

Alberta's drive to use market-based instruments for ecosystem services provision

G. L. Kerr¹ & H. Bjornlund^{2,3}

¹*University of Calgary, Canada*

²*University of Lethbridge, Canada*

³*University of South Australia, Australia*

Abstract

Governments globally are struggling to reverse negative trends of decreased ecosystem function. Due to their nature as landscape drainage 'sinks', aquatic ecosystems are particularly in jeopardy. In response to some of the significant impacts on land and aquatic ecosystems, the province of Alberta (Canada) has recently introduced institutional, legislative and policy initiatives explicitly promoting ecosystem services (ES) production through market-based instruments (MBIs). This paper presents a brief account of the current state of aquatic ES knowledge and use in Alberta. Further, the paper explores the critical role that property rights play in MBIs, as a design criterion and applies this to the key legislation and policies in Alberta that currently enable MBIs. With few MBIs currently enabled, this paper evaluates the property rights regime for one MBI, the current water market in southern Alberta. The strengths and weaknesses of the property rights for water transfers provide some lessons for Alberta as it implements new MBIs for ES provision.

Keywords: ecosystem service, market-based instruments, property rights, water markets.

1 Introduction

Governments globally are struggling to reverse negative trends of decreased ecosystem function. Due to their nature as landscape drainage 'sinks', aquatic ecosystems are particularly in jeopardy. The Ecosystem Services (ES) approach has evolved from this struggle [1]. The complex nature of ES has promoted a number of governments to look beyond their current 'command and control'



regulatory approach to environmental management toward the incorporation of market-based instruments (MBIs) [2, 3].

Within its legislation and policy context, the Government of Alberta (GoA), Canada, has shown strong support for using the ES approach to support aquatic ecosystem outcomes and for the use of market-based instruments (MBIs) to encourage the production of important ES. It is critical to understand both the context for ES in Alberta and the critical design criteria for MBIs to ensure that MBIs effectively modify the way humans interact with the environment so that the needed level of ES is produced.

Two main types of MBIs for ES exist; one provides a direct payment for ES provision by paying resource users to implement certain acts on their land. The second is based on markets in which willing sellers and willing buyers trade in licenses to e.g. catch fish or use water, or permits to e.g. emit pollutants into the air or water bodies. This paper will discuss both types in the context of Alberta policy and legislation but will deal in more detail with the important property rights issue associated with trading in licenses or permits, using water as an example.

2 Ecosystem services

The concept of ecosystem services (ES), as the benefits that humans derive from ecosystems, became popular among governments and stakeholders because it connects actions to protect and restore ecosystems with an improvement of human well-being [5, 6]. A key issue with the production of ES is that most demonstrate public good characteristics in that they are non excludable and non rival. A farmer, for instance, would have less incentive to produce these public goods when their livelihood depends on the private goods, such as crops and livestock.

The literature shows that increasingly, governments in the United States, Europe, Australia and Canada, are recognising a need to encourage the production of critical ES on both public and private land and to integrate the ES into environmental policy and legislation [6–8].

Alberta has recognized that there have been some significant impacts on land and aquatic ecosystems and has responded in turn with a number of key institutional, legislative and policy initiatives, including a recognition that the environment and society are interconnected. The vision statement in the Alberta Ministry of Environment business plan commits that “Alberta’s environment sustains a high quality of life”. The plan also recognizes that achieving this requires an understanding of the ties between nature and the environment and specifically highlights the importance of ecosystem services [9].

3 Market-based instrument design: property rights

Drawing again on the public goods nature of ES, MBIs do not typically develop for public goods such as pollination or climate regulation. Governments have had to develop clear incentives to ensure that critical ES are produced.

Traditionally governments have relied on regulation for environmental objectives, but recently MBIs have emerged as potentially a more effective tool.



With any tool development, the design of the tool is critical. No tool can be simply replicated in another jurisdiction as the context (spatial, temporal, scientific, political, social, etc) and policy and legislative history must be understood [2, 3, 10].

