



UNIVERSITY OF ALBERTA  
ALBERTA CENTRE FOR SUSTAINABLE  
RURAL COMMUNITIES

# Scoping Review of Successful Practices in Water and Watershed Management in Rural Albertan Communities



Alberta Centre for Sustainable Rural Communities

ACSRC Report Series #15-12

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## **Authors**

Alberta Centre for Sustainable Rural Communities

## **Acknowledgements**

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## **Abstract**

The objective of this project was to identify, synthesize and categorize the multiple strategies and initiatives that have been undertaken within the province to resolve the pressures of economic and population growth with issues of water supply and policy. It did so through a combination of conventional academic methods (scoping review) combined with a more innovative approach to knowledge sharing and problem solving (crowdsourcing). The project concluded with a workshop to assess, validate, edit and contribute to the results of both the crowdsourcing and scoping review phases.

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## Executive Summary

This scoping review is the starting point in the research project aimed at improving the quantity, quality and long term sustainability of water in rural areas of Alberta. The project was implemented by a partnership between the University of Alberta's Augustana Campus in Camrose and Sustainability Resources Ltd. It provides an inventory and categorical assessment of water and watershed management policies in rural communities, and engages rural communities in the research process and in the dissemination of its findings in an active way.

This review follows the general format outlined by Arksey and O'Malley (2005) for scoping reviews. This method is guided by a requirement to identify all relevant literature regardless of study design or data (qualitative or quantitative). As familiarity with the extant literature is increased, researchers will want to redefine search terms and undertake more sensitive or varied searches of the literature. The scoping review is not an evaluation or analysis. It is simply an attempt to describe what is out there.

The majority of projects (63%) have taken place in 5 water basins/sub-basins: Bow River (50 projects), North Saskatchewan River (29 projects), South Saskatchewan River (20 projects), Oldman River (14 projects), and Red Deer River (13 projects). Thirty-three projects were designed to cover the entire province of Alberta, such as educational or policy projects.

Sixty-eight projects out of 157 grey literature projects were implemented by municipalities, the rest being done by provincial or federal government and NGOs. It should be noted that many municipal or NGO projects were completely or partially funded by government agencies; respectively, they can be credited to more than one actor.

<u>Subject Area</u>	<u>Number of Reports</u>	
	<u>Academic</u>	<u>Grey Literature</u>
Allocation	3	N/A
Conservation	1	31
Ecosystems	2	N/A
Education	N/A	54
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Management	4	31
Market-Based Tools	2	5
Modeling	8	N/A
Policy	4	16
Quality	14	15
Quantity	4	3
Reuse	2	N/A

## **Introduction**

This scoping review is the starting point in the research project aimed at improving the quantity, quality and long term sustainability of water in rural areas of Alberta. The project was implemented by a partnership between the University of Alberta's Augustana Campus in Camrose and Sustainability Resources Ltd. It provides an inventory and categorical assessment of water and watershed management policies in rural communities, and engages rural communities in the research process and in the dissemination of its findings in an active way.

## **Background**

While Canada holds 20% of the world's fresh water, many forces cause stress on Canada's water supplies. Most fresh water drains north towards the Arctic Ocean and away from the heavily populated centers clustered close to the U.S. border. In fact, 60 percent of Canada's water flows north while 84% percent of the population lives in the southern part of the country, within 300 kilometers of the U.S. border (Nowlan, 2004).

Canadian water policy has progressed through three phases of development: (1) pre-regulation; (2) public law; and (3) market-based, co-operative and comprehensive substance instruments (Brooks and Miljan, 2003). Before 1894, water allocation was based on the common law doctrine of riparian rights that allowed only those owning land adjacent to a watercourse to access water. As settlement and agriculture in the West expanded, it was recognized that development would be limited unless the right to access water was expanded beyond riparian owners. In 1894, the North West Irrigation Act vested all property in and the right to use water in the Crown and established a system to grant water use rights to non-riparian landowners. This system, based on the first-in-time first-in-right principle, ensured farmers had secure access to water and established an orderly allocation of water for those who settled the West (Droitsch & Robinson, 2009). Having secured control of the resource, the Crown then allocated the right to divert and use water to those who obtained a license, which allowed the holder to use the amount of water allocated on the land described in the license (Percy, 1996).

