WATER MANAGEMENT OPTIONS FOR THE MILK RIVER, ALBERTA

by

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PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF PUBLIC POLICY

In the
Faculty
of
Arts and Social Sciences

SIMON FRASER UNIVERSITY

Spring 2007

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Abstract

The Milk River, flowing from Montana to Alberta and back into Montana, is the sole water source for many of the farmers, ranchers and communities in south-eastern Alberta. A number of factors including the existence of an international treaty regarding water issues and the fact that water supply does not temporally meet demand, contribute to the problem that there is a dearth of management of the Milk River water resources.

This study assesses five policy options for the management of the Milk River: water marketing, water banking, joint operations and on- and off-stream storage facilities. A survey of Milk River Basin residents, interviews with key stakeholders and case studies reveal that only a combination of such policies will solve the Milk River water management problems.

Executive Summary

Although Canada has an abundance of fresh water, significant regional and seasonal variations exist. Alberta experiences both of these characteristics. The north of the province receives the bulk of the water supply while the south produces the bulk of the demand. The Milk River Basin (MRB) is in the southeastern corner of the province and is subject to seasonal variation of water supply and demand.

The Milk River originates in western Montana, flows north from Montana through Alberta and then returns to Montana in the eastern half of that state. The water in this river comes from spring precipitation and runoff and as a result, the water supply is highest between March and July while the demand for water, largely for irrigation purposes, occurs in late summer through early fall. The disparity between supply and demand is the basis of the policy problem being studied here, that there is too little management of the water resources of the Milk River.

Five additional factors contribute to this problem. First, Alberta has no storage facility on the Milk River that would allow the capture of water during the high supply season for use during the irrigation season. Second, the water allocation system in Alberta known as first-in-time, first-in-right, puts priority on the seniority of the water licence and thus inhibits the efficient allocation of water. Third, although Alberta's recent water strategy calls for water management plans for each basin in the province, the MRB is currently not subject to such a plan. The lack of a water management plan highlights the fact that there is not a comprehensive policy framework on water issues in the MRB. Fourth, because the river crosses the U.S.-Canada border, it is subject to the Boundary Waters Treaty signed between the two countries in 1909 and a subsequent Order signed in 1921. These agreements, under the purview of the International Joint Commission (IJC) apportion the water from the river to each country and thereby limit the action each country can and will take regarding the management of that water. Lastly, although there are many similarities between the Canadian and American portions of the MRB, there is very little interaction and coordination between water users on either side of the border resulting in a paucity of cooperative arrangements on water issues.

Recent events have highlighted these factors. An IJC Task Force was convened in 2004 after the Governor of Montana requested that the IJC review whether each country was receiving

its correct apportionment of the Milk River water. This request may have been at least in part a result of Montana users being alerted to the fact that Alberta was conducting a preliminary feasibility study into storage options for the water of the Milk River. The Task Force issued a report in 2006 which included administrative recommendations and a recommendation that particular water management policies outside of their mandate be studied. These policy options were: water marketing, water banking, joint water management operations and infrastructure improvements/enhancements. These options are the focus of this study.

Water marketing refers to a new system of water allocation whereby holders of water licences obtained through the first-in-time, first-in-right system, could choose to sell some or all of their water allocation, either permanently or temporarily to other users. Water banking is a policy option involving a financial agreement between two jurisdictions with one signatory physically storing water for another to be released when needed. The suggestion of joint operations stemmed from the IJC recognizing that the border can act as an impediment to efficient water administration and that working towards treating the basin as one instead of two could improve the situation. The infrastructure improvements being studied here are on-stream, meaning a dam and storage reservoir on the Milk River, and off-stream, meaning a diversion canal to a storage facility off the river, options. These two options are included because they were the focus of the recent feasibility study in Alberta.

In order to assess these policy options relative to political, economic, legal, environmental, effectiveness and complexity criteria, I undertook a mixed methods approach. A survey of Canadian MRB residents was undertaken, eight key stakeholders were interviewed, case studies were analyzed to learn lessons about conditions for success and relevant literature review was reviewed. The analysis of the results revealed that some of these options are not feasible and that a combination is necessary to address the multiple factors contributing to the policy problem.

Key Findings and Recommendations:

- **Water markets** transfer water from low to high value uses and in Alberta can involve water conservation through the utilization of a 10% hold back of water and increased efficiency of water practices. They should be put into practice in the MRB with educational campaigns for potential market participants and a website run by Alberta Environment with market information.

- The vast majority of survey respondents and all of the key stakeholders who were interviewed support the option of **joint water management operations** through the creation of an IJC St. Mary – Milk River board and greater collaboration between water users. The case study also indicates that this option will improve the management of the water in the Milk River.
- The two **storage options** have been studied several times over the last fifty years and have the support of local Canadian residents. These options would be subject to numerous provincial and federal regulations and are currently not viable when weighed against economic, environmental and political criteria.
- In order to allow **water banking**, the on-stream storage option would be required therefore this option faces the same obstacles as the on-stream option. However, it would have the added advantage of Alberta receiving financial recompense from Montana for the banking and release of their water.
- Other water management options not studied here but worthy of consideration include an infrastructure option of a pipeline diverting water from the St. Mary River in Canada to the Milk River in Canada and the idea of Montana banking water for Alberta (in contrast to what was studied here, Alberta storing water for Montana).

Dedication

"When you put your hand in a flowing stream, you touch the last that has gone before and the first of what is still to come."

- Leonardo da Vinci

To my husband Kevin for his love, support and encouragement. To my parents for instilling in me the importance of, and love for, learning and for their unwavering love and support. To my brother, Colin, Tracey and especially little Lucy for inspiration. To my friends for listening to me on this topic for the past year and never complaining.

Acknowledgements

First and foremost I acknowledge and thank my supervisor Nancy Olewiler. Her support, encouragement and clarity of thought have been invaluable, she is an inspiration. Special thanks also go to thank Benoit LaPlante for his comments and feedback; I was fortunate to have him as an external supervisor.

Thank you to the Milk River Watershed Council Canada. Its support early on in the process gave me the confidence to persevere. Thank you to all those who responded to my survey, their comments and concern about this issue put a human face on a complex problem.

A major component of this project was the information gleaned from interviews. Thank you to those who participated: Tom Gilchrist, Jack Blaney, Terry Michaelis, Cheryl Bradley, Cliff Wallis, Larry Mires, Richard Thule, Dave McGee and Sal Figliuzzi. Particularly thank you to Mr. Figliuzzi for not only talking to me on this topic but reviewing a draft and providing feedback.

Finally, thank you to my colleagues, Nancy, Claire, Eric and Calvin. Not only is my project better because of their involvement but we managed to have fun at the same time!

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Glossary

AE	Alberta Environment
AF	Acre-feet
AITC	Administrative-induced transaction costs
AWBA	Arizona Water Banking Authority
AWA	Alberta Wilderness Association
COAG	Council of Australian Governments
CFS	Cubic feet per second
dam^3	Cubic decameter
DWR	Department of Water Resources
IJC	International Joint Commission
IRBB	International Red River Board
IWI	International Water Institute
MAF	Million acre-feet
ML	Megalitres
MRB	Milk River Basin
MRWCC	Milk River Watershed Council Canada
MRIA	Milk River International Alliance
NWI	National Water Initiative
OECD	Organization for Economic Co-operation and Development
PFRA	Prairie Farm Rehabilitation Administration
PITC	Policy-induced transaction costs

RRBC	Red River Basin Commission
SMRID	St. Mary River Irrigation District
SAGE	Southern Alberta Group for Environment
SOW	State of the Watershed Report
SSRB	South Saskatchewan River Basin
WMP	Water Management Plan

1 Introduction

Water scarcity is a growing problem in many regions of the world. According to the United Nations, water use has been growing at a rate more than twice the rate of population a trend that if continued will translate into 1.8 billion people by 2025 living in regions of absolute water scarcity (United Nations, 2006, p.2). Canada is home to somewhere between 7 to 13% of the world's freshwater resources with the Great Lakes and St. Lawrence River being the world's single largest source of freshwater (Catley-Carlson, 2004, p.6).

Despite this relative abundance of water in Canada, there are significant regional disparities and even large differences within provinces. For example, in Alberta, 80% of the water supply is located in the north while 80% of the demand is in the south. In the southern semi-arid region of Alberta, farmers often experience water supply shortages necessitating the development of huge irrigation networks (AENV, 2002). Population growth and industrial development, combined with water shortages, have served to increase the pressure on water resources in Alberta.

Alberta also has to consider the demands of its Canadian and international neighbours on water that crosses its borders. Alberta abuts British Columbia, the Northwest Territories, Saskatchewan and Montana. There are currently apportionment agreements with Saskatchewan and Montana concerning their shared waters. The combined effect of population growth, industrial development, water supply shortages and variability and apportionment agreements have created a complex web of issues to be navigated when considering water policy in Alberta.

1.1 Policy problem

The Milk River Basin (MRB) is the southernmost region of Alberta and regularly experiences water supply problems; depending on the time of year, the Milk River dries up completely (see *Appendix A* for a map of the MRB). Water apportionment is an issue in all conditions because the Milk River flows through Montana into Alberta and then back into Montana. A formal agreement on water sharing has been established between Canada and the United States but has been the subject of controversy. Considering all the stakeholders in this basin, ranchers, farmers and residents on both sides of the border, and the economic and political

ramifications of water policy decisions, ***there is too little management of these water resources***. The following factors contribute to this problem:

- The water supply in this basin occurs largely in the early spring months from snowmelt runoff and rainfall on frozen ground while the demand largely occurs in late summer and early fall.
- Canada currently has no method of capturing this water in the spring for summer-fall use.
- The system of water allocation in Alberta, known as first-in-time, first-in-right, rarely results in an efficient allocation of water.
- The MRB basin is underdeveloped in terms of a policy framework.
- The international apportionment agreement limits what unilateral action Alberta or Montana will take to manage the water from the Milk River.
- There is little interaction and coordination between users on either side of the border on water issues.

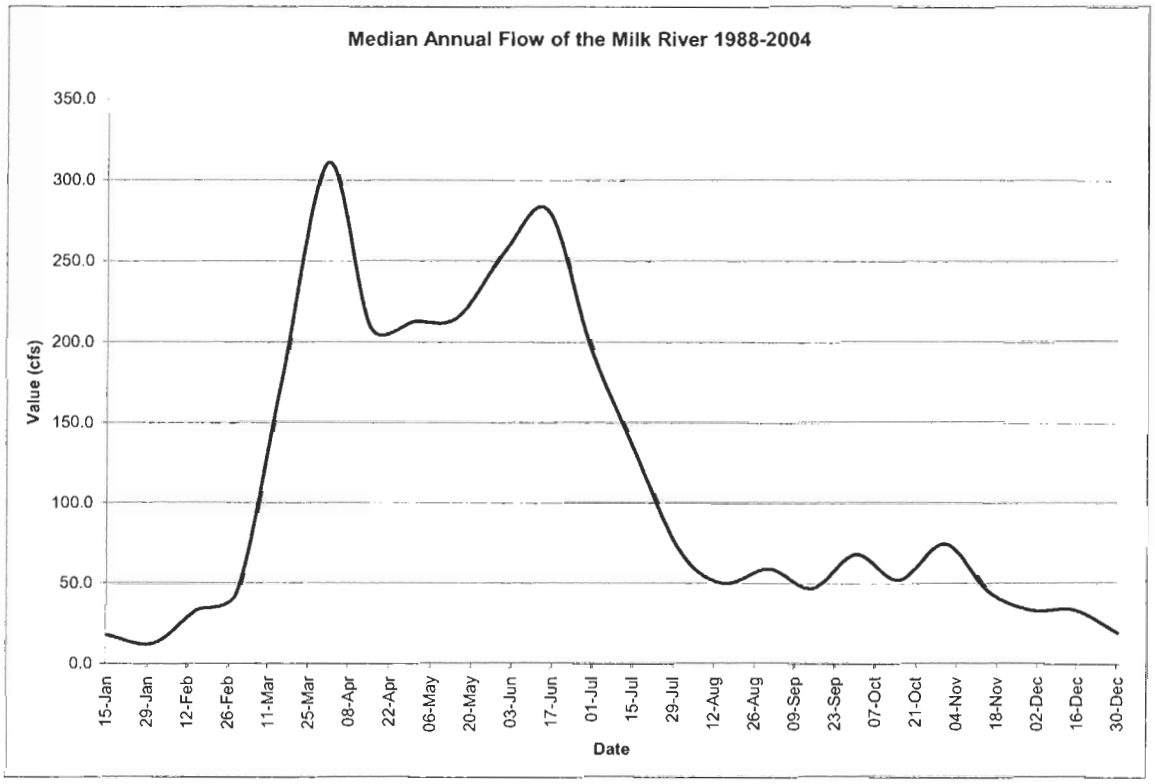
1.2 Study Outline

This study is organized into eight sections. Section one introduces the policy problem while section two provides further elaboration of this problem. Section three reviews the background to this problem including an overview of the relevant legislative framework. Section four covers the methodology used in this study and section five describes the policy alternatives analyzed. Section six describes the data results and seven provides a summary analysis of the options and outlines criteria which are then used to evaluate the alternatives. This section also includes policy recommendations. The final section provides a conclusion and recommendations for further study.

2 Policy Problem Defined

The water in the Milk River originates in the foothills of Montana; coming largely from spring runoff and spring precipitation. This pattern of supply is shown in the following chart, illustrating the median annual flow in the Milk River in the time period 1988 to 2004 (see *Appendix B* for source data).

Figure 1: Median Annual Flow of the Milk River

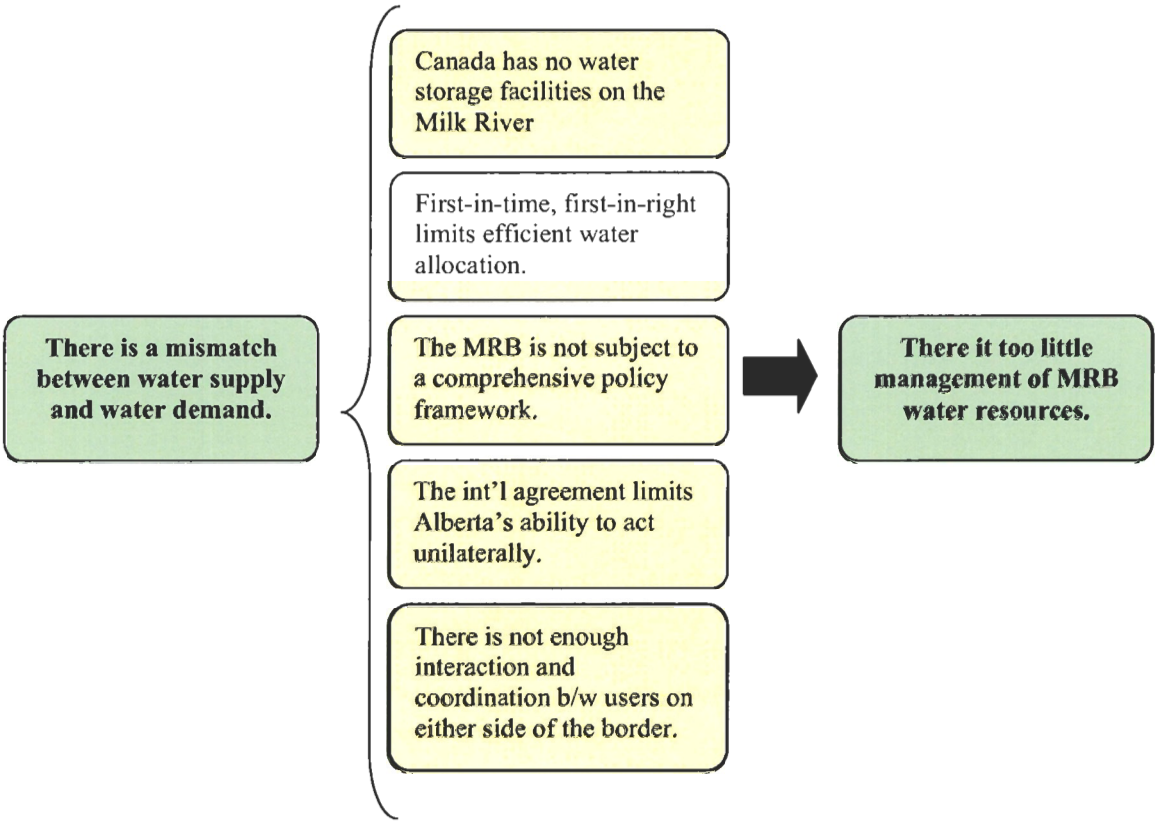


Source: Alberta Environment, 2006

Demand for water in the MRB comes largely from irrigators; the irrigation season in southern Alberta is late summer to early fall. Therefore, sufficient water to meet demand does not naturally flow through the Milk River when it is needed. This seasonal supply of water, combined with the factors described below, particularly when taken together, highlight the policy

problem that there is too little management of the water resources from the Milk River. The following chart is an illustration of these contributing factors.

Figure 2: Policy Problem Flowchart



Of these factors, the construction of a dam and reservoir on the Milk River is the most heavily studied and debated. It has been discussed for the past 100 years and has not yet materialized. The proponents posit that a dam would be able to capture the water from the spring freshet and release it later in the year as needed.

Construction of a dam also highlights another of the above factors: that the international agreement between the United States and Canada can pose an obstacle to Alberta acting unilaterally on water matters concerning the Milk River. An illustration occurred in 2002 when a group from Alberta visited Montana to discuss a preliminary feasibility study that was underway in Alberta examining a dam and storage reservoir. The meeting and study may have been instrumental in Montana's request to the International Joint Commission (IJC) to reopen the apportionment agreement (AWA, 2005, p.1). The Alberta study will now not be released until the IJC makes its final report on the apportionment agreement.

Montana's request to the IJC indicates that there is a lack of effective communication and coordination between users on either side of the border. There is currently no permanent group representing water interests from Alberta and Montana other than the IJC[1]. Is the IJC, a bilateral government agency with a narrow mandate the appropriate institution to address cross-border disputes? Perhaps in conjunction with other cooperative arrangements that would be more responsive to immediate needs, less legalistic, and able to promote dialogue between the parties.

The reaction to the feasibility study brought the lack of a comprehensive policy framework in the MRB to the forefront. In a submission to a public meeting regarding this study, the Southern Alberta Environmental Group (now known as the Southern Alberta Group for Environment, SAGE) contended that the study was contrary to the Alberta *Framework for Water Management Planning* (2001) as the MRB has not been subject to a water management planning process as described in that framework. The lack of a water management plan for the MRB also limits what instruments can be used to manage the water. For example, a transfer of an allocation of water under a licence cannot occur unless such transfers are provided for in an approved water management plan or by order of the Lieutenant Governor in Council [Alberta Water Act, 1996, S.81(7)].

A final factor that contributes to the lack of water basin management is the principle of first-in-time, first-in-right which is the method of water allocation in Alberta. It has been in practice for over 100 years and means that water rights are prioritized according to the licence's seniority, the older the licence, the higher the priority. As the Alberta Government notes "While the principle of 'First in Time – First in Right' provides security, on its own it does not ensure the most beneficial use of water, nor does it enable water to move to new uses in the watershed and it does not provide any incentive for water conservation." (AENV, undated)

[1] Annual International Records Meetings do take place with representation from both sides of the border. The issues discussed include data and natural flow reports, the IJC working group reports and other IJC issues as they pertain to the St. Mary-Milk River.

3 Background

3.1 Water Resources in southern Alberta

Alberta's Water Act divides the province into seven major river basins[2]; from north to south. The water in these basins comes from a combination of precipitation and glaciers in the Rocky Mountains and supplies most of the water Albertans use. The two industries that use the most surface water[3] in Alberta are irrigation (accounting for 71% of water use) and commercial/industrial (accounting for 15%); municipalities use only 6% of the total surface water in Alberta (AENV, 2002, p.27). 20 million hectares of land in Alberta are devoted to crop and livestock production, bringing more than $8 billion to the economy in 2004 (AED, 2005).

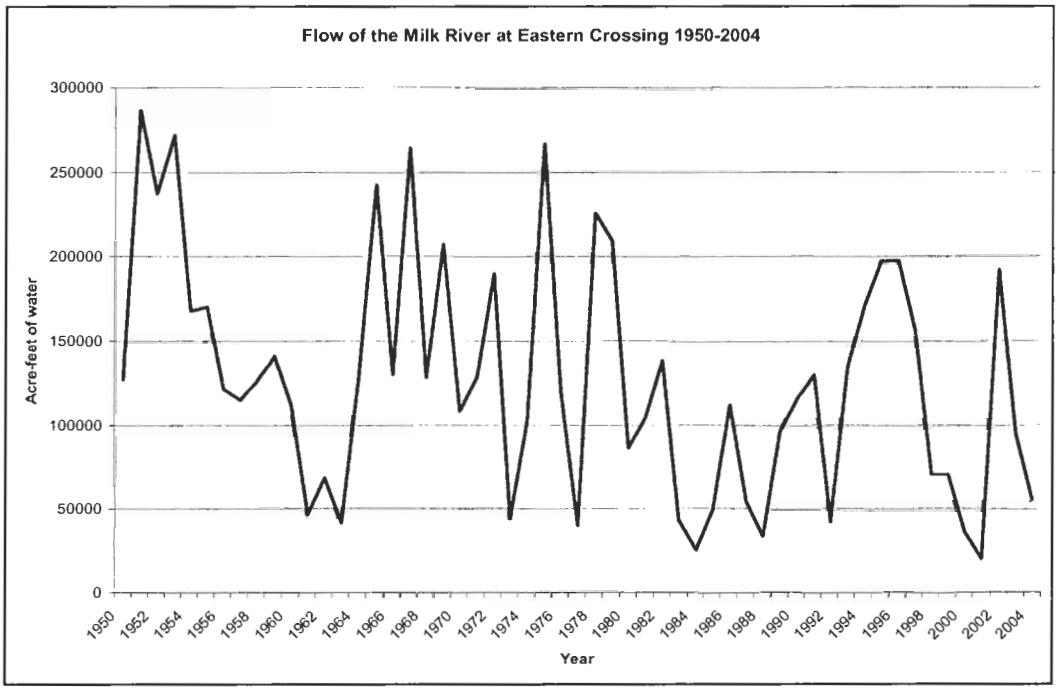
Within Alberta there is regional variation in the water supply, with the north having more water than the south and variation within a region from year to year. The following *Figure 3* shows the flow in the Milk River between the years 1950 and 2004[4]. The flow noted here includes not only the river's natural flow but also the water that the United States diverts through its St. Mary Canal from the St. Mary River to the Milk River; this water flows through Canada and back into Montana for users in eastern Montana (MRWCC, 2006, p.9).

