little direct impact was identified by seven landowners, representation by other interests was indicated by five landowners, and the hearings were inconvenient was cited by four landowners for non-participation. One landowner was new to the area and did not participate, and one landowner felt the hearings were ineffective.

Responsibility for local provincial Crown forest management has fallen to Louisiana-Pacific Canada Limited. Table 4.13 reveals public opinion regarding the management. The majority of landowners (47%) felt that management could not yet be assessed and were neutral regarding management. In addition with six landowners unsure of management and five landowners feeling that management was ineffective, concern regarding LP-Canada Ltd.'s forest management is evident.

Table 4.13: Public Opinion Regarding Forest Management in FML # 3

Opinion	Landowners
Neutral	18 (47%)
Positive	9 (24%)
Unsure	6 (16%)
Negative	5 (13%)

n = 38

Thirty landowners (79%) identified areas for improvements in forest management. Suggestions regarding cut blocks and cut regimes were the most common (24 landowners or 80%). The use of debris (seven landowners or 25%) and access for local contractors and timber users (four landowners or 17%) illustrated the concern for efficient use of timber resources. Six individuals (20%) identified ensuring that regulations were followed, suggesting skepticism towards forest management. Input of public opinion (four landowners or 17%) and improvements on private land (one landowner or 3%) were also suggested.

Forestry operations are regulated in different manners depending on land ownership and operation type. More confidence is placed on private forest operations with twenty-five landowners indicating that private forest operations are sustainable (Table 4.14). Despite the increased confidence, local opinion indicate that landowners are concerned about the sustainability of both commercial forest operations (47%) and private operations (34 %).

Table 4.14: Landowner Opinion of Sustainability of Commercial and Private Forest Operations and Management

	Landowners	
Opinion	**Commercial Operations**	**Private Operations**
Yes	20 (53%)	25 (66%)
No	10 (26%)	8 (21%)
Unsure	8 (21%)	5 (13%)

n = 38

Concerns regarding commercial forest operations include the accuracy of the Annual Allowable Cut calculation, change in park boundaries to accommodate harvest, renewable resource quality, and LP-Canada's commitment to stay in the area. Concern regarding private harvest includes the fact that "little forests remain on the private land" and that conservation of the remaining land can be change with ownership. Landowners view the removal of the remaining trees on private land in two prominent ways. The small amount of forest harvested can cause little additional impact or it is essential to protect remaining trees.

4.3.4 Availability of Local Timber

With the development of a local market for hardwood timber, an additional use for timber cleared from private land has arisen. In the past, trees harvested were cut on a

small-scale using small-scale forestry equipment (12 landowners or 60%), pushed over and disposed of (6 landowners or 30%) and or a combination of these techniques including burning (2 landowners or 10%). Of trees cut for wood products nine landowners (56%) used the timber privately, three landowners (19%) sold wood commercially and four landowners (20%) sold to both private and commercial users.

Nineteen landowners (50%) have commercially viable aspen or poplar on their property. Seven landowners (37%) indicated that nothing would influence the removal of trees from their property. The need to increase productive land area was the most commonly identified influence to remove timber, cited by three landowners of the twelve landowners (25%)that would harvest private timber. Secondary sources of income was identified by two landowners (17%), and the availability of local markets, the facilitation of field work, and the removal of old trees before tree rot occurs were each identified by one landowner as an influence. Four landowners (33%) expressed a combination of these factors would influence harvest decisions, illustrating that harvest of trees requires incentives specific to individual landowners.

Numerous options for forest management are available to the twelve landowners that will potentially harvest timber. Two landowners indicated that while they may eventually be influenced to remove trees in the future, no present plans for harvest exist. Of the remaining ten landowners, 30% indicated that to remove timber on their land they would use a contractor to plan and harvest trees, 20% would implement a woodlot program, 10% would harvest the timber without assistance, and 10% would consult a forestry representative. Three landowners (30%) would use a combination of these options to harvest their timber.

Of the ten landowners that do or plan to harvest timber on their own lands, 60% would be interested in receiving assistance. General assistance, such as how to get started or available options, is required by three landowners. Two landowners would require specific information including appropriate harvest rates. The other landowner would require both specific and general information. Six landowners were familiar that information such as this is available from Louisiana-Pacific Canada Limited to promote the development of woodlot operations.

4.3.5 Interview Analysis

During the course of interviews, obvious trends in the opinions of landowners developed. First an overall concern for the impact of excess water on the landscape is evident. Runoff naturally arises from the Manitoba Escarpment during periods of snowmelt or intense rainfall. Agricultural activity has contributed and continues to contribute to the problems that arise from the escarpment. Upland removal of cover and the construction of drains have enhanced the impact of runoff on downstream areas. As one landowner stated, "we are all guilty of wanting water off our land as quickly as possible." Yet, while the impacts of past agricultural activities are well known and with little land available for future expansion, landowners have less concern for the impact of agricultural activities on runoff. Rather, concern has been focused on the expanding forestry industry in the area, especially in the Duck Mountains. Increased harvest on Escarpment slopes and in the headwaters and upstream areas is seen as a potential to increase runoff rates and volumes reaching the lower agricultural lands. The potential problem was described by one landowner, as "No longer is there a delay between

Escarpment melt and low-land area melt. Historically, melt water arising from the Escarpment would reach low-lying areas after melt water from these low areas had flowed. Today, all melt water must be transported by natural or artificial drains at the same time, often exceeding the capacity of drains resulting in flooding and or erosion".

A second trend in the data is the difference between the impact of regulation on private and public land, more specifically agriculture and forestry. Until recently, little regulation was directed at agricultural activities occurring on private lands. Even with increased regulation, such as drainage regulations, few landowners are significantly impacted by regulation at the present. Potential impact is dependent upon the development of future regulation and increased enforcement of current legislation. In addition, increasing regulation is viewed unfavorably. "Regulations are made by individuals who have no local knowledge of agricultural operations. How can someone in "the City" tell us how to farm?", was a comment from one landowner.

Unlike agriculture, which primarily occurs on private land in the IMCD, the majority of forestry activity occurs on public lands. Eighty-five percent of LP-Canada Ltd.'s fiber requirements are met through harvest on Crown land. Landowners recognized that numerous policies and practices were available to regulate and mitigate forest operations on Crown land. Numerous approvals are also required to actively harvest crown timber. Standards and techniques must be adhered to if foresters are to continue to conduct their operations without penalty. In contrast, forest harvest on private land lacks these detailed instruments. Rather landowners are free to remove timber from their landscape in any manner. Despite the regulations directing Crown timber, skepticism regarding the effectiveness of forestry regulations exists. As indicated by one

landowner, common local perception is that "resource users (commercial foresters) are making the rules in which they operate". Changes in provincial forest boundaries and the lack of harvesting rights for local residents are seen by local landowners as the forest companies control over the use of the resources, rather than government controlling harvest of Crown timber.

The difference in how regulations are seen in regards to Crown forest operations and agricultural operations illustrates the difference in how agriculture and forestry activities themselves are viewed. Agriculture and forestry have been practiced in the IMCD since settlement, shaping the landscape that is seen today. While both activities have impacted the landscape, landowners are more concerned with the future impacts of forestry rather than the individual impact of agriculture. The fact that many agricultural producers do not see a cumulative affect from agricultural activities causes this difference. Landowners appear to recognize the cumulative impact of forestry more easily. As well, landowners also have more control over the local agricultural land use. Common sentiment indicates that if soil and water resources are harmed it is the agricultural producers themselves that will be impacted the most. Foresters and forest companies will not be impacted. In addition, skepticism regarding the commitment of LP-Canada Ltd. to stay in the local area results in distrust regarding the Company's commitment to ensure that appropriate measures are taken to protect forests resources including soil and water. As one landowner summarizes it, "Why would they spend all the money to protect the resource when they are leaving in twenty years?".

Uncertainty regarding forestry operation and forest management is the fourth trend in the data. The majority of landowners were unfamiliar with many of the

provincial instruments used to direct forest operations on Crown land. As well, while the majority of landowners were familiar with the mitigative techniques addressing potential impacts of forestry, a portion of these landowners were unsure that these techniques were actually used. Concern for the long-term status of the LP-Canada Ltd. was also common. Among the landowners this uncertainty and skepticism has arisen from lack of knowledge, the word of mouth of neighbors, and personal experience at cut sites. The need to educate local residents regarding forestry activity and management is evident as many of the means of public participation are unknown or unused. Many landowners felt "unqualified" to participate, as they were unfamiliar with forest operations. The fact that the majority of landowners had suggestions regarding forest management, such as cut block size and location and the use of slash illustrates that local residents would like to see improvements to forest operations and management. Incorporation of these suggestions will reduce the uncertainty regarding the effectiveness of regulations and the Company's commitment to the area.

Some degree of concern regarding forest operations can be seen from all landowners, including those landowners actively involved in forestry activities. While the source of skepticism and uncertainty may vary, common concern for forest operations on Crown and public lands illustrates the importance placed in the remaining forested lands located in the District. While no landowner advocated the elimination of forest operations in the area, numerous landowners gave examples showing that that many of the benefits of the industry are not remaining in the local area. If impacts continue and or develop, more benefits must remain in the local IMCD area.

While concern for the impact of forestry is evident, the lack of participation in available arenas addressing local forest operations is also evident and is the sixth evident trend. Only six landowners participated in the public environmental hearings addressing LP-Canada Ltd.'s forest operations in the area. At that time, the majority of landowners were not keenly interested in forestry development. "The operations had no economic impact on my individual livelihood" was a common sentiment of landowners. As well, some landowners felt that they could not effectively participate. And at least one landowner felt any participation in the hearings was futile as "you can't fight city hall", and the decision to allow forestry activity had already been made. Concern is evolving today. Current avenues for participation are available through local public forums and through the local Stakeholder Advisory Committee. Again many landowners are unaware of the avenues or feel that input into these avenues have limited impact on the decisions made. "How can valid decisions be made when all the information is provided from the Forest Company" and "Why is local expertise of the area not used?" were two comments of local landowners regarding the SAC. As local stakeholders have the most to gain from responsible forest management and the most to lose from unsustainable forest practices (CCFM, 1997), public participation in available arenas must increase. However for participation to increase, an obvious influence of that participation on decision outcomes is necessary. One landowner involved in an organization that is a member of the SAC indicates that the process "can be effective at specific times and ineffective at others". A more transparent process is required to reduce the skepticism regarding the decision-making process and increase participation.

A final trend is the existence of the conservation ethic and the fact that this conservation ethic is often subdued because of outside influences, such as economic considerations. Landowners often want to implement conservation-based techniques, but economics of the agricultural industry often hinder the implementation. "Economics is the major influence on land use and management" and "economics are the cause of many of the agricultural land use impacts" were common comments from landowners. Similarly, economics is also seen to impact conservation regarding forestry. Acknowledged in the interview is the fact that large-scale clear-cut forest operations, which are often viewed skeptically, provide the greatest economic advantage to the Company. Selective cutting, advocated by the majority of landowners, while more environmentally friendly is not economically feasible for the Company. As one landowner indicated "conservation is costly" and "economics limit the practicality of using conservation techniques".