In the twenty-first century, Alberta faces new challenges. Alberta is considered a relatively dry province. Evaporation and evapotranspiration exceeds precipitation in most of Alberta. The southern half of the province is categorized as semi-arid, but even in the northern half of the province there are water limitations. In the Northern Alberta, the estimated net annual water allocation for planned oil sands mines is more than two and a half times the City of Calgary's yearly water consumption for a population of over one million people (Droitsch & Robinson, 2009). In Central Alberta, two basins are under considerable pressure for new surface water diversions largely because of oil and gas development. Demand for water by the City of Edmonton along with new demands by the oil and gas industry for bitumen upgraders is creating challenges around ensuring a reliable supply on the North Saskatchewan River. It is estimated that when all the projected upgraders are operating (between 2015 and 2020), they will consume about 10 times as much water as the City of Edmonton (Droitsch & Robinson, 2009).

In the South Saskatchewan River Basin in Southern Alberta, where over 20,000 water licenses have been issued over the past 100 years, the government made an unprecedented decision in 2006 announcing they would no longer accept surface water license applications for three of the sub-basins in this major river basin – the Bow, the Oldman, and the South Saskatchewan river systems. Only the Red Deer sub-basin remains open to new surface water license applications.

The introduction of the “water transfer” in the 1996 Water Act legislation was designed to allow for the re-allocation of water between different parties and uses. For most users wishing to acquire water allocations, water would have to be obtained by a transfer of all or part of a water license allocation from an existing license holder. By 2008, there had been approximately 28 successful water rights transfers under this system (Droitsch & Robinson, 2009).

Alberta has taken a “watershed approach” to managing water resources. In the “Water for Life” strategy, communities and stakeholders are responsible for watershed management and developing plans to ensure the supply and control the pollution of source water, including aquifers and groundwater. While it is not possible to point to a true shift to community and integrated watershed management, there is no doubt that water policy has moved away from end of pipe and command-based models. The combinations of water quality crises, drought and urban development have brought both quality and supply concerns into sharp relief across multiple sectors.

Historically the majority of the water supply has been utilized for agricultural purposes, with over 400,000 hectares in southern Alberta drawing from this source. Most irrigators in this region gain access to water through membership in an irrigation district, which in turn holds the necessary water license in order to access surface water. Water has been used for irrigation purposes in this region for over 140 years, and has been subject to legislation and regulation since 1894. Since that time, water allocation has been governed on the basis of non-transferable, site-specific and use specific licenses, with limited (if any) attention paid to pricing or either supply or demand based allocation mechanisms. In fact, as Water Matters noted in their 2009 report, a significant failing of the approach taken to date is that the emphasis lies entirely upon licensing access, rather than taking into account return flow, conservation, variable demand or (as in increasingly important) variability in supply (Horbulyk and Lo, 1998).

As a result of this combination of climate variability, supply variability, anticipated increases in domestic, agricultural and industrial demand, it is increasingly important and relevant to communities across Canada (but perhaps particularly in Alberta) to increase their knowledge about the effects, costs and scope of different programs, policies, interventions and strategies that have been undertaken to manage water supply and demand. This project, therefore, seeks to identify and categorize the multiple strategies and initiatives that have been undertaken within the province to reconcile the pressures of economic and population growth with issues of water supply and policy. It does through a combination of conventional academic methods (scoping review) and a more innovative approach to knowledge sharing and problem solving – crowdsourcing. The project concluded with a workshop to assess, validate, edit and contribute to the results of both the crowdsourcing and scoping review phases.

### **Project Design**

As the quantity and distribution of scientific, practitioner, organizational and “internal” or “grey” literature increases through both the proliferation of programs and interventions, as well as the accessibility of virtual archives and electronic documents, it is becoming more and more important to understand the nature, scope and dimensions of the evidence-based available to support water decisions and policy in Alberta. As evidence-based practice becomes increasingly incorporated into public policy and the practices of delivery, methodologies are being refined for conducting the systematic review and survey of existing literatures on the effectiveness of

interventions, programs, and policies. These methodologies include: systematic reviews, scoping reviews, and meta-analyses (Poth and Ross, 2009).