There is a great body of literature about the design criteria for MBIs, including specific and measureable outcomes, appropriate scale and fit within legislative and policy context, clear property rights, information disclosure, flexibility, monitoring and enforcement, and tool evaluation [6, 11, 12].

3.1 Property right and the nature of ecosystem services

The Government of Alberta (GoA) has explicitly included MBIs as instruments in a number of key documents that relate to environmental outcomes. It is apparent that there currently is a preference for, and acceptance of, the use of MBIs for environmental management [8, 13–16].

The choice of MBI will depend partially on the nature and security of the rights that government is prepared to provide to polluters or resource users. Understanding the nature of these rights is critical to the successful design and implementation of MBIs as the characteristics of the property rights will drive what types of tools that can be developed and conversely, if there is a desire for a new tool, it will drive how the property rights must be defined [17].

The role that property rights play with MBIs and the public goods nature of most ES are so critically important that it warrants further discussion [6, 17]. The key feature that distinguishes MBIs from other tools is the need to clearly define the rights and obligations of the parties involved in a transaction associated with the provision of ecosystem services. Within current natural resource management the issue of property rights, such as a permit to use resources like fish, or a right to emit pollutants, is quite clear. There is less clarity when the unit traded is, for example, a nutrient credit gained from a non-point polluter such as a land owner implementing a Best Management Practice for reducing the emission of nutrients into the river. When the landowner sells this credit to a point polluter, or the government because it improves ecosystem services, the new buyer owns the credit, but which obligations does the seller still have and what happens if the actions the seller took do not continue for the agreed duration? Uncertainty may result in failure to meet the environmental outcome. The following are the key elements of property rights [6, 17, 18]:

- **Exclusivity** - The permit or licence must belong to a specified party that has the exclusive ability to exercise the rights contained in the permit. There must be clear title to the permit. It is valued because it protects the right holder from interference from others that may want access to the specific right.
- **Transferability** - The permit or licence holder must have a relatively unfettered ability to dispose of the permit in any manner that suits their interests. This means being able to buy, sell or rent the right in accordance with changing market conditions. This is valued because it allows the right holder to choose the best use of his capital and time by transferring or selling the right.



- **Duration** - The time period over which the right holder expects to have control and benefit from the right. This is important for many resource users since considerable capital expenditures are required to utilize the resource and benefit from its use.
- **Scarcity** - For an individual or licence permit to be considered valuable there must be a limited number of permits available and/or it must have specific characteristics that make it unique. As long as parties can obtain additional rights from the government, there is little incentive to acquire existing rights.
- **Security or quality of title** - This answers the question of how vulnerable the right holder is to a challenge on the right. A set of legal rights reinforced by a registration system must secure the property right and must be enforceable against third parties and be enforced by the proper authorities. Lack of security produces uncertainty, which is an impediment.
- **Flexibility** - The flexibility of the right will determine how well the use of the resource can be adapted to changing conditions and what the right holder is enabled to do without consulting others. Limited flexibility can result in delays, costly procedures and losses for the right holder.

4 The Alberta context

Alberta has experienced intense economic and population growth over the past decade resulting in increased activity on the landscape. Alberta has recognised that this increased pressure combined with the increasingly complex nature of environmental issues, the current regulatory approach has severe limitations: in effectiveness and efficiency and the increasing costs for monitoring and compliance [19, 20].

The ES concept is evolving rapidly in Alberta. An ES assessment was undertaken in 2006 for land use planning in Southern Alberta and categorized twenty ecosystem services that then were assessed for their importance [8]. This ES assessment was included in the 2009 terms of reference for the South Saskatchewan Regional Plan [21]. The initial work by this group has listed some priority ES, including water supply; the emerging water market in southern Alberta will be evaluated in Section five.

4.1 Current state of aquatic ecosystem services in Alberta

Aquatic ecosystems are recognised as landscape ‘sinks’ into which the surrounding watershed activities drain. The primary human-induced impacts on rivers come from water withdrawals (allocations to divert), dams, and land cover changes [22]. While critical human activities like agriculture and irrigation provide society with food, community and economic contributions, the water allocation from the river to these activities have trade-offs. The depletion of river flows fundamentally alter aquatic ecosystems and the ability to provide such services as flood prevention; regulating runoff; water supply; assimilative capacity and improved quality of surface and ground waters; erosion and sediments control; bank stabilization; water infiltration in soil; groundwater recharge and cultural services, such as recreational, aesthetic and spiritual [1, 5].