4.4 Forest Harvest

4.4.1 Watershed Analysis

As required by Environmental License 2191E, LP-Canada Ltd. is to "limit the area in a watershed which is in a harvested state and not sufficiently regenerated state" (17(ii). This aspect of the environment license requirement addresses the fact that the potential impacts of harvesting on water regimes, particularly water quality and peak flow rates, are highest immediately after harvest, primarily due to the lack of vegetative cover. LP-Canada Ltd. conducts an analysis of harvest activities to monitor the amount of productive forest harvested within a single watershed. Acting upon recommendations

arising from Environmental Assessment Hearings, a maximum limit of 20-25% of productive forest may be in a harvested state within a single watershed. In addition, LP-Canada Ltd., in consultation with the Department of Fisheries and Oceans, is conducting a review of scientific literature to determine if the current maximum level is appropriate relative to forest type, soil conditions and local topography in west-central Manitoba.

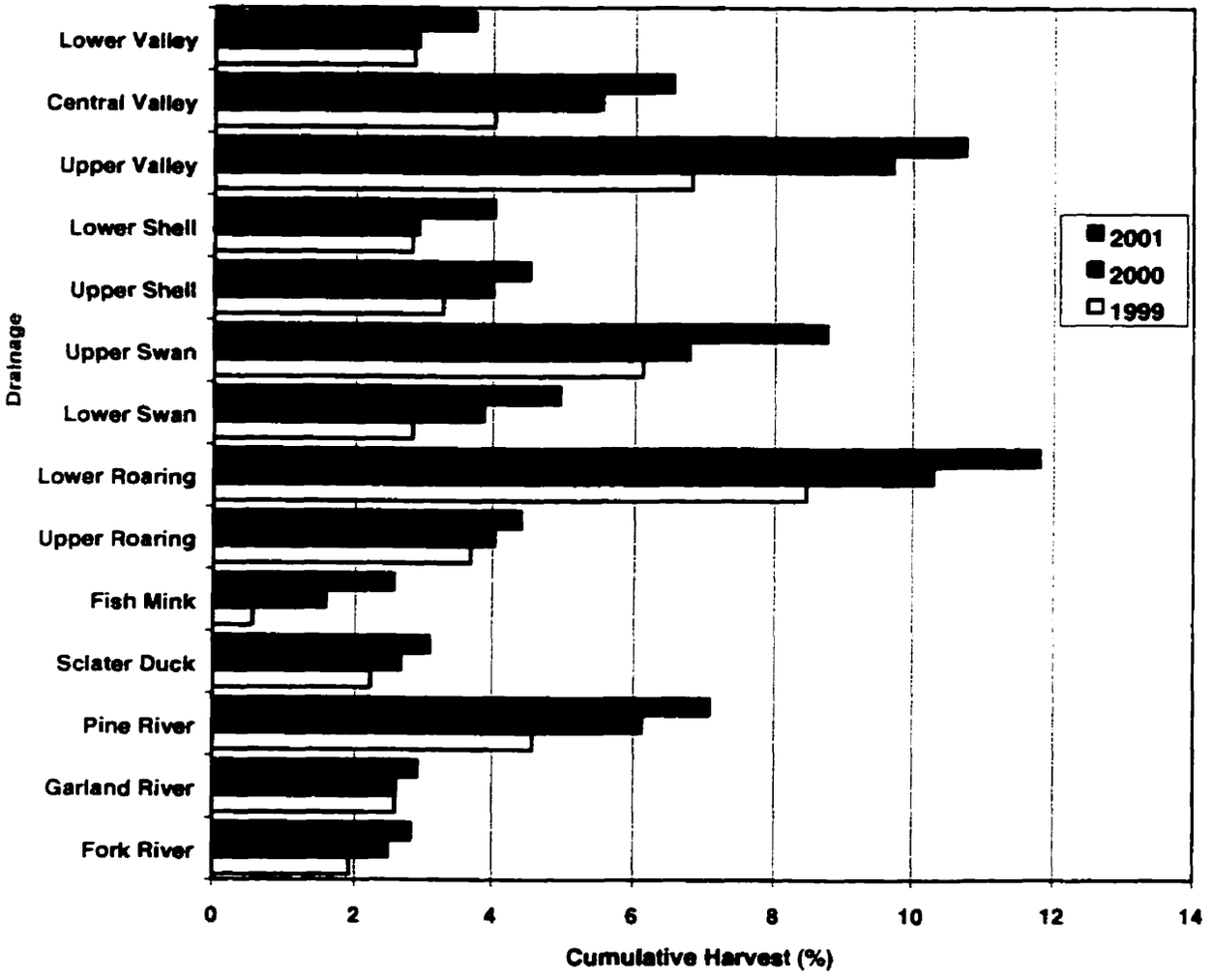

Figure 5: Watershed Analysis: Percentage of Productive Forest in a harvested state or proposed to be harvested by drainage basin and year in FML #3. *LP-Canada Ltd. Standard Operating Procedures, 1999-2001

The percent of productive forest in a harvested state or proposed to be in a harvested state in each watershed of FML # 3 in 1999, 2000 and 2001 (LP-Canada Ltd., Annual Operating Plan, 1999-2001) is presented in Figure 5. The bars represent yearly cumulative percentages of productive forest in a harvested state. Yearly changes in harvest percentages within a single watershed are a result of that year's total area harvested in the watershed minus the area of previously harvested sites that reach a regenerated state (five years post harvest for hardwood and fifteen years post harvest for softwood) that year within that watershed. Thus a single harvested hardwood block would contribute the yearly cumulative level of harvest in a single basin for five years until the vegetation has sufficiently regenerated and the block is no longer considered to be in a harvested state. Similarly, a harvested softwood area would contribute to the cumulative level of harvest from the year of harvest and each year thereafter for the next fourteen years, when that area reaches fifteen years post harvest and is sufficiently regenerated.

Figure 5 identifies fourteen watersheds within FML # 3. Of these watersheds, eight are located within the IMCD - the Upper Valley Basin, the Central Valley Basin, the Lower Valley, the Fish Mink Basin, the Sclater Duck Basin, the Pine River Basin, the Garland River Basin, and the Fork River Basin. Of these basins, the highest cumulative harvest is scheduled n the Upper Valley Basin (10.8% in 2001) and the lowest cumulative harvest is scheduled n the Fork River Basin (2.8% in 2001).

Within the last three years the percentage of cumulative harvest within these watershed has increased, reflective of the continued and increased forestry activity occurring in the area. From 1999 to 2001, the largest increase in cumulative harvest

percent by watersheds within the IMCD will occur in the Upper Valley Basin with an increase of 4 %. An increase of 2.5 % is expected in the Central Valley Basin and the Pine River Basin. The smallest increase will occur in the Garland River Basin at 0.3%. With the increases expected for the Upper and Central Valley Basins potential impact on the local water regime is heightened for these areas. Monitoring the harvest levels in these watersheds to ensure the productive forest does not exceed 25% is thought to be an effective means of mitigating potential water quality impacts associated with forest harvest activities.

As harvest continues, these cumulative percentages will reach a plateau at a level below the 20-25 % level, as past harvested sites reach a sufficiently regenerated state (Epp, 1999). When the plateau is reached and at what exact percent of productive forest in a harvested state will vary between watersheds. Watershed analysis and maximum allowable harvest within any single watershed are one method used by LP-Canada Ltd. to minimize the effect of harvest operations on peak flow rates, associated with various levels of harvest. However, other factors can influence water quality and water flow in a harvested area, such as the location and extent of wetland areas that can act as natural buffers and storage areas for runoff and discharge, the extent of lakes and other watercourses within the watershed that can receive potential impacts, the amount and effect of beaver activity, and variations in annual weather events. As such, watershed analysis provides one approach to monitor the level of harvest within a watershed to limit potential impacts on the local water regime.

It must be noted that watershed analysis is only one component of the many criteria considered when developing forest management plans and determining which

areas should be harvested. Other criteria include, but are not limited to, wildlife habitat and access management considerations, stand type and age distribution objective and annual allowable cut determination by FMU as set by the Province of Manitoba. These criteria are essential to ensure the management of local forests addresses all values of the forest ecosystem, not just the timber resource.

4.4.2 Projected Harvest

An annual harvest of 1,100,000 cubic meters of hardwood from FML # 3 has been allocated to LP-Canada Ltd. in its Forest Management Agreement No.03. (1994). Current volume requirements of LP-Canada Ltd.'s OSB Mill have resulted in annual harvests below this annual allowable cut. In 1999-2000 the mill will require 800,000 m^3 of Trembling Aspen and Balsam Poplar with 70% of this fiber supplied from open Crown, leased Crown and private land within FML # 3. The remaining 30% is to be acquired from outside sources including FMUs 12 and 14 and private land outside of FML #3 (LP-Canada Ltd., 1999). Table 4.15 provides volumes for individual forest management units on open Crown land for all quota holders in FML # 3.

Table 4.15: Harvest Volume by Forest Management Units for 1999-2000 of Open Crown Land in FML # 3

FMU	HARDWOOD		SOFTWOOD	
	VOLUME (M3)	% OF AAC	VOLUME (M3)	% OF AAC
10	6,586	82%	-	0%
11	33,755	62%	3,628	22%
13	407,104	81%	221,949	111%
FML # 3 TOTAL	447,445	79%	225,577	92%

*LP-Canada Limited Annual Operating Plan 1999-2000

Figure 4.16 provides LP-Canada Ltd. annual proposed harvest levels as outlined in LP-Canada Ltd.'s Ten-Year Forest Management Plan, which are under provincial ACC levels.

Table 4.16: Harvest Volume by Forest Management Units

Forest Management Unit	Projected Volume m^3/y
10	196 650
11	146 482
13	446 180

• LP-Canada Ten Year Forest Management Plan, 1996

As illustrated, the majority of harvest (56.5 %) by LP-Canada Limited in FML #13 is carried out in FMU 13, which encompasses Duck Mountain Provincial Forest. 18.6 % occurs in FMU 11 and 24.9 % in FMU 10, which includes the Intermountain Conservation District. Yearly harvest volumes may not equate to these exact percentages and values, but range around these projected volumes.

Recently, LP-Canada Ltd. has begun to incorporate birch in its annual harvest volumes, prompting local interest. Many local quota holders have an interest in birch as a source of fuel wood. This change in activity has contributed to local skepticism regarding the management control that LP-Canada Ltd. has in regards to access to timber in DMPF. While the Company did not use birch in previous years, birch was included in the hardwood ACC allocated to LP-Canada Ltd. and birch was to be used or the province would be re-allocate the resource (Donnelly, 2000). Until recently the plant was unable to incorporate birch into the final oriented strand board production. With technological development, the Company is now using up to 10% birch, along with 70% aspen and

20% balsam poplar. With the incorporation of birch in harvest activities, a potential conflict may arise between local birch quota holders. It is essential that LP-Canada Ltd. ensures that these birch quota holders have adequate access to fiber, addressing others interests in the local forests.