[2] Alberta Environment defines a river basin as: "An area of land drained by a river and its associated streams or 'tributaries'" (AENV, 2002, p.5) These basins are: the Hay River Basin, the Peace/Slave River Basin, the Athabasca River Basin, the Beaver River Basin, the North and South Saskatchewan River Basins and the Milk River Basin.

[3] 97.5% of consumptive water use (use where water may not be entirely returned to its source), comes from surface water. The remainder comes from ground water.

[4] This data should not be interpreted to mean that the water flowing through the eastern crossing of the Milk River originates in glaciers in Montana and that therefore there is less water coming from the glaciers (as evidenced by the downward trend). At this location, the water in the Milk River comes from a variety of sources including the diversion from the St. Mary and from the Oldman River (Dave McGee, personal communication, December 7, 2006)

Figure 3: Flow of the Milk River at the Eastern Crossing 1950-2004



Source: IJC, 2006.

This figure illustrates great variation in supply between years. For example, 1995 witnessed flooding in southern Alberta while 2001 was a period of drought. There is currently no control of this water on the Alberta side of the border; there are no dams and reservoirs to capture the flow. On the American side, the St. Mary Canal diverts water from the St. Mary to Milk Rivers and there are two reservoirs downstream of the Milk Rivers re-entry into the U.S.: Fresno and Sherburne.

The MRB is the smallest basin in Alberta. It includes the Milk River, which originates in western Montana, curves up into Alberta and then returns to Montana. This basin is one of two in Canada that is part of the Mississippi-Missouri River Basin with the waters of the Milk River ending up in the Gulf of Mexico. The basin encompasses approximately 6500km^2 in Alberta and includes the towns of Warner, Milk River and Coutts, the population of the Canadian side of the basin is approximately 3,300. Mean annual precipitation in this area is between 316mm and 450mm while mean annual potential evaporation if in excess of 750 mm making the basin a semi-arid zone. Agriculture is the economic basis of the basin with 400 commercial farms, largely focused on grain and beef production. Of the water licences issued in this basin, 93% are for agricultural uses and irrigate a total of 3,318 hectares (MRWCC, 2006, p.12). The Town of Milk River and the Village of Coutts rely on pumping water from the Milk River to storage ponds as their sole water source.

Box 1: The Story of the Spite Ditch

The Story of the Spite Ditch

The history of conflict between American and Canadian water users goes back to at least the story of the 'Spite Ditch' at the turn of the twentieth century. In 1902 the Reclamation Act was passed in the U.S. Congress providing funds for irrigation projects in the American West. It was proposed at the time to divert water from the St. Mary River through a canal into the North Fork of the Milk River, thereby depriving irrigators in southern Alberta of water from the St. Mary.

While discussions for this project continued, a project commenced on the Canadian side to build the Canadian Milk River Canal, also known as the Spite Ditch. To add insult to injury, one of the contracts for this project was awarded to an American.

This Canal showed that the Canadians had the ability to divert Milk River water, "Alberta had 'structurally' called the Americans bluff...a peaceful solution did come about. With the 1909 Boundary Waters Treaty of 1909, the International Joint Commission (IJC) was born." (Dormaar, 2005, p.2)

In Montana, the basin covers approximately 23,250 km^2 and has a population of approximately 38,000. The main communities on the U.S. side are Havre, Chinook, Malta and Glasgow. Land use is largely range, dry land agriculture and irrigated agriculture, the bulk of irrigated cropland is found after the Milk River drains back into Montana with approximately 670 farms and ranches growing alfalfa, hay and small grains (MWC, 2003).

Because the water of the Milk River crosses an international boundary, there is an agreement on how this water is apportioned between Canadian and American users. The Boundary Waters Treaty contains this agreement and is under the purview of the International Joint Commission (IJC).

3.2 International Joint Commission

The purpose of the Boundary Waters Treaty, signed between the United States and Great Britain in 1909, was and is to address concerns over shared waters.

> The primary, short-run objective of the Boundary Waters Treaty was to resolve three existing transboundary disputes – the St. Mary and Milk Rivers in Montana and Alberta, the Niagara River, and the St. Marys at the Sault – the long term expectation was that it would help to avoid and resolve future conflicts over transboundary waterways. (Cohen, 1981, p.107)

Article VII of this treaty created the International Joint Commission. This body is comprised of six commissioners, three from each country. The commission "...shall have jurisdiction over and shall pass upon all cases involving the use or obstruction or diversion of the waters..." (Boundary Waters Treaty, 1909). The treaty provided the IJC with powers in administrative, quasi-judicial, arbitral and investigative spheres (Willoughby, 1981, p.24).

The IJC has set up more than twenty boards, those responsible for water bodies such as the International Osoyoos Lake Board of Control to other trans-boundary topics such as the International Air Quality Advisory Board. When asked by governments, the IJC will authorize water uses such as dams or investigate water or air pollution problems in lakes and rivers along the border and issue reports on the matter. In its deliberations, the IJC hears from experts on the issue and provides all interested parties an opportunity to be heard.

Article VI of the treaty outlines how the waters of the St. Mary and Milk Rivers are to be apportioned between the two countries. This agreement equally divided the waters of the two rivers between the two countries allowed one party to take more than its half from one river as long as it took that amount less from the other river, and also recognized prior appropriations by Canada in the St. Mary River and by the U.S. in the Milk River. It also allowed the United States to convey water from the St. Mary River through the Milk River in Canada and back into Montana for use by Americans. A series of hearings took place between 1915 and 1921 to clarify Article VI of the treaty. Following the hearings, the commission reached a unanimous decision and in October 1921 issued an Order directing how the waters of these streams were to be measured and apportioned.

The October 1921 Order further detailed the apportionment of the waters from the St. Mary and Milk Rivers; it further specified where the gauging sites were to be and directed that a daily record be kept of the flows (IJC, 2006, p.17)[5]. The rivers were addressed individually in the Order. During the irrigation season, April 1 to October 31, the Order directed that when the natural flow in the Milk River is less than 666 cubic feet per second (cfs), the U.S. shall be entitled to three-fourths of that flow and Canada one-fourth. When the flow in that season is more than 666 cfs, the U.S. shall be entitled to a prior appropriation of 500 cfs, and the amount over 666 shall be divided equally between the two. In the non-irrigation season, the flow shall be

[5] As daily records were not feasible it was agreed between Field Representatives that a 15- to 16- day balancing period would be used to allow time to undertake the calculations of apportionment. This issue is at the core of the recent IJC task force report. Parties in Canada would like the status quo to remain (Personal communication, Tom Gilchrist, December 20, 2006) while American interests would like a longer balancing period. A longer balancing period would potentially advantage the upstream jurisdiction (Personal communication, Sal Figliuzzi, January 19, 2007).

divided equally. The Order further states that the U.S. may use the channel of the Milk River in Canada to convey water diverted from the St. Mary (Order, 1921)[6]. The inclusion of the prior appropriation in the Treaty and Order has meant:

> Based on the past 55 years of record, application of the 1921 Order does not provide for equal entitlements to both countries of the annual flows of the St. Mary and Milk rivers. The combined entitlement for the St. Mary River, Milk River and Eastern Tributaries results in approximately 45 percent going to the U.S. and 55 percent going to Canada. (IJC, 2006, p.18)

After concluding in 1921 that "...the St. Mary and Milk Rivers problem is one that might easily become a source of serious irritation and misunderstanding to the people of the two countries..." the IJC made several recommendations. These were that the two countries should jointly build a reservoir in western Montana and that Canada should undertake the construction of a reservoir in the Verdigris Coulee (Order, 1921).

The United States has never viewed the 1921 Order as satisfactory. They pushed for and achieved two votes on whether to re-open the issue. In both 1927 and 1932, the Commission voted on the issue and split down national lines with the three American Commissioners voting to reopen and the three Canadian Commissioners voting against reopening the apportionment discussion. After the final vote in 1932, the IJC created an engineering board (today referred to as the Accredited Officers) to deal with the apportionment issues and who managed, until recently, to handle the issue without further IJC involvement (Willoughby, 1981, p.29).

3.2.1 IJC Administrative Measures Task Force Report

In 2003, the then Governor of Montana Judy Martz wrote a letter to the IJC asking that the 1921 Order be reviewed to determine whether the water flows of the St. Mary and Milk Rivers were being apportioned equally between the two countries as per Article VI of the Treaty. The Governor asked for "...an evaluation of the assumptions, methods and parameters that are used to establish the natural flows, depletions and apportionments." (Martz, 2003, p.1) Based on this request the IJC held public consultation throughout the summer of 2004 and then convened a Task Force in December 2004 to examine these issues.

The mandate of this bi-national Task Force was "...to examine and report to the [IJC] on measures for improvements for existing administrative measures of the St. Mary and Milk Rivers apportionment to ensure more beneficial use and optimal receipt by each country of its

[6] The Order goes on to address the St. Mary River and the eastern Tributaries. As they are not the focus of this study, this information is not included here.

apportioned waters." (IJC, 2004) The administrative measures to be examined included the computational procedures for determining the natural flow of the waters, the reporting of this natural flow on a bimonthly basis (known as the balancing period) and rules for refunding deficits when one country is calculated to have diverted more than its apportioned share (IJC, 2006, p.8). The Task Force released its report to the IJC in April 2006.

The Task Force noted that there are fundamental differences between Alberta and Montana over the interpretation of the 1921 Order. Alberta believes that the 1921 Order is based on the instantaneous flow in any point of time and that delivery of entitlements must be on a real-time basis, allowing for downstream canals and diversions. Montana agrees that entitlements are computed on a daily basis but believes that their delivery can occur over time at their discretion. (IJC, 2006, p.19) The conclusions of the Task Force ranged from the need to improve natural flow determinations to the need for a mechanism allowing for surplus credit deliveries if the balancing period were to be extended (IJC, 2006, p.4). The Task Force mentioned several other issues that fell outside their mandate but they felt might deserve further consideration in order to improve water allocation: water banking, water marketing, joint water management operations and infrastructure improvements and enhancements (IJC, 2006, p.5). These policy options are the focus of this study.

3.3 Legislative and Policy Framework

Against the backdrop of the international realities surrounding the Milk River, the province of Alberta has a long history of policy and legislation that has affected its water resources. In particular, its long history of irrigation has meant that a great deal of political attention has been paid to the issue of water and who has the right to water. The foundation of water policy in Alberta is contained in the 1894 Northwest Irrigation Act, which vested water rights in the hands of the Crown. This Act also established the principle of first-in-time, first-in-right in Alberta. Priority for water licences is decided based on the application date for that licence (Nicol, 2005, p.13). The Water Resources Act of 1931 transferred jurisdiction over water resources from the federal government to the provincial governments.

With revisions in 1975, the 1931 Act was replaced in 1999 with a new Water Act designed to address the increasing water challenges confronted by the Province. While the earlier Act focused largely on allocating water, this new legislation looked to managing and protecting Alberta's waters. This new Water Act has several features relevant to the policies studied here.

The Act continues the tradition of first-in-time, first-in-right by grandfathering water rights that had been previously allocated based on the date of the first water use. Section 46 of this Act prohibits the granting of a licence for the purposes of transferring water outside the Province, with the exception of processed and municipal waters. Similarly, section 47 prevents the granting of a licence to transfer water between major river basins within the province. Sections 81-83 introduce the idea of transferring water allocations under a licence. This latter section enables the creation of a water market.

For an application for a transfer of an allocation under a licence to be considered, a licence must be in good standing and the area subject to a water management plan. The Milk River Basin is currently not subject to such a plan and transfers, or a market, are not yet allowed. The South Saskatchewan River Basin is does however have such a plan. Some of the features of a transfer of an allocation under a licence are as follows: they are within the same major basin, they require the approval of Alberta Environment; they can be either permanent or temporary in nature; they can involve all or some of the water under a licence and the transfer cannot have a significant adverse effect on the aquatic environment. For water conservation objectives, or to protect the aquatic environment, Alberta Environment can decide to withhold 10% of the total transferred water. Such a decision is at the discretion of the Director, the conserved water may either remain in the natural water body to maintain a flow or it may be reserved or added to an existing reservation[7].

Another recent development that is guiding water policy in Alberta is the *Water for Life Strategy* announced in 2003. This comprehensive water policy is the result of three years of consultation and is guided by the following three broad goals: 1) a safe, secure drinking water supply; 2) healthy aquatic ecosystems; and 3) reliable, quality water supplies for a sustainable economy. (AENV, 2003, p.7) Each of these is further divided into short, medium and long-term descriptions. With this strategy, the Alberta government has committed to improving the efficiency and productivity of water use in Alberta by 30% from 2005 levels by 2015[8] (AENV, 2003, p. 8). Another focus is the building of partnerships with citizens and stakeholders. In particular, the strategy aims to encourage Community-based Watershed Stewardship Groups to participate for guidance, technical advice and mentoring (AENV, 2003, p. 16).

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[7] The reservation referred to is an amount of water not currently allocated under a licence the Minister has ordered 'reserved'. This water may remain in its natural body of water or a licence may be issued for its temporary diversion.

[8] Firm targets are to be established by the Provincial Water Advisory Council.

One such group is the Milk River Watershed Council Canada (MRWCC). This Council was formed in 2005 and "...strives to proactively preserve and improve the economic, social and environmental interests of the basin through effective partnerships and sound science." (MRWCC, 2006, p.18) The Council is composed of residents of the Alberta portion of the basin and includes representatives of ranching, farming, government, industry, irrigation and healthcare.

Additional Provincial Legislation

Any water management decisions made regarding the Milk River must be reviewed in the context of Provincial Legislation. At least the following should be considered in addition to what has been discussed above[9]; excerpts are provided in *Appendix C*.

1) Environmental Protection and Enhancement Act (R.S.A. 2000, c. E-W-12)
2) Natural Resources Conservation Board Act (R.S.A. 2000, c. N-3)
3) Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act (R.S.A. 2000, c. W-9)

Federal Involvement

Although environmental issues fall largely under provincial jurisdiction, rivers impact upon fish habitat, navigation and First Nations; all invoke federal responsibility. As a result, any major water management projects require both provincial and federal review. (AWA, 2005, p. 1) At least the following pieces of federal legislation[10] would impact on water management decisions for the Milk River, excerpts are provided in *Appendix C*.

1) Canadian Environmental Assessment Act (1992, c. 37)
2) Fisheries Act (R.S., 1985, c. F-14)
3) Navigable Waters Protection Act (R.S., 1985, C. N-22)
4) Species at Risk Act (2002, c. 29)
5) International Boundary Waters Treaty Act

3.4 Next Steps

This background, as well as the explanation of the problem, has highlighted several key points. These include the fact that the Milk River experiences variable flow, from year to year

[9] This is not an exhaustive list of relevant provincial legislation.
[10] This is not an exhaustive list of relevant federal legislation.

and within a year. There is currently no system of water storage on the Milk River in Alberta despite the agricultural focus of the basin. The Boundary Waters Treaty (specifically the 1921 Order) and the fact that the U.S. diverts water into the Milk River for use by eastern Montana, limits the ability of Alberta to act independent of support from Montana on issues concerning water from the Milk River (and vice versa). It is clear from this background that there have been ongoing discussions, and disagreement, between Canadians and Americans over issues surrounding the Milk River for over 100 years.

The IJC Task Force identified several policy options that will be studied here. The next section outlines the methodology undertaken in this study and examines how these options may apply to and contribute to better management of the Milk River.

4 Methodology

4.1 Study Population and Design

The aim of this study is to assess the feasibility of and support for various policy options designed to increase the efficient use of water from the Milk River, Alberta. A survey, interviews and case study analysis were the three methods of data collection undertaken for this study. The participants in the survey were residents of the Milk River Basin in Warner County while the interviews were with individuals who have particular knowledge of the relevant issues but not necessarily residents of southern Alberta. The case study analysis was necessary to better understand the potential outcomes of policies that have not yet been studied or implemented in the Milk River Basin.

4.1.1 Survey

The population is a non-random sample of land-owners in the County of Warner No.5, Alberta. A portion of this county is within the Milk River Basin[11] (population 3,300), including the villages of Coutts and Warner and the town of Milk River. In order to compile a mailing list, names of land-owners were recorded from a Warner County map. The selection criteria for my sample were those names closest to the Milk River and then branching out until I generated a list of 250 names. Addresses were then located for those names through searches conducted online at www.411.ca. 211 packages were mailed on October 19, 2006. The packages consisted of a cover letter describing the purpose of the survey and outlining its voluntary and confidential nature, the three page double-sided survey, a self-addressed stamped envelope and a ticket to enter a random draw for a $100 Canadian Tire gift certificate. Of those 211, five were undeliverable, two were not applicable to the addressee and one addressee had passed away. Therefore, the final number of qualifying surveys was 203. The cover letter and survey are located in *Appendix E*. To encourage responses 192 reminder notices were sent to the original recipients of the surveys on November 6, 2006. The difference between 203 and 192 were those

[11] Portions of the following also lie within the Milk River Basin: Cardston County, the County of Forty Mile, and Cypress County.

surveys that had already been completed and returned with identifying information, negating the need for a reminder.

The data consists of responses from 54 returned surveys. Due to ethics requirements, respondents were advised that they were not required to fill out any questions they were not comfortable with and as such, there was a wide range of completeness in the responses. The questions were in both open-ended and close-ended formats, the latter including Yes/No and Likert scale questions.

The survey was comprised of five sections. The first dealt with the respondents' previous experience with studies regarding water from the Milk River and their level of concern with the issue of quantity of water. Sections two through four addressed the respondents support for the policy options. The final section assessed their relative preferences for the options, their level of confidence in various bodies to manage the water from the Milk River and questions about their use of water from the Milk River and some basic socio-economic characteristics of their household.

The primary data from the surveys is presented in one of two ways: the responses to the close-ended questions are presented as summary statistics in *section 6.1*. The highlights from the responses to the open-ended questions are also provided in *section 6.1*.

4.1.2 Elite Interviews

In addition to surveys, the researcher conducted eight elite interviews to collect primary data for this study. The list of interviewees is threefold. First, it is comprised of representatives of impacted parties such as the Mayor of Milk River and the chair of the MRWCC. Second, the list contains government representatives such as Alberta Environment and the International Joint Commission. Lastly the list contained individuals who have particular knowledge of a policy option but are not necessarily residents of the Milk River Basin, for example, the past president of the Alberta Wilderness Association.

A list of interviewees is located in *Appendix G*. The respondents gave consent for their identities to be disclosed and the interviews were transcribed. A summary of responses, with their important findings highlighted, can be located in *Tables 11* and *12*.

4.1.3 Case Studies

The analysis of the Water Marketing and Banking and Joint Operations policy options will involve case study data in addition to the survey and interview data. The case studies will examine jurisdictions that have implemented Water Marketing and Banking and Joint Operations policies (defined below) and draw from them insights as to the efficacy of the policies and also what conditions led to the success or failure of those policies.

4.1.3.1 Water Marketing and Banking Case Selection

This study will present case studies reflecting both of these instruments for water management. Australia's Murray-Darling Basin, Alberta's South Saskatchewan River Basin and California's Drought Water Bank will be the case studies relied upon for the water marketing option. The Colorado River and specifically the Arizona Water Banking Authority is the relevant case study for the water banking option. This latter policy option is closely related to some proposals for on-stream storage options. This link will be explored in the analysis section of this study.

A water market involves the temporary or permanent selling of an allocation of water. Water allocations are obtained with a licence giving a right to that water. When these rights are independent from land rights, they can be traded separately. There may be restrictions on the market relating to prices or water quality, for example ensuring a minimum flow is maintained (Holden and Thobani, 1996, p.6).

There are some water markets in existence that operate with a 'bank' or exchange (not to be confused with the Water Banking option outlined below). This can be described as:

> ...a means of reallocating or transferring the use of water through some kind of centralized management entity. Rather than trying to find buyers or lessees for a particular water right, water rights holders "deposit" their water right in a "bank", which then leases the water right to a third party. The water rights holder is protected from forfeiture of the water right and benefits from revenues obtained for use of the water by a third party. (Cartron, 2002, p.1)

The water banking option being studied here has elements of water markets in that water is transferred between users. However, water banking involves an agreement between two or more jurisdictions with one signatory physically storing water on behalf of the other party(ies) in return for some financial recompense or other benefit.