Within Alberta, there are significant differences in the state of aquatic ecosystems and the way in which they are used across Alberta, especially north and south illustrated by the presence of irrigation districts in the south and drainage districts in the north. The region with the most severe impacts on its aquatic ecosystems is Southern Alberta. In 2003, the GoA undertook instream flow needs (IFN) studies in the South Saskatchewan River Basin (SSRB) to understand the aquatic ecosystem needs and found that for healthy aquatic ecosystems about 70-80% of natural flow was required. Around the same time a study for the GoA found that 30 of 33 main stem rivers in the SSRB ranged from 'moderately impacted' to degraded [24, 25].

The issues with aquatic ecosystems and the reduction in ES is clear; however, just because the GoA developed an IFN does not mean it can protect it. In context of water licences in Alberta, licence holders have a set of rights, established in law, on a first-in-time first-in-right basis. Licences were historically allocated to facilitate the settlement of western Canada and enable agricultural/irrigation use, not to protect aquatic ecosystems and ES [26]. A consequence of this system is that current consumptive licenses have the oldest priority while any new IFN licenses will be dated with that date and level of risk. Hence, during scarcity the IFN will have lower priority to any previous licences. Currently the SSRB is said to be over allocated; whereby the needs of the environment and the needs of the water licence holders can not all be met.

Alberta has met this challenge by developing legislation and policy. Four key pieces are presented based upon the potential impact they have on aquatic ecosystems and the use of MBIs to improve the provision of ES: i) the Water for Life Strategy (WFL) [27]; ii) the *Water Act* [28]; iii) *Alberta Land Stewardship Act* (ALSA) [29]; and iv) the Land-Use Framework (LUF) [30]. The following section will tease out the ES implications and will assess the MBIs included in these documents, looking specifically at the intended purpose, the current state of use and the clarity of property rights.

4.2 The *Water Act* and water for life strategy

The *Water Act* is the principal legislation governing water management in Alberta. Like many other jurisdictions the GoA owns the water on behalf of its citizens and is responsible for administering water legislation and regulations. Historically license holders were granted perpetual licenses to use water; while more recent licenses have been for a specified duration. The *Water Act* [28] relies heavily on regulation however it does specify that water transfers can be enabled through an approved Water Management Plan (WMP). To date only one of seven river basins in Alberta have an approved WMP, the South Saskatchewan River Basin (SSRB). In 2006 the approval of this WMP lead to both the closing of the basin to new surface water licences and the introduction of water transfers, leading to the birth of a water market.

The Water for Life Strategy (WFL) established three priority outcomes one of them being healthy aquatic ecosystems [27]. This was to focus the GoA and stakeholders on building strategies and tools to promote healthy aquatic ecosystems to secure the ES Albertans obtain from them. As such, WFL



specifics three related objectives that pertain to ES and MBIs: i) develop a policy framework for ecosystem services markets in collaboration with Institute for Agriculture Forestry and Environment; ii) enhance the water rights transfer system; and iii) implement market-based ecosystem incentive program to meet water conservation and productivity objectives [27]. At present the only concrete action on these objectives has been an announcement by the GoA that they are undertaking a water allocation management system review.

4.3 Alberta land stewardship act and land-use framework

The 2008 Alberta Land Use Framework (LUF) and its resulting legislation the 2009 *Alberta Land Stewardship Act* (ALSA) are emerging as critical legislation and policy to connect aquatic ecosystems and land use actions and management [29, 30]. Both LUF and ALSA recognize that the environment provides “public goods” that Albertans enjoy and value. The GoA is currently trying to find new ways in which to share the costs of conserving them such as new policy instruments to encourage stewardship and conservation on private and public lands [31].