Recognized in the forest agreement, is that in order for LP-Canada to meet fiber requirements, timber from private land must be acquired (Department of Natural Resources Forestry Branch, 1994). Approximately fifteen percent of the harvest volume used by LP-Canada is from private land. Due to large transportation costs, the majority of wood from private lands arises from local sources. In an average year, approximately 40,000 cubic meters of fiber is purchased from FMU 10, with the majority coming from lands around the Swan River area, including the IMCD (Bauman, 2000). In 1999, only 28,000 cubic meters was purchased from private sources in FMU 10, illustrating the large variability in annual supply.

While volumes from specific areas vary yearly, it is expected that private harvest will continue to supply LP-Canada with 15 % of the Company's fiber requirements. As such, it is probable that landowners will continue to clear land with the availability of this local market reducing remaining tree cover on private land. While LP-Canada will purchase private timber, the Company indicates that it has no direct influence on the landowner decisions to permanently remove stands (Bauman, 2000). It is ultimately the private landowner's decision to clear stands and ultimately the owners decision whether to regenerate the site or not. LP-Canada has committed to the Agri-Woodlot Program and will provide landowners with assistance in forest management and the sustainable development of private woodlots. However, such programs will not be effective until

landowners place different values in local aspen stands, including economics and the importance of habitat.

The remaining 85% of fiber is obtained from Crown Land in FML # 3, primarily from FMU 13 or DMPF. As LP-Canada Ltd. has management responsibility for all harvest operations in FML # 3, the following maps include harvest by all quota holders, illustrating total harvest of hardwood and softwood on Crown land in the area (Refer to Table 4.15). Quota holders other than LP-Canada carry out the harvest that occurs in Duck Mountain Provincial Park located within the DMPF.

Figure 6 illustrates total harvest from 1996 to 1998 on Crown lands. Total planned harvest for Crown forests from 1999-2001 is presented in Figure 7. Figure 8 provides a cumulative picture of the harvest of Crown forests from 1996-2001. While harvest will occur throughout DMPF, a larger degree of harvest occurs and is planned for the southern and eastern portions of the forest within or adjacent to the IMCD. Harvest carried out on these southern and eastern slopes has the potential to impact waterflow onto the lands of the IMCD. Specifically, areas in the Valley River watershed, located in areas of the largest harvest, have an increased potential for impacts on the area's water regime. Thus, these areas should be monitored to differentiate if impacts are arising from harvest.