As authors such as Poth and Ross (2009) note, scoping reviews are less statistically or “scientifically” oriented, as they do not attempt to aggregate or draw statistically valid conclusions from the aggregation of evaluated interventions. Additionally, they may include, but are not restricted to, quantitative data. Instead, scoping reviews may be defined as a method for compiling and interpreting a collection of studies, programs and interventions that may involve more than one intervention, may involve all types of people and may utilize a range of outcome measures to evaluate effectiveness (JBIEBNM, 2000). Arksey and O’Malley (2005) suggest that a scoping review tends to address broader topics where many different study designs might be applicable. It is also less likely neither to address very specific operational research questions nor to assess the quality of included studies. They are, therefore, often appropriate as a method to summarize and disseminate research findings and identifying gaps in the existing research literature, policies and practices.

### **Objective**

The objectives of this scoping review are to identify and categorize strategies, interventions and initiatives that have been undertaken in the rural communities across the province to address issues of water policy, supply and quality.

### **Methodology**

This review follows the general format outlined by Arksey and O’Malley (2005) for scoping reviews. This method is guided by a requirement to identify all relevant literature regardless of study design or data (qualitative or quantitative). As familiarity with the extant literature is increased, researchers will want to redefine search terms and undertake more sensitive or varied searches of the literature. The scoping review is not an evaluation or analysis. It is simply an attempt to describe what is out there. The scoping process is intended to systematically develop the broad picture of what is happening and what has happened in the field of water resources in Alberta. As a result, (and unlike systematic reviews) we do not place limitations on search terms, identification of relevant studies, or study selection at the outset.

The scoping review was carried out in two phases. In the first phase, activities included reviewing existing literature. These included articles in peer-reviewed academic journals, industry magazines and newsletters, projects proposals and watershed management plans, stakeholders’ websites, status reports, research documents and conference proceedings. We set a number of criteria for potential water projects or interventions. First, we searched peer-reviewed academic literature using Web of Science, Water Abstracts, and Google Scholar databases. Search results contained more than 3,000 water-related articles for Alberta. These results then were narrowed down to exclude what we identified as technical, or “hard” science (e.g., hydrology, chemistry, biology) articles which could not be used to achieve our priority task of benefiting rural residents. Articles that address various water-related aspects of oilsands development were also excluded from the review. The remainder is limited to only 44 academic (peer reviewed) articles and papers.

The second source of information about water projects in Alberta was “grey” literature: government, NGO and private sector’s reports and newsletters. This project identified 157 different interventions and projects from the “grey” literature in Alberta. This does not include

nearly the 1,200 infrastructure projects implemented from 1998 to 2011 with the financial assistance of the Alberta Municipal Water/Wastewater Partnership (e.g., water treatment plant construction or upgrades, water supply projects such as wells and waterlines, and water reservoir construction). A list of infrastructure projects is attached, but is not included in the categorical analysis .

The second phase of the scoping review involved consulting with stakeholders in water: government agencies, rural municipalities, and public organizations such as watershed councils and partnerships. The consultation process involved telephone interviews and e-mail exchanges with staff from different stakeholders and individuals representing different sectors and interests within water sector. This phase was intended to complement phase 1 in terms of the resources collected, as well as to engage a dialogue around possible priority areas or notable successes.

This report was prepared to describe the findings of the first phase of the scoping review, i.e. an inventory and categorization of the academic and grey literatures. As mentioned above, it was not intended to be all-inclusive but was designed to describe what has been done and is being done in rural Alberta in relation to water policy, supply, and quality of water.

### **Thematic Overview**

In the context of this review, the term “water projects” is used to cover a wide range of activities and for the purposes of the review is taken to include:

- irrigation and drainage (production of food, or water for agriculture);
- domestic water supply, sanitation, health and hygiene promotion, cultural use of water (e.g., landscaping);
- protecting ecosystems, ensuring in-stream flows and ecosystems services;
- improved assessment, development and management of water resources.

In addition, there are trans-boundary issues, as in Milk River Water Management Initiative (Montana/Alberta border).

The total number of selected water projects we included in the database from both academic and grey literature is 201. These projects categorized according to the aspect or dynamic of water as a core resource that they were intended to address:

- water supply, or quantity;
- water quality;
- water policy;
- education;
- conservation (including reuse and recycling);
- management (including modeling and allocation);
- market-based instruments.

The water for agriculture theme covers many projects relating to various aspects of irrigation. Specific subjects covered include community involvement in irrigation system management (irrigation districts), techniques for reducing water use in irrigation, the economics of irrigation. These projects fall under the categories of management, conservation, and market-based instruments.