ALSA was made into legislation in 2009 and perhaps its most significant impact is that it has legal precedence over all other acts that deal with the environment and natural resource management. This power specifically states that if there are conflicts between ALSA and other acts, ALSA prevails. The enabling of MBIs and the promotion of ES may influence other Ministries and legislation in the future and drive environmental and natural resource management. The impacts this may have on current MBIs such as the water market in the SSRB remain to be seen.

LUF and ALSA heavily promote the use of MBIs; however there is a bit of confusion in that the MBIs presented in LUF and ALSA are not all the same. LUF lists tradable disturbance rights, transfer of development credits, land trusts, conservation easements, conservation offsets, and lease-swapping; while ALSA enables conservation easements, conservation directives, stewardship units, conservation off-sets, and transfer of development credits to encourage the conservation and stewardship on private as well as public lands. As ALSA is legislation it is likely that the tools in ALSA will be the focus on the GoA work for the next few years.

With the exception of conservation easements, none of the ALSA tools have been developed to date and the information within the LUF and ALSA is quite limited; however based on the information available the following paragraphs introduce the tools, the intended purpose, current status, and property rights implications.

- Stewardship Units - Stewardship units (SU) are not clearly defined in ALSA and do not appear in LUF at all. The purpose of SU would be to provide a unit of measure for stewardship, such as a hectare of a certain vegetation or wetland that would be the basis for a number of market-based incentive tools and could create a common property right that is to be exchanged across different land-use categories. It is clear that the SU do not, and may not constitute an interest in land, but would likely be an ecosystem services



or bundle of ecosystem services [31]. This has significant implications or direction for MBI development, especially if all MBIs must use the SU.

- **Conservation Easements** - Conservation easements (CE) are a one time payment to landowners to preserve some ES. While non-government groups like Ducks Unlimited Canada area already using this tool, ALSA formalizes the government support. A landowner may grant a CE for any, or all of their land. A CE constitutes an interest in land that can be registered in the Land Titles Office that provides some security with respect to the right. Most existing conservation easements in Alberta have not been secured in this way and have therefore not been binding on subsequent owners. Consequently, some CEs have been dishonoured by subsequent landowners.
- **Conservation Off-set Program** - The creation of conservation offset programs is enabled; however ALSA does not elaborate when or how this tool might be used to compensate for impacted landscapes. LUF states that land conservation offsets are compensatory actions to address biodiversity or natural value loss (ecosystem services) arising from development on both public and private lands [31].
- **Transfer of Development Credit** - Transfer of development credits (TDC) allow for economic development on private lands, but direct it away from specific landscapes; however ALSA contains no description of the purpose behind a transfer of development credits scheme (TDC scheme). The TDC scheme will have to have the same purposes and principles as a CE.

In summary, ALSA and LUF provide a large number of MBIs that could positively impact ES production. At present only conservation easements are functioning. The lack of clarity and security of the property rights of CEs creates uncertainty for groups wanting to use them to secure easements. The evolution of the SU will be important to monitor. The development of a single type of unit of exchange for all ES will potentially make it easier to manage MBIs; however the practicality of being able to establish a single unit of measure for all ES will be exceptionally challenging given the nature of ES [4].

While Alberta is an apparent proponent of MBIs for environmental outcomes, there is limited experience with implementing these tools. The emerging water market is perhaps the best example to date of an MBI which can potentially be used for ES provision, through its ability to impact aquatic ecosystem health. The next section will explore the water market, assess the nature of the property rights and provide a few examples of how the aquatic ecosystem could benefit more directly from this market.

5 Alberta's emerging water market

Alberta Environment is mandated with the delivery and assurance of water allocation through the *Water Act*, including issuing licences and approving transfers. Within the SSRB there are approximately 13,000 water licenses. Similarly to many jurisdictions around the world agriculture and specifically irrigation is the largest user of water. All 13 of Alberta's Irrigation Districts (ID) are located in the SSRB and account for 75% of the total volume of water



allocated, have the most senior (secure) licences and occupy 75% of the land [26, 32]. There has been increasing pressure from environmental groups in Alberta to ensure that water can be freed up from current licence uses to enhance aquatic ecosystem health [33].