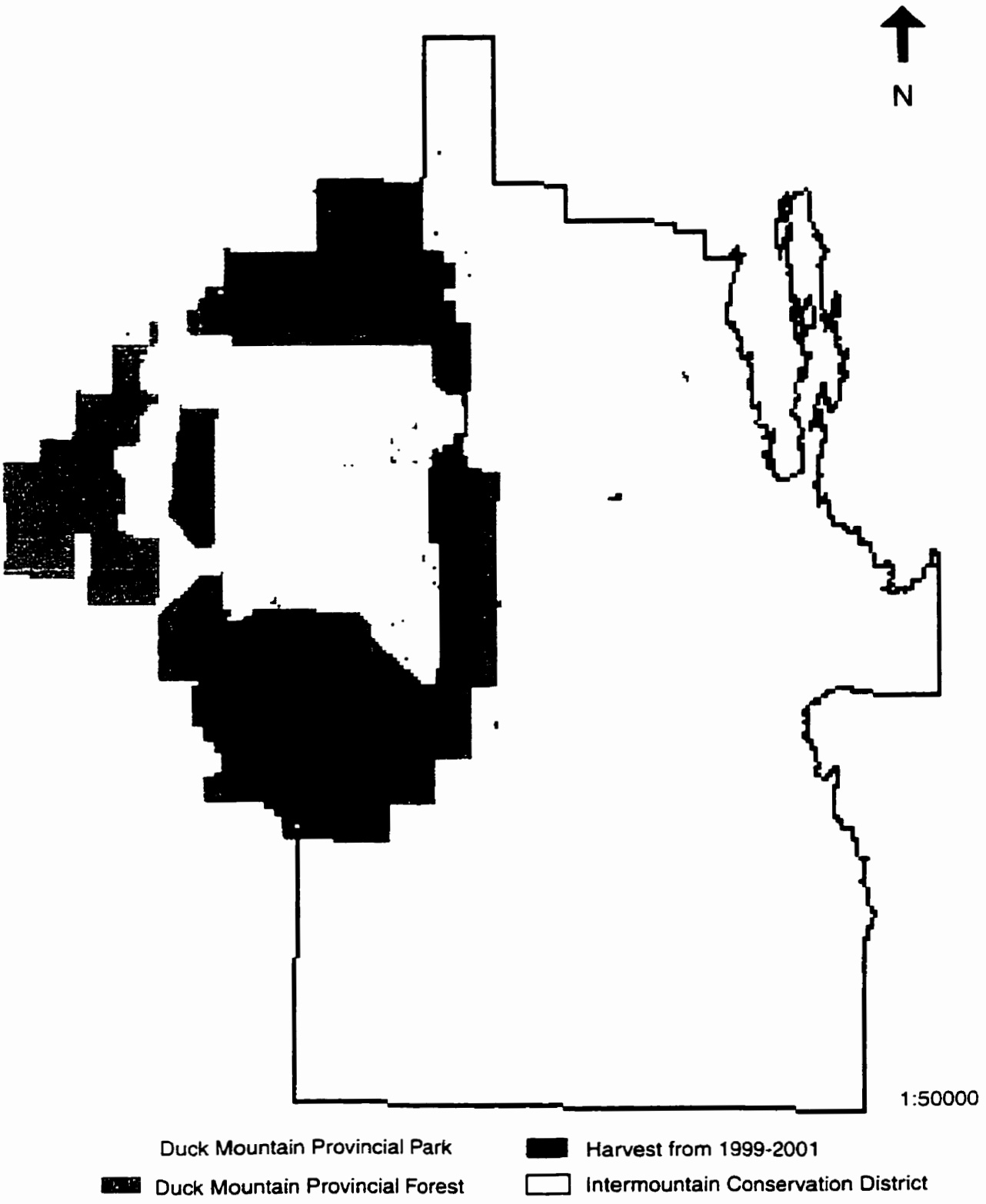

Figure 6: Harvest Activity on Crown land from 1996-1998

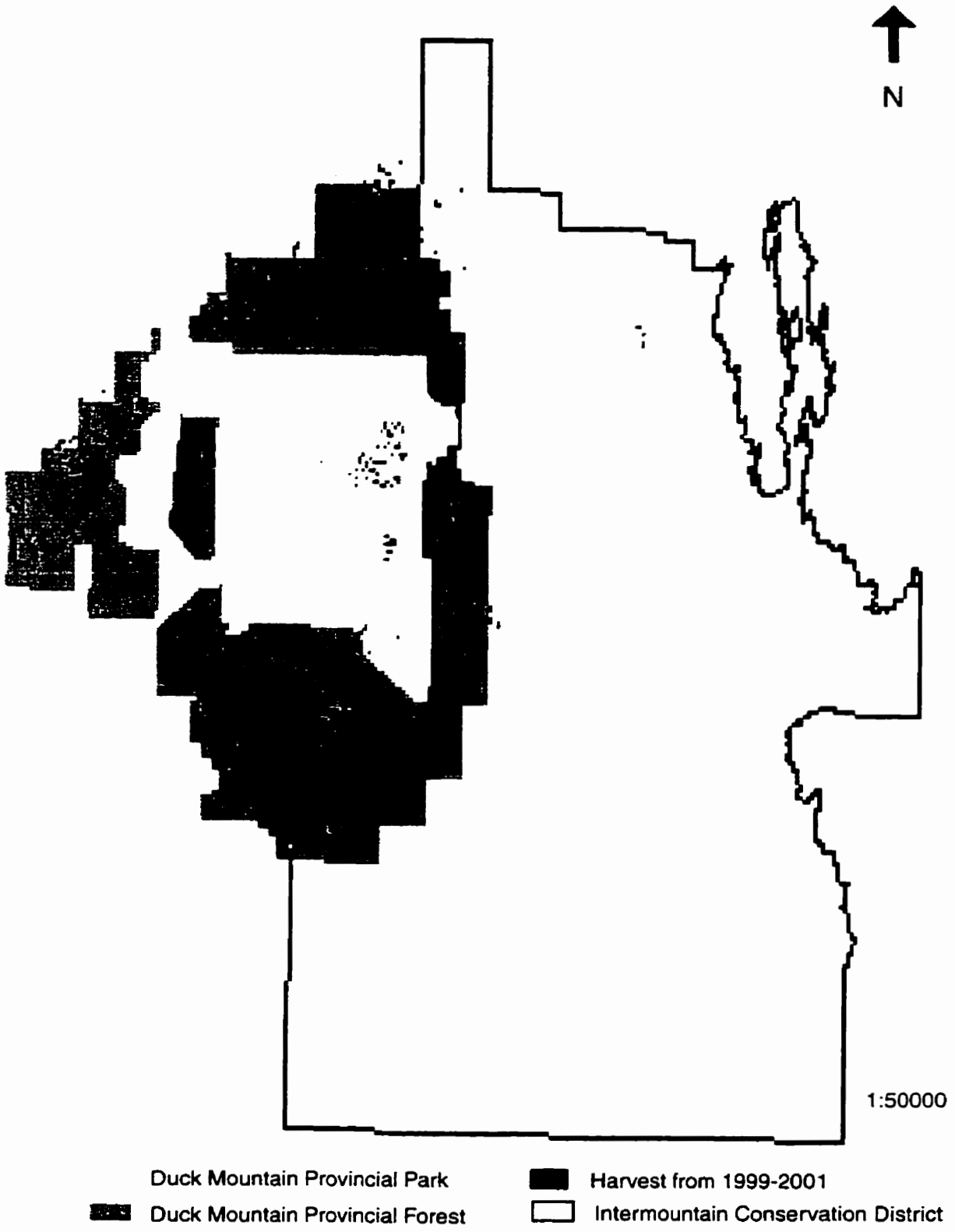

Figure 7: Harvest Activity on Crown land from 1999-2001

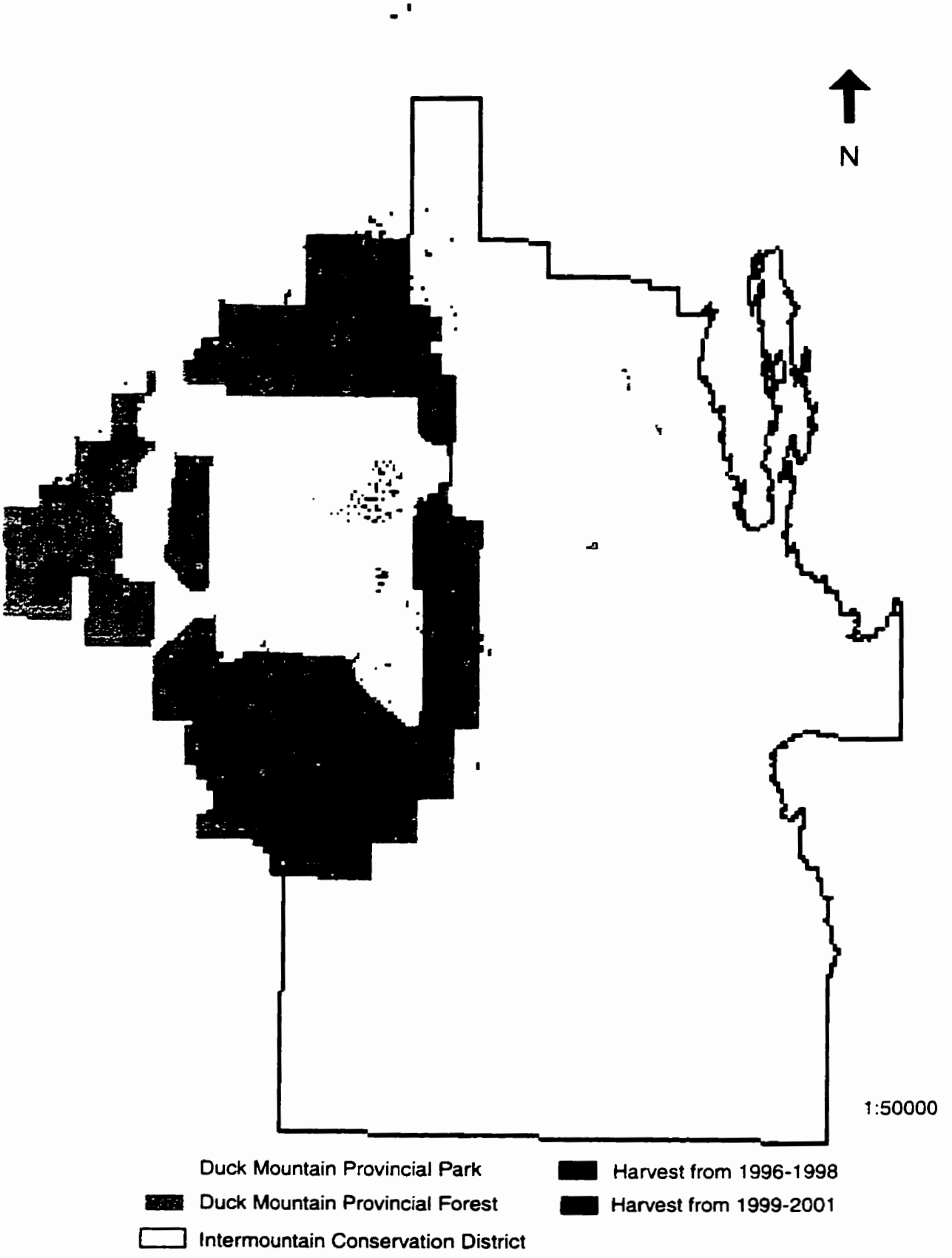

Figure 8: Harvest Activity on Crown Land from 1996-2001

4.5 Land Use

From settlement to today, land use activity has impacted the local landscape, resulting in the land cover types seen today. As these activities have changed, so has the land cover type. Within the last ten to fifteen years, land cover has changed illustrating the impacts that agriculture and forestry have on the landscape and illustrating changes within the land use activities, as well.

Figure 9 provides a picture of land cover or land use in the early 1980's. (Data sources are explained in Appendix Two). As illustrated, annual cropland dominated the landscape. Small areas of grassland and forage were scattered throughout the cropland with the majority occurring in the center of the District. Additional areas of grassland were located on the eastern edge of the District, on land, which borders Lake Winnipegosis or Lake Dauphin. The majority of forests were located in Riding Mountain National Park (southern edge of the IMCD), in Duck Mountain Provincial Forest (western edge of the IMCD) and in the north area of the District on 'unorganized crown land'. Pockets of treed lands were also located throughout the annual cropped lands.

Figure 10 illustrates land use cover in 1994. (Data sources are provided in Appendix Two). The most obvious change in land cover from the 1980's is the decrease in annual cropland. Grassland and forage have replaced annual crops. This decrease in cropland may be reflective of changing agricultural production that focuses attention on soil and water conservation, changing agricultural production that is more suitable to the landscape of the area (for example, livestock production), changing production arising from global commodity price changes, or a combination of these factors. Wetland areas

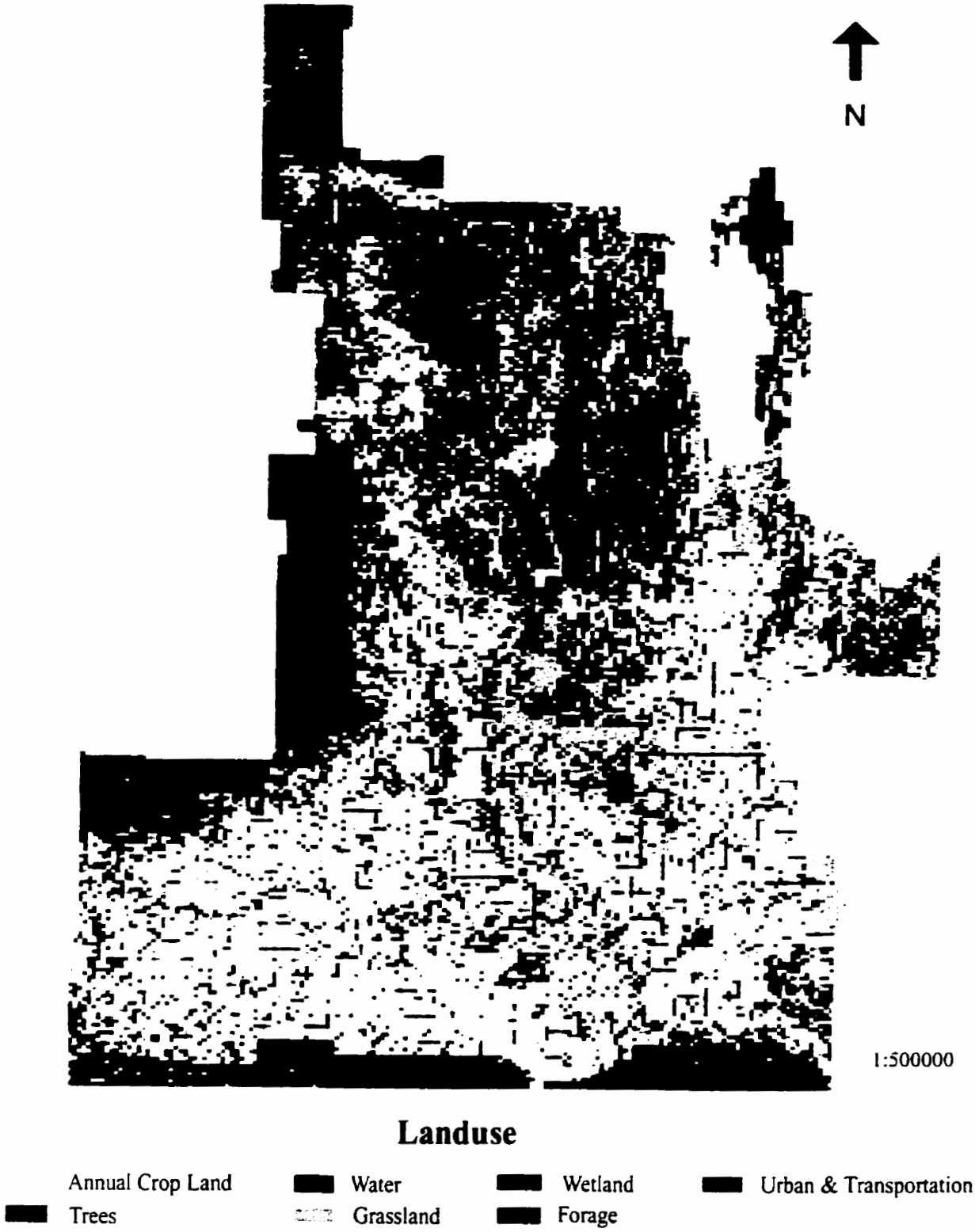

Figure 9: **Land use in the Intermountain Conservation District in 1980-1983**

Figure 10: Land use in the Intermountain Conservation District in 1994

also have increased, perhaps reflective of wetland restoration , the impact of deforestation from commercial activities, or beavers creating new wetland areas.

Figure 10 also illustrates a decrease of forested land on private agricultural land. Many of these areas have been converted to grassland areas, illustrating an increase in pasture land. In addition, agricultural land continues to encroach upon the edges of Duck Mountain Provincial Forest, further reducing the remaining timber on private land in the District. Forest harvest on Provincial forest land and other Crown land areas is also illustrated. Larger volumes have been removed from lands on the southern edge and northwest edge of the Duck Mountain Provincial Forest, the western border of the IMCD.

These land use cover changes illustrate significant trends in land use activity occurring in the IMCD over the last two decades. A decrease in annual cropping will decrease the potential for soil and water erosion on much of the land that was once cropped annually. While the erosion potential has decreased, an increase in livestock operations poses concern for a different potential impact, organic point-source water pollution, in the IMCD. The need for the proper disposal of livestock waste and water quality protection is heightened.

The removal of trees on private land only further enhances the past problems arising from deforestation, including an increased risk of wind and water erosion, a decrease in the availability of wildlife habitat and the continued loss of biological diversity on the landscape. Due to the natural topography of the landscape, excess water will continue to occur in the area indefinitely. Additional removal of the remaining trees on private land will only further accentuate run-off problems. With the development of local markets, there also exists an additional incentive to harvest private trees, further

reducing forests on the low-lying lands of the IMCD. Policies and practices that maintain these stands must be developed and advocated to reduce deforestation on private lands

Continued commercial forest activities in Duck Mountain Provincial Forest, specifically those harvests occurring on the slopes of the Escarpment, also has the potential to enhance natural runoff. Unlike deforestation on private land, commercial operations conducted on Crown land require regeneration, and therefore deforestation will not be permanent. However as forest operations continue it is likely that the amount of Crown land in a regenerating state will remain consistent, as the trend for changes in ACC throughout Canada has been to increase (British Columbia Royal Commission on Forestry, 1975). In addition, questions remain regarding the quality of regenerated sites and if these stands will provide the watershed with the same degree of ecological service such as water retention and the absorptive capacity of the soil. Thus, it is necessary for foresters to examine the potential impact that harvest operations have on runoff and attempt to minimize any potential impact, ensuring the protection of local water regimes.

The combined impact of deforestation arising from forestry and agriculture has the potential to increase natural runoff and impact both upstream and downstream areas, affecting local soil and water regimes. As well, continued deforestation on private and public land will enhance the loss of natural biodiversity and habitat. While all land use activities have some degree of impact, monitoring of future potential land use and resulting land cover changes should be focused on the degree of deforestation on public and private lands, as well as the conversion of annual crop to livestock operations. Both of these land use changes have the potential to further impact water flow and water quality in the IMCD.