The management of water resources theme encompasses a wide variety of projects. Subjects covered by more than one project include: water rights and allocation; water scarcity; community based management and monitoring of water resources (both surface and ground water); water resource planning, including the effects of climate change on water resources; modeling. Projects of this theme were categorized as management, policy, supply, or market-based projects. Projects implemented under the management theme also included those relating to water quality category, specifically wastewater management, for both domestic and commercial wastewaters, and removal and reducing impacts of chemicals, such as arsenic.

Protecting ecosystems theme covers projects such as estimation of low flows in streams, protecting riparian areas and other water ecosystems, promoting best management practices in agriculture and industry. These projects were categorized as water quality, management, policy, and conservation projects.

Finally, a majority of projects were related to domestic supply and sanitation, such as toilet replacement rebate programs, introducing water meters, reuse of water for lawns. Most of these projects were listed under the conservation category, with remaining projects going under the categories of education, water supply, and policy.

Other criteria used to further categorize selected projects were targeted basin (sub-basin) and agency or jurisdiction involved in the project implementation. The majority of projects (63%) have taken place in 5 water basins/sub-basins: Bow River (50 projects), North Saskatchewan River (29 projects), South Saskatchewan River (20 projects), Oldman River (14 projects), and Red Deer River (13 projects). Thirty-three projects were designed to cover the entire province of Alberta, such as educational or policy projects.

Sixty-eight projects out of 157 grey literature projects were implemented by municipalities, the rest being done by provincial or federal government and NGOs. It should be noted that many municipal or NGO projects were completely or partially funded by government agencies; respectively, they can be credited to more than one actor.

## Scoping Review Content:

Table 1.0  
Distribution of Academic and Grey Literatures

<u>Subject Area</u>	<u>Number of Reports</u>	
	<b>Academic</b>	<b>Grey</b>
Allocation	3	N/A
Conservation	1	31
Ecosystems	2	N/A
Education	N/A	54
Infrastructure	N/A	3
Management	4	31
Market-Based Tools	2	5
Modeling	8	N/A
Policy	4	16
Quality	14	15
Quantity	4	3
Reuse	2	N/A

### **Allocation**

Water allocation is an area of contention in Alberta due to the large number of agriculture (and other) industries, as well as large and small communities and their reliance on the resource.

Although there are great shortages of water in several water basins in Alberta, the demand for water usage has not slowed. Because of this, it is very interesting that this subject is only featured in three academic publications.

The content of these three publications points to two major ideas: (1) Closing waterways to new water allocations; and (2) Sharing the shortage to allow for expansion and success of all businesses and communities in the area. With minimal research in this domain, it is not possible to draw any conclusions that can be used to adequately improve the reality of the water shortages in both the South Saskatchewan River and the Oldman River. However, rather than focus on the simple rejection of new water licenses to new businesses or declining the request for increased water consumption by growing businesses, these publications examine the effects of closing water basins to new licenses, as well as other solutions such as decreasing water usage to all using the resource during times of shortage. The publications all result in similar findings: (1) It is an unacceptable approach to reject new licenses or shut down recently acquired licenses; (2) Rejecting water licenses results in water shortages for a variety of communities and industries; and (3) Sharing the water shortages amongst all who hold licenses results in a more equitable satisfaction than focusing on priority based water allocation.

The effects of, and strategies for, water allocation is an important area of study that will benefit from increased research and knowledge transfer in order to bridge the gaps and provide for communities in Alberta. By extending the studies that are currently available, researchers may very well come across an appropriate solution to the water shortage issues in a variety of water basins in Alberta.

### **Conservation**

The majority of the water conservation projects are unique to specific Alberta communities. 31 projects from a variety of Alberta communities including Airdrie, Cochrane, and Calgary were featured in this scoping review including *toilet replacement rebate programs*, and *storm water reuse projects*. Water conservation is very minimally focused on by academic papers, as our scoping review has found only one academic article based on water conservation.

The 31 projects that are used in this scoping review were found on Alberta town or city websites. These sites offer an overview of the project that was conducted in an attempt to help the community as a whole begin to conserve water, whether it be an incentive program, reusing resources and infrastructure, or including new charges for services.

Investigating the projects shows that, overall, most city and town websites identify the project, the eligibility requirements, and provide a brief overview of the benefits of the project. There is rarely conclusive evidence as to whether they are truly beneficial to the community's overall water conservation plan. This is likely due to the fact that most of the projects are still running presently. In some cases, there are accompanying reports that have been used to create a background of information for the projects. In addition, it appears that most of these projects have been developed in conjunction with the development of a community water conservation plan. Returning to the project websites in the future will be helpful to determine if they were successful in decreasing water consumption, but for now, lessons can be learned about the variety of water conservation projects, rebate programs and other initiatives that communities are using to promote a responsible use of the limited water resources in Alberta.