The 1999 *Water Act* enabled water transfers with an Approved WMP. The first such plan was approved for the SSRB in 2006 and allowed for water transfers and closed three of the four sub basins to new surface water licences: a young quasi-market is born. To date transfer or trading activity has been very small and only 31 transfers have occurred [34].

While there are a number of reasons cited in the literature for why the market has so few trades even with the water scarcity issues and closed basin, this paper has focused on the role that property rights and the characteristics of those rights play in building certainty for licence holders to participate in a market, Table 1 highlights the strengths and weaknesses based upon the six characteristics listed above.

As noted in Table 1, water licence holders have usufruct rights to water in Alberta. Licence holders have exclusive right to use their licence based upon the conditions held in the licence and most licences were issued in perpetuity which gives added certainty in the right. There is also flexibility with regard to what the licence holder can do with the licence; however changes to the licence require government approval and some changes, like a transfer, are subject to appeal, which can increase transaction costs, opportunity cost and time.

The transferability of the licence is fairly clear at present, although it has high transaction costs, including a provision in the Water Act that allows for a 10% hold back on the transfer if deemed important for the aquatic ecosystem by the Director. In addition, irrigators in an ID have added 'red tape' as the licence is held by the ID on behalf of the irrigators within it and is subject to plebiscite votes and GoA approval for changes in licence.

There is a high level of certainty with most aspects of the water right. Perhaps the key challenge is the GoAs ability to cancel a licence under the emergency conditions in the Water Act or changes made as a result of the current water allocation system review.

Given the characteristics of property rights associated with water licenses in the SSRB and the emerging water market an obvious solution to enhance aquatic ecosystem health and the production of ES would be to transfer or buy water for the environment. There are a number of possibilities that have occurred in other water markets, including government purchase of licences, water trusts holding licences, private parties holding water licences for specific ecosystem functions or services (e.g. flushing the cottonwoods trees at critical times) and expropriation of water by government. Currently the *Water Act* only allows the government to hold licences for in-stream purposes, while Ducks Unlimited an NGO holds very large licenses for flooding wetlands, which is possible because the water is diverted for this purpose. However, the current Alberta water allocation system review is hearing from a number of parties that this should be modified [26, 36].

Table 1: Water licence property rights in the SSRB.

Property Right	Strengths	Weaknesses
Exclusivity	Water licences are registered exclusively to a licence holder for a specific purpose, diversion point, rate of flow, volume and priority date. The licence holders have usufruct rights.	The Water Act gives the GoA the emergency authority to suspend a licence [27, Part 7. 107]
Transferability	The approved SSRB Water Management Plan enabled transfers of all or part of a licence that is in 'good standing'	Transfers are subject to the Water Act and the SSRB WMP and can have no adverse impact on the aquatic environment or third parties [21]. Irrigators face more restrictions within an Irrigation District (ID) as they can only transfer inside the ID. Transfer process has high transaction costs, is complicated and time consuming [35].
Duration	Most licences were granted in perpetuity. Some licences have specific terms and conditions that restrict withdrawals at below specified river flows giving priority to environmental requirements.	Threat of government modifying existing licences as a result of the current water allocation system review is a concern. Since 1990 licenses have been granted a 10 year renewable licence
Scarcity	The SSRB is closed to new water licences; if anyone wants water they must buy a licence. In the SSRB water scarcity is a constant issue or threat on the horizon	Most current license holders have excessive allocations relative to their needs and hence can manage quite severe scarcity
Security of title	Existing water licences provide clearly defined usufruct rights that are legally enforced. Water licences are registered exclusively to a licence holder for a specific purpose, diversion point, rate of flow, volume amount and priority date.	Have to be in good standing for three years or entire licence can be cancelled. Water metering and actually mandatory reporting are not complete which may detract from real or perceive security of title

Table 1: Continued.

Property Right	Strengths	Weaknesses
Flexibility	There are a number of 'products' that can be traded - permanent and temporary transfers of whole or part of license or assignments can be made of whole or part of seasonal allocations.	Any modification of a licence has to be approved by the government. Some changes are minor while others may require public consultation and a more time consuming process. There is less flexibility in an ID as a plebiscite with 50% is necessary for major changes like land expansion or transfers [21].