Chapter 5.0 Summary, Conclusions and Recommendations

5.1 Introduction

Past impacts arising from forestry and agriculture activities in the local Intermountain Conservation District area have been well documented (Carlyle, 1980 and McGarry, 1987). As both forestry and agricultural activities continue, it is vital that decision-makers and land users ensure that individual activities do not unnecessarily impact the aquatic and terrestrial environments, particularly soil and water, which is essential to ensure future agriculture and forestry activity on which residents of the IMCD are dependent. This chapter examines the sustainability of both agriculture and forestry in the IMCD, with specific reference to soil and water conservation. Conclusions regarding the provincial and local management frameworks of forestry and agriculture are discussed. Land use impacts are discussed, further illustrating how forestry and agriculture interact and impact the landscape. Recommendations to promote the sustainable use of the land base by of agricultural and forestry operators, the IMCD and Louisiana-Pacific Canada Ltd. are presented. Specifically, recommendations regarding soil and water conservation are proposed, as appropriate environmental management of these activities is essential to protect the land base.

5.2 Conclusions

5.2.1 Sustainable Land Use in the IMCD

Both forestry and agriculture have economic and environmental effects that must be addressed in the sustainable management of land in the IMCD. Achieving sustainable management of the local landscape requires co-coordinated initiatives by foresters,

agricultural producers, and government to address the interactions between forestry and agriculture activity that occur in the IMCD. For example, the presence of local commercial forest operations contributes to deforestation on private land as local markets provide economic incentives for landowners to clear timber stands on private land to increase agriculture land. Future impacts arising from this incentive could lead to further habitat loss and strain local water and soil resources on private land, or result in a increased development of local woodlots, resulting in increase habitat on marginal lands and providing land owners with economic benefit. Outside influences, such as increased public awareness, government policy and program development, or personal economics, will influence which outcome becomes a reality.

To ensure the conservation of both aquatic and terrestrial environments in the IMCD, changes are required in the regulations that govern land use activities on both Crown and private land. Despite the numerous policies and practices that address forest operations on Crown land, local concern regarding the effectiveness of these policies and practices has evolved. Currently, there are few regulations that address the broader impacts of agricultural operations on the environment and even fewer environmental regulations are seen to be effective by landowners. In addition, many agricultural policies contradict forestry polices, as exemplified by the requirements to harvest trees on leased Crown agricultural land rather than promote the protection of these stands as outlined in Manitoba's Forest Policies.

Working together, the Intermountain Conservation District and Louisiana-Pacific Canada Limited, with increased financial and technical support from the Province of Manitoba, can develop effective partnerships and programs that address the interactions

of forestry and agriculture in the IMCD and protect the landscape of the District. Developing a framework to monitor soil and water conservation throughout the District, on both forest and agricultural lands, provides on mechanism in which local individuals can promote sustainable land use in the Intermountain Conservation District.

5.2.1.1 On Private Land

Agricultural operations and management on private land is reflective of the values and interests of the individual landowners. While regulations that apply to agricultural activity, such as drainage rights and stubble burning, are increasing to address broader impacts of agriculture on the local environment, agriculture operations continue to reflect individual values and economics. Government public policy, programming, and guidelines provide direction and assistance for producers to implement environmentally sound agricultural practices and operations. However, participation in these programs is voluntary. Soil and water conservation programs are only effective if landowners decide to participate. Similarly, the harvest of timber on private land is not regulated and is at the discretion of individual landowners. The provincial government supports the increased development of woodlots and shelterbelts for commercial and conservation purposes on private and Crown lands in the agricultural zone of Manitoba. Again, participating in these programs is voluntary. Management and use of forests on private land reflects the values attributed to these forests by individual landowners.

5.2.1.2 On Public Land

Numerous policies and practices have been developed to ensure the sustainable use of Crown forests and meet provincial management objectives including ecosystem-based management. Environmental impact assessment provides an examination of the impacts of forest operation prior to the allocation of forest resources to forest companies. Government regulations including annual allowable cut measurements, harvest guidelines addressing wildlife, fish habitat and stream crossings, environmental licensing, and annual approvals of management plans address the potential impacts of forestry activity on the landscape, including those affecting soil and water resources. Corporate self-monitoring and government monitoring also ensures that these regulations are followed. Formal public participation methods are available to provide a means of public participation in the management of Crown forests, including public hearings and the local stakeholder advisory committee.

5.2.2 Land Use Practices and Polices

Sustainable land use management is the objective of both the IMCD (The Conservation District Act, 1987) and LP-Canada Ltd. (Manitoba Natural Resources Forestry Branch, 1994). Forestry and agriculture are the subject of two distinct regulatory frameworks that have been developed to protect the landscape and to ensure the sustainable forestry and sustainable agriculture is achieved.

5.2.2.1 Agriculture and Private Land

Presently, regulations directed at the broad environmental impacts of agriculture have had a limited impact on agricultural management in the IMCD. As indicated by several landowners, current regulations have little influence on their activity, and are even ignored by landowners due the bureaucratic complexity, a lack of awareness, or lack of enforcement. Soil and water conservation techniques are used at the landowner's discretion. As a result of economics and personal experience, many of these conservation techniques, such as green manure and reduced tillage, are inconsistently applied. Similarly, personal interests and values are seen as key factors that influence how forests on private land are managed. Until economic and environmental values are attached to forests on private land by individual landowners, permanent deforestation on private land will continue.

A primary challenge to agricultural producers is to recognize that their individual agricultural impacts contribute to the land use activity impacts that affect the whole region. The Intermountain Conservation District is one of eleven conservation districts that have developed programming to address regional impact. Progress has been made, as illustrated by changing agricultural practices, including the reduction of summer fallow and decreased annual cropping on inappropriate land. Land use challenges for agricultural producers in the IMCD include the continuation of gains made in soil conservation, the need to manage the risks to water quality specifically from livestock operations, and the retention of critical wildlife habitat

5.2.2.2 Forestry and Crown Land

Numerous provincial regulations apply to the use of Crown forests in and adjacent to the IMCD. Issues of soil and water protection are addressed through government approved management plans, as provincial guidelines are incorporated into annual harvest plans. LP-Canada Ltd. has also developed a local Stakeholder Advisory Committee to address the impacts that forest operations may have on other local interests in the forest.

With many quota holders operate within FML # 3, LP-Canada Ltd. has the responsibility for all aspects of forest management responsibility including the planning, allocating, supervision, and administration of both harvest and forest renewal activities within all areas and sites in FML # 3, illustrating the trend of reduced government regulation regarding natural resource use. Additional government monitoring through government agencies, natural resource officers, and environmental inspectors conducted to ensure that conditions of environmental licenses and annual and long-term harvest plans are met. As LP-Canada Ltd. pursues forest certification, the development of third party audits will provide an additional review to ensure sustainable forest management principles are being incorporated and met by LP-Canada Ltd.

Skepticism regarding the effectiveness of provincial regulations in reference to forestry operations on Crown land has developed in the IMCD, as a result LP-Canada Ltd.'s management authority and the present role of government in the use of Crown forests. Many local residents feel that LP-Canada and other forest companies have too much control over management. With such a vast area, "can all forest operations be monitored appropriately" is a common sentiment of local landowners interviewed. Until

public confidence is raised in the effectiveness of management techniques used by LP-Canada Ltd. and the provincial government, skepticism regarding the sustainability of local crown forests will remain. Public confidence can be gained through increased public education, the continued incorporation of local interests in decision-making, the development of local partnerships, and a visible increase in the enforcement of regulations by government representatives.

5.2.3 Land Use Impacts

5.2.3.1 Agriculture Impacts

Historic land clearing, which has decreased natural biodiversity and habitat, has resulted in the agricultural landscape of the IMCD. Land clearing that occurs today contributes to continued natural habitat and biodiversity loss in the area on private land. The majority of current agricultural impacts, identified by local landowners, are seen to influence local water regimes. Land clearing, drainage operations, and wetland removal have all increased runoff rates causing increased soil erosion, streambank deterioration and damaged aquatic habitats. Other, less common impacts of agriculture include soil degradation, soil chemistry changes, odor, and non-point source pollution.

5.2.3.2 Forestry Impacts

Current harvest activities are seen by local landowners to have a variety of impacts, most notably the disruption, degradation or destruction of habitat and wildlife dependent upon the forest. These habitat changes can also benefits species, including moose and elk. Forest removal is also perceived to impact the water regime of the area

and is believed to reduce the absorptive capacity of the soil, increase runoff rates, and affect water quality.

Many of the landowners interviewed indicated a concern for the future or long-term impacts of continued harvest activity in the region. Future concern is focused on potential impacts on habitat and wildlife and runoff rates. Respondents feel that continued harvest might have a long-term effect on wildlife, disrupting breeding, and migration patterns. Interviewees also feel that continued forestry activity will enhance natural runoff, straining drainage capabilities and impacting downstream activities.

5.2.3.3 Interactive Impacts

Delineating the individual impacts of agriculture and forestry on the IMCD, particularly downstream areas, is difficult, as many of the impacts arising from these two activities are similar and interact. Both forestry and agriculture can impact water flow and result in increased run off rates, erosion, flooding, and sedimentation. Harvest activities in headwaters in the forested escarpment reduce the absorption capacity of soil, reducing shade, and as several landowners indicated "eliminate the time span between the arrival of melt water from the Escarpment on the low-lying agricultural landscape and the passage of melt water arising from agricultural lands, increasing the volume of water in rivers or drains at one time.". Agricultural activities including wetland drainage and development of drainage channels can further contribute to increased water flow rates and volumes and the problems associated with increased water volumes and flows. As both activities have the potential to impact water flow and water quality, forestry and agriculture activities both have the potential to impact fish habitat. The fishery in Lake

Dauphin has already been affected by past land use activity including forest removal and land clearing. Further impacts on local fish habitats, including Lake Dauphin, are probable if local water regimes are impacted.

5.3 Recommendations

Agriculture and forestry decision-makers and resource-users must ensure that their operations do not negatively impact the aquatic and terrestrial environments and the soil and water regime of the local area, and ensure that their operations result in sustainable landuse practices in the IMCD. As the Intermountain Conservation District and Louisiana-Pacific Canada Limited represent the resource manager in these two land use activities, recommendations are proposed to these organizations to address potential individual and interactive impacts of forestry and agriculture activities on soil and water. Recommendations are also directed at the Provincial Government as the Department of Agriculture and Department of Conservation have the ability to change management policies and practices regarding forestry and agriculture on both Crown and private land.

5.3.1 Intermountain Conservation District

1. **Land use monitoring should be implemented in the Intermountain Conservation District.** Volunteer landowners, from throughout the entire District, will record information regarding seeding and harvest data, chemical use, a description of residue management and tillage systems, drainage operations and other information of interest to the Board. Monitoring will provide the Board with an in-depth illustration of on the land agriculture land

use and practices over time. Land use changes that occur or do not occur over time will reveal areas where increased education or program development may be required.