The academic article included in this scoping review narrowly focuses on the use of water for irrigation for Southern Alberta agricultural ventures. The paper introduces two possible solutions to the over usage of water for irrigation: (1) Charging for use of water; and (2) Adaptation of agricultural irrigation processes and the willingness of farmers to do so. The paper concluded that there is a high concentration of awareness amongst farmers that conservation of water is necessary for survival into the future, but that without changes to the current economic system, the introduction of new technology, or ways to increase efficiency will not be met. Therefore, the current usage of water for irrigation will remain the same, and the problems will persist.

Because of high usage indicators being focused on the agriculture industry, there may be a need for projects focused on incentive programs and rebates for those in the industry. If the academic paper is accurate in its conclusions, providing necessary economic advantages to farmers to introduce more efficient technology into the industry may alleviate some of the strains on the current water situation.

## **Ecosystems**

Focus on ecosystem protection and policy in response to the increasing demand for water usage is an important topic area for many watershed alliances and environmental sectors. However, this scoping review only recovered two academic journals focused primarily on protection and policy of water basin ecosystems under pressure in Alberta.

The basins that are discussed are the Oldman River and the Battle River, both of which possess a heavy human reliance. Due to this reliance, the ecosystems that survive within the watersheds are being harmed by the water shortages. Both of the papers discuss that (1) the current human condition and reliance on these watersheds makes it difficult to implement ecosystem protection policy; (2) creatures who rely on the watersheds for survival are being harmed; and (3) there needs to be an understanding of the footprint being felt by the watersheds in order to successfully manage the water resources for both human usage and for the entire ecosystem.

Where they differ, however, is that one focuses on the idea that it is important to reflect on the culture and history of Alberta water policy and protection, while the other highlights the importance of focusing on the current human condition and its effects on the water basins in order to find feasible solutions to properly protect and create lasting policy surrounding the stressed watersheds.

Ecosystem protection does not seem to be a primary focus of Alberta communities at this time, but is an important area of study, due to the mutual reliance on water resources. Healthy ecosystem surrounding Alberta watersheds are essential for the future of the waterways. Academia and grey literature ought to divulge in the ecosystem policy and protection conversation in order to ensure safe and healthy water for years to come.

## **Education**

Education is the most notable theme, comprising of 54 reports and projects from the 201 project/report total (approximately 27% of the total reports included in the scoping review). Interestingly, every educational initiative comes from grey literature. The lack of academic literature surrounding water education initiatives may be indicative of such initiatives only recently coming to the forefront of community and community organization efforts. Due to their infancy, water education initiatives such as those developed by Alberta Ecotrust, who has devoted a large sum of money to public and youth education programs, academia has minimal or no results to develop a report about.

Upon completion of some of these education programs, it is likely that academic publications surrounding water education will become more prominent. Until such time, the educational initiatives that have been developed can serve as a learning device for other communities and organizations wishing to create education programs.

Alberta Ecotrust has developed the majority of public education projects seen in this scoping review (23 projects). Battle River Watershed Alliance has also played a large role in education program development in Central Alberta (5 projects). In addition to watershed organizations, and community organizations such as the Federation of Canadian Municipalities, a variety of Alberta communities have taken it upon themselves to develop educational initiatives.

The projects included in this scoping review all point to similar intent: (1) Develop a public education program that helps to change the public viewpoint, and increase knowledge about the current water situation in Alberta; and (2) Create programs that are youth-focused to begin to develop new behaviours and create an understanding of the implications that our environmental footprint has on Alberta's waterways. By fostering such programs and learning, communities and organizations will be positively contributing to the many water conservation plans in the province. Although each education program is executed in a different way (for example, answering frequently asked questions, creating a brochure on current water management processes, creating youth water ambassador programs, etc.), with different lessons being learned, the overarching themes remain the same – improve public understanding of the current water situation in Alberta, and introduce ways that the public can create less of an environmental footprint in their watersheds.

Each of the projects that have been selected in this scoping review offer the public the opportunity to learn from, and improve upon the programs for their own communities. As these projects are completed, it is important that reporting is completed in order to show the effectiveness. Focusing on the outputs and outcomes of the educational initiatives, academics can help to close many gaps in educational practice surrounding water conservation.