Table 1: Characteristics of Water Banking and Marketing Case Selection

	Australia - Murray-Darling Basin	Alberta – South Saskatchewan River Basin	United States – California	United States – Colorado River	Alberta - Milk River Basin
Involved governments	Commonwealth, New South Wales, Victoria, South Australia	Canada, U.S. Federal, Alberta, Montana, Saskatchewan	U.S. Federal, California	U.S. Federal, Arizona, Nevada, California	Canada, U.S. Federal, Alberta, Montana
Relevant agreements	National Water Initiative Agreement Murray-Darling Basin Agreement	International Boundary Waters Treaty and related 1921 Order Prairie Province Master Agreement on apportionment		1922 Colorado Compact 2001 Agreement for Interstate Water Banking	International Boundary Waters Treaty and related 1921 Order
Nature of water supply and demand	- Semi-arid region - Water in basin is apportioned between 3 states - 1.5 million ha irrigated in this basin (71% of Australian total) - 95% of water removed is used for irrigation. - Volume of water extracted capped in 1997 at 1993-94 levels.	- Semi-arid region - Includes Bow, Red Deer, Oldman and South Saskatchewan Rivers. - Water is used largely for irrigation and municipal. - applications for new water allocations in Bow, Oldman and South Saskatchewan River sub-basins no longer being accepted	- Semi-arid region - Water comes from the Sacramento and San Joaquin Rivers. - Agricultural, environmental and urban users compete for water.	-Semi-arid region - Water from the Colorado River is apportioned between 3 states. - Water is used largely by municipal and industrial users.	- Semi-arid region - Water from the Milk River is apportioned between Alberta and Montana. - 93% of licences are for agricultural purposes (Milk River Watershed Council, 2006, p.12). - No more water allocations are being granted on the Milk River.
Market	- Water marketing involves the buying and	- Water marketing involves buying and selling of water	- Thousands of informal water transfers occur	- Water banking involves Arizona	- Currently no water

	Australia - Murray-Darling Basin	Alberta – South Saskatchewan River Basin	United States – California	United States – Colorado River	Alberta - Milk River Basin
Details	selling of water allocations. - Water rights separate from land titles. - Water markets have existed for 20 yrs. - Institutions involved: water exchanges within irrigation areas, the National Water Exchange, and an inter-state water-trading program. - Emphasis on temporary trading.	allocations, either permanent or temporary - Market has developed in last five years - Trades occur between individuals with approval of Alberta Environment	every year. - a Drought Water Bank is established in drought years with the state acting as a broker.	storing for its own use and for Nevada. Also California storing water for Nevada. - Arizona has a contract with Nevada to store water in an underground aquifer, when needed Nevada withdraws same amount from the river. - Does not involve sale of rights to water. - Managed by the Arizona Water Banking Authority.	banking in either form. - Although Water Act allows for transfers of water rights, does not apply to MRB as a prerequisite is a water mgmt plan. - Currently no storage facilities on or off the river, other than for municipal use.

4.1.3.2 Joint Operations Case Selection

The option of joint operations refers to building a collaborative, watershed focused plan for management of the MRB. This would in theory work to reduce the barriers the political border imposes on water management. This concept is a recent one in the context of international borders and as such the available case studies are limited. The International Joint Commission's first attempt at this watershed approach provides our only reference.

Table 2: Characteristics of Joint Operations Case Selection

	Red River Basin IJC Watershed Initiative	**Alberta–Montana Milk River Basin**
Involved governments	Canada, U.S. Federal Minnesota, Manitoba, North Dakota, South Dakota	Canada, U.S. Federal Alberta, Montana
Key topics	- Agriculture is economic focus of the basin. - Floods from the river have caused considerable damage on both sides of the border. - Devils Lake diversion. North Dakota wants to divert Devils Lake water into Sheyenne River which joins the Red River eventually ending up in Manitoba and draining in Hudson Bay. Canada objects due to presence of foreign organisms. - Focus on encouragement of watershed approach.	- Agriculture / ranching is economic focus of the basin. - There have been ongoing diversion proposals on both sides of the border. - Droughts and floods have impacted both sides of the border.
Considerations	Red River Basin Commission is a watershed-based grassroots organization.	There is not yet an organization with representation from both sides of the border.

5 Policy Alternatives

In its report to the IJC, the Administrative Measures Task Force identified several policy options that could potentially improve each country's use of its apportioned waters. These options were not studied by the Task Force as they were not within their mandate; they are the policy alternatives presented here.

The ideal option would be a scenario where there are no borders within the Milk River Basin. In this theoretical environment, multiple jurisdictions would not act as a constraint on policy. Several of the factors leading to the current policy problem would not exist in this scenario. There would be no international apportionment agreement limiting the parties' actions, and interaction between users would not be constrained by the presence of a border and the distrust that generates. It is also likely that the water storage environment would have evolved differently in the absence of borders and a policy framework would not have to account for the involvement of provincial, state and two national governments.

With no borders it would be possible to achieve better efficiency of water use through a water market. Given that the demand for water varies temporally within the MRB, water transfers could be utilized to exchange water between users throughout the year depending on demand. Water would transfer from low to high value uses and conservation and efficiency would be encouraged throughout the basin.

However, there are multiple jurisdictions present and they do act as a constraint on water policy in the Milk River Basin. They do act as an impediment to efficient water management so it is a matter of adopting policies that can improve water management while operating within this complex multi-jurisdictional, multi-interest environment.

5.1 Status Quo

The status quo has resulted in the current policy problem: that there is too little management of the water resources from the Milk River. If the status quo is maintained and no new water management policies are implemented in the MRB the policy problem as described in *section 2* will persist. The lack of planning in the basin leads to continued uncertainty for the

local residents and the lack of collaboration contributes to the escalation of problems. For example, the Alberta Wilderness Association concluded, "It is likely that the 2002 meeting between Alberta's Milk River Water Management Committee and members of the international group regarding the Milk River Water Study was the catalyst for the Montana challenge [letter from Governor Martz to the IJC]." (AWA, 2000)

The status quo in the MRB also relies solely on the system of first-in-time, first-in-right. This manner of water allocation results in efficient allocation of water only by coincidence (Freebairn, 2003, p.205). The reality of fluctuating water availability means "...frequent reallocations are required to maintain efficiency over time." (Freebairn, 2003, p.205) First-in-time, first-in-right largely prevents such reallocations and it is therefore worthwhile to look at a system that would reduce these inefficiencies.

5.2 Water Marketing

As pressure increases on water resources around the world, countries are researching and implementing economic instruments to manage the allocation of this resource. This movement away from supply side management of water resources is at least partly driven because such "Budgetary constraints and less tolerance for environmental damage are making supply side solutions to water shortages, such as building dams, much less feasible and acceptable." (Nicol, 2005, p.22)

The World Bank advocated the use of economic instruments to manage water resources in a policy paper published in 1993. (Easter et al., 1993, p.10-11) One policy is the establishment of water markets and examples of these markets are found in Chile, Australia and some western states including California. The advantage of a market is that "Tradable water rights allow the price of water to reflect the value of its alternative use, which creates incentives to put it to the most productive use." (Holden and Thobani, 1996, p.11) There is also a conservation benefit to water marketing both buyers and sellers have incentives to use water more efficiently, sellers to be able to sell more and buyers to have to buy less (Holden and Thobani, 1996, p.11). For an illustration of these concepts, refer back to *Figure 4*. An obstacle to successful water markets is that they require "...complex institutional and legal frameworks, as well as strong social and economic capacities." (Bjornlund and McKay, 2002, p.792)

There are two types of tradable water rights regimes: formal and informal. A formal market operates within a regulated and institutionalized framework. The transactions are often permanent and over longer distances. Such a market typically develops with parties with long-

term capital investments in their operations and long periods of insufficient supply. An informal market involves temporary transfers of water, the advantage of which, Bjornlund and McKay note, is that it allows irrigators to respond to temporal changes in market conditions, climate, farm problems, and personal circumstances (2002, p.771).

5.2.1 Why Efficiency Pricing is Needed

Compared to other Organization for Economic Co-operation and Development (OECD) countries, prices for water in Canada are generally lower. In Canada, water has traditionally been provided for agricultural purposes at heavily subsidized rates. To achieve efficient water allocation, different instruments than those currently employed may be necessary. Water pricing reforms in Canada have focused on replacing the federal and provincial subsidies with a situation where costs are covered by the farming community itself. (OECD, 1999, p.19).

Several issues must be considered when determining efficient pricing and use of water. First, that there are competing users with different needs; second, the variability of water supply; and lastly the system of water allocation, for example first-in-time, first-in-right. In the MRB there are high and low value water users. High value users include municipalities and farmers of specialty crops such as sugar beets, potatoes and alfalfa. Low value users include farmers of forage and cereal crops. The majority of water in the Milk River comes in the spring and early summer while much of the water demanded for agriculture comes in later summer and early fall. Because there is a lack of storage on the river, and the price cannot adjust [fully or at all], there may not be enough water to supply all the potential users. Alberta relies on a system of first-in-time, first-in-right where water licences are based on seniority regardless of the use and productivity of that water.

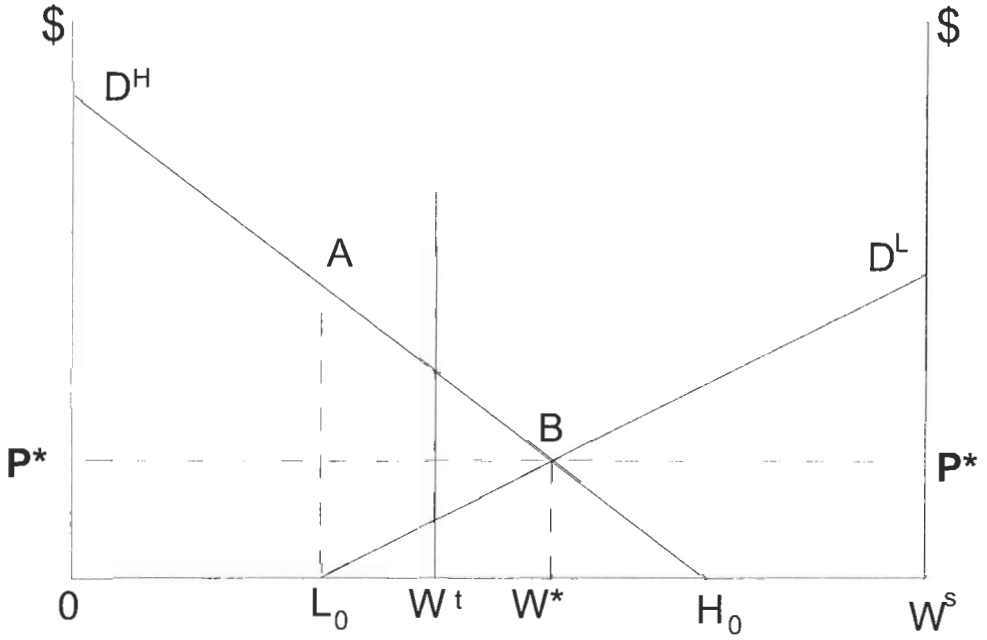
Figure 4 illustrates two demand curves for surface water. D^H is the demand curve of high value users while D^L is the curve for low value users. The horizontal axis, $0W^S$, represents the supply of water in a given year. Several examples of possible water allocation can be seen in this graph:

- At a price of 0, the total demand for water will be $0H_O + W^SL_O$ exceeding the supply of OW^S.
- In the situation where the low value users have priority licences due to the first-in-time, first-in-right principle, they will consume water until its marginal value = 0, they will consume W^SL_O.

- In this scenario, high value users would receive the remainder of the water supply $0L_O$, because they have higher values of the water lying to the left of W*, economic waste occurs. The loss to high value users is L_OABW^*.
- An efficient water market would occur when $D_H=D_L$ (B) at an equilibrium price of P*.
- When price P* is charged for water there would be a reduction in low value crop output in favour of high value.
- When the supply of water is constricted to W^t, as occurs in the MRB in the late summer and early fall (see *figure 1*), there will be no price at which $D_H=D_L$[12].

These basic premises provide the economic assumptions of this study.

Figure 4: Illustration of a Water Market



5.2.2 Transaction Costs

Transaction costs are those that are incurred within a trade but are not the actual cost of the water being purchased. These costs are an important consideration in water markets as they can drive up the cost of transactions and impede market activity.

[12] This depends on the amount of the shortage and where the demand curves intersect.

> Due to the lack of public and private institutions supporting the markets, potential traders often spend considerable resources gathering market information, finding potential trading partners, negotiating deals, and legally effecting transfers, that is trading in water markets is subject to large transaction costs. (Carey et al., 2002, p.734)

There are two types of transaction costs: administrative-induced transaction costs (AITC) and policy-induced transaction costs (PITC). AITCs are, for example, those costs related to locating parties and negotiating the transfer. PITCs are those generated by legal requirements relating to, for example, fish and wildlife and third-party effects. Easter, Rosegrant and Dinar conclude that with respect to water trading: "For markets to be effective, transactions costs must be kept low. To keep these costs low, the appropriate institutional and organizational arrangements need to be in place, as well as flexible infrastructure and management." (1999, p.113)

The necessary institutional framework depends on the types of transactions being conducted. A formal water market requires a legislative framework that provides for contract enforcement and therefore clear, legal protection of water rights. An informal water market relies on enforcement based on reputation and personal trust, in an instance where a seller doesn't deliver, the buyer can use another supplier. Other than institutional framework, the following factors should be considered in a market and some may contribute to low transaction costs:

- Adequate management and infrastructure for trades where users are not in the immediate vicinity.
- Mechanisms should be in place to ensure monopoly control over water does not develop and to ensure groundwater is not over-exploited.
- Governments may also want to ensure the preservation of in-stream uses such as recreation, fish production and the aquatic environment by purchasing some of the water themselves.
- Adequate data must be available regarding the supply and demand of water.

If transaction costs are prohibitive and exceed what the buyers and sellers are willing to pay, an informal water market may be a cheaper alternative to a formal market (Easter et al., 1999, p.100-103).

Traditionally in Canada such markets have not existed, the situation is changing with Alberta leading the way. Case studies illustrate where markets have been created. The information gleaned from the cases help determine if water markets would be advantageous for

water management of the MRB. Three case studies will be introduced; the first is the Murray-Darling Basin in Australia, secondly, the South Saskatchewan River Basin in Alberta and lastly the Drought Water Bank in California. A short description and general conclusions are included here with a more detailed description of each case provided in *Appendix F*.

5.2.3 Case Study #1: Australia – Murray-Darling Basin

The Murray-Darling Basin covers over 1,000,000 km^2 and drains most of New South Wales and portions of Victoria, Queensland and South Australia. The Murray and the Darling are the basins' largest rivers; the Murray has four large reservoirs along its length, which have stabilized the flow of water to a year-round low level (as opposed to high in summer and dry in winter). The Darling River experiences years with almost no flow at all. Much like the Boundary Waters Treaty as it pertains to the St. Mary and Milk Rivers, the Murray-Darling Basin Agreement apportions how much water each state is entitled. This case is a good example of a semi-arid region heavily relying on water for irrigation purposes, with a sophisticated intra-basin water market and a developing inter-basin water market. See *Appendix F* for a detailed description of this market.

General Conclusions

- When no new water allocations are being provided, users will look to new ways to obtain water.
- The motivation for buying water depends on the type of uses (high or low value) the water is put to and the amount of investment that has been put into that use.
- The majority of water being sold was, prior to the transfer, unused and the main motivation for selling was the need for money.
- Water is generally transferred from low value to high value uses.
- The majority of trades are of a temporary rather than permanent nature.
- Exchanges have been developed and provide information and facilitate transactions.
- Given certain conditions environmental benefits can be achieved through water trading.

5.2.4 Case Study #2: Alberta - South Saskatchewan River Basin

The South Saskatchewan River Basin (SSRB) covers approximately 121,095 km^2 and includes cities such as Calgary and Lethbridge. The basin is home to the province's thirteen irrigation districts providing water for the production of crops such as potatoes and sugar beets. There are currently no further water licences being issued in the Bow, Oldman and South Saskatchewan sub-basins (there is only one other sub-basin, the Red Deer). Water allocations can however be now obtained through water transfers resulting in water markets, both formal and informal, in this part of southern Alberta. The basin is subject to a water management plan, a necessary precursor to water transfers. The St. Mary River, originating in Montana, flows through this basin.

A formal and informal water market has existed in this basin since 2001 and general conclusions can be reached about the results of this market. See *Appendix F* for a detailed description of this market.

General Conclusions

- This basin is subject to a water management plan.
- When no new water allocations are being provided, users will look to new ways to obtain water.
- Water transferred from low value to high value uses.
- The motivation for purchasing water in informal markets is for immediate protection against drought while in the formal market the motivation was long-term economic adjustment and security.
- The majority of trades are of a temporary rather than permanent nature.
- Water conservation has occurred when 10% of water involved in a trade has been held back for the benefit of the aquatic environment. This does not occur in every trade.
- The majority of water sold, in both markets, was unused prior to the sale.
- Transaction costs did not appear to hinder market activity.
- Challenge:

- No exchange or list of possible buyers or sellers exists to facilitate transactions although the information can be requested of Alberta Environment.

5.2.5 Case Study #3: California Drought Water Bank[13]

California, similar to Alberta, relies upon a system of first-in-time, first-in-right as the basis of their water allocation system. Another similarity is the geographic focus of water; the supply is based in the north while the demand is heaviest in the south. Water marketing has been occurring on an informal basis for many years - indeed thousands of water transfers occur every year. In these instances the trades are almost exclusively bilateral and the prices are not announced (Carey, 2002, p.733). During a drought between 1987 and 1992, the state instituted the California Drought Water Bank. The bank is only enacted in years of drought and the state purchases the water and limits the price to what the income sellers would have otherwise obtained with an additional incentive. See *Appendix F* for a detailed description of this market.

General Conclusions

- Transactions costs are reduced with a centralized Water Bank.
- The agricultural, urban and environmental sectors were all interested in buying water from the Bank. Their motivation was for immediate security against drought.
- Agricultural users were willing to sell their water but that willingness is price dependent. They were motivated by the income generating possibilities.
- Water sellers in a temporary market require legislation assuring them that their long-term rights are not affected by the transfer.
- The water sold was being used prior to the sale.
- <u>Challenges:</u>
    - Ground water substitution was an indirect source of water in these banks further depleting ground water levels.

[13] The term 'bank' used here should not be confused with the policy option "Water Banking" introduced below. In the California context it refers to a centralized agency where water entitlement can be bought and sold. In the water banking, as will be shown below, it refers to a physical storing of water between two jurisdictions.

- Environmental impacts are not known as environmental assessment reports were not required.

5.3 Water Banking

The water banking being discussed here is Surface Storage Banking. In this instance banks are formed around a reservoir or other storage facility and storage allotments are banked and exchanged; it is backed by physically stored water. This generally provides greater reliability in supply as it is based on specific volume or percentage of annual available storage. In this instance, the banking would occur between Alberta and Montana, with Alberta storing water for its downstream neighbour. This would require a storage facility which is discussed below as an additional option.

5.3.1 Case Study #4: United States – Colorado River

The case study of water banking presented here is a 10-year agreement between Arizona and Nevada whereby Arizona will store water from the Colorado River for Nevada in exchange for storage and delivery costs and $230 Million. See *Appendix F* for a detailed description of this water banking arrangement.

General Conclusions

- Innovative, inter-jurisdictional water management strategies are being developed to address water shortages.
- For the jurisdiction banking the water, the motivation is largely financial although maintaining good relations with their neighbours is also a factor.
- There is the potential for substantial financial benefits to be made from being the banker of water.
- The motivation for purchasing the water is two fold: to provide an immediate necessary water supply and the time to explore other water management options.
- Storage facilities are required to house the water.

5.4 Joint Water Management Operations

Currently, there is a lack of coordination across the border on issues that affect the Milk River. The IJC has representation from both Alberta and Montana but there is no non-governmental body that can say the same. There has been dialogue and meetings between organizations such as the Canadian MRWCC and the American Milk River International Alliance (MRIA), their activities have not been coordinated and there has not been a united approach to water issues. This has meant that the MRB has not been treated as one basin but instead two. The IJC task force recognized that:

> ...in some cases, the international boundary appears to act as an artificial barrier and impediment to efficient water administration. Some have theorized that water management might likely have evolved differently had the entire basin been within one jurisdiction and they go on to suggest that there exists an opportunity for the existing jurisdictions to develop an innovative, collaborative approach to management of the entire St. Mary-Milk River Basin. (IJC, 2006, p.44)

This issue is relevant not only in the MRB but in many places around the world where bodies of water cross international boundaries. There is therefore a volume of research into this area of water management. A study recently completed for the Swedish Ministry of Foreign Affairs, examined five international river basins to determine whether the concept of public goods was a valuable framework for the study of inter-state water management issues (Odi et al., 2001). The conclusions from this report were grouped into four categories: Institutional development: Building politically-feasible environments; Financial Development: Establishing new financing options; Participation and civil society: Enhancing roles; and Legal and Policy Dimensions: Creating conditions for agreement.

The first conclusion highlights the importance of political feasibility to effective transboundary water management and notes that institutions change to reflect the political environment. Both technical and political communication with a goal of developing a joint vision and strategic plan for a basin are necessary to achieve progress. With this in mind the study recommends that international transboundary river basins have:

> A facility with a specific mandate to assist regional management of transboundary waters...[to] provide a clear focus and the opportunity to consolidate international concerns, streamline initiatives, and direct them towards mobilizing the idea of effective international water resources management as a regional public good.....[this would] promote politically feasible environments. (Odi et al., 2001, p.v)

Several financing mechanisms are examined in this study. The first option is public financing whereby money would be raised through new taxes or charges, establishing a direct link between the activities the funding supports, for example, public awareness campaigns, and the provision of the public good. A disadvantage is that it is a complicated process. Another option is private financing; this has existed only in instances of hydropower development; a variety of incentives and enabling conditions are necessary and potential profitability must exist for the private sector to express interest. Endowment or Trust Funds are a possible option for sustaining institutions and long-term planning. The requirement of a board of directors would encourage stakeholder participation. The final option discussed is inter-riparian financing whereby a wealthier jurisdiction provides investments in poorer countries. There are few precedents for such an approach (see Box 2 for one such example). "Where inter-riparian financing has taken place...it has consisted of negotiated deals between riparian countries under the aegis of a trans-boundary water management commission or agreement...As with private sector financing, the key is the presence or absence of a transboundary management structure." (Odi et al., 2001p.viiii-ix).

The third conclusion of this study centers on the role of civil society in transboundary water management. In the case studies examined, the role of civil society in development policy programs is limited. The recommendation to emerge is that "To be effective, transboundary water management has to include the balancing of priorities between users groups, essential to which is more effective partnering of government and private sector with civil society." (Odi et al., 2001, p.xii) They further recommend that the entry of civil society and local government into the

Box 2: The Indus Waters Treaty

The Indus Waters Treaty

The Indus Water Treaty was signed between India and Pakistan in 1960. This treaty has endured through many years of violent conflict between the two countries. The provisions of this treaty apportioned the waters of the 'eastern' rivers to India while Pakistan was apportioned the waters of the 'western' rivers. This was not only an apportionment agreement however; the treaty also contained financial provisions in which India provided Pakistan 62,060,000 Pounds Sterling for the replacement of water works in Pakistan (IWT, 1960). These works would replace Pakistan's dependence on waters from the eastern with waters from the western rivers.