6 Conclusions

Governments are struggling to reverse negative trends of decreased ecosystem functions and aquatic ecosystems are particularly in jeopardy due to their nature as landscape drainage 'sinks'. Within Alberta the Ecosystem Services (ES) approach has been incorporated into a number of policies and legislation to promote the health of aquatic ecosystems. MBIs are promoted as an appropriate tool for managing ES, but must be designed carefully given the public goods nature of most ES. The characteristics of the property rights associated with the units, such as the Stewardship United discussed in this paper, that are traded and which defines how the ES will be provided, are critical to the design and successful implementation of the MBI and to the successful provision of the ES. If a landholder or right holder does not have confidence or clarity about what their rights are and what they are expected to do, there may be a resistance to adopting MBIs.

While Alberta has explicitly promoted the use of MBIs for production of ES and introduced MBIs as part of recent legislation, these policies and pieces of legislation are quite new. There is little evidence of implementation of these new tools. The next few years will be a very interesting time to watch Alberta to see what will happen with the numerous MBIs that have been enabled. The nature of the property right associated with the provision of ES will be a critical consideration in the design of any of the potential MBIs that have been enabled.

References

- [1] Millennium Ecosystem Assessment, *Ecosystems and Human Well-being: Wetlands and Water Synthesis*. Millennium Ecosystem Assessment Series. Island Press Publications: Washington, D.C, 2005.
- [2] de Loë, R.C., Armitage, D., Plummer, R., Davidson, S. & Moraru, L., *From Government to Governance: A State-of-the-Art Review of Environmental Governance. Final Report*. Prepared for Alberta Environment,



- Environmental Stewardship. de Loë Consulting Services Guelph, ON, 2009.
- [3] Coggan, A., Whitten, S.M., and Langston, 2005. *Nesting MBIs in current institutions and structures – can it be done and what are the implications?* CSIRO Sustainable Ecosystems, 2005.
 - [4] Stoneham, G., An overview of the ideas and information needed to develop and implement MBIs. Proceedings of the 6h Annual AARES National Symposium. Canberra, 2004.
 - [5] Ranganathan, L, Raudsepp-Hearne, Lucas, N., Irwin, F., Zurek, M., Bennett, K., Neville, A. and West, P., *Ecosystem Services: A Guide for Decision Makers*. World Resources Institute, 2007.
 - [6] Landscape Change Team, *Ecosystem Services through Land Stewardship Practices: Issues and Options*. Land Management Group. Department of Sustainability and Environment. Victoria Australia, 2003.
 - [7] Mistakis Institute. *Alberta Ecological Goods and Services Scan and Recommendations to NAWMP* Prepared for Alberta North American Waterfowl Management Plan (NAWMP), 2008.
 - [8] Integrated Environments and O2 Planning and Design (Integrated), *Ecosystem Goods and Services Assessment – Southern Alberta, Phase 2 Report*. Publication: Alberta Environment, 2007.
 - [9] Alberta Finance, Alberta Environment Business Plan 2009-12. Online. <http://www.finance.alberta.ca/publications/budget/budget2009/envir.pdf>
 - [10] United Nations Environment Program, *The Economics of Ecosystems and Biodiversity (TEEB) for National and International Policy makers*. 2009.
 - [11] Kamarck, E.C., *The End of Government As We Know It: Making Public Policy Work*. Lynne Rienner, Boulder, CO. 2007.
 - [12] Chaudhri, V. *Market Based Instruments and NRM: Proceedings of the 6h Annual AARES National Symposium*. Canberra, 2004.
 - [13] Institute for Agriculture, Forestry and the Environment, *Market-based Instruments. Fact Sheet*. Alberta Agriculture, Alberta, 2008.
 - [14] Integrated Environments, *Ecosystem Goods and Services Assessment – Southern Alberta, Phase 2 Report: Conceptual Linkages and Initial Assessment*. Published by Alberta Environment, Alberta, pp. 131, 2007.
 - [15] Alberta Water Council. Alberta Water for Life Strategy, Alberta Online. <http://www.waterforlife.gov.ab.ca>
 - [16] Alberta Environment. Environmental Assurance Division. Environmental Tools Guide. Online. <http://environment.alberta.ca/1985.html>)
 - [17] Alberta Government. Land-use Framework. Online. www.landuse.alberta.ca/documents/Final_Land_use_Framework.pdf
 - [18] Scott, A., Introducing Property Rights in Fishery Management (Chapter 1). *Use of Property Rights in Fisheries Management. Fisheries Technical Papers*, ed. R. Shotton. Fisheries and Agricultural Organization of the United Nations, pp.1-13., 1999.
 - [19] Bjornlund, H., Efficient water market mechanisms to cope with water scarcity. *International Journal of Water Resources Development*. **19(4)**, pp.553–567. 2003.