2. **A water-monitoring program should be developed in the IMCD to assess the impact of agricultural activities on water.** Collecting samples along the entire course of a river from the lower slopes of escarpment to the Lakes Dauphin or Winnipegosis will illustrate any impact that agricultural practices have on water quality through the District including sedimentation and chemical residue. To get accurate picture of agricultural impacts, a river arising from the Riding Mountain portion of the escarpment should be selected, as little if any forestry operations impacts these rivers.

3. **Water flow data should be monitored to determine if the perception that increased runoff rates from the Escarpment are occurring is valid.** To distinguish between agricultural impacts on waterflow and forestry impacts, on waterflow, monitoring waterflow on rivers affected by agricultural activity alone and rivers affected by agriculture and forestry need to be assessed. Existing monitoring stations such as that located on the Wilson River near Ashville, monitors water arising from the Riding Mountain where forestry is prohibited. Data from stations such as that located in the North Duck River at Cowan, record runoff from the Duck Mountains where forestry and agricultural activities occur must also be examined to provide a comparison.

Flow rate between the two types cannot be directly compared due to potential climatic differences, but significant changes in runoff from individual streams can illustrate trends in runoff from agriculture activity and trends in runoff from forestry and agriculture.

4. **The IMCD should develop a program that addresses the removal of timber from private land, encouraging cleared areas be restored to a forested state rather than converted into productive agricultural land.** As only large stands of aspen can be converted to an economically successful woodlot, and the majority of remaining stands in the area are small, a program to promote regeneration of sites will limit further permanent on private land. Reforestation promotes biodiversity and enhances natural habitat, and establishes natural protection for local soil and water regimes. LP-Canada Ltd's expertise in silviculture and forest renewal can be used to assist in the development of a program that promotes the sustainable development of remaining local forest stands. In return, LP-Canada Ltd. has knowledge of local wood sources that could be used to meet fiber requirements.

5.3.2 Louisiana-Pacific Canada Limited

1. **A comparative watershed study should be developed to determine the impact of harvest on water flow.** Public perception is that increased logging on Crown and private land will decrease water retention in the Escarpment area, accelerate runoff from clear-cut areas which may strain riparian

resources, leading to increased water erosion and impacts on water quality. Evaluating water flow and water quality arising from a logged watershed or sub-watershed and water flow and water quality from a similar unlogged watershed will illustrate if impacts arise from logging. A local study, such as this, will provide local answers to the potential impacts of logging on water flow and quality on the local landscape and address local concerns regarding forest activity on the Manitoba Escarpment.

2. **Public tours of harvest operations should be offered to alleviate the uncertainty and skepticism that surrounds commercial forest operations in the local area.** Illustrating on-site techniques will provide the public with a personal picture of forest operations and the measures taken to mitigate potential impacts. In addition, providing tours will illustrate LP-Canada's commitment to providing mechanisms for public education and the Company's commitment to be accountable for its actions. Tours such as this will likely elicit more participation by local residents in available arenas. With increased knowledge, the confidence of local residents to effectively participate in such discussion increases.

5.3.3 Intermountain Conservation District and Louisiana-Pacific Canada Limited

1. **A joint research project assessing water quality should be developed to determine the individual and cumulative impact of activities on the landscape.** Since water quality is a good indicator of ecosystem health, establishing a research project to identify the influence of forestry and agriculture on water quality will identify areas in which both activities must improve. As the impacts of activities can be similar, it is essential that watercourses selected for study must enable the impact of forestry to be distinguished from those due to agriculture. A watercourse that has forest harvest near its headwaters and agriculture further down stream may provide for the analysis of cumulative impacts. Assessing cumulative impacts will require a rigorous, scientific approach and experimental design to determine agriculture and forestry impacts, in addition to other factors including climate and natural ranges.

2. **From the information provided from the proposed recommendations, a framework to assess soil and water conservation should be developed.** The degree of soil and water conservation on agricultural land can be assessed through land use monitoring, water flow and water quality monitoring and land conversion. Monitoring of land use activities provides a picture of on the land application of soil and water conservation techniques. Program use, such as the private land reforestation program, provides a similar measure of conservation. Results from water flow and water quality monitoring provide

information regarding the broader impacts of agriculture on the water regime. In reference to forestry activities, soil and water conservation information can be obtained through watershed studies, waterflow monitoring and other harvest planning information. Watershed studies and water flow water can provide insight into potential increased runoff or changes in water quality and impacts on aquatic fauna and flora. Harvest areas, percentages and potential site disruptions provide insight into the amount of area that is in a harvested state at one time, delineating areas of potential impact. Through data sharing, a cumulative framework monitoring soil and water in the Intermountain Conservation District is developed. Monitoring of this information, will provided decision-makers with a baseline from which to assess future individual activities and foster soil and water conservation throughout the local area.

5.3.4 Provincial Government Departments (Agriculture and Conservation)

1. **To re-evaluate Departmental programs, initiatives, regulations and objectives to ensure the policies within and between Departments are effective and coordinated.** The effectiveness of regulation on both private land and public land has been questioned. Re-evaluating regulation to ensure that specific objectives are met through rewriting regulation or increased enforcement is required. While sustainable development principles incorporated into the mandates of the Department of Agriculture and the Department of Conservation, separate initiatives of the Departments can and do contradict objectives in other

departments, contributing to miscommunication and misunderstanding between different resource users. Ensuring the policy objectives on both agricultural land and forested land are compatible promotes the protection of the entire landscape including forests on private and public land.

2. **An increase in provincial financial and technological support of local organizations to address local issues is required.** While local organizations are often best suited to work towards sustainable solutions at the local level, funding and expertise often limits the breadth at which these organizations can operate. Providing local organizations with financial and technological capital to address management issues that arise from land use and the Manitoba Escarpment (as those examined in the Wilson Creek Study) will empower local residents to address land use issues problems and implement many of the policies and initiatives advocated by the Manitoba Government.

6.0 References

Aaker, D., V. Kumar, and G. Day. 1998. Marketing Research. Sixth Edition. John Wiley and Sons Inc., Toronto, Canada. p 468.

Agriculture and Agri-Food Canada. 1999. The Crawford Creek Project. PFRA Communicator. PFRA's Communications Division. Regina , Saskatchewan. pp1-3.

Agriculture and Agri-Food Canada. 1997. A. Profile of Production Trends and Environmental Issues in Canada's Agriculture and Food Sector. Minister of Works and Government Services, Ottawa. p15.

Agriculture and Agri-Food Canada. 1997. B. Agriculture in Harmony with Nature. Strategy for Environmentally Sustainable Agriculture and Agri-Food Development in Canada. Minister of Works and Government Services, Ottawa. p1.

Agriculture and Agri-Food Canada. Undated. National Soil and Water Conservation Program (NSWCP) Manitoba. Prairie Farm Rehabilitation Association.

Anderson, Bill. 1994. Sustainable Agricultural Development and the Environment: Toward an Optimal Solution. Agricultural Institute of Canada, Ottawa. p1.

Babbie, E. 1998. The Practice of Social Research. Wadsworth Publishing. Belmont, California. p G7.

British Columbia Royal Commission on Forestry. 1975. Timber Rights and Forest Policy in British Columbia. The Commission. Victoria.

Bruce, G. 1983. The Development of a Soil and Water Management Plan for the Sub-escarpment of the Turtle River Watershed Conservation District. MNRM Practicum, Natural Resources Institute. University of Manitoba, Winnipeg. pp34-35.

Canadian Council of Forest Ministers. 1995. Defining Sustainable Forest Management: A Canadian Approach to Criteria and Indicators. Natural Resources Canada. pp3-4.

Canadian Council of Forest Ministers. 1997. Criteria and Indicators of Sustainable Forest Management in Canada. Natural Resources Canada. p1 and pp43-44.

Carlyle, W. J. 1980. The Management of Environmental Problems on the Manitoba Escarpment. The Canadian Geographer. v.27(3): 255-269.

Committee on Headwater Flood and Erosion Control. 1993. Summary Report of the Wilson Creek Experimental Watershed Study 1957-1892. Winnipeg. p4-5

Dunster J. and K. Dunster. 1996. Dictionary of natural resource management. UBC Press, Vancouver. p104.

Federal-Provincial Committee on Environmental Sustainability, 1990. Report to the Minister of Agriculture. Ottawa. p11.

Food and Agricultural Organization of the Untied Nations.. 1994. Strategies for Sustainable Agriculture and Rural Development: New directions for Agriculture, Forestry and Fisheries. FAO of the UN, Publications Division, Rome. p5.

Forest Use and Management Regulations. 1988. Regulation 227/88R of the Forest Act.

Grumbine, R.E. 1994. What is ecosystem management? Conservation Biology. Vol.8: 27-38.

KPMG Management Consulting. 1995. Manitoba's Forest Plan ...Towards Ecosystems Based Management. KPMG, Winnipeg.

Lawrence, E. and Bainbridge, J. (eds). 1998. Canada's Environmental Legislation. Templegate Information Services Inc., Toronto, Canada. p3.1-3.3

Likens, G. 1992. An Ecosystem Approach: Its Use and Abuse. Excellence in Ecology Book 3. Ecology Institute, Oldendorf/Luhe Germany.

Livestock Manure and Moralities Management Regulation. 1998. Regulation 42/98 of The Environment Act.

Louisiana-Pacific Canada Ltd. 1999. Louisiana-Pacific Canada Forest Management License # 3 Annual Operating Plan 1999-2000. p13.

Louisiana-Pacific Canada Ltd. 1999. Quota Holders in Forest Management Area # 3.

Louisiana-Pacific Canada Ltd. 1996. Louisiana-Pacific Canada Ltd. Ten-Year Forest Management Plan.

Markandya, Anil (ed.). 1994. Policies for sustainable development. Food and Agricultural Organization of the United Nations, Rome. p23.

Manitoba Department of Mines, Natural Resources and Environment. Undated. Rosedal Farm Conservation Project.

Manitoba Department of Rural Development. 1998. Manitoba's Conservation Districts. piii and p15.

Manitoba Environment. 1997. State of the Environment Report For Manitoba. Canadian Cataloguing in Publication Data, Manitoba. p9.

Manitoba Environment. 1996. Environment Act License 2191 E.

Manitoba Natural Resources Forestry Branch. 1994. Forest Management License No.03. Manitoba Natural Resources.

Manitoba Sustainable Development Coordination Unit. Undated Applying Manitoba's Forest Policies. Sustainable Development Coordination Unit, Winnipeg. p2 and p5.

Manitoba Sustainable Development Coordination Unit. Undated. Sustainable Development Strategy for Manitoba. Sustainable Development Coordination Unit, Winnipeg. p5, 9 and 11.

McGarry, P. T. 1987. An assessment of the Physical Impacts of Agriculture Development on the Valley River Watershed. MNRM Practicum, Natural Resources Institute, University of Manitoba, Winnipeg. p148.

McRae, T., C.A.S. Smith and L.J. Gregorich (eds). 2000. Environmental Sustainability of Canadian Agriculture: Report of the Agri-Environmental Indicator Project. Agriculture and Agri-Food Canada, Ottawa, Ont.