Although there are ongoing discussions on this treaty, it is an interesting example of two neighbours with a long history of disagreement, coming to an agreement on a shared resource.

policy process should be a focus of any planning. Lastly this study concludes that an important part of the process is "...agreement on principles for participation (who should participate and at what level), for decision-making (how to make these processes transparent and who to Include), and on the principles by which benefits (or water shares) should be apportioned." (Odi et al., 2001, p.xiii).

An initiative that has incorporated many of these principles is the International Joint Commission's Watershed Initiative. In 1998, the two federal governments asked the IJC to further develop the concept of a "...integrated, ecosystem approach to transboundary environmental issues." (Comras, 1998, p.1). To date the IJC has responded with reports in 2000 and 2005. The first report to the governments presented the Commission's findings to date on the idea of international watershed boards. The Commission envisioned that such boards would have the following responsibilities:

1) identify and articulate issues affecting the system;
2) communicate these issues across the watershed and provide a forum for the public to engage these issues;
3) study and research emerging issues and suggest possible solutions to issues that cannot be resolved as effectively through other mechanisms;
4) provide the ability to enhance local capacity to address transboundary issues by bringing knowledge, experience and resources from across the two countries to bear on local cross-border questions; and
5) provide a means for dealing with asymmetrical governance in the two countries.

(IJC, 2000, p.7)

During the two years that the Commission worked on this issue leading up to the 2000 report, they found widespread, almost universal, support of the concept (IJC, 2000, p.1). They initiated the amalgamation of boards within the Red River[14] and St. Croix watersheds and asked the International Red River Board to increase stakeholder participation. They established the International Red River Board as a pre-pilot international watershed board and recommended that $165,000US be allocated to fund this initiative on an annual basis. This board is the next case study to be examined.

5.4.1 Case Study #5: The Red River Watershed Initiative

The Red River covers 116,500 km^2; its basin covers Manitoba, Minnesota and North and South Dakota. The IJC has had a board overseeing this river since 1948 and since then has issued

[14] The Red River basin encompasses parts of Minnesota, Manitoba and North and South Dakota.

regular reports on issues such as apportionment, pollution and flooding. In recent years, the focus of the IJC board has been on flooding and the Devils Lake diversion. This latter project would involve a diversion project removing water from Devils Lake, Minnesota, and rerouting it into Canada. Objections have been raised on the Canadian side of the border as there are concerns that parasites from Devils Lake would eventually make their way to the Hudson Bay Basin as a result of this diversion with ensuing negative ecological effects.

In June of 2005, the IJC released a report entitled *A Discussion Paper on the International Watersheds Initiative*. This initiative is designed to encourage cooperation and trust-building at the local watershed level with a goal of eliminating the need to involve the two national governments or the IJC. The focus of this initiative is two-pronged, firstly enhancing the capabilities of existing IJC boards and secondly strengthening cooperation among local entities (IJC, 2005, p.27). This initiative has identified three watersheds as a starting point including the Red River watershed. The IJC considers this watershed an ideal starting point for several reasons. First, several issues exist within this watershed that have created significant cross-border political problems (for example, Devils Lake). Second, policies such as flood mitigation would benefit from transboundary collaboration. Lastly, an organization exists, the Red River Basin Commission (RRBC), which is working towards a watershed vision through a Natural Resources Framework Plan. Such an initiative is an example of joint operations in practice. See *Appendix F* for a more detailed description of this case study.

General Conclusions

- An experience such as the severe floods of 1997 can prompt an awareness of the need for increased collaboration between watershed groups.
- A watershed with established, stakeholder organizations with clear mandates and membership from both sides of the border is a more likely candidate for the IJC Watershed Initiative.
- Significant cross-border political problems create a situation where cross-border collaboration can be particularly useful at achieving resolution.
- Environmental benefits can be achieved through greater cross-border collaboration.

5.5 Infrastructure Enhancements

The IJC Administrative Measures Task Force commented on the option of infrastructure enhancements. Specifically, the report discussed the possible rehabilitation of the St. Mary Storage and Conveyance works in Montana and a dam and storage reservoir on the Milk River in Alberta. The St. Mary facilities in Montana consist of: Sherburne Dam, the St. Mary Diversion Dam and U.S. St. Mary Canal headworks.

> This system which brings water from the St. Mary River Basin to the Milk River Basin, has been in operation for over 85 years. The capacity of the system has decreased...[from] 850cfs to approximately 670 cfs...additional diversion and conveyance capacity in the system potentially increases operational flexibility and hence provides an opportunity to increase the ability of both countries to access and utilize their respective entitlements. (IJC, 2006, p.45)

As this option is not under Canadian jurisdiction, it is not reviewed as a separate alternative in this study.

There is a relevant facet of this infrastructure improvement on the American side of the border that should be noted as it may impact on some of the options being studied. In a *Public Comment on the April 2006 Task Force Report*, John Bohlinger, Montana's Lieutenant-Governor and co-Chairman of the St. Mary's Canal Rehabilitation Working Group, stated:

> Hydrologic analysis shows a functioning St. Mary Canal to be a benefit to water users on both sides of the border. A shared investment in the St. Mary Canal will benefit both countries by assuring a reliable water supply in the Milk River. We ask Canada and the IJC to...work with Montana and the United States on creative new approaches that will share the cost of rebuilding the canal for the benefit of both countries. (2006, p.8)

A resident of the MRB responded to the suggestion by Montana that Canada pay for at least a portion of the cost of improving infrastructure works in Montana. The respondent indicates Montana in this request for funding ignores that Albertans pay for all of the canal maintenance of the Milk River (Snow, 2006, p.1). The level of the Milk River is unnatural in that it contains and transports water diverted from the St. Mary River on the American side through Canada and back into the United States. This water level has caused erosion, high silt and sedimentation affecting fish stocks and additional costs for river crossings; "...to ignore that there are very real expenses in maintaining this canal is a disservice to all riparians through whose land it flows." (Snow, 2006, p.2) The difference of opinion regarding who should fund this infrastructure improvement will be a factor in any discussions between Montana and Alberta.

The option of increasing infrastructure on the Canadian side to better capture the flow of the Milk River has been debated and discussed for many years.

> Decisions to increase the effective available water supply by, for example, new or larger reservoirs, pipes to replace open channels and recycling waste water would involve a comparison of *MSB*[15] for the additional water with the marginal social costs, *MSC*, of the expanded capacity…Only when marginal social benefits exceed marginal social costs does the investment contribute to national efficiency or productivity. (Freebairn, 2003, p.204)

The benefits and costs of storage facilities on the Milk River have been the subject of numerous studies. The most recent study to be completed was undertaken by Klohn Crippen Consultants Ltd. on behalf of Alberta Environment. The study was submitted to Alberta Environment in 2004 and although the Alberta Environment website indicates a decision will be made by Fall 2004, one has not been announced and the report has not been publicly released. The report will not be released until the IJC releases a final report on the Task Force's report[16]. As this report examined both on- (a dam and storage reservoir on the Milk River) and off-stream (a diversion canal on the Milk River to an off-stream storage facility) storage options, they are both presented here.

5.5.1 On-stream dam and storage reservoir

In 1921 the IJC recommended that Canada proceed with a reservoir in the Verdigris Coulee. Over the next five years studies were completed that indicated the Fork Site on the Milk River would be a better location for a reservoir. This was confirmed in 1941 by a Privy Council Order. Further studies have been completed in 1954, 1978, 1980, 1981, 1985, 1986 and 1987 regarding the issue of a dam on the Milk River. In order to assess this policy option, information is gleaned from these reports as to what these options would entail.

1978 Engineering Report Milk River Basin Study

The mandate of this study was to "…identify potential storage reservoir sites in the Milk River Basin and to determine their engineering feasibility and estimated costs." (PFRA, 1978, p.i) Five sites[17] were investigated with storage capacities ranging from 28 500 dam^3 to 124 000 dam^3 and would supply existing licence demands in Canada, satisfy international commitments and allow for some economic expansion (PFRA, 1978, p.i). The estimated costs ranged from approximately $10 million to approximately $19 million; these costs included "works, land acquisition and reservoir damages" (PFRA, 1978, p.5). Two sites of the five were identified as being able to contain more than 123,000 dam^3, Milk River Site 2 and North Fork Site 2. Of these, Milk River Site 2 "…was judged the more economical and hydrologically efficient of the two

[15] Marginal social benefits equals marginal private benefits less marginal external costs. In this instance the external costs to downstream users would have to be considered, both in Canada and Montana.
[16] Personal communication with Dave McGee, Alberta Environment, December 7, 2006.
[17] The sites are referred to as: Milk River 1, Milk River 2, South Fork 2, North Fork 2, and North Fork 3.

because the deep, narrow valley in that reach would require a smaller embankment and would limit evaporation losses." (PFRA, 1980, p.2)

1980 Engineering Report Milk River Basin Study

Alberta Environment requested a closer study of the two sites and introduced an off-stream option of diverting water from the Milk River and storing it in Verdigris Lake. Each option was assessed relative to various storage capacities; the following table provides the results:

Table 3: Results of 1980 Engineering Study

Proposed Project		Flooded Area (hectares)	Storage capacity (dam^3)	Estimated Project Cost * (1980 dollars)
Milk River Site 2	Low Level	540	34, 400	$15,000,00
	Intermediate	1160	120,000	$17,300,000
	High Level	1853	246,000	$23,900,000
North Fork Site 2	Low Level	455	39,800	$15,200,000
	High Level	950	132,400	$27,100,000
Verdigris Lake	Low Level	902	57,000	$17,500,000
	High Level	1376	173,000	$28,300,300

*Excludes land acquisition costs

Source: PFRA, 1980

1981 Milk River Basin Planning Study

This study provides an overview of all previous studies and examines ten storage options in total. The study identified three preferred sites: Milk River 2 Intermediate, Milk River 3 High and North Fork 2 High. Of these, "The overview studies did not identify any environmental problems serious enough to rule out implementation of any of three large storage alternatives and no significant differences in the relative impacts were found. Sociological problems identified in the overview studies are not regarded as critical, and could be largely offset by mitigative measures." (WER, 1981, p.51)

The costs in this study included storage, conveyance and irrigation systems; the benefits were those that additional irrigation would provide. For all of the alternatives considered, the

benefit-cost ratio was less than unity[18], the two preferred sites, Milk River intermediate and high, had benefit-cost ratios of 0.93 and 0.91 respectively. It notes that only direct agricultural benefits were included and that if that were to be expanded, the benefit-cost ratio may be higher than unity (WER, 1981, p.48-51). This study recommended the Milk River Site 2[19] as the preferred option, the higher level providing the maximum amount of water for use by Canada but having a greater social impact than the intermediate (WER, 1981, p.53).

In 1985, the Alberta Government approved a dam on the Milk River to be built approximately 16 km west of the town of Milk River, construction was to begin in 1987 at a projected cost of $30 million. These plans were shelved in 1989 due to a withdrawal of federal financial support (AWA, 2006)[20].

1986 Engineering Feasibility Report Milk River Forks Reservoir

This report focused on the Milk River Site 2 (referred to as the Milk River Forks Site) identified as the preferred option in the previous studies, and conducted an analysis of three storage facilities with varying capacities at this site. The Forks Site is located 4.5 km downstream of the confluence of with the North Milk River; in this area the River has cut a 40-50 m deep valley approximately 400 to 500 m wide (PFRA, 1986, p.7).

Table 4: Results of 1986 Engineering Study

Proposed Project	Flooded Area (hectares)	Storage capacity (dam^3)	Estimated Project Cost (1986 dollars)
Topographic Limit	2160	310 000	$48,490,000
High Level	1853	248 000	$44,330,000
Intermediate II	1442	166 000	$42,870,000

Source: PFRA, 1986, p.6-7

The costs in this study include: construction, power provision, relocating and flooding of buildings, bridge and roadway modifications and financial and economic costs relating to the flooded land (PFRA, 1986, p.6-7, D45, D49, D53, E1-E5).

[18] These earlier studies did not include net present values for the options being studied. A limitation of benefit-cost ratios is that they do not account for scale between projects.
[19] This study notes the cost of Milk River Site 2 Intermediate being $18,012,000 in 1981 prices and Milk River Site 2 High $25,679,000.
[20] The Mayor of Milk River, Terry Michaelis, states that the dam wasn't constructed in the 1980s due to 'political' reasons, a decision made in Ottawa.

1987 Milk River Basin Studies Economic Evaluation of Alternate Reservoir Sizes – Site 2

This is an economic impact study of three different reservoir sizes. Three scenarios are presented: a guaranteed water supply for irrigation 100% of the time, 90% and 80% of the time. This study concludes "The preferred choice of reservoir size to maximize the net present value and benefit-cost ratio is with the High Dam operated to supply irrigation requirements 80% of the time (4 out of 5 years)." (Andersen, 1987, p.54) The net present value of this option was, $31.6 million, calculated at a 5% discount rate. Alberta Environment noted, in its lead up to the 2003 feasibility study that the original study was abandoned because "After extensive consultations, the dam was considered to be marginally feasible at the time and was delayed while work on the Old Man, Pine Coulee and Little Bow dams proceeded." (AENV, 2004)

2003 Milk River Basin Preliminary Feasibility Study

This most recent study is intended to update the 1986 PFRA Feasibility Report by reassessing the three alternatives and ensuring they meet with Canadian Dam Association guidelines. A second aspect of this study will examine the feasibility of off-stream storage options (see section 5.5.2 below). This economic evaluation is intended to address: hydrology and water supply, design and delivery systems, environmental issues, analysis of benefits and costs[21], legislative requirements, environmental impact assessments and aboriginal issues (AENV, 2002, p.2).

Although the final version of this report has not been publicly released, there are references available from those who viewed the draft version. This information cannot be corroborated. The Governor of Montana[22] commented in 2006 in reference to this draft report:

> The report evaluated a number of options for constructing new storage and associated irrigation in the Alberta portion of the Milk River Basin. The storage site with the greatest potential was called the "Forks" site...A number of other off-stream storage sites were analyzed in the report...Based on a comparison of benefits and costs with a 5 percent discount rate, none of these reservoir alternatives were found to be economically viable. (Schweitzer, 2006, p.18)

The Governor further noted that such a reservoir would allow Alberta to expand its irrigation in the Milk River Basin by 20,000 acres and that a 200,000 af reservoir at the Forks Site might cost $115 million. The option of the United States leasing some of this capacity to store some of its

[21] The benefits and costs are to include: dam and reservoir costs, land acquisition, road and utilities relocation, water uses, irrigation development, hydroelectric power generation, flood control, recreational benefits, environmental assessment and mitigation..

[22] The water that flows through Canada that is not used in Canada, is used and relied upon by users in Montana. Therefore, any construction of storage options in Canada will impact upon Montana users and can expect to garner a reaction from them.

excess Milk River flows and U.S. St. Mary canal water was also discussed. The calculations completed by the Americans on this issue assume an annual balancing period and that they would be asked to contribute one quarter of the construction costs[23] (based on leasing ¼ of the storage capacity). Based on this analysis "[r]aising the level of Fresno Reservoir[24] to increase its storage would appear to be a better and more economically viable option for the United States." (Schweitzer, 2005, p.21)

However, another mention of the results of this report states that designs for three on-stream and four off-stream reservoirs were prepared. The environmental and archaeological impacts were studied and economic analyses including the internal rate of return, net present value and benefit-cost ratios were prepared to assess the viability of each report. "The team [Klohn Crippen consultants] found that the development of a major storage reservoir in the Milk River Basin would have a significant impact on local municipalities, encouraging additional economic growth and diversification while expanding irrigation by more than 13,000 hectares." (BergerWorld, 2005). The source of this information, the Louis Berger Group, is a group of infrastructure, engineering, environmental science and economic development firms including Klohn Crippen Berger Holdings Ltd.

To summarize, the apparent most likely option for on-stream water storage is a dam at Milk River Site 2 (the 'Forks' Site). Such construction, depending on its final size, would flood at least 20 km^2 of land and would potentially impinge on the Twin River Heritage Rangeland which has been designated an Order-in-Council Natural Area (AWA, 2004, p.5). Other environmental concerns include the impact a dam would have on at-risk fish species in the Milk River such as the western silvery minnow and the stonecat, and on the cottonwood forests, floodplain wetlands and native grasslands. Additional considerations include the potential ramifications for the internationally significant protected area known as Writing-on-Stone Provincial Park. The park was recently damaged by flooding and a potential benefit of such a dam would be the ability to mitigate such damage.

When considering this option, three additional issues should be considered. Firstly, as discussed in *section 3.3* the provincial and federal regulatory framework that will be involved with such a project. Secondly, the regulatory costs associated with this framework will be high.

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[23] Neither of these assumptions are known, the balancing period is currently 15-16 days (and under review at the IJC) and a reference to what contribution, if any, Alberta would expect from Montana cannot be located.

[24] The Fresno Reservoir is in Montana near Havre and stores the water the U.S. diverts from the St. Mary River into the Milk River. It is then conveyed through southern Alberta and returned to Montana.

Thirdly when considering this option, and the off-stream option, it is important to keep in mind the history of these studies. Considering all of these studies, and that a storage facility still has not been constructed points to the fact that it might not be feasible and there may be a fundamental flaw in the project.

5.5.2 Off-stream diversion canal and storage reservoir

The IJC report did not mention the option of an off-stream canal and reservoir. However, a recent report commissioned by Alberta Environment requested an analysis of both on-stream and off-stream options. Given the consideration the government is giving to this option, it will be included here.

The terms of reference for the 2003 Preliminary Feasibility Study stated: "The second component shall examine the feasibility of off-stream storage alternatives in the Milk River Basin. The study should examine the potential enhancement of existing water bodies as well as the development of potential new diversion and storage locations." (AENV, 2002, p.2) The economic evaluation described in the on-stream storage option applies to this option as well. Three sites were identified as having some potential for water storage: Shanks Lake, Lonely Valley and MacDonald Creek (AENV, 2004).

Of the studies described above, there were some considerations relevant to this option. The 1978 study considered and rejected a site called 'Lonely Valley Site 1'. This was located on a tributary to the Milk River and "...was considered hydrologically inefficient in that it would not control any flows on the main stem. Because of this hydrologic constraint the optimum reservoir was quite small, and consequently the cost per acre-foot of storage impounded was much higher than at any of the other sites" (PFRA, 1978, p.8). It is not known if the site studied in 1978 is the same referred to in 2003.

The 1980 engineering study studied the Verdigris Diversion. This would have involved a diversion dam and headworks on the Milk River, 28 km of diversion canal and dams at both ends of Verdigris Lake (PFRA, 1980, p.24). The issue that became apparent with this option is that the lake developed high levels of salinity and so would the water extracted from it[25]. One option mentioned by Alberta Environment would involve pipelines through the Verdigris Coulee, as the water wouldn't pass through the lake it would not have the same salinity problems[26].

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[25] Personal communication with Sal Figliuzzi, Alberta Environment, January 19, 2007.
[26] Personal communication with Sal Figliuzzi, Alberta Environment, January 19, 2007. Personal communication with Dave McGee, Alberta Environment, December 7, 2006.

Many of the environmental concerns with the on-stream storage option would exist as well for the off-stream, although they may be mitigated. The potential advantage with the on-stream vis-à-vis flooding would not exist with off-stream[27] storage. Either of these infrastructure options would be subject to review within the context of various federal and provincial legislation, refer to section 3.3 for a listing of the main pieces of legislation.

[27] Personal communication with Tom Gilchrist, MRWCC, December 20, 2006.

6 Data Results

6.1 Survey Results

The survey data was collected to provide policy makers a picture of the local use of water, local knowledge of current policies and the level of local support for the various policy options (see *Appendix E* for the cover letter and survey). Of the 203 surveys sent out to residents of the MRB, 54 were returned. The completeness of responses varies and so the following tables indicate the number of responses there were to each of the questions summarized here. The data presentation is divided into sections as per the survey. The first section dealt with the respondent's involvement with the issue of water from the Milk River.

Table 5: Summary Statistics for involvement with issue of water from the Milk River

Survey inquiry	Response	% (# of 54)
Duration of residence in southern Alberta	More than 20 years	96% (52)
Level of concern with quantity of water available for use within the MRB	Not at all concerned	2% (1)
	Somewhat concerned	28% (16)
	Very concerned	70% (37)
Familiar with 2006 IJC task force report	Yes	28% (15)
	No	70% (38)
	No response	2% (1)
Consulted in 2006 IJC task force report	Yes	13% (7)
	No	85% (46)
Consulted in 1986 feasibility study	Yes	15% (8)
	No	85% (46)
Consulted in 2003 feasibility study	Yes	20% (11)
	No	80% (43)

The second section of the survey introduced the concept of creating a market for water. Respondents had a description of three transactions in the market with prices ranging from $0.36 to $0.49 per cubic metre[28]. The following table presents the summary statistics from this section. As the levels of non-responses were higher in this section, the percentages provided are those of the responses only, the numbers in brackets indicate the number of respondents with that response and the total number of responses received for that question. For the questions with lower response rates, the applicability of the percentages to the general population decreases.

Table 6: Summary statistics for water banking

Survey Inquiry	Response	% (#)
Aware that Water Act allows for transfer of an allocation of water under a licence	Yes	54% (28 of 52)
	No	46% (24 of 52)
If yes to above, aware that it can only occur within a Water Management Plan or with an order of Lieutenant-Governor in Council, and that MRB isn't subject to a water management plan?	Yes	39% (13 of 33)
	No	61% (20 of 33)
Support the development of a water management plan for the MRB	Yes	96% (47 of 49)
	No	4% (2 of 49)
Holder of a water licence	Yes	32% (17 of 53)
	No	68% (36 of 53)
If yes, would consider selling some of allocation to another user	Yes	35% (6 of 17)
	No	65% (11 of 17)
If you don't have a licence or if your current licence doesn't provide you with sufficient water, would you consider buying water	Yes	50% (19 of 38)
	No	50% (19 of 38)
If yes to either, would you consider buying or selling water to/from Montana users	Yes	48% (11 of 23)
	No	52% (12 of 23)

The next section of the survey dealt with the issue of joint operations across the border. There was only one question (followed up with a why or why not) in this section, again the percentage provided is of the responses only and the number of responses is in brackets.