### **Infrastructure**

This scoping review found three water-based studies/projects focused on improving infrastructure. The reports and projects were produced by three organizations: Alberta Environment, Federation of Canadian Municipalities, and Shirley McClellan Regional Services Commission, all of which are identified as grey literature.

Each of the studies and projects focuses on how improvements to infrastructure can have increased benefits along a variety of lines, including: (1) health & safety; (2) economic development; (3) accessible clean drinking water; and (4) reducing the damaging effects of releasing wastewater into water basins. Although these publications all vary in focus, they all seem to set precedent for improving infrastructure across Alberta. By introducing new studies and solutions to issues affecting Alberta's drinking water, these three reports have identified the importance of improving and increasing infrastructure in order to ensure safe water for all. The benefits of clean water extends to the introduction of new economic development initiatives – such as contracting out projects to local industry, or providing new employment – and also extends to ecosystem protection, as seen in the Federation of Canadian Municipalities project.

With all of the benefits that arise from these types of infrastructure projects, the question of cost still arises. Because of the high start-up costs of completing these projects (estimated \$45M for a new water line), there are questions raised about the costs versus benefits. However, these publications appear to point to the many benefits of taking part in projects that improve water infrastructure. Having more studies focused on infrastructure improvements may help to solidify the benefits of doing such to a wider audience, and may help to decrease costs of these projects by learning from issues that have arisen from projects highlighted in such publications.

### **Management**

The various materials within this section identified many key stressors in terms of water use in Alberta. These stressors included the inevitable growing demand for water by industry, municipalities, agriculture and resource extraction. There is anticipated economic, social and

population growth that will cause additional stress or push current water allocations over sustainable levels. These stressors are intensified by the likelihood of droughts and water shortages, especially in the more arid reaches of central Alberta where agriculture is common. Lastly the possible effects of climate change need to be considered.

From these issues a series of management goals were produced. Goals that were common between all sources include: (1) Finding a way to balance environmental needs and ecological integrity with social needs and development; (2) Maintaining or improving the current water quality within Alberta; (3) Maintaining or improving Alberta's water quantity; (4) Maintaining or improving the current rates of biodiversity and aquatic ecosystem health within Alberta; (5) Identifying and filling knowledge gaps and increasing the amount of data available; (6) Educating and involving both stake holders and the general public in the creation of management plans and raising awareness about water conservation and sustainable practices. The general consensus of this work is that management plans and objectives should be created through collaborative partnership and group work in order to cover the full area of watersheds and to involve as many parties as possible.

Some possible solutions that were presented include: increasing the efficiency of current water usage. This could be particularly useful in the areas of waste management and waste water treatment. The number of new water use allocations could be limited or capped. A charge could be added for the use of water in order to provide revenue to be put back into the area of water management and to provide an incentive for more conservative water use. More research and studies could be done to fill knowledge gaps and provide more data. It is suggested that it would be best to take an incremental approach in implementing any new water policy.

### **Market-Based Tools**

The three articles relevant to market-based policy instruments studied Southern Alberta water policies such as the Alberta Water for Life strategy. The three studies introduced methods to create awareness for the conservation of water in Alberta.

The first article studied the awareness of the Kananaskis river system. A survey was created and distributed on the University of Calgary campus that questioned the current knowledge about the dam by citizens. The results showed that people did want to support water conservation issues in Southern Alberta. From the survey, a marketing strategy was constructed that studied the citizens' preference on the best methods to receive information. From the results, it was concluded that the best methods were Facebook, website upgrades, and print media. If Facebook was the method chosen, it should utilize either a fan page, group page or both. These pages would direct supporters to the website that had more information available on it. Print media could be anything from pamphlets to posters.

The second and third articles contained development strategies for water conservation. One article analyzed short-term water trading and volumetric water pricing as methods to substitute water allocation. The last article suggested that water allocation should be voluntary. This article introduced two primary economic instruments to increase efficiency. Changing water markets and water pricing would achieve small gains in water efficiency. However, the financial capability of farmers presents a constraining factor to water conservation methods. As well, water users do not want to pay for the currently free resource unless they get a higher return.

## **Modeling**

These articles focused primarily on the South Saskatchewan River Basin in Canada that is located in Southern Alberta. The articles explored different types of models that will result in optimal net benefit from the resource. This is a concern because water is a limited resource. Quantity and quality is of utmost importance when discussing water conservation practices.