Mok S. T and Poore, D. 1991 Criteria for Sustainable Forest Management. In Salleh, M. N. Sustainability: The Panacea for Our Forestry Ills ? In Boumand, O. Thomas and David G. Brand. Editors. Sustainable Forests: Global Challenges and Local Solutions. Food Products Press, Binghamton. p34.

.National Research Council, Committee on Watershed Management. 1999. New Strategies for America's Watersheds. National Academy Press, Washington, DC. p1.

Natural Resources Canada. 1997. The Sustainable Management of Forests. Minister of Public Works and Government Services Canada, Ottawa. pp1-5.

O'Grady, L. 1990 Integrated Resource Management Planning on the Pembina Escarpment: The Deerwood Experience. MNRM Practicum, Natural Resources Institute, University of Manitoba, Winnipeg. p41.

Patton, M.Q. Qualitative Evaluation Methods. Sage Publications, Beverly Hills. pp202-204.

Planning Branch, Water Resources Division. 1978. 'Report on activities in Wilson Creek Watershed April 1, 1977 to March 31, 1978. Unpublished report. In Carlyle, W. J. 1980. The Management of Environmental Problems on the Manitoba Escarpment. The Canadian Geographer. v.27(3): 255-269.

Prairie Farm Rehabilitation Association Dauphin District. 1998. Dauphin District Strategy for the National Soil and Water Conservation Program (NSWCP). Unpublished.

Pretty, Jules. 1995. Regenerating Agriculture. Joseph Henry Press. Washington, D.C. pp 8-9.

Salleh, M. N. 1997. Sustainability: The Panacea for Our Forestry Ills? In Boumand, O. Thomas and David G. Brand. Editors. Sustainable Forests: Global Challenges and Local Solutions. Food Products Press, Binghamton. p34.

Sample, V., N. Johnson, G. Aplet and J. Olson. 1993. Introduction: Defining Sustainable Forestry. In Sample et al. Editors. Defining Sustainable Forestry. Island Press, Washington. p4.

Science Research Council of Canada. 1992. Sustainable Agriculture: The Research Challenge. Minister of Supply and Services Canada, Ottawa. p15 and p25.

Somers, J.G. Undated. History of Park and Recreational Development on Crown Lands in Manitoba. Unpublished. p257 *In* Carlyle, W. J. 1980. The Management of Environmental Problems on the Manitoba Escarpment. The Canadian Geographer. v.27(3). pp 255-269.

Tetris Consultants Inc. 1995. Environmental Impact Statement. Volume 1 & 2. Louisiana-Pacific Canada Limited, Forest Management License #3, Ten Year Forest Management Plan (1996). Tetris Consultants Inc., Winnipeg.

The Agricultural Guidelines Committee. 1998. Farm Practices Guidelines for Hog Producers in Manitoba. Manitoba Agriculture. p3.

The Agricultural Guidelines Committee. 1994. Farm Practices Guidelines for Beef Producers in Manitoba. Manitoba Agriculture. pp1-2.

The Conservation Districts Act. 1987. Chapter C175.

The Environment Act. 1987. Chapter E125.

The Farm Practices Protection Act. 1992. Chapter F45.

The Federal Fisheries Act. 1985. Chapter F-14.

The Forest Act. 1987. Chapter F150.

The Planning Act. 1980. Chapter

The Standing Senate Committee on Agriculture. 1992. The Path to Sustainable Agriculture. House of Commons Queen Printer for Canada, Canadian Government Publishing Center, Ottawa, Canada. pi-14.

The Standing Senate Committee on Agriculture, Fisheries and Forestry. 1984. Soil at Risk: Canada's Eroding Future. House of Commons Queen Printer for Canada, Canadian Government Publishing Center. Ottawa, Canada. p4.

The Steering Committee of the Manitoba Escarpment Headwater Storage Study. 1988. Manitoba Escarpment Headwater Storage Study. pp1-8.

The United Nation Commission on Environment and Development. 1987. Our Common Future. Oxford University Press, Toronto. p8.

Vanclief, L. 2000. In McRae, T., C.A.S. Smith and L.J. Gregorich (eds). 2000. Environmental Sustainability of Canadian Agriculture: Report of the Agri-Environmental Indicator Project. Agriculture and Agri0Food Canada, Ottawa, Ont. p v.

Web Sites

Deerwood Soil and Water Management Association. 1999. DSWMA Web Site. www.cici.mb.ca/deerwood/stcol.

Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. 1995. The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. ESA Web Site. www.esa.sdsc.edu/ecmtext.htm

Hardy, Y. 1997. Sustainable Forest Management: The Mark of a Society. Canadian Forest Service Web Site. www.nrcan.gc.ca/cfs/mandat/adm/admcontrol_e.html

Manitoba Department of Agriculture. 1999. Manitoba Department of Agriculture Web Site. www.gov.mb.ca/agriculture

Manitoba Department of Forestry. 1999. Manitoba Department of Forestry Web Site. www.gov.mb.ca/natres/forestry/industry

Manitoba Industry, Trade and Management. 1999. Manitoba Government Web Site. www.db.itt.gov.mb.ca

Manitoba Department of Rural Development. 1999. Manitoba Department of Rural Development Web Site. www.gov.mb.ca/rd/index.html

Minnesota Department of Natural Resources. 2000. Minnesota Department of Natural Resources Web Site. www.dnr.state.mn.us/ebm/approach.html

National Forest Strategy 1998-2003. Canadian Forest Service Web Site. www.nrcan.gc.ca/cfs/strategy/control.ehtml

Team EBM. 2000. Ecosystem Based Management. www.teamedm.com

The University of Illinois at Urbana-Champaign, Department of Natural Resources and Environmental Sciences. 2000. Department of Natural Resources and Environmental Sciences Web Site. www.nres.uius.edu/outreach/esm_il_lo/intro-esmgmt.htm

Personal Communication

Baumann, Vern. 2000. Louisiana-Pacific Canada Limited, Forest Resources Division Operations, Planner.

Donnelly, Margaret. 1999 and 2000. Louisiana-Pacific Canada Limited, Forest Resources Division, Regional Biologist.

Epp, Brad. 1999. Louisiana-Pacific Canada Limited, Swan Valley District Forester

McGarry, Pat. Prairie Farm Rehabilitation Association. Winnipeg Region.

Theile, Jeff. 1999. Soil Conservation Specialist. Prairie Farm Rehabilitation Association Dauphin Region.

Weiss, Phil. 1999. Rural Development. The Manitoba Water Services Board: Conservation Districts.

APPENDIX ONE: Map Source and Information

The following details the information sources for Figures 6-10.

Figures 6-8:

Harvest sites for 1998 and 1998 supplied by LP-Canada Limited were plotted over current land use data. The Duck Mountain Provincial Forest Boundary was obtained from provincial forest inventory data.

Figure 9:

Older land use cover was identified from the use of forest inventory data. Data received in individual township shape files. To create the land use classes identified in Figure 9, the status of land attribute was reclassified to reflect land use categories. The following details the classification scheme used to compose this map.

Land Use Type	Land Identification Status
Trees	1-799
Forage	800-811
Annual Cropland	812, 815-816
Grassland	813, 821-824, 846
Wetland	825-839, 848
Urban and Transportation	840-845
Water	900-995

Digital data for the Intermountain Conservation District was not available prior to 1980. As well, the entire year was never photographed in the same year. As a result, individual township data used to compose this map ranges from 1980 data to 1983 data. The following details the year of individual township data.

Township	Range	Year	Township	Range	Year	Township	Range	Year
28	18-21w	1980-81	36	23w	1980-81	26	23-25w	1983
29	18-21w	1980-81	37	23w	1980-81	27	23-25w	1983
30	18-21w	1980-81				28	22-23w	1983
31	18-21w	1980-81	23	18-26w	1981	29	22-23w	1983
32	18-22w	1980-81	24	18-26w	1981	30	22-23w	1983
33	18-22w	1980-81	25	18-26w	1981	31	22-23w	1983
34	18-23w	1980-81	26	18-22w	1981	32	23-23w	1983
35	18-23w	1980-81	27	18-22w	1981	33	23-23w	1983

Figure 10:

Current land use cover was found from 1994 satellite imagery provided by Prairie Farm Rehabilitation Administration. Eight cover classes were defined to produce current land use.

APPENDIX TWO: Landowner Questionnaire

Landowner #

Introduction

The following questionnaire is directed at the landowners of the local Intermountain area. The purpose of the survey is to obtain the knowledge and expertise of landowners regarding agricultural and forestry operations occurring in the local area. Information obtained through the study will be used in a study assessing the sustainability of agriculture and forestry in the Intermountain Conservation District.

The interview is composed of three sections- background, agriculture and forestry. In part one, background information of the interviewee will be obtained. Part two and part three will each consist of three sections addressing impacts, mitigation and legislation and regulations regarding the land use activities of agriculture and forestry.

ALL INFORMATION YOU PROVIDE IS STRICTLY CONFIDENTIAL. A SUMMARY OF RESULTS WILL BE PROVIDED.

Definitions and Terms

A. Point-source pollution: A stationary location from which pollutants are discharged. An example of point source pollution is direct, concentrated discharge, such as sewage effluent discharging from a pipe into a river.

B. Non-point source pollution: Originating from diffuse sources, non-point source pollution, as caused by rainfall or snow melt moving over and through the ground picking up natural and manmade pollutants and depositing them into ground or surface water.

C. Environmental Assessment: the evaluation of effects likely to arise from a major project (or other action) significantly affecting the natural and man-made environment

D. Impact: Any change in the biophysical and/or social environment caused by or directly related to a past, present or proposed activity.

E. Mitigation: An application of design, construction or techniques used to minimize or eliminate potential adverse impacts and where possible, enhance environmental quality.

F. Riparian Zone: A margin of vegetation which includes trees, shrubs, and grasses extending 30-50 meters from the waterline of rivers and streams (from the high water mark)

G. Reduced Tillage: Any tillage system that minimizes soil disturbance between harvest and seeding events

H. Conservation Fencing: Controlling the access of livestock to a stream or water source using fencing. Livestock access to water is available only at specific sites along the water source.

I. Understory: The underlying brush, shrubs, vegetation and non-commercially viable trees that are not removed during harvest operations. This vegetation provides habitat as well as serving as seed stock for the cut site.

Instructions

Please answer the following questions, if applicable, by circling the correct answer or providing written comments.

PART ONE: BACKGROUND

1. Indicate the total area of land that you use and manage

Owned _____
Rented _____
Total _____

2.Indicate what type of operations you conduct on this land?

a) grain production
b) livestock production
c) mixed
d) other _____

3. If you are involved in forestry activities on your land or within the local area, describe your operations.

_____

_____

PART TWO: AGRICULTURE

A. IMPACTS

4. Agricultural activities have a number of potential impacts. Of the following, which impacts occur on your land?

Soil

a) soil erosion
b) soil degradation including loss of soil structure or loss or organic matter
c) change in soil chemistry due to farming activities

Water

d) non-point source pollution from fertilizers and pesticides, organic sources and sediment
e) point source pollution from livestock operations
f) streambank deterioration
g) increased runoff rates
h) increased deposition of sediment downstream
i) the disruption, degradation or destruction of aquatic habitat

Air

j) odor
k) decrease in air quality arising from stubble burning, blowing soil or other activities

Wildlife

l) loss or removal of natural habitat

Other

m) _____

5. (1) Of the impacts you have identified which impacts, if any, are affecting the use of your land? Provide examples of the effects.