[28] Cubic meters x 0.0008107 = acre-feet.

Table 7: Summary statistics for joint operations

Survey Inquiry	Response	% (#)
Support the creation of an IJC board	Yes	94% (44 of 47)
	No	6% (3 of 47)

The final policy options included in the survey were the on-stream and off-stream storage options. The on-stream was described as a possible dam and storage reservoir on the Milk River while the off-stream was described as water being diverted from the river to an off-stream storage facility.

Table 8: Summary statistics for On- and off-stream storage options

Survey Inquiry	Response	% (#)
Support an on-stream dam and storage reservoir	Yes	87% (41 of 47)
	No	13% (6 of 47)
Support a diversion canal and off-stream storage reservoir	Yes	71.5% (30 of 42)
	No	28.5% (12 of 42)

To supplement the statistics generated from Yes/No questions, space was provided for comments and why or why not elaboration. The following bullet points highlight some of the main points made in the "Why or Why Not" portions of the responses:

- A WMP should be developed to protect future water supply and guard against droughts.
- Trading water with Americans users would put Canadians at a disadvantage.
- If American users need water and we have extra, we should trade with them and vice versa.
- An IJC board would improve the transboundary relationship but shouldn't be at expense of Albertans rights. It would need to have local representation.
- An on-stream dam and reservoir would ensure our water supply and bring recreation and industry.
- Off-stream would have less environmental impact but wouldn't capture flood flows.
- Spring runoff is currently being wasted and storage would fix that.

Likert scale responses

To be able to distinguish between individuals policy preferences, respondents were asked to indicate what level of support they had for each option, on a scale of one through five, one being low support and five being high. *Table 9* shows how many respondents indicated what level of support they have for each option. It can be seen that of the four options described, an on-stream dam and storage reservoir was the preferred choice.

Table 9: Likert scale statistics for policy options

	1	2	3	4	5	Don't Know	No response	Total[29]
Water marketing	4	6	11	6	12	6	9	**133**
Joint Operations	3	4	11	8	12	6	10	**136**
On-stream	2	5	6	8	23	2	8	**177**
Off-stream	6	6	5	9	15	4	9	**144**

Table 10 shows how many respondents indicated what level of support for what governing body in terms of their ability to manage the use and apportionment of Milk River water. The Milk River Basin Council is the preferred body to manage the use and apportionment of Milk River water according to this response. However, in terms of levels 4 and 5, both Warner County and the Milk River Council scored high, this underscores the fact that respondents emphasize local representation over either provincial or international. These results and the conclusions drawn from them, like all the others from this survey, should be viewed in the context of the number of respondents.

[29] These are the weighted sum of the responses.

Table 10: Likert scale statistics for governing options

	1	2	3	4	5	Don't Know	No response	Total[30]
Government of Alberta	11	5	15	8	4	2	9	**118**
International Joint Commission	4	7	21	10	1	3	8	**126**
Warner County	6	4	7	16	11	7	3	**154**
Milk River Basin Council	2	4	8	10	21	3	6	**179**

Additional information was gathered from the survey and is presented here. 46 of the 54 respondents provided information as to the occupation of the adults in their households: 70% are farmers, ranchers and housewives of those farmers and ranchers. 40 respondents provided information as to their use of water from the Milk River, 77.5% of these respondents indicated their primary use was for household & farm/ranch/production uses while 20% indicated it was largely for personal use. The average land holding of the 36 respondents who answered the question was 1646 acres, with a median of 1050 acres. The average age of adults in the respondent's households was 53.2 years.

6.2 Interview Results

Six formal interviews were conducted with: Jack Blaney, IJC Commissioner, Cheryl Bradley, Southern Alberta Group for the Environment, Tom Gilchrist, Milk River Watershed Council Canada, Terry Michaelis, Mayor of Milk River, Larry Mires, St. Mary Rehabilitation Working Group, and Cliff Wallis, Alberta Wilderness Association. In addition, two informal conversations were held with Dave McGee and Sal Figliuzzi of Alberta Environment. The interviews were transcribed and the main points from each, pertaining to the policy options being studied here, are in *Table 11*. Points not directly relevant to these policy options are summarized after this table.

[30] These are the weighted sum of the responses.

6.3 Summary of Interviews

Table 11: Summary of Interviews

Key Stakeholder	(1) Water Marketing	(2) Water Banking	(3) Joint Operations	(4) On-stream	(5) Off-stream
Blaney, Jack[31] IJC Commissioner			- "Dialogue between Alberta and Montana is something that I think we would like to see happening." - a watershed initiative is a positive thing, local people work together to solve local problems. - better to resolve problems than going to IJC or federal governments - entities need to want to make it work - need a balanced number of Canadians and Americans and balanced types of representation	- the current systems don't necessarily allow users to use the water that's there - infrastructure currently doesn't allow use of water when the water users need it (not expressing an opinion about whether there should be different/more infrastructure)	
Bradley, Cheryl Southern Alberta Group for the Environment	- supports the idea of transferring water allocations as a means to return flows to stressed rivers with 10% holdback		- VP of SAGE represents academic community on MRWCC - SAGE is a member - not welcomed with open arms at MRWCC	- open to communication and discussion - concern is that proposed dam is in a natural area - would be worried about	- concerns not as great for off-stream - still concerned about location - implications of a

[31] Dr. Blaney was not speaking on behalf of the Commission.

Key Stakeholder	(1) Water Marketing	(2) Water Banking	(3) Joint Operations	(4) On-stream	(5) Off-stream
	- holdback might mean in the future conservation groups can engage in transfers and secure allocations for conservation objectives - only transfers within province		as seen as outsiders - that perception might be changing - SAGE does not have cross-border affiliations - have talked to specialists in Montana on specific issues such as biologists with fisheries knowledge - if storage facility proceeds will form alliances with environmental organizations in Montana - supports idea of IJC board and collaborative approach to basin	flooding, downstream impacts, species at risk, native grasslands - there may not be a need for a dam - want a broad consideration of economic and social implications - would need to be considered within context of a water management plan	weir and affects of conveyance structure on aquatic environment - downstream effects of water withdrawals on species at risk and cottonwood forests
Gilchrist, Tom Chair, MRWCC	- positive to be able to move water from one land holder to another - it will have a role with changing demographics, changing market opportunities	- possible to have an arrangement such as that that exists between Arizona and Nevada - would need political consensus and appropriate storage - would have to deal with financial implications - need enthusiasm on both sides - it's possible with on-stream option for AB to store water for	- there is merit in increased collaboration - MRWCC has worked with MRIA in the past, have had tours on both sides of border - MRIA no longer exists there is the Diversion Reconstruction Committee - aimed at getting better understanding of opportunities that might be available for storage and water management to provide more usable	- on-stream is most desirable option because with it we can capture major flood flows which goes by us now - it would capture what CDA is entitled to under 1921 Order - diverted flow from St. Mary and Montana share of the MR would pass through the storage - at least five years for environmental and design studies before construction can begin	- less beneficial - smaller storage and more difficult to fill because they can't handle major flood flows - high cost. Cost per unit of storage is substantially higher than the unit cost for on-stream storage - only environmental difference is this would have a

Key Stakeholder		(1) Water Marketing	(2) Water Banking	(3) Joint Operations	(4) On-stream	(5) Off-stream
			Montana. Would require storage modeling work to determine implications. Economic benefits would have to be substantial to push this process along	water for both sides - supports idea of an IJC board but composed of local water users or citizens, not just government interests	- would allow us to make use of water for recreational, municipal, agricultural and industrial uses	smaller footprint
Alberta Environment	McGee, Dave, Member of IJC Administrative Measures Task Force	- water market is positive in a management, administrative way - wouldn't solve international problems or balance of water issues - it's a drought management technique - moves water to higher value users	- requires storage - there is a short time period between storage and release in Alberta so difficult - if water is kept in storage reservoir until sold, and reservoir spills over, whose water was it that spilt over? Difficult to say.	- the task force has submitted its report and has ended unless IJC asks for more work - there are 2 groups on Montana side, one concerned with quality and the other on rehabilitation needs of canal - AE supports idea of an IJC board, wants public and community working together, they aren't right now	- this is the best option for capturing short peak flows, MR is peaky not continuous which would suggest this is best option for capturing water - drought conditions would mean it's delivering water over years and therefore would lose water to evaporation = inefficiencies - the type being suggested is not conducive to shore-line based recreational uses	- very complicated - less viable than on-stream - water in Milk comes 'fast and furious' and is subject to icing, neither condition is conducive for a diversion canal - pumping is expensive, economics not as good for this over on-stream
	Figliuzzi, Sal Head, Transboundary Policy Section				- a reservoir would significantly reduce the amount of CDN MR entitlements which flow unused into Montana - there is an interest and desire to provide better access to water for CDN irrigators in the MRB - Alberta can't capture spring snowmelt because	

Key Stakeholder	(1) Water Marketing	(2) Water Banking	(3) Joint Operations	(4) On-stream	(5) Off-stream
				of no storage facilities	
Michaelis, Terry Mayor, Milk River	- there is too little water when demand is high for marketing to make sense - real concerns about a market, gets into legal situations like theft of water, deregulation regularly means higher prices		- there is some value in an IJC board - from an irrigation point of view Alberta is quite efficient and with more collaboration Montana could learn from that	- strongly advocates an on-stream storage facility - location is Site of the Forks -it won't happen in next 20 years - we were within one day of it being announced after the 1986 feasibility study, political reasons stopped it - the only water to be captured in this is spring runoff, it would be filled every 10 years when there is a big runoff, water that would normally end up in Gulf of Mexico - wouldn't have all the dead animals from drought - in 1986 on stream would have cost approx $40M, now it's probably $500M, cost is not the point	- off-stream is only being discussed for political reasons, for the 'environmentalists' - the lack of movement in an off-stream reservoir would result in West Nile problems - more difficult to manage
Mires, Larry Executive Director, St. Mary Rehabilitation Working Group	- markets currently do not exist in Montana - he tried to introduce legislation allowing it and "just about got	- the problem with the idea of Alberta banking water for Montana users is the distrust that exists	- wants to have a cost-benefit undertaken determine who benefits from what %age and users would contribute	- if the US St. Mary Canal is rehabilitated to 1000cfs, part of answer might be building a storage facility be it on	- comments for on-stream apply to off-stream

Key Stakeholder	(1) Water Marketing	(2) Water Banking	(3) Joint Operations	(4) On-stream	(5) Off-stream
	killed" - people don't understand it - it's a great idea, it will come but with time and education. Explaining that it happens in Arizona, Nevada, Colorado - it stops wasting water, creates conservation and therefore better use of water	- need to work together for this to work	an amount equal to that %age - a problem is that both sides of the border are not using the same hydrology numbers - "Anytime you can get more cooperation and collaboration between groups on both sides of the border, they're going to come back with better water conservation, water management, a much better system." - SMRWG hasn't worked with groups across the border because they're a quasi advisory committee to the governor and looking almost entirely at rehab - he has had a discussion with members of MRWCC and others in Montana and would like closer ties - wants more local participation, less Ottawa and Washington	Blackfoot reservation, in southern Alberta or Montana - state is adamantly opposed to this idea because their hydrology numbers say it would cost Montana irrigators and farmers acres of irrigation. They say what is proposed would drain irrigated lands out of Montana and divert waters they currently use - until everyone is using the same numbers this will be a political challenge - instinct says that storage at anytime is good but if Montana numbers are at all accurate that Montana won't support this with the IJC - there need to be discussions across the border without intervention from politicians	
Wallis, Cliff Past President, current board member, Alberta Wilderness	- market has a role to play as long as its within a basin		- we are members of the MRWCC broader membership	- the 1986 proposal of a dam "MP of the day said that if the environmentalists made a	- if taxpayer financed and for low value crops like alfafa forage

Key Stakeholder	(1) Water Marketing	(2) Water Banking	(3) Joint Operations	(4) On-stream	(5) Off-stream
Association	- problem is subsidies, they must be removed. Right now they make irrigation districts and farmers the winners. With them can't have a fair market. - 10% conservation holdback should be mandatory until main stream flows are re-established. - groups should be able to buy for conservation purposes.		- they don't like outsiders, we're seen as the enemy because we want change. Our agenda is conservation, biodiversity and sustainability of water resources, their agenda is around short-term development. - our members in the basin aren't enough to sway the majority - although originally included in creation of MRWCC we were dis-invited because they wanted to creates terms of reference without interference from outside - we need more resources to get out there and explain what our agenda is We think our ideas are good for local economy - we've successfully co-managed the Milk River Natural Area, Kennedy Coulee Ecological Reserve, so we can work together - we have loose cross-border affiliations with Montana Wilderness Association, Northern Plains Conservation	squeak it would be a problem. Well we squeaked and then they shelved it..." - opposed to on-stream - wants focus to be on demand side of management - need to change from low value crops	crops and that supports a feedlot industry, we'd be opposed - if high value, municipal or clean industry supply, and privately financed or taxpayer dollars through repayable loans, we'd be more open

Key Stakeholder	(1) Water Marketing	(2) Water Banking	(3) Joint Operations	(4) On-stream	(5) Off-stream
			Network etc - we would support an IJC board if it had broad representation, not just commercial and vested interests. Public interest, environmental, social and First Nations would have to be included.		

Additional comments from interviews:

- Mr. Figliuzzi notes Montana is suggesting a system whereby the upstream jurisdiction could receive a credit for water entitlements the upstream country is unable to capture that flow to the downstream jurisdiction. An implication of this is that the upstream users could take their share during low flow periods, when water is most valuable, while the downstream jurisdiction would get their entitlements either sporadically or in the form of flood flows.
- Both Alberta Environment representatives note that an alternative to on- or off-stream storage is a pipeline from the St. Mary River through the Verdigris Coulee re-entering the Milk River just before the eastern crossing. This would enable Canadians to return to Americans any U.S. entitlements that Canadian irrigators take further upstream.
- Mayor Michaelis notes that there is a "pretty good size aquifer" the municipality could tap into but currently don't because of the expense.

Table 12: Additional Interview Comments

Interviewee	Opinion on greatest challenge confronting the Milk River	Opinion on a WMP for the MRB
Blaney, Jack	If the climate change predictions are right any concerns they have regarding the allocation of water is going to be about the allocation of a diminishing supply. That worries me for the people, the irrigators and farmers, living in that area.	----------
Bradley, Cheryl	----------	Supports the development of a WMP. Would like to be involved, not sure if welcome. A member of SAGE is on the MRWCC and so they have a voice that way.
Gilchrist, Tom	Inadequate supplies for irrigation users and some domestic and municipal users by the low flows in drought years.	The MRWCC is currently working on a State of the Watershed Report (SOW), a necessary precursor to a WMP. The Council will be the leader on the WMP
Michaelis, Terry	----------	Doesn't think a WMP will have benefits for town of Milk River. Wants to see action, not more paper

Interviewee	Opinion on greatest challenge confronting the Milk River	Opinion on a WMP for the MRB
Wallis, Cliff	Climate change. I don't think we understand the implications of the changing climate are going to be on the nature of the flows in the basin, whether we're going to get more moisture or less.	Support the development of a plan and want involvement/input.

7 Evaluation

To synthesize the above information from the background, policy descriptions, case studies, survey and interviews, a summary of each policy option is provided here. This will include each policy's goals, mechanisms, actors, time line, measure(s) of successful implementation, advantages and disadvantages and additional considerations. By providing a cohesive snapshot of each option, a policy recommendation including an implementation timeline can be developed.

7.1 Water Marketing Summary

- **Goal:**
  - To increase efficiency of water use.

- **Policy Mechanisms:**
  - Drafting and approval of a MRB **Water Management Plan** (market now permitted)
  - **Guidelines** for operation of a water exchange, ensuring transparency and accessibility.
  - Public information and education campaign.

- **Actors:**
  - **Buyers and sellers**
    - Buyers are those who don't have water rights, or not enough water. Could be municipal, agricultural, industrial, or environmental buyers.
    - Sellers are those who hold water rights and want to sell all or a portion of that right permanently or temporarily.
  - **Alberta Environment**

- **Time Line:**
  - **Short-term:** MRWCC to finalize State of the Watershed Report and then WMP for the MRB[32] (will require government approval).
    - Estimated completion of SOW: 2007
    - Estimated completion of WMP: 2009
    - Closer to time of WMP approval, AE to provide information and education to potential market participants.
    - Once WMP is approved, water transfers can be undertaken.
  - **Long-term**: Establish a government controlled exchange where sellers can deposit, and buyers can purchase, an allocation. Will require government resources, both

[32] Personal communication with Tom Gilchrist, MRWCC, December 20, 2006.

staffing and funds, to establish and maintain. Time line uncertain as it requires AE to initiate.

- **Measure of Successful Implementation:**
  - The number of transactions occurring between users and transfers showing more efficient use of water by moving water from low to high value uses and more efficient irrigation techniques to conserve water to sell.

- **Advantages:**
  - With a WMP, a precursor to this option, a more comprehensive policy framework will be achieved.
  - Inefficient system of water allocation (first-in-time, first-in-right) will be improved upon as case studies show water markets result in water being transferred from low to high value uses.
  - Most interviewees support this option with various opinions regarding implementation (see *Table 11*).
  - Potential environmental benefits if:
    - the 10% holdback is utilized;
    - water use becomes more efficient as individuals realize benefit of conserving to sell unused water allocations.
  - Low cost from a capital, operating and transaction cost perspective.
    - Costs will include those incurred by the MRWCC for drafting WMP and additional resources for Alberta Environment for involvement in plan, educational campaign, and resources for approving transfers and creation of bank.
    - Based on SSRB case study transaction costs will be low and not a hindrance to market activity. Can be lowered with creation of centralized bank.
  - Can be achieved without Montana involvement or concern.

- **Disadvantages:**
  - Only moderate support from survey respondents. This can potentially be mitigated through education highlighting success of markets in SSRB.
  - Potential negative environmental impact of greater ground water extraction. Currently three water cooperatives in the MRB use a combined total of 238,000m^3 of water per year from the Whiskey Valley Aquifer in the MRB (MRWCC, 2006, p.11-13). California case study shows a market encouraged participants to sell their surface water allocations and substitute ground water for their own use.

- **Considerations:**
  - This policy cannot be enacted until a WMP is approved for the MRB.
  - This plan should outline how users will be discouraged (perhaps through prohibition) from substituting ground water for surface once a market is created as ground water levels in the MRB are already in a precarious state[33].
  - Specifically addresses only two of the five contributing factors to the policy problem. It may mitigate the other three. For example, by increasing the efficiency of water use through markets, the need for a water storage facility may be lessened.

[33] Well levels from this aquifer have dropped 1 meter in the past ten years. Levels have also dropped in areas covered by the Milk River Aquifer, by 30m. The aquifer is now subject to Milk River Aquifer Reclamation and Conservation Program.

7.2 Joint Water Management Operations Summary

- **Goal:**
  - To increase cooperation and interaction between water users on either side of the border to improve efficient water administration.

- **Policy Mechanisms:**
  - Drafting and approval of a MRB **Water Management Plan**.
  - Drafting of a St. Mary – Milk River Board **Mandate**.
  - Drafting of watershed groups' **mandate**, **goals** and **action plan**.

- **Actors:**
  - **Province of Alberta** (in particular for approval of WMP)
  - **Government of Canada** – to provide membership on IJC board
  - **IJC** – within this option a St. Mary – Milk River Board will be created
  - **U.S. Government** – to provide membership on IJC board
  - **MRWCC** – organization has significant experience and membership on the Canadian side and has interacted in the past with American users
  - **Non-governmental organization** – with membership from both sides of the border, with mandate to deal with issues concerning water in the MRB

- **Time Line:**
  - **1 year process**
  - WMP for the MRB (will require government approval). Estimated completion: 2009.
  - With motivation of actors, the process of creating an IJC board could be completed by 2008 as could the creation of watershed group(s). These groups will have to work together for a period of time before the watershed will be subject to an IJC Watershed Initiative.

- **Measures of Successful Implementation:**
  - Establishment of an IJC board.
  - Establishment of transboundary watershed group(s).
  - Participation in the IJC Watershed Initiative.

- **Advantages:**
  - Directly addresses policy problem of not enough interaction between users on either side of the border.
  - Significant support for increased collaboration and IJC board amongst survey respondents and interviewees (see *Table 7 and 11*).
  - Would address problems including environmental on a basin wide basis.
  - Would contribute to overcoming distrust and hopefully lead to resolution of political disagreements. For example, there is currently opposition in Montana to idea of a dam on the river in Alberta. With improved dialogue a compromise may be reached, for example, a dam with storage capabilities for Montana water.
  - Ideally will negate the need for federal government involvement.
  - Could be combined with other policies such as water banking.

- **Disadvantages:**
  - Does not directly address most of the factors leading to the policy problem.
  - Relies on individuals volunteering their time and resources.

- May be all talk and no action.

- **Considerations:**
  - Those interviewed and surveyed, emphasized local representation.
  - Survey respondents indicated support for the MRWCC as the body best capable of managing the MRB water resources. This organization has a wide range of members and addresses various issues confronting the watershed. Its executive supports an on-stream dam and storage reservoir; with an even wider membership including Montana representatives and additional environmental interests in Alberta, and an arrangement whereby Alberta banks water for Montana, such an option may become feasible.
  - Costs include those incurred by watershed groups and IJC Board and eventual Watershed Initiative.