Three of the eight articles discussed water allocation as a means for modelling water sources and watersheds. The three key points in relation to water allocation are equity, efficiency and sustainability. Water allocation is suggested to diffuse downstream water pollution and optimize the use of the resource based on consumers. The authors argue that stakeholders must be willing to cooperate and share/divide their water nodes based on use. Successful coalitions of stakeholders trading water resource areas will result in optimized benefit of water. Traders must be fully informed of all situations and consequences if this process is to be beneficial for all parties involved and have optimal results. Each stakeholder should reallocate water among different users based on consumer use. This will result in optimal net benefit.

The remaining eight articles discussed methods to promote optimal resource use. For optimal water net benefit, studies must be based on population growth and industrial/agricultural expansion. Work patterns should be modified according to these two factors. For sector-based resource management, science-based methods should be used as the basis of studies to develop predictions and testing methods. Water is essential to Alberta's economy because water is a significant contributor to the largest parts of Alberta's economy—agriculture and oil. However, oil is a non-renewable resource. One potential optimal path is to focus on supplying the oil industry with water now because the agriculture sector will be able to resume when oil is depleted. Process-based tools should be utilized which will provide potential outcomes for different geographical regions, spatial scales and future conditions. Research should be promoted to improve existing models with open process-bases. Objectives and limits should be established for each project.

## **Policy**

Alberta is one of the heaviest water users of the Canadian provinces; in addition Alberta is starting to feel the effects of drought more frequently. This and other factors contribute to the need to re-valuate or implement new policy surrounding water. Some areas where changes or implementation in policy are needed were identified as: (1) Giving Albertans the ability to adapt to drought and considering the affects that climate change could have on the frequency and severity of drought in the future; (2) Coping with the possibility of lower water quality caused by an increase in pollution and bacterial presence in the water supply; (3) The continued negotiation of aboriginal water rights; (4) Monitoring water trade allocation and water transfers and observing how they relate to NAFTA.

Some current provincial policy and policy goals surrounding water are present in Alberta. The most frequently used or mentioned example of water policy and initiatives would be Alberta's Water for Life Strategy. Aspects of this strategy that were frequently mentioned in regards to regional and local policy and management include: (1) The need to provide safe and secure drinking water; (2) Promoting healthy aquatic ecosystems; (3) Insuring reliable and good quality water supplies for a sustainable future. These initiatives are being pursued on several different scales including provincially, regionally (watershed based approach) and municipally.

Municipal water policy and initiative throughout Alberta are also striving towards the above mentioned goals. Some ways in which these initiatives are being implemented and experimented with include: (1) Refining the way storm water managed to make it more efficient; (2) Educating the public on water conservation; (3) Implementing water meters and a rate of pay for water use; (4) Providing rebate programs for high efficiency or sustainable technology (most often seen in the way of toilet rebate programs); (4) Encouraged limited water use in regards to lawn and garden and the promotion of nature-scaping (planting vegetation that naturally grows in the communities climate).

## **Quality**

Water quality plays an extremely important role in ensuring the health and safety of Albertans who rely on these waterways for their livelihood – both for personal use, and often for professional use (through a variety of industries or agriculture). This scoping review has recovered 29 projects motivated by water quality in Alberta. Out of all of the identified themes in this scoping review, water quality seems to see the most even distribution of academic (14 publications) and grey (15 reports) literature. This seems to suggest that water quality is an important area of study for both academic professionals and communities/community organizations.

There is a large variation in the projects/reports/studies seen in this body of literature. Included are: (1) Studies focused on water quality; (2) Studies of factors affecting water quality and the deterioration of water quality; (3) Drinking water safety practices (especially in rural agricultural communities); (4) Water quality restoration; (6) Garbage, waste and toxin removal; (7) Water monitoring; and, (8) The effect of agricultural practices on water quality.

## **Reuse**

Water reuse and recycling is used extensively in a variety of countries, however, Canada seems to do this less frequently. Outside of using non-potable wastewater to irrigate fields, the reuse and recycling of water is not at the forefront of Canadian water policy. Two academic papers discovered in this scoping review, both by the same author, discuss the implications for such practices (or a lack thereof) on the water shortage issue in Canada.