_____

_____

_____

(2) Of the impacts you have identified, which impacts of your operations or your neighbors operations, if any, have had or are having impacts downstream or on the local landscape? Provide examples of the effects.

_____

_____

_____

(3) Of the impacts you have identified, which impacts, if any, will be of greater concern in the future? Provide examples of these effects.

_____
_____
_____

6. In the last ten years indicate and describe any of the following operations conducted on your land.

(1) Drainage Operations

When	Area
_____	_____
_____	_____

(2) Broken Native Pasture

When	Area
_____	_____
_____	_____

(3) Brush Cleared

When	Area
_____	_____
_____	_____

(4) Trees Cleared

When	Area
_____	_____
_____	_____

(5) Of these activities, indicate the main reasons for these activities on your land.
   a) to bring more land into production
   b) to facilitate field work
   c) to reduce crop damage arising from wildlife
   d) other _____

7. In the next 5 years, describe any plans you have for conducting any of the following activities.

	When	Area
Drainage Operations	_____	_____
	_____	_____
Break Native Pasture	_____	_____
	_____	_____
Clear Brush	_____	_____
	_____	_____
Clear Trees	_____	_____
	_____	_____

8. Of any trees cleared, indicate how the trees were removed.
   a) pushed over and disposed of
   b) cut using forestry harvesting equipment
   c) burnt
   d) other _____

9. Of the trees cut for wood products, indicate the users of the trees
   a) private
   b) used locally
   c) commercial use
   d) combination of above
   e) other

   _____

B. MITIGATION

10. Numerous steps can be taken to minimize the impact of agricultural activities on landscape. Of the following which techniques do you use in your management of you land?

    Residue Management
    a) reduced tillage
    b) planting of winter crops
    c) forage seeding
    d) crop rotation

    Soil loss
    e) shelter belts
    f) grassed runways

    Riparian Management
    g) conservation fencing
    h) streambank stabilization
    i) vegetated buffer zones between waterways and agricultural activity
    j) retention of wetlands
    k) weirs, riffles, small dams or other structures used to slow water flow

    Habitat Management
    l) retention of cover for habitat
    m) restoration of marginal lands providing habitat

    Other
    n) _____

11. *Residue Management:*

    (1) Please indicate the percentage of land that receives each specific residue management techniques:
    a) reduced tillage _____
    b) winter crops _____
    c) forage seed _____
    d) crop rotation _____

    (2) If these techniques are not consistently applied, indicate your reasoning
    a) cost
    b) technique not effective
    c) more confident in traditional techniques
    d) other _____

12. *Soil Loss*

(1) In the next five years, indicate your plans for shelterbelts on your property.
- a) add
- b) remove –proceed to 12(2)
- c) no change

(2) If shelterbelts are to be removed, indicate your reasoning
- a) to allow access of larger machinery
- b) to increase land under production
- c) shelterbelts are ineffective
- d) other _____

(3) If grassed runways are not implemented on your land indicate why.
- a) not needed
- b) unaware of the technique
- c) other techniques more economical
- d) other techniques more effective
- e) other _____

13. *Riparian Management:*

(1) If conservation fencing is not used, please indicate why
- a) no livestock
- b) livestock do not have direct access to waterways
- c) alternative water sources too costly
- d) livestock do minimal damage
- e) other _____
- f)

(2) If streambank stabilization techniques are not used, please indicate why
- a) no water ways on property
- b) not needed
- c) too costly
- d) other _____

(3) If buffer zones are not used or maintained on any or all waterways on you property, indicate your reasoning
- a) no water ways on property
- b) the land is required for production
- c) buffers not effective
- d) other _____

(4) If wetland areas are not retained, please indicate your reasoning
- a) no wetland areas on property
- b) area required for production
- c) reduces wildlife damage
- d) other _____

(5) If water control structures are not used, please indicate your reasoning
- a) not required
- b) too costly
- c) not aware of options
- d) other _____

12. *Habitat Management*

(1) If habitat cover is not maintained, please indicate your reasoning
- a) reduce wildlife damage
- b) land required for production
- c) other _____

13. What would persuade you to implement any of the conservation based techniques described above?
- a) tax incentives
- b) availability of cost shared programs
- c) program availability
- d) education regarding techniques
- e) other _____

14. Indicate any of the following organizations involved in conservation in the local areas that you are familiar with
- a) Dauphin Lake Advisory Board
- b) Duck Mountain Conservation Group
- c) Intermountain Conservation District
- d) other _____

C. LEGISLATION AND REGULATION

15. Agricultural activities impact more than just the specific land on which the activities occur. To address these impacts numerous acts and regulations, such as the Water Rights Act and normal farming practice guidelines have been introduced. Describe the influence, if any, that regulations and guidelines have on your use and management of your land.

_____
_____
_____

16. (1) Land assessment is used to determine the amount of tax that is paid by landowners. Tax rates for prime agricultural land, agricultural land type, marginal land and conservation land, such as brush or wetlands, all differ. Are you aware of these differences?
- a) yes
- b) no

(2) Does the land assessment process affect the use of your?
- a) yes- proceed to 16(3)
- b) no – proceed to 17

(3) Using examples, illustrate how, if at all, the tax assessment process affects the use of your land.

_____
_____
_____

PART THREE: FORESTRY

A. IMPACTS

17. Forestry operations have a number of potential impacts. Of the following, which impacts are occurring in the local area of the Intermountain Conservation District?
    a) soil erosion
    b) soil compaction
    c) reduction in absorptive capacity (infiltration) of soil during storm events and snow melt
    d) organic matter loss
    e) disruption, degradation or destruction of habitat
    f) disruption or loss of wildlife dependent upon forest habitat
    g) reduction in water quality arising from increased sediment load
    h) increased sedimentation downstream
    i) disruption, degradation or destruction of aquatic habitat
    j) increased runoff rates
    k) other _____

18. (1) Of the impacts you have identified, which impacts, if any, are occurring on provincial forest lands? Provide examples of the effects.

    _____
    _____
    _____

    (2) Of the impacts you have identified, which impacts, if any, have had or are having impacts downstream or on the local area? Provide examples of the effects.

    _____
    _____
    _____

    (3) Of the impacts you have identified, which impacts, if any, will be of greater concern in the future. Provide examples of the effects.

    _____
    _____
    _____

B. MITIGATION

19. Numerous steps can be taken to mitigate or minimize potential impacts of forestry operations of Crown timber on the landscape. Of the following please indicate which techniques you are aware of.
    a) maintenance of understory on harvesting sites
    b) retention of non-commercially useful trees
    c) harvesting of sites in appropriate seasons
    d) in sensitive areas, designated pathways for machinery are developed or the use of heavy machinery is limited
    e) pre-harvest survey are conducted to identify sensitive sites, wildlife use of the area and other information needed to minimize impacts of cutting
    f) buffer zones around nesting sites and by riparian areas are created
    g) cutting and other activities must follow provincial guidelines addressing wildlife, water crossings and fish habitat
    h) roads no longer needed for harvest are decommissioned unless otherwise indicated by the Province

i) constructed roads are landscape and vegetated as soon as possible to minimize runoff
j) regeneration of cut sites through natural regeneration or tree planting
k) limiting fire by making cuts irregular, of differing size and leaving dead and living material on site
l) other _____

20. (1)Do you feel that these techniques are adequate to minimize the impacts of forestry on your area?
a) yes
b) no

(2) Using examples, illustrate why you feel these techniques are or are not effective.

_____
_____
_____

21. (1) Forests provide a number of goods and services other than the use of timber. Louisiana-Pacific Canada Ltd. has developed a stakeholder advisory committee to address non-timber values of the forest. Are you familiar with the Stakeholder Advisory Committee?
a) yes - proceed to 21(2)
b) no - proceed to 21(3)

(2) Do you feel that the local Stakeholder Advisory Committee is effective? Illustrate your opinion with examples

_____
_____
_____

(3) Do you feel that the development of an advisory committee of local people, representing local interests in the forest, would be a useful technique in managing forests and minimizing the effects of forestry on the local area?
a) yes
b) no

22. (1) Do you have commercially viable aspen or poplar timber on your property?
a) yes- proceed to 22(2)
b) no – proceed to 23

(2) What would influence you to remove the trees on you land?
a) increase need for more productive land
b) trees are a secondary source of income
c) the availability of local markets
d) reduction of damage due to wildlife
e) nothing
f) other _____

(3) Regulations based on sustainable forest management regarding the acquisition and harvest of Crown timber are well documented. Fewer regulations exist for timber on private lands. If you harvest or plan to harvest timber, indicate how you plan to manage your lands.
a) use of woodlot management programs
b) harvest timber yourself
c) use a contractor to plan and harvest trees
d) consult with forestry representative
e) other _____

(4) Would you be interested in receiving assistance in the management of your timber?
   a) yes- proceed to 22(5)
   b) no – proceed to 22(6)

(5) What type of assistance would you require?

_____

_____

(6) Are you aware that assistance is available from Louisiana-Pacific Canada Limited?
   a) yes
   b) no

C. LEGISLATION

23. Are you familiar with any of the following legislation and regulation directing the use and management of crown timber? Circle those you are familiar with.
   a) The Forest Act
   b) Forest Use and Management Regulations
   c) Environmental Assessment of forest management plans
   d) Forest Management Agreements and licenses
   e) Environmental licenses

24. Environmental assessment hearings were held for the Oriented Strand Board Mill in Minitonas (1994) and for Louisiana-Pacific Canada Limited's Ten Year Forest Management Plan (1996).

(1) Were you aware of these hearings?
   a) yes – proceed to 24(2)
   b) no – proceed to 25

(2) If yes, did you participate in these hearing?
   a) yes- proceed to 25
   b) no – proceed to 24(3)

(3) Indicate why you did not participate in the hearing
   a) not aware of the hearings
   b) unaware that you could participate
   c) no interest
   d) represented by other party
   e) other _____

25. (1) Indicate your opinion regarding the management of the local forests following the approval of Oriented Strand Board Mill in Minitonas (1994) and for Louisiana-Pacific Canada Limited's Ten Year Forest Management Plan (1996).
   a) positive
   b) negative
   c) neutral
   d) other _____

(2) What improvements, if any, can be made in the management of the forest resource?

_____

_____

_____

26. (1) Indicate, using examples, if you feel that the requirements placed on commercial forest operations are adequate to produce a forest that is sustainable or viable in the long-term.

(2) Indicate, using examples, if you feel that the requirements placed on private forest operations are adequate to produce forests that are sustainable or viable in the long-term.