- [20] Wenig, M.M., A.J. Kwasniak, & Quinn, M.S., Water Under the Bridge? The Role of Instream Flow Needs (IFNs) in Federal and Inter-Jurisdictional Management of Alberta's Rivers. Proceedings of the Alberta Society of Professional Biologists, ed. Alberta Society of Professional Biologists, Edmonton, Alberta. 2006.
- [21] Bankes, N., The Legal Framework for Acquiring Water Entitlements from Existing Users. *Alberta Legal Review*, **44(323)**, 2006.
- [22] Alberta Government (AG), 2009 Terms of Reference for Developing the South Saskatchewan Region <http://www.landuse.alberta.ca>
- [23] Palmer, M.A. Lettenmaier, D.P., Poff N.L., Postel, S.L. Richter, B. & Warner, R., Climate Change and River Ecosystems: Protection and Adaptation Options. *Environmental Management*. **44**, pp.1053–1068, 2009.
- [24] Alberta Environment, Approved Water Management Plan for the South Saskatchewan River Basin in Alberta. Edmonton: Alberta Environment, 2006.
- [25] Alberta Environment, *Draft South Saskatchewan River Basin Water Allocation*. Online www3.gov.ab.ca/env/water/regions/ssrb/studies.asp
- [26] Kwasniak, A.J., Quenching Instream Thirst: A Role for Water Trusts in the Prairie Provinces. *Journal of Environmental Law and Practice* **16(3)** pp. 211, 2006.
- [27] Alberta Environment, Alberta Water for Life: Strategy for Sustainability. Online <http://www.waterforlife.gov.ab.ca/docs/strategyNov03.pdf>
- [28] Alberta Government. Alberta Water Act. Online. <http://www.canlii.org/en/ab/laws/stat/rsa-2000-c-w-3/latest/rsa-2000-c-w-3.html>
- [29] Alberta Government. Alberta Land Stewardship Act (ALSA). Online <http://www.landuse.alberta.ca/AlbertaLandStewardshipAct/Default.aspx>
- [30] Alberta Government. Alberta Land-use Framework. Online. <http://www.landuse.alberta.ca/AboutLanduseFramework/Default.aspx>
- [31] Poschwatta-Yearsley, J. & Zelmer, A., The Alberta Land Stewardship Act: Certainty or Uncertainty? *Canadian Institute for Resource Law*. University of Calgary. **106**, 2009.
- [32] Alberta Environment, South Saskatchewan River Basin Planning Program: Summary Report. Government of Alberta, 1984.
- [33] Droitsch, D. & Robinson, B., Share the Water: Building a Secure Future for Alberta. *Water Matters and Ecojustice*. pp. 5-33, 2009.
- [34] McGee, D. Personal communication, 5 January 2010, Director, Southern Saskatchewan River Basin Water Management Plan Implementation, Lethbridge, Alberta.
- [35] Nicol, L., Klein, K. & Bjornlund, H., Permanent Transfers of Water Rights: A Study of the Southern Alberta Market. *Prairie Forum*, **33(2)**, pp.341-56, 2008.
- [36] Alberta Water Council. Water Allocation Transfer System Upgrade. Online. http://www.albertawatercouncil.ca/Portals/0/pdfs/WATSUP_web_FINAL.pdf