7.3 On-stream and Off-stream Storage Options Summary

- **Goal:**
  - To store water when it is abundant (spring) to provide when it is needed (late summer to early fall)

- **Policy Mechanisms:**
  - Drafting and approval of a MRB **Water Management Plan**.
  - Approval according to various provincial and federal legislation including:
    - federal **Fisheries Act**
    - federal **Species at Risk Act**
    - **Canadian Environmental Assessment Act**
    - federal **Navigable Waters Protection Act**
    - Alberta **Environmental Protection and Enhancement Act**
    - Alberta **Natural Resources and Conservation Board Act**
    - Alberta **Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act**
    - **Boundary Waters Treaty, 1921 Order and Letter of Intent**.
    - **International Boundary Waters Treaty Act**

- **Actors:**
  - **Province of Alberta** (in particular Alberta Environment)
  - **Government of Canada**
  - **IJC**
  - **State of Montana, U.S. Federal Government**
  - **MRWCC**
  - **Environmental Organizations** (including AWA and SAGE)

- **Time Line:**
  - **7 to 10 year process**
  - WMP for the MRB (will require government approval). Estimated completion: unclear.
  - Project design, environmental, impact assessments, and legislative approvals. Construction process.

- **Measure of Successful Implementation:**
  - The ability of Alberta to store water when it is plentiful and release it when supply is low.

- **Advantages:**
  - Directly addresses policy problem of no water storage facility in Alberta for Milk River water.
  - Support for this option amongst survey respondents and some interviewees (see *Tables 8, 9 and 11*).

- **Disadvantages:**
  - Does not directly address most of the factors leading to the policy problem.
  - Opposition from Montana which will involve the IJC, and environmental groups in Alberta.
  - Environmental impacts.
  - Capital costs.
  - Regulatory costs in approval process.
  - Must be reviewed and approved according to numerous Provincial and Federal legislation (see list above).

- **Considerations:**
  - Provides possibility of water banking.
  - Unclear from a cost effectiveness point of view if this option is worthwhile, the recent unpublished feasibility study may contribute to this discussion.
  - Construction costs in Alberta currently are prohibitive.

7.4 Water Banking Summary

- **Goal:**
  - An agreement whereby Alberta would store water for and provide it to Montana users when required. This option would require the construction of an on-stream dam and storage reservoir.

- **Policy Mechanisms:**
  - Drafting and approval of an MRB **Water Management Plan**.
  - Approval according to various provincial and federal legislation including:
    - federal **Fisheries Act**
    - federal **Species at Risk Act**
    - **Canadian Environmental Assessment Act**
    - federal **Navigable Waters Protection Act**
    - Alberta **Environmental Protection and Enhancement Act**
    - Alberta **Natural Resources and Conservation Board Act**
    - Alberta **Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act**
    - **International Boundary Waters Treaty, 1921 Order and Letter of Intent.**
  - Approval according to various provincial and federal policies and legislation regarding the export of bulk water to the United States.
  - A water agreement between Alberta and Montana would be required.
  - Potential policy requirements in Montana/U.S.

- **Actors:**
  - **Province of Alberta** (in particular Alberta Environment)
  - **Government of Canada**
  - **IJC**
  - **State of Montana, U.S. Federal Government**
  - **MRWCC**

- **Time Line:**
  - **7 to 10 year process**
  - WMP for the MRB (will require government approval). Estimated completion: unclear.
  - Project design, environmental impact assessments, and legislative approvals. . Construction process.
  - Agreement process.

- **Measure of Successful Implementation:**
  - Implementation of an agreement between Alberta and Montana for Alberta to store water for Montana users.

- **Advantages:**
  - Overcomes Montana objections to a water storage facility on Milk River.
  - Directly addresses policy problem of no water storage facility in Alberta for Milk River water.
  - Support for the option of storage amongst survey respondents and some interviewees (see *Tables 8, 9 and 11*).
  - Increased interaction between users on either side of the border.
  - Financial compensation from Montana for storage[34].

- **Disadvantages:**
  - Moderate support for selling water to Montana users (however, not tested on issue of storing water)
  - Opposition from environmental groups in Alberta.
  - Environmental impacts.
  - Capital costs (Alberta would likely have to bear these costs).
  - Must be reviewed and approved according to numerous Provincial and Federal legislation (see list above).
  - Process of negotiating an agreement between Alberta and Montana would likely involve both federal governments and will be complex and time-consuming. For example, both Alberta and Canada currently have policies that prohibit the export of bulk water to the United States which this may contravene.

- **Considerations:**
  - If on-stream option is currently not cost effective, it may become so once water banking is introduced.
  - Will require trust and political consensus in order to proceed.

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[34] Canada undertaking storage for American users would potentially negate the need for a rehabilitation of the Fresno Reservoir near Havre, Montana, a cost benefit to American users.

7.5 Criteria for Assessing Alternatives

To determine if the alternatives will improve the management of the water supply, within the context of the five factors creating the need for more management, six criteria will be used in this study. Each alternative will be evaluated relative to legal and political feasibility, implementation complexity, effectiveness, and economic[35] and environmental criteria. The following table defines each criterion, indicates the measure that will be used, the value that will be assigned in the evaluation and the source of that information.

[35] The economic criteria will not include an examination of the value of economic impacts from the policy options (for example, the economic value of increased irrigation). It is beyond the scope of this study but is a potential avenue for further research.

Table 13: Criteria, Measures, Definition and Value

Criteria	Definition	Measures	Value	Source
Legal Feasibility	Asks whether the legislative framework exists to permit the policy option.		Exists Doesn't exist	Alberta Water Act (and refer to s.33)
Implementation Complexity	Extent of regulatory and legislative requirements.	Existence of regulatory and legislative framework.	High Moderate Low	Review of literature
Political Feasibility	Level of acceptance among key stakeholders: local residents, mayor of MR, MRWCC, AE, IJC, Environmental groups, Montana.	Negative or positive reaction to proposals.	**0 – 5** 0 = none 1 = 1 stakeholder supports option 2 = at least some of stakeholders support option 3 = half of stakeholders support option 4 = almost all stakeholders support option 5 = all stakeholders support option	Surveys Interviews Review of literature
Effectiveness	Extent to which proposed policy option addresses five factors leading to lack of	- Storing water on MR is enabled.	**0 – 5** One point for each	Interviews

Criteria	Definition	Measures	Value	Source
	water management on the Milk River.	- Efficiency of water allocation improves.	objective policy achieves.	Case Studies Review of literature
		- A comprehensive policy framework is created for the MRB.		Review of literature
		- The international environment is no longer seen as an impediment to efficient water administration.		Interviews Review of literature
		- Interaction and coordination between users on both sides of the border is increased and formalized.		Interviews
Economic Criteria				
Capital costs	Monetary expense of the initial investment in land, plant, equipment, policy implementation	Dollars.	$	Interviews Review of literature
Operating costs	Monetary expense of operating the option on a yearly basis.			Case studies Review of literature
Transaction costs	Monetary expenses incurred as a result of an economic exchange[36].			Case studies
Environmental Criteria				

[36] The potential transaction costs to Montana as a result of water banking are not estimated here.

Criteria	Definition	Measures	Value	Source
Groundwater impacts	Impact of a policy on the amount of water withdrawn from an aquifer.	Amount of groundwater extracted as a result of policy implementation.	High Moderate Low	Interviews Review of literature
Other Environmental impacts	Impacts on aquatic environment, fish, riparian habitats such as cottonwood forests, protected areas such as Writing-on-Stone Provincial Park, native grasslands (other than groundwater impacts)		High Moderate Low	Interviews Review of literature

7.6 Summary of Criteria Evaluation

Table 14 evaluates each policy option relative to each criterion with the 'best' option other than the status quo highlighted. In terms of the economic criteria, the amounts provided are only estimates based on the available information. In particular the capital costs for the on- or off-stream storage options should be treated with caution; the $115 million figure cannot be corroborated and is likely a conservative estimate given the current construction climate in Alberta. There is no direct information as to the recent estimates for the off-stream option however previous studies (see *Table 3*) have shown off-stream options to be similar in price to on-stream and so they are assigned the same value.

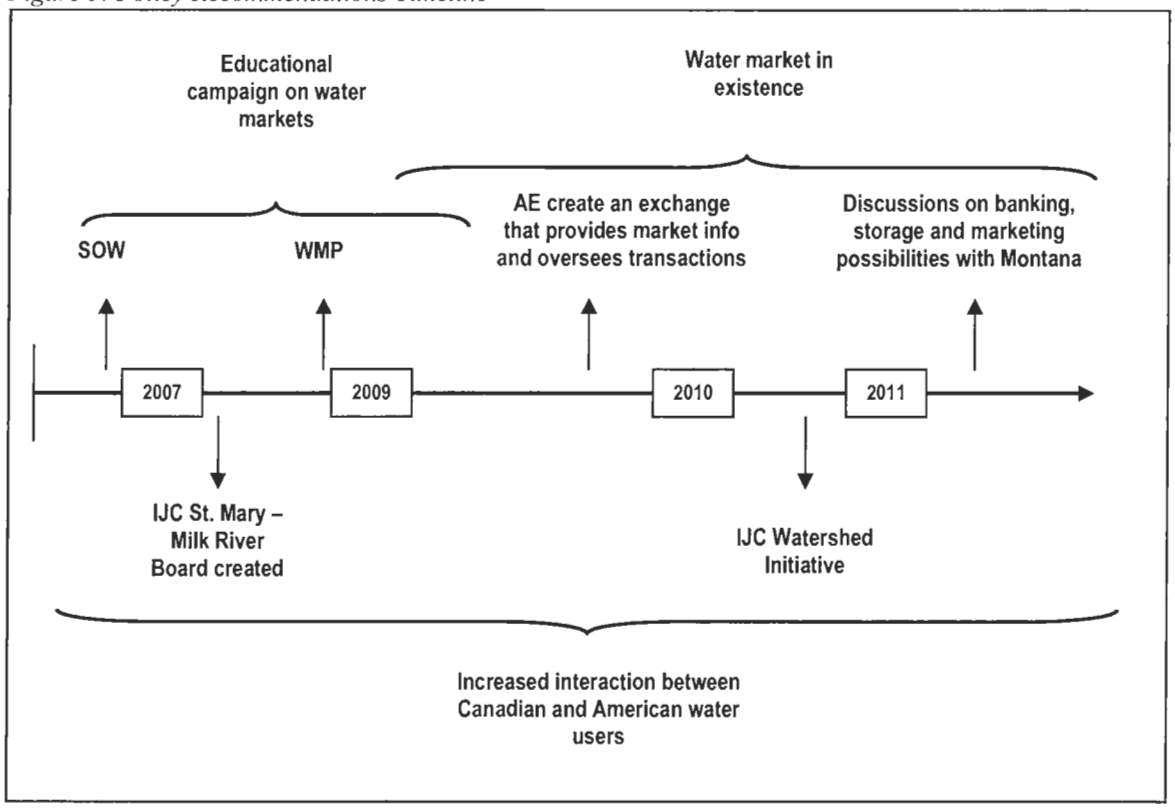
Table 14: Outcome of the Criteria Evaluation Process

Criteria	(1) Status Quo	(2) Water Marketing	(3) Water Banking	(4) Joint Operations	(5) On-stream	(6) Off-stream
Legal feasibility	Exists	Doesn't exist	Doesn't exist	Exists	Doesn't exist	Doesn't exist
Political feasibility	1	4	2	5	2	2
Effectiveness	0	2	4	2	1	1
Implementation Complexity	N/A	Moderate	High	Low	High	High
Economic Criteria						
Capital costs	0	$80 000 ±	$115Million +	0	$115Million +	$115Million +
Operating costs	0	$80 000 ±	$400,000 +	$70 000 - $240,000 ±	$400,000 +	$400,000 +
Transaction costs	0	Informal market -minimal Formal - $18-$63/af	0	0	0	0
Environmental Criteria						
Groundwater impacts	Moderate	Moderate	Low	Moderate	Low	Low
Other Environmental impacts	Moderate	Low	High	Low	High	High

7.7 Recommendation and Rationale

The summary matrix in *Table 14* shows that no one policy option addresses all five of the factors leading to the policy problem of insufficient management of the Milk River. The following recommendation is a multi stage process with a goal of resolving the policy problem that there is too little management of the water resources from the Milk River. These stages involve participation of the MRWCC, other watershed groups as they develop, Alberta Environment, and the IJC. Figure 5 illustrates the suggested timeline.

Figure 5: Policy Recommendations Timeline



As demonstrated in the above figure, there are several steps involved in the implementation of my policy recommendations. Several of these steps are overlapping and one is overarching all others. Beginning immediately, efforts should be made by the MRWCC, AE and IJC to increase the interaction and collaboration between **watershed groups** in Alberta and Montana on issues surrounding water in the MRB; this may involve the creation of such groups in Montana. These watershed groups should have membership from both countries and reflect a wide range of interests in each. An additional related first step is the creation of an IJC **St. Mary**

– **Milk River Board** with, in accordance with the IJC mandate, equal representation from both sides of the border. The purpose of this board and increased collaboration will be to better communicate on issues that impact upon the watershed and enhance local capacity to address transboundary issues.

The work already started by the MRWCC on the **State of the Watershed Report** should continue with support from Alberta Environment. Upon its completion the MRWCC should continue their efforts, as planned, with the drafting of the **Water Management Plan.** This should also be supported by Alberta Environment and the process should be streamlined so that approval can be obtained expeditiously. The reality of a water market should be considered when drafting these reports to ensure that the potential impact of transfers on the aquatic environment is documented including the impact on ground water levels. While these reports are being compiled Alberta Environment should undertake an **educational campaign** for the water users of the MRB on water markets. This campaign would benefit from participation of watershed groups from the South Saskatchewan River Basin, for example the Oldman Watershed Council and highlight the successes of the water market that has occurred in the SSRB. With the approval of the WMP, **water transfers can now occur** in the MRB (pending their approval by the Director); a market is created.

The next step for Alberta Environment should be to undertake the creation of a **centralized exchange** where market information is centralized. This will include an office where individuals wanting to buy or sell water allocations can go to do so as well as a website. Although not within the scope of this study, it is envisioned that this office (and potentially satellite offices such as Lethbridge) and website will eventually be responsible for all water transfers in Alberta, not just within the MRB.

With encouragement and support from Alberta Environment, the IJC and existing groups such as the MRWCC and SAGE it is envisioned that there will be several groups with transboundary membership. At this point the IJC should introduce a Watershed Initiative in the St. Mary – Milk River Basin. Such an Initiative would serve the following functions:

- Employ a broader, systemic perspective of the watershed;
- Expand outreach and cooperation among organizations with local water-related interests and responsibility;
- Promote the development of a common vision for the watershed
- Develop a better hydrologic understanding of the water-related resources; and
- Create the conditions for the resolution of specific watershed-related issues.

(IJC, 2004, p.3)

While I do not recommend storage options for the Milk River due to low political feasibility and high financial and environmental costs, the option of water banking should not be discounted completely. Once more transboundary collaboration and cooperation is achieved, both within and without the IJC, and if the economic and social benefits to both Alberta and Montana can be shown to outweigh the costs, the option of **water banking** should be discussed with Montana. One option not discussed in this study is that of Montana storing water for Alberta based on the infrastructure already established in western Montana. The storage facility would have to be upgraded to be able to contain more water but the environmental and financial costs of this option would likely be less than an entirely new storage facility in Alberta as the foundation already exists. As the IJC Task Force noted in its report the St. Mary storage, diversion and conveyance facilities in the U.S. already require rehabilitation. The option of water banking suggests that not only rehabilitation but expansion should be undertaken.

If a storage facility in Alberta does proceed, the concerns raised by environmental groups in Alberta could be addressed with cooperation and discussion. For example, as shown in interviews, there are conditions under which the concerns about an on-stream facility could be mitigated. For example, by examining different financing options for the storage facility and the uses to which the stored water would be put (low value versus high value). A united approach would help to address the complex web of provincial and federal legislative requirements.

8 Conclusion

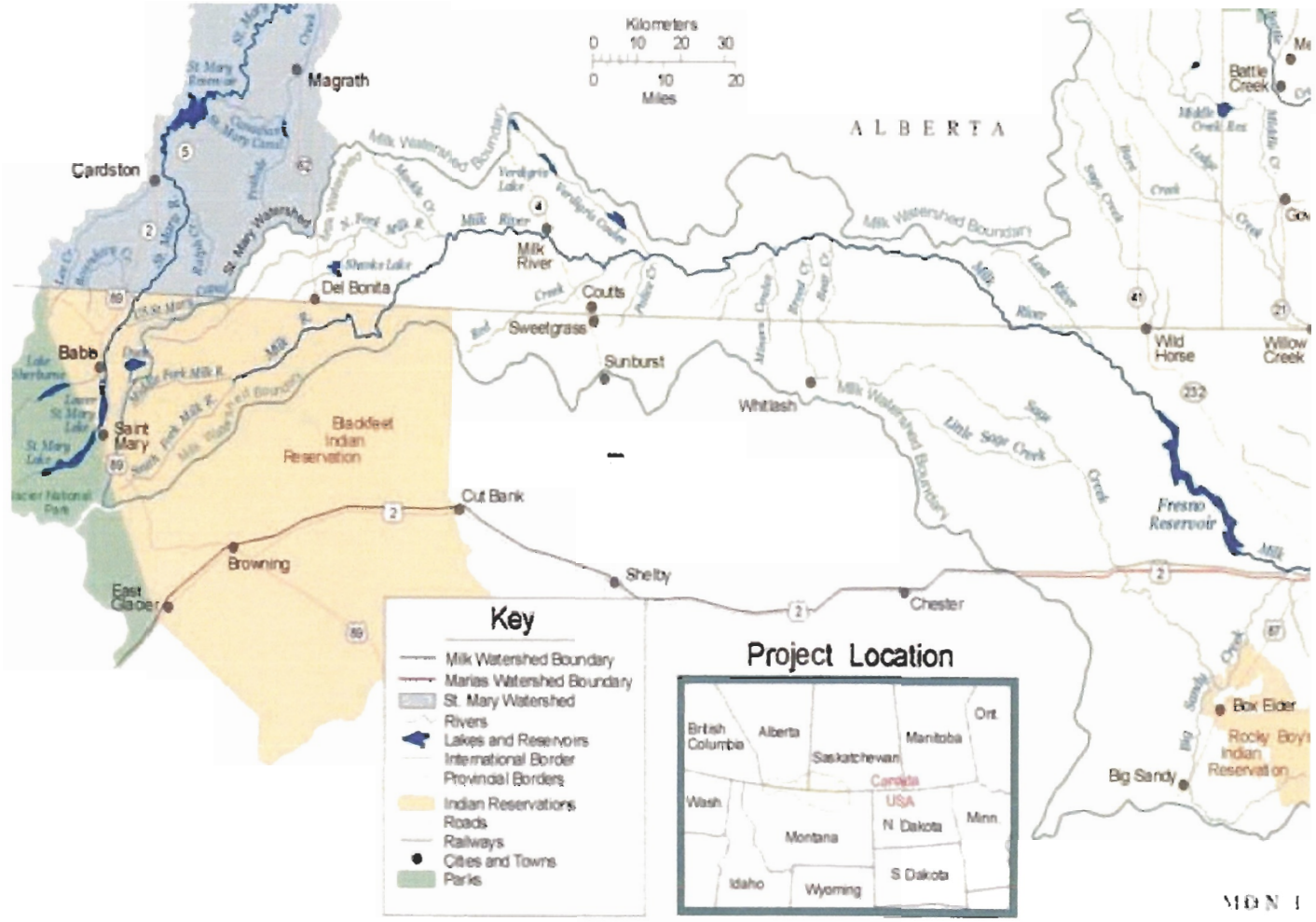
The residents of the Milk River Basin have struggled for over 100 years from the effects of an irregular annual water supply. Combined with a lack of water storage, a shortage of interaction and collaboration between water users in the basin, the commitment to an international treaty and an inefficient water allocation system, it is clear that there is not enough management of the Milk River waters to address these complexities.

Throughout 2005 and into 2006, the International Joint Commission Administrative Measures Task Force examined ways to "...improve the administrative procedures for the apportionment of the St. Mary and Milk rivers to ensure more beneficial use and optimal receipt by both Canada and the United States of its apportioned water." (IJC, 2006, p.4) After making several recommendations on administrative measures, the Task Force went on to recommend the study of other options: water banking, water marketing, joint water management operations and infrastructure improvements/enhancements. This study has sought to shed some light on the efficacy and applicability of these policies as they pertain to the Milk River Basin.

What became clear with the results of the surveys, interviews and case studies is that the political issues surrounding the Milk River will largely drive any policy being made concerning that water. More and improved transboundary management of this resource will serve residents on both sides of the border and contribute to an environment where decisions about this valuable resource can be made in unison and for the benefit of the basin as a whole.

Appendices

Appendix A: Map



Source: International St. Mary and Milk Rivers Administrative Measures Task Force. *Report to the International Joint Commission* 2006, Reprinted with permission.

Appendix B: Natural Flow Data

Natural Flow of the Milk River (cfs)															
	Period ending														
	15-Jan	31-Jan	15-Feb	29-Feb	15-Mar	31-Mar	15-Apr	30-Apr	15-May	31-May	15-Jun	30-Jun	15-Jul	31-Jul	15-Aug
1988	2.8	2.7	3.1	21.8	84.1	405.2	247.5	169.9	62.1	108.3	144.4	11.9	25.6	0.0	0.0
1989	4.1	2.1	2.3	39.0	939.7	310.8	209.0	285.2	215.7	559.4	237.2	160.0	176.9	12.3	44.0
1990	60.5	53.7	37.7	131.6	309.4	326.4	407.9	356.0	295.9	667.0	484.7	208.0	33.9	39.8	23.8
1991	3.7	9.7	84.9	98.0	88.2	166.9	326.8	301.8	367.0	754.7	516.7	711.3	445.2	145.4	127.3
1992	31.1	34.8	43.1	54.1	296.5	470.4	65.6	78.5	58.7	33.9	68.0	113.1	160.4	73.2	53.5
1993	3.0	3.0	14.0	16.8	574.7	438.1	340.6	240.4	151.1	191.2	233.0	140.4	351.8	621.8	172.1
1994	56.1	62.4	52.3	44.6	2370.5	377.3	275.8	365.6	390.3	443.0	320.8	197.2	134.0	31.9	35.0
1995	30.9	31.4	34.2	83.4	263.3	240.9	123.8	112.3	662.2	567.9	1449.9	786.6	609.9	402.5	225.4
1996	79.4	59.9	262.1	347.4	1841.2	736.6	713.0	375.1	339.7	482.1	398.6	305.6	124.2	70.8	4.3
1997	29.7	42.7	75.8	214.6	174.0	1793.9	274.2	417.5	425.0	716.9	436.0	301.7	218.4	58.6	16.2
1998	17.8	12.4	33.1	90.8	82.7	161.7	190.0	212.9	109.9	158.2	218.4	327.7	525.9	70.7	83.7
1999	6.4	12.6	31.5	44.2	107.8	159.3	98.1	137.7	224.4	249.1	425.7	267.1	96.1	104.7	45.2
2000	25.9	11.1	16.2	40.5	106.3	165.8	139.3	181.3	44.0	53.3	88.7	18.6	15.4	3.5	10.5
2001	8.5	10.2	9.8	7.3	29.2	95.3	77.6	185.3	117.8	47.4	4.3	0.0	0.0	0.0	93.2
2002	0.0	0.0	0.0	0.0	0.0	0.0	170.4	112.5	0.0	624.0	2760.1	1190.7	507.4	222.9	131.6
2003	157.9	204.5	239.8	213.2	41.4	910.3	313.1	371.3	238.9	255.8	197.1	191.7	134.5	88.8	50.1
2004	0.0	0.0	0.0	0.0	296.9	143.3	37.0	37.9	96.5	242.8	281.6	124.7	128.6	87.2	71.8
Median	17.8	12.4	33.1	44.6	174.0	310.8	209.0	212.9	215.7	255.8	281.6	197.2	134.5	70.8	50.1

Natural Flow of the Milk River (cfs)									
	Period ending								
	31-Aug	15-Sep	30-Sep	15-Oct	31-Oct	15-Nov	30-Nov	15-Dec	30-Dec
1988	59.0	36.2	27.8	5.3	5.7	10.5	13.1	8.5	6.2
1989	76.1	97.5	43.2	0.0	81.0	105.5	65.7	54.8	6.2
1990	91.6	28.6	11.1	1.9	91.3	61.3	32.2	25.1	19.6
1991	76.8	35.6	77.9	75.0	47.0	45.1	44.5	52.2	40.5
1992	2.5	90.1	68.7	36.0	54.6	45.0	29.5	13.6	7.7
1993	296.2	242.8	158.9	216.5	168.1	94.9	81.9	116.7	82.2
1994	6.7	50.4	74.1	111.6	130.1	77.6	50.7	33.7	34.9
1995	191.8	182.9	148.4	160.1	170.8	136.9	147.3	64.1	83.2
1996	0.0	0.0	62.5	84.8	89.6	45.3	33.6	47.5	39.8
1997	77.0	7.5	22.0	73.6	83.8	51.0	54.7	35.3	33.6
1998	43.1	46.9	51.2	18.1	74.9	46.0	59.6	47.1	21.6
1999	12.9	64.1	67.8	69.1	46.8	35.4	47.4	35.7	35.3
2000	0.0	59.7	78.0	41.0	22.6	8.5	10.5	9.9	6.9
2001	104.8	28.2	28.9	0.0	1.4	0.0	0.0	0.0	0.0
2002	49.5	30.7	68.2	349.7	100.8	0.0	0.0	0.0	0.0
2003	7.4	2.7	74.1	40.4	23.4	0.0	0.0	0.0	0.0
2004	71.1	79.1	76.4	52.1	50.0	0.0	0.0	0.0	0.0
Median	59.0	46.9	68.2	52.1	74.9	45.1	33.6	33.7	19.6

Source: Alberta Environment

Note: Interpretation of data is author's alone.

Appendix C: Excerpt from Boundary Waters Treaty, 1909

ARTICLE VI

The High Contracting Parties agree that the St. Mary and Milk Rivers and their tributaries (in the State of Montana and the Provinces of Alberta and Saskatchewan) are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each. It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow, and that Canada is entitled to a prior appropriation of 500 cubic feet per second of the flow of St. Mary River, or so much of such amount as constitutes three-fourths of its natural flow.

The channel of the Milk River in Canada may be used at the convenience of the United States for the conveyance, while passing through Canadian territory, of waters diverted from the St. Mary River. The provisions of Article II of this treaty shall apply to any injury resulting to property in Canada from the conveyance of such waters through the Milk River.

The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by the properly constituted reclamation officers of the United States and the properly constituted irrigation officers of His Majesty under the direction of the International Joint Commission.

Appendix D: Excerpts from Provincial and Federal Legislation

The following are key excerpts from legislation for the purposes of this study.

Excerpts from the Alberta Environmental Protection and Enhancement Act (R.S.A. 2000, c. E-W-12)

http://www.qp.gov.ab.ca/documents/Acts/E12.cfm?frm_isbn=0779718771

Purpose of environmental assessment process

40 The purpose of the environmental assessment process is

(a) to support the goals of environmental protection and sustainable development,

(b) to integrate environmental protection and economic decisions at the earliest stages of planning an activity,

(c) to predict the environmental, social, economic and cultural consequences of a proposed activity and to assess plans to mitigate any adverse impacts resulting from the proposed activity, and

(d) to provide for the involvement of the public, proponents, the Government and Government agencies in the review of proposed activities.

1992 cE-13.3 s38;1994 c15 s18

Any Director may require assessment

41 Where any Director is of the opinion that the potential environmental impacts of a proposed activity warrant further consideration under the environmental assessment process, that Director may refer the proponent or the proposed activity to the Director who is designated for the purposes of sections 43 to 56 so that the proposed activity may be dealt with under section 44.

Inter-jurisdictional agreements re environmental assessment

57 Where an enactment of Canada or of another province or territory contains provisions that operate for substantially the same purpose as corresponding provisions of this Division, the Minister may, with respect to a proposed activity that is governed in part by the laws of Alberta and in part by the laws of Canada or the other province or territory, enter into an agreement or arrangement with any Minister or agency of the Government of Canada or of the other province or territory for any or all of the following purposes:

(a) to determine what aspects of the activity are governed by the laws of both jurisdictions;

(b) to provide for the carrying out jointly by both jurisdictions of

(i) the environmental assessment process, or any part of it, for the purposes of this Division, or

(ii) the provisions in any enactment of the other jurisdiction that operate for substantially the same purpose as this Division;

(c) to provide for the adoption by one or both jurisdictions, for the purposes of their environmental assessment requirements, of

(i) all or part of the environmental assessment or review process of the other jurisdiction, and

(ii) reports and similar documents prepared by or under the authority of the laws of the other jurisdiction as part of the environmental assessment or review process of that jurisdiction.

Excerpts from the Alberta Natural Resources Conservation Board Act (R.S.A. 2000, c. N-3)

http://www.qp.gov.ab.ca/documents/Acts/N03.cfm?frm_isbn=077972447X&type=htm

Purpose of Act

2 The purpose of this Act is to provide for an impartial process to review projects that will or may affect the natural resources of Alberta in order to determine whether, in the Board's opinion, the projects are in the public interest, having regard to the social and economic effects of the projects and the effect of the projects on the environment.

Reviewable projects

4 The following are subject to a review in accordance with this Act and the regulations:

(a) forest industry projects;

(b) recreational or tourism projects;

(c) metallic or industrial mineral projects;

(d) water management projects;

(e) any other type of project prescribed in the regulations;

(f) specific projects prescribed by the Lieutenant Governor in Council.

Excerpts from the Alberta Wilderness Areas, Ecological Reserves, Natural Areas and Heritage Rangelands Act (R.S.A. 2000, c. W-9)

http://www.qp.gov.ab.ca/Documents/acts/W09.CFM

Preamble

WHEREAS the continuing expansion of industrial development and settlement in Alberta will leave progressively fewer areas in their natural state;

WHEREAS it is in the public interest that certain areas of Alberta be protected and managed for the purposes of preserving their natural beauty and safeguarding them from impairment and industrial development;

WHEREAS to carry out these purposes for the benefit and enjoyment of present and future generations it is desirable to establish certain kinds of areas and reserves and to provide varying degrees of protection to those areas and reserves; and

WHEREAS it is also desirable to establish certain lands as heritage rangelands in order to protect their grassland ecology;

THEREFORE HER MAJESTY, by and with the advice and consent of the Legislative Assembly of Alberta, enacts as follows:

3 No Minister of the Crown, Provincial agency within the meaning of the *Financial Administration Act* or other person on behalf of the Crown shall

(a) construct, maintain, repair or operate any public work, road, railway, aircraft landing strip, helicopter base, structure or installation in a wilderness area or ecological reserve, or

(b) expend or authorize expenditure of any money for any of those purposes.

Excerpts from the Canadian Environmental Assessment Act
http://laws.justice.gc.ca/en/showdoc/cs/C-15.2///en?page=1

Projects requiring environmental assessment

5. (1) An environmental assessment of a project is required before a federal authority exercises one of the following powers or performs one of the following duties or functions in respect of a project, namely, where a federal authority

(*a*) is the proponent of the project and does any act or thing that commits the federal authority to carrying out the project in whole or in part;

(*b*) makes or authorizes payments or provides a guarantee for a loan or any other form of financial assistance to the proponent for the purpose of enabling the project to be carried out in whole or in part, except where the financial assistance is in the form of any reduction, avoidance, deferral, removal, refund, remission or other form of relief from the payment of any tax, duty or impost imposed under any Act of Parliament, unless that financial assistance is provided for the purpose of enabling an individual project specifically named in the Act, regulation or order that provides the relief to be carried out;

(*c*) has the administration of federal lands and sells, leases or otherwise disposes of those lands or any interests in those lands, or transfers the administration and control of those lands

or interests to Her Majesty in right of a province, for the purpose of enabling the project to be carried out in whole or in part; or

(*d*) under a provision prescribed pursuant to paragraph 59(*f*), issues a permit or licence, grants an approval or takes any other action for the purpose of enabling the project to be carried out in whole or in part.

International environmental effects

47. (1) Where no power, duty or function referred to in section 5 is to be exercised or performed by a federal authority in relation to a project that is to be carried out in Canada or on federal lands and the Minister is of the opinion that the project may cause significant adverse environmental effects occurring both outside Canada and outside those federal lands, the Minister and the Minister of Foreign Affairs may refer the project to a mediator or a review panel in accordance with section 29 for an assessment of the environmental effects of the project occurring both outside Canada and outside federal lands.

Agreement

(2) The Minister and the Minister of Foreign Affairs shall not refer a project to a mediator or a review panel pursuant to subsection (1) where the Minister and the governments of all interested provinces have agreed on another manner of conducting an assessment of the environmental effects of the project occurring both outside Canada and outside federal lands that

(*a*) includes a consideration of the factors required to be considered under subsections 16(1) and (2);

(*b*) includes an opportunity for the public to participate in the assessment;

(*c*) includes a requirement that the report is to be submitted to the Minister at the end of the assessment;

(*d*) includes a requirement that the report is to be published; and

(*e*) meets any criteria established pursuant to paragraph 58(1)(*h*).

Excerpts from the Canadian Fisheries Act (R.S., 1985, c. F-14)

http://laws.justice.gc.ca/en/showdoc/cs/F-14///en?page=1

20. (1) Every obstruction across or in any stream where the Minister determines it to be necessary for the public interest that a fish-pass should exist shall be provided by the owner or occupier with a durable and efficient fish-way or canal around the obstruction, which shall be maintained in a good and effective condition by the owner or occupier, in such place and of such form and capacity as will in the opinion of the Minister satisfactorily permit the free passage of fish through it.

Idem

(2) Where it is determined by the Minister in any case that the provision of an efficient fish-way or canal around the obstruction is not feasible, or that the spawning areas above the obstruction are destroyed, the Minister may require the owner or occupier of the obstruction to pay to him from time to time such sum or sums of money as he may require to construct, operate and maintain such complete fish hatchery establishment as will in his opinion meet the requirements for maintaining the annual return of migratory fish.

Place, form, etc.

(3) The place, form and capacity of the fish-way or canal to be provided pursuant to subsection (1) must be approved by the Minister before construction thereof is begun and, immediately after the fish-way is completed and in operation, the owner or occupier of any obstruction shall make such changes and adjustments at his own cost as will in the opinion of the Minister be necessary for its efficient operation under actual working conditions.

To be kept open

(4) The owner or occupier of every fish-way or canal shall keep it open and unobstructed and shall keep it supplied with such sufficient quantity of water as the Minister considers necessary to enable the fish frequenting the waters in which the fish-way or canal is placed to pass through it during such times as are specified by any fishery officer, and, where leaks in a dam cause a fish-way therein to be inefficient, the Minister may require the owner or occupier of the dam to prevent the leaks therein.

Harmful alteration, etc., of fish habitat

35. (1) No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.

Excerpts from the Canadian Navigable Waters Protection Act (R.S., 1985, C. N-22)

http://laws.justice.gc.ca/en/showdoc/cs/N-22///en?page=1

Construction of works in navigable waters

5. (1) No work shall be built or placed in, on, over, under, through or across any navigable water unless

(*a*) the work and the site and plans thereof have been approved by the Minister, on such terms and conditions as the Minister deems fit, prior to commencement of construction;

(*b*) the construction of the work is commenced within six months and completed within three years after the approval referred to in paragraph (*a*) or within such further period as the Minister may fix; and

(*c*) the work is built, placed and maintained in accordance with the plans, the regulations and the terms and conditions set out in the approval referred to in paragraph (*a*).

Exceptions

(2) Except in the case of a bridge, boom, dam or causeway, this section does not apply to any work that, in the opinion of the Minister, does not interfere substantially with navigation.

Excerpts from the Canadian Species at Risk Act (2002, c. 29)

http://laws.justice.gc.ca/en/showdoc/cs/s-15.3///en?page=1

Destruction of critical habitat

58. (1) Subject to this section, no person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species — or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada — if

(*a*) the critical habitat is on federal land, in the exclusive economic zone of Canada or on the continental shelf of Canada;

(*b*) the listed species is an aquatic species[37]; or

(*c*) the listed species is a species of migratory birds protected by the *Migratory Birds Convention Act, 1994*.

[37] There are at least two species of fish on the 'Endangered Species' list of the Species at Risk Act in the Milk River, they are: Minnow, Western Silvery (*Hybognathus argyritis*) and Sculpin, "Eastslope" (*Cottus* sp.) St. Mary and Milk River populations.

Appendix E: Cover letter and Survey

SIMON FRASER UNIVERSITY
AT HARBOUR CENTRE

Graduate Public Policy Program

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Canada V6B 5K3
Tel: (604) 291-5289
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E-mail: olewiler@sfu.ca
http://www.sfu.ca/mpp/

Dear Milk River Basin Resident:

The International Joint Commission (IJC) recently recommended that various policy options for the management of the St. Mary - Milk Rivers be studied to assess their applicability and feasibility. I am a Masters student in the Graduate Public Policy Program at Simon Fraser University and will be examining these proposed policy options for my Masters thesis. With family in Alberta and a keen interest in water issues, I know that people in southern Alberta are concerned about their water supplies and anxious to see policies that ensure water is available. My research focuses on an assessment of the policies proposed by the IJC as they pertain to the Milk River. I am asking for your help in my assessment.

Enclosed is a survey that asks for background information on your water use and your opinions about the policy options for management of the Milk River. I will use your information to help examine the viability of policy options. By participating in this study, you will contribute to the discussion surrounding the Milk River and my hope is that the policy recommendations that emerge in this report will contribute to better management of the Milk River and help ensure an adequate water supply for all residents of the Milk River Basin.

If the completed survey and enclosed ticket are returned to me by November 7, 2006, you will be entered in a random draw for a $100 Canadian Tire gift certificate!

By filling out this questionnaire, you are agreeing to participate in this study; your input is completely voluntary. The information that you provide will be kept confidential and used only by me. This document is not a legally binding agreement and will not impose any legal obligations on any survey respondents. Please answer as many questions as you feel appropriate. If you have any questions, please do not hesitate to contact me at (604) 999-8049 or carriee@sfu.ca. You may also contact my supervisor, Professor Nancy Olewiler, at (604) 291-5289 or olewiler@sfu.ca. If you have any concerns or complaints you may contact Dr. Hal Weinberg at (604) 268-6395 or hal_weinberg@sfu.ca.

I would be happy to share my final report with you; simply indicate your interest and include your email address. Thank you for taking the time to participate in my study.

Sincerely,

Carrie Elliott
encl.

THIS SUVERY IS CONFIDENTIAL AND VOLUNTARY DOUBLE-SIDED

The first section of this survey deals with your involvement with the issue of water from the Milk River.

1) Are you a resident of southern Alberta?
   □Yes □No
   a) If yes, how long have you lived in southern Alberta?
      □less than 1 year
      □1-5 years
      □6-10 years
      □11-20 years
      □more than 20 years

2) How concerned are you with the quantity of water available for use within the Milk River Basin?
   □ Very concerned
   □ Somewhat concerned
   □ Not at all concerned

3) Are you familiar with the contents of the April 2006 report to the International Joint Commission (IJC) from the St. Mary – Milk River Administrative Task Force?
   □Yes □No

4) Have you been consulted in these previous studies?
   a) International St. Mary – Milk River Administrative Measures Task Force report to the IJC.
      □Yes □No
   b) 1986 feasibility study of a storage facility on the Milk River.
      □Yes □No
   c) 2003 feasibility study of a storage facility on the Milk River.
      □Yes □No
   d) If yes to any of the above, please describe your involvement; provide any comments you have on the process and note studies you are aware of in addition to the above.

_____

_____

_____

_____

_____

_____

This section will deal with the first policy option recommended for study by the IJC: *water banking.*

- **Water banking is the idea of creating a market for water with buyers and sellers.**
- **If you are in need of water you could buy it and if you have excess you could sell it, all on a voluntary basis.**
- **Three such transactions occurred in Alberta in 2004 involving a total of 3,274,073m^3 of water with prices ranging from $0.36 to $0.49 per cubic metre.**

5) Are you aware that the current Alberta Water Act allows for the transfer of an allocation of water under a licence?
☐Yes ☐No

a) If yes, are you further aware that such a transfer can only occur if there is an applicable approved water management plan, or by an order of the Lieutenant Governor in Council, and that the Milk River Basin is currently not subject to such a plan?
☐Yes ☐No

b) Do you support the development of a water management plan for the Milk River Basin?
☐Yes ☐No

c) Why or Why not?

_____

_____

_____

6) Are you currently the holder of a water licence?
☐Yes ☐No

a) If yes, in what amount and from what source?

_____

b) If yes, how much of your allocation do you use? (as a percentage)

_____

7) If you answered yes to 6), would you consider selling some of your water allocation to another user?
☐Yes ☐No

8) Alternatively, if you do not have a water licence, or if your current licence does not provide you with sufficient water, would you consider purchasing water from another user?
☐Yes ☐No

9) If yes, to either 7) or 8), would you further consider either selling your water to, or purchasing water from, Montana users?
☐Yes ☐No

a) Why or Why not?

_____

_____

_____

Please provide any additional comments you have pertaining to the issue of water banking:

_____

_____

_____

_____

_____

This section addresses the second area of study recommended by the IJC: *joint operations* across the international border.

The IJC concluded that the international boundary limits efficient water administration. One way to deal with this would be to create an IJC board for the St. Mary – Milk Rivers (similar to that which exists for the Red River). The duties of such a Board may include:

- **Monitor activities/conditions that may affect quantity and quality of water.**
- **Identify, discuss, and resolve water issues relevant to the Milk River basin.**
- **Inspect, evaluate and assess to ensure compliance with agreed upon objectives.**

10) Would you support the creation of an IJC board for the St. Mary – Milk River Basin?
☐Yes ☐No

a) Why or Why not and do you have any comments/suggestions on this issue?

_____

_____

_____

_____

_____

_____

_____

This final policy option involves increasing infrastructure capabilities in one of 2 ways:

1) *On-stream* dam and storage reservoir – this would include a dam and storage reservoir on the Milk River.

2) *Off-stream* storage reservoir – this would involve water being diverted from the Milk River to an off-stream storage facility.

11) Do you support the construction of a dam and reservoir on the Milk River in Alberta?

☐Yes ☐No

a) Why or Why not?

_____

_____

_____

_____

12) Do you support the construction of off-stream storage options on the Milk River?

☐Yes ☐No

a) Why or Why not?

_____

_____

_____

_____

Please provide any additional comments you have pertaining to the issue of on-stream or off-stream options:

_____

_____

_____

_____

_____

_____

_____

This final section will ask about your policy preferences, some final questions about your water use and for some demographic information regarding your household.

13) Please indicate your level of support for each of the following policy options as described above. For example, circling (1) would indicate low support for that policy option.

	Low		Medium		High	Don't know
Water banking	1	2	3	4	5	_____
Joint Operations	1	2	3	4	5	_____
On-stream	1	2	3	4	5	_____
Off-stream	1	2	3	4	5	_____

14) Do you currently divert water without a licence because you own or occupy land that adjoins a river or other natural watercourse (as per S.19(1) of the Alberta Water Act)?

☐Yes ☐No

15) Are you currently a member of a water co-operative?

☐Yes ☐No

a) If yes, can you describe which and what this involves?

_____

_____

_____

_____

16) Please indicate your level of confidence in the following bodies to manage the use and apportionment of the water from the Milk River? For example, circling (5) would indicate high confidence in that particular organization.

	Low		Medium		High	Don't know
Government of Alberta	1	2	3	4	5	_____
International Joint Commission	1	2	3	4	5	_____
Warner County	1	2	3	4	5	_____
Milk River Basin Council	1	2	3	4	5	_____

17) If you hold land, what is the size of your holding?_____

18) For how long do you expect to continue your current use of your land and water?

_____

19) What do you use water from the Milk River for?

- ☐ Personal/household only
- ☐ Household & farm/ranch/production
- ☐ Other (please describe) _____

20) How many people are in your household? _____

21) Please describe the age, gender and occupation of people in your household including yourself.

Age	Gender (M/F)	Occupation
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

22) Are you willing to discuss this survey in person? Please provide your contact information if so.

_____

Additional comments:

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for your time and good luck in the draw for the gift certificate!

Appendix F: Case Study Information

Australia – Murray-Darling Basin

Australia's water has been under severe stress since the early 1980s. Since that time the country has had the characteristics of a mature water economy, that is:

> (i) an inability to raise enough revenues to cover service costs and to replace depreciated capital; (ii) severe environmental degradation; (iii) strong dependence on government budgets to refurbish waterworks; (iv) wide differences (both intra- and inter-sectoral) in water productivity; (v) strong involvement of government financing in projects, without much attention being paid to economic feasibility; (vi) a significant lack of transparency in service costs and charge collection systems among different users; and (vii) an excessive degree of water over-allocation in critical basins. (OECD, 1999, p.16)

In order to address these problems, several changes have been implemented, not the least of which was a cap of water allocations from the Murray-Darling Basin in 1997. The body responsible for these reforms is the Council of Australian Governments (COAG).The Australian Government and all state and territory governments signed an original framework agreement in 1994; however, water planning was introduced on a state/territory basis prior to this time period.

The River Murray, in South Australia, has been undergoing serious review since at least 1969 when a moratorium was placed on new licences. In 1976, existing water rights were "...reduced to reflect actual or committed use. This created community pressure to introduce instruments which could provide water to new enterprises, mainly horticulture. South Australia was therefore the first state to officially introduce temporary and permanent trade between private diverters in 1983." (Bjornlund and McKay, 2002, p.778) In order to transfer water the buying property must be subject to an Irrigation Drainage and Management Plan illustrating that the irrigation activities have no impact on the quality of river water. Although the impact of this policy is not monitored other environmental restrictions have been placed on trade, for example trade is not allowed on properties with saline soils and maximum water use levels are set depending on irrigation and drainage infrastructure (Bjornlund and McKay, 2002, p.778-779).

Since the introduction of water trading in South Australia, the volume and price of these trades has been steadily increasing. Bjornlund and McKay conducted interviews by mail to determine why individuals are buying and selling water in both South Australia (SA) and in Victoria, in the Goulburn-Murray Irrigation District (GMID). They found that in SA buyers focused more on trade to increase production, largely due to the boom in viticulture and some horticulture, while the focus of buyers in the GMID was more on 'non-expanding reasons' that is

to increase water application on existing area, for security against drought or to speculate in water, due to their permanent pastures and significant investments in their operations (Bjornlund and McKay, 2002, p.778-779). The motivations for sellers were largely 'non-reducing', that is activating unused water and not resulting in a reduction of productivity. The Bjornlund and McKay study also concluded that there is a group of farmers selling water that they rely upon but not changing their production practices, they conclude that there is "...a group [25 per cent of sellers] of struggling farmers, unwilling to accept reality and make the inevitable adjustment, which might be to their long-term financial detriment." (Bjornlund and McKay, 2002, p.784)

As noted above, most water sold in trades in SA and GMID was previously unused. Fifty-eight per cent of the water trades in the GMID and 69 per cent in SA were sold by low value users, meaning from uses such as cattle and sheep production to higher value uses such as viticulture, horticulture and vegetable production (Bjornlund and McKay, 2002, p.784 and Nicol, 2005, p.43). The GMID saw 4,500 trades of water during the 1997/98 season totaling 250,000 ML, all of a temporary nature, compared to 2,000 ML of water in permanent trades (Bjornlund and McKay, 2002, p.787).

Within three states, exchanges now exist for water trading, providing public information about the supply, demand and prices. These exchanges "...mainly facilitate trade between distant parties, and transfers of smaller volumes of water." (Bjornlund and McKay, 2002, p.787) South Australia, for example, operates a water trading website; it details every water trade in the current financial year and provides annual summaries of all trading activity. Buyers and sellers can also post advertisements for their water requirements which remain on the website for eight weeks.

Bjornlund and McKay also review the social, community and environmental impacts associated with these trades. They found that although the expectations were that improvements to irrigation would be made with these sales of water, within the GMID only 20 percent of sellers used the proceeds to improve their own irrigation it was more often put towards general revenue (63 per cent) or debt reduction (26 per cent). There were similar numbers for the SA although the percentages of debt reduction and irrigation improvement were reversed. They conclude that the main motivation for sellers was the need for money (p. 785-786). They further state that:

> Trade, however, seems to widen the gap between smaller and water-poor farmers and larger water-rich farmers...trade seems to facilitate a stable but changing rural community by consolidating productive land and water into larger units, separating excess farm improvements and unviable land to be purchased by 'life-style' farmers helping to uncouple the economy of rural communities from farming. (p. 786)

In terms of environmental effects of water trading, Dyson and Scanlon conclude that environmental benefits can be achieved if several conditions in place. First, a cap reflecting the sustainable allocation limit. Second, well-defined property rights are in existence. Thirdly, appropriate rules are in existence reflecting the environmental effects of the use of water in the affected locations (Dyson and Scanlon, undated, p.2). These conditions are in place in the Australian context, Bjornlund and McKay conclude that "...water trade generates environmental benefits. If water is sold, out of inefficiently irrigated and drained properties on saline soils, into properties with more efficient drainage and irrigation management practices on suitable soils, it will reduce the negative environmental impact." (p.786)[38]

The 1994 framework agreement of the NWI was updated with a final agreement signed in 2004. A goal of this agreement is to expand trade in water resulting in a "...more profitable use of water and more cost-effective and flexible recovery of water to achieve environmental outcomes." (NWI, 2004) In this agreement the States and Territories agreed to have in place by 2006, compatible, reliable and publicly-accessible water registers showing all water access entitlements and trades (NWI Agreement, 2004, p.11). The NWI created the National Water Commission (NWC) with a goal of sustainable management and use of Australia's water resources.

Alberta – South Saskatchewan River Basin

The South Saskatchewan River Basin (SSRB) in southern Alberta contains large urban and rural populations, thirteen irrigation districts and numerous hydropower plants. It is also home to many recreational activities and environmental groups (Cutlac and Horbulyk, undated, p.1). Approximately 500,000 hectares of land receive irrigation water and more than 2,700 private irrigation projects use the water resources (AAGR, 2000, p.5). Unlike Australia, the SSRB is not experiencing all of the problems of a mature water economy. For example, neither severe environmental degradation nor an excessive degree of water over-allocation exist in the basin. The amount of licences issued for this basin is more than the actual water being used (AAGR, 2000, p.5); unlike the Australia case they have not been reduced to reflect actual use.

Despite the fact that the SSRB is not a mature water economy compared to Australia, considerable work has been done over the past 20 years to manage water resources. The 1991

[38] Bjornlund and McKay note an environmental impact of water marketing that is occurring in India and Pakistan. That is declining groundwater as the "...ability to sell water encourages sellers to keep pumping to maximize the profit from the investment in infrastructure." (p. 772) In these two countries groundwater is an open resource while in Australia it is subject to water extraction rights and a growing management regime.

South Saskatchewan Basin Water Allocation Regulation instituted a cap on the total volume of water that could be allocated for irrigation use in the SSRB. When the 1999 Alberta Water Act, specifically sections nine through eleven introduced the idea of water management plans for river basins and then established a framework for such plans, the SSRB plan was drafted. Phase one of the plan was enacted in 2002 and the final plan was approved in 2006. It seeks to achieve a balance between protecting the aquatic environment and the amount of water required for economic development in the SSRB. The 1991 regulation has been replaced by this plan which calls for a halt to new water allocations in three of the basin's sub-basins.

Given that a few years has now passed since transfers have been occurring in this basin, it is possible to examine those transfers and learn lessons from them for possible policy development elsewhere. A study completed by Nicol (2005) examines the efficacy of water markets in the SSRB. The goal of the study was to "...determine the characteristics and experiences of this newly-established informal and formal water markets in southern Alberta" and compare those experiences to the experiences of water markets around the world (Nicol, 2005, p.4).

This study was focused on transfers that occurred within the St. Mary River Irrigation District (SMRID). This is the largest irrigation district in the SSRB, indeed in all of Canada. It irrigates approximately 372,000 acres and has over 2,060 kilometres of canals and pipeline. There are 1,800 irrigators in this district, 20% of whom produce specialty crops such as sugar beets, potatoes and alfalfa; the other major crops are forage and cereal. The district also provides water for towns such as Seven Persons and Wrentham (SMRID, 2006). Both formal and informal market transactions have been occurring in this irrigation district although the majority of them have been informal.

In 2001, there were 222 informal market transactions totaling only 3.5% of all water allocated. Nicol concludes that the water moved from low to high value crops and to those irrigators with more efficient irrigation systems. Those who purchased the water generally had more irrigated acreage than the sellers and the transaction costs were minimal as the buyers and sellers did not have much trouble finding each other. The prices for this water ranged between $69 and $89 per acre-foot (af), the higher prices for larger volumes for very high value potato and specialty crop production. As 2001 was a drought year the sellers viewed the opportunity to sell water as a good income-making opportunity; the small irrigators of wheat and barley didn't require the water in the dry summer months. This drought motivated the producers of the high value crops to seek water to protect their "high input-cost specialty crops" (Nicole, 2005, p. 155-158).

The formal market in southern Alberta is smaller than the informal, but growing. Transactions to date account for 0.05% of total allocations. The prices from these transactions are much higher than in the informal market and reflect the seniority of licences. The sellers of the water were generally not using the water prior to the sale and the purchasers were motivated more by long-term economic adjustment and security of water supply than the immediate security against drought experienced in the informal market. There were higher transaction costs in this market as the water traveled further and the information was harder to obtain but the absence of legal challenges helped to keep these costs low. These costs were generally split between buyers and sellers and ranged from $480 to $23,900, the higher the volume of water the higher the transaction costs. (Nicol, 2005, p.128-146) "Transaction costs probably have less bearing on water price than the value the water is expected to generate in its new use and the seniority of the licence". The largest volume of water, 1,300 af, generated a price of $600 per af while the smallest transaction of 20 af cost $500 per af (Nicol, 2005, p.158-160). These transactions took at least one year to complete and a common comment was that the delay in the approval process from Alberta Environment was excessive and that the staff there were overworked and understaffed (Nicol, 2005, p.145).

The two permanent transfers that occurred in 2003 changed the water use from irrigation to municipal and Alberta Environment held back the 10% conservation amount in each case. Three permanent transfers occurred in 2004 with Alberta Environment holding back 10% of one of the transfers and only one changed from irrigation to municipal use while two remained for irrigation use only (Palacios and Brown, 2005, p.2). In order to facilitate these market transactions, Alberta Environment committed to creating a list of water allocation licence holders in order of priority (AENV, 2002, p.13). Although this list is not yet publicly available, it can be obtained within a few hours of a request made to Alberta Environment[39].

United States – California

The drought that occurred in California between 1987 and 1992 motivated the state to become a broker in water transfers, acting as a purchaser and seller of water. What is termed the California Drought Water Bank, in the hands of the Department of Water Resources (DWR), operates only in years of drought and as such has been formed in 1991[40], 1992, 1994 and 1995. The Bank does not reflect free market conditions as it is constrained by the fact that it is a monopsony with the state being the only purchaser facing many sellers of water and by the fact

[39] Personal communication with Dave McGee, Alberta Environment, January 25, 2007.
[40] The first such bank actually occurred during the 1977 drought in California. It was operated by the Bureau of Reclamation and laid the groundwork for the bank in the 1990s.

that Congress has limited the price of water to the income the seller would have received with the water plus a small incentive for participating (Nicol, 2005, p.48). These transfers were not subject to Environmental Impact Reports and most transfers involving the Water Bank were given blanket approval by the State Water Resources Control Board (Israel and Lund, 1995, p.11).

Israel and Lund (1995) note several features of the transactions that occurred in 1991. In order to convince potential sellers to participate, legislation was enacted to reassure sellers that these temporary transfers would not affect their long-term rights and a price escalator clause was included in the contracts. This meant that if the price in subsequent contracts, by a specific date, was greater by 10% or more, the original sellers would receive the higher price as well. The water in these transactions came from three sources: 1) fallowing farmland (i.e., not planting or irrigating a crop), 2) using ground water in lieu of surface water, or 3) transferring stored water from local reservoirs. The buyers of water were chosen by California DWR based on 'Critical Needs', allocations were made by California DWR, requiring purchasers to show they had obtained maximum use of current supplies, that they had an adequate water conservation program and the necessary funds for the transaction (p.3-5).

The substitution of ground water for surface water largely resulted in contracts whereby the landowners would irrigate with ground water and transfer their surface water entitlements to the Bank for the season. There were a few contracts whereby the landowners provided their pumped ground water directly to the Bank. The ground water being used had to be considered 'new', in that it was only being used because of the Bank program. To address concerns about depleting ground water levels, the sellers had to install meters to monitor the water levels, when ground water was used in place of surface water being sold to the Bank, the local water district released an equal amount of water to the Bank. The ground water was used on lands overlying its source. (Israel and Lund, 1995, p.4-5)

In 1991, the state purchased approximately 821,000 af of water from 348 sellers at a cost of $125 per af, the water was then resold to 12 urban and agricultural entities for $175 per af (Dixon et al., 1993, p.xi). Less than half the water purchased was sold due to heavy rains reducing demand and because some of the water was required to satisfy Delta outflow requirements for through-Delta transfers. In the next Bank in 1992, the DWR required buyers to agree in writing to the purchase before they acquired the water (Westlands Water District, undated). In 1991; the majority of purchases were made by three jurisdictions, two of which were urban (Israel and Lund, 1995, p.6).

Some of the conclusions about the 1991 Water Bank cited by Israel and Lunch include the fact that overall economic gains were realized and environmental effects were mitigated by, for example, releasing additional fish into the aquatic environment and returning water to the stream. Recommendations were made and implemented for the 1992 Water Bank including earlier notice to improve participation of sellers and the clarity of the contracts was improved with guidelines being established. In 1992 a smaller amount of water was transferred through the bank, a total of 158,715 af, the Bank purchased the water from eleven sellers at $50 per af and sold to sixteen buyers at $72 per af, the bulk of purchases in 1992 were made by agricultural users (water had replenished urban water supply reservoirs). The reasons for the reduced size of the bank were increased precipitation and decreased price. In 1992 the Bank did not purchase water conserved through the fallowing of land because there had been significant environmental and political reactions to this concept, however if it had been a severe drought year it may have still happened. Studies on the impacts of fallowing land have been completed and have shown that one year of fallowing was sustainable but that more than one year is potentially not sustainable for agricultural communities (Israel and Lund, 1995, p.7-9).

Another difference in 1992 was that the Department of Fish and Game purchased 20,000 af of water for preserving fish and wildlife habitats and a larger percentage came from ground-water substitutions (Israel and Lund, 1995, p.8-10). The Drought Water Bank was opened again in 1994 and 1995; it was not put into practice in this latter year due to heavy precipitation leading to reduced demand. (Westlands Water District)

United States – Colorado River

In 1922 the Colorado River Compact was signed between the seven Colorado River Basin states, this compact became the basis of the 'Law of the River' which governs the management of the Colorado River (Gelt, 1997, p.1). This compact apportioned the Lower and Upper Basin each 7.5 million acre-feet (maf) each year, the states within the basins are to work out for themselves how that is to be divided. The Upper Basins apportioned the water 51.75 per cent to Colorado, 23 per cent to Utah, 14 per cent to Wyoming and 11.25 per cent to New Mexico. Of the Lower Basin states, Nevada is entitled to 300,000 af, Arizona 2.8 maf and California 4.4 maf. Nevada anticipated its allocation not meeting its needs by 2015 while California already uses more than its allocation. Until it established its Water Bank Arizona was not expecting to use its full allocation until the mid-21st century (Gelt, 1997, p.5).

The Arizona Water Banking Authority was created (AWBA) in 1996; its purpose is to store unused Colorado River water for municipal and industrial purposes, to assist settling Indian

water rights claims, and exchanging water to assist Colorado River communities. When the AWBA was created, the Arizona legislature banned interstate banking until it could be assured that Arizona's interests could be protected (AWBA, 1999). With the passing of a federal rule governing interstate water banking[41], negotiations began with Nevada. An agreement was signed in 2001 and "In 2005, the AWBA began storing water for Nevada pursuant to the Amended Agreement for Interstate Water Banking." (AWBA, 2006).

The 2001 Agreement for Interstate Water Banking was signed by the AWBA, the Southern Nevada Water Authority and the Colorado Commission of Nevada. In this agreement, the AWBA agreed to use its 'best efforts' to store enough water in Arizona to develop a total of 1.25 maf of long-term storage credits. "Those credits would then be recovered to develop Intentionally Created Unused Apportionment (ICUA) for Nevada as a temporary supply of water to allow Nevada time to develop other long-term water supplies." (AWBA, 2006a, p.3) Conditions of this agreement included that it could not be water that could be utilized by users in Arizona, the water could come from sources other than the Colorado River, and Nevada would pay the cost of delivery, storage and recovery and a fee to mitigate the risk to Arizona.

> The two most significant provisions of the Amended Agreement are that Arizona has now guaranteed Nevada that a sum total of 1.25 million acre-feet of credits will be developed on their behalf. In exchange for this guarantee, Nevada agreed to pay Arizona $100 million above the actual cost of water delivery and storage. The initial $100 million dollar payment was made in two installments in 2005. (AWBA, 2006a, p.3)

The cost of storage and delivery was negotiated at $230 million to be paid over ten years starting in 2009. Nevada intends to use the period of this agreement to develop other non-Colorado River resources. One of the benefits to Arizona is the additional financial resources the banking provides; the intent is to use some of that funding to develop alternative water supplies. Other benefits to Arizona include the improved state relationship with Nevada and a portion of the funding goes to the Arizona Water Protection Fund, its sole source of funding (AWBA, 2006a, p.3-4).

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[41] "This rule establishes a procedural framework for the Secretary of the Interior (Secretary) to follow in considering, participating in, and administering Storage and Interstate Release Agreements among the States of Arizona, California, and Nevada (Lower Division States). The Storage and Interstate Release Agreements would permit State-authorized entities to store Colorado River water offstream, develop intentionally created unused apportionment (ICUA), and make ICUA available to the Secretary for release for use in another Lower Division State. This rule provides a framework only and does not authorize any specific activities. The rule does not affect any Colorado River water entitlement holder's right to use its full water entitlement, and does not deal with intrastate storage and distribution of water. The rule only facilitates voluntary interstate water transactions that can help satisfy regional water demands by increasing the efficiency, flexibility, and certainty in Colorado River management." (Department of the Interior, 1999)

The Red River Watershed Initiative

The IJC Watershed Initiative was further developed in 2004 with the release of its second report. This report emphasized that local people with appropriate assistance are those best suited to resolving local transboundary issues (IJC, 2005, p.1). This report shifted the focus of the IJC from merely creating and utilizing international watershed boards to: "The aim of the initiative is to enhance the capabilities of existing IJC international boards while at the same time, strengthening cooperation among the various local entities in transboundary watersheds." (IJC, 2005, p.4)

The already existing Red River Board was one of the three recommended for this development (the other two were the St. Croix River watershed and the Rainy River watershed). The reasons for the selection of the Red River watershed were fourfold. First, an effective IJC board was already in existence; secondly there was a wide variety of local organizations with watershed interests. Thirdly, this watershed faced a range of intermediate to long-term challenges. And finally, these challenges included some cross-border disputes that could potentially involve the two governments and result in formal references to the IJC (IJC, 2005, p.4). It was further decided that:

> IJC boards would continue their current responsibilities and, in full cooperation with other entities, build partnerships to improve local capability in monitoring and addressing transboundary water and related environmental concerns (IJC, 2005, p.6)

The Red River Basin has several characteristics that made it a candidate for this watershed initiative including a common concern about flooding, population growth that will lead to increased pressure on the resource, agriculture is its economic base, environmental concerns and significant cross-border political problems surrounding the issue of water. There are problems within this basis that would benefit from transboundary collaboration, for example, flood mitigation works and flood policy (IJC, 2005, p.17). Severe floods in 1997 highlighted the need for watershed stakeholders to coordinate their activities; the Red River Basin Commission (RRBC) was formed in 2002 with a merger between the Red River Basin Board, the International Coalition and the Red River Water Resources Council. The RRBC is a chartered not for profit corporation in Manitoba, Minnesota, North Dakota and South Dakota; it has a 41 member Board of Directors including representatives from local government, water resource districts, joint power boards, First Nations and environmental groups (RRBC, 2007). The mission of the RRBS is "To develop a Red River Basin integrated natural resources framework plan; to achieve

commitment to achieve the plan; and to work towards a unified voice for the Red River Basin." (RRBC, 2007)

The RRBC is not the sole stakeholder group in the basin that is partaking in this initiative; the International Water Institute (IWI) was formed in 2000. Its purpose is to "...provide a forum for research, public education, training, and information dissemination relating to flood damage reduction and water resource protection and enhancement in the Red River Basin." (IWI, undated) Its management board is comprised of individuals from both sides of the border and its research partners include the Universities of Manitoba, Minnesota, North Dakota and Tri-College.

The International Red River Board works closely with the RRBC, the IWI and other organizations in the watershed to "...improve a shared understanding of water issues and to develop the knowledge base for better transboundary decision-making." (IJC, 2005, p.18) The specific foci have been Outreach and Coordination, Notification of intensive operations, Lower Pembina River flooding, Water quality and ecosystem health, International water quality objectives for nutrients and a Comprehensive Flood Mitigation Plan (IJC, 2005, p.18). An example of a project the IRBB has undertaken and its result is around the issue of nutrients from the Red River flowing into Lake Winnipeg. The IRBB has called for all jurisdictions to reduce these nutrients by 10%; the board will track the progress. An example of a proposed project is a call for a framework for a watershed-wide aquatic ecosystem health assessment (IJC, 2005, p.19).

Appendix G: Elite Interview Information

Table 15: Elite Interview Information

Name	Title	Organization
Jack Blaney	International Joint Commission	Commissioner
Cheryl Bradley	Member/Spokesperson	Southern Alberta Group for the Environment
Sal Figliuzzi	Head, Transboundary Water Policy Section	Alberta Environment
Tom Gilchrist	Chair	Milk River Watershed Council Canada
Dave McGee	Lethbridge District Approvals Manager	Alberta Environment
Terry Michaelis	Mayor	Milk River
Larry Mires	Executive Director	St. Mary Rehabilitation Working Group
Cliff Wallis	Past President and Member	Alberta Wilderness Association

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