The two papers note some important facts about the possibility of increasing the presence of water reuse and recycling in Canada. First, identifying the potential risks of water reuse is important; secondly, understanding the available technology needed to salvage water for reuse is necessary; and, third, understanding the implications of developing water reclamation projects in regards to both the economy and to health and safety is crucial. These papers review these facts, and introduce a review of all of the possible water reuse initiatives that can be used in Canada, based on those that are being used presently in other places around the world.

Concluding, these papers identify the importance of using the practices from other countries to begin to identify future initiatives and applications of water reuse. They also point to the fact that water reuse can move beyond the traditional practice of using wastewater for agricultural purposes, into the urban environment. All of this information is extremely helpful in increasing the frequency of Canada using water reuse practices, however, with a minimal amount of literature surrounding the limitations, implications, and information, it becomes much more challenging to create a feasible argument directed towards implementing water reuse policies in the provinces, and country-wide.

## **Watershed Resources Website**

As part of the crowdsourcing process and future-oriented deliverables of this project, a dedicated website and database for the content of this project was created. Housed at [www.watershedresources.ca](http://www.watershedresources.ca), this site contains a fully searchable database (organized by category and basin) of the resources identified by this scoping review (less infrastructure), as well as discussion fora, venues for information sharing and workshops. It is intended to provide the core resources for an expanded intervention to support evidence-informed decisionmaking in Alberta.

## **Watershed Resources – Scoping Review Workshop**

### **Workshop Notes**

#### **Rural Municipality Water Resources Workshop**

**Executive Inn, Leduc Alberta- September 11, 2012**

#### *Goal:*

Examine the content and organization of the scoping review and crowdsourcing completed with the water resources to date.

#### *Objective and Outcomes:*

1. Introduce scoping review, resource inventory
2. Share knowledge of resources available
3. Understand issues and needs of rural communities
4. Identify further resources and delivery mechanisms

#### *Intended Context:*

Rural Water management Resources- Providing an introduction to a Scoping Review of Resources and “crowdsourcing” input and refining the categories and resources collected throughout the project.

#### *Intended Audience:*

Municipal Water Managers and Watershed Planners  
WPAC Planners and Managers, Government Watershed Planners  
Stewardship Community – Leaders and Coordinators

## **Welcome & Introduction – Lars Hallstrom**

How do we start to build some bridges and connections with each other and to the content?  
(Went into detail around the background of the project and the reasons to have the workshop)

Mike MacIntyre (?) - One of the frustrations with a database or search engine such as this is the costs. For example, universities have access to databases such as ProQuest. Would it be possible to get funding and access to databases to get the full article and not just the abstract?

Lars - This would be a large undertaking, as university libraries purchase these up in bundles, not just one database at a time.

There isn't an easy answer, but the easiest would be to go through a post secondary institution.

Lisa - This needs to be a robust for rural communities/municipalities.  
Keep a sense of transparency between water managers, we will be able to develop a much broader and much more rich resource.  
If we are going to invest our time, we want to know that this is going to go somewhere further.  
Where is it headed next?

Jeff -Would it be possible when searching for terms and databases, etc. would it be possible to find key individuals according to categories that we could get in contact with?

Lars - Website members and authorial – CAOs, researchers, professors, etc. If you have someone who has spent years working on a certain topic (i.e. Bill Sheer?) Is there some more functionality with that (over time)?

### **Round Robin Feedback from Session One – Lisa**

Session #1: What are your water resource needs (information, capacity building, professional resources, networking and support resources)?

Lisa – What were some of the highlights?

#### *Group 1*

##### Management Issues

- Information gaps, reliable resources- how to fill gaps, ID gaps, avoid bias.
- Consistent reporting – what do we need to know (e.g. Basic indicators).
- Credibility- language of reporting.
- How to engage the public- language, relevance
- Regulations, legislation regarding water- so many different bodies governing water, no consistency between industries. (e.g. Agriculture, Forestry, Oil and Municipalities).
- “Alberta Advantage”- people think they can do what they want.
- Cumulative effects- new considerations from pharmaceuticals synergistic effects. Point sources vs. non-point source.
- Climate change- precipitation patterns change.
- Water usage
- Urban users no thought to where water comes from beyond the tap.
- Misconception of industry and private water usage.
- Perception of water rights- who owns the water.
- WPACs all have different resources and different measures.
- Historical information on the land is lacking, or does not play a part in management when it should.

##### Education

- Lots of raw data out there we need to package it
- Lack of manpower to pull information together get into the nitty-gritty instead of brushing the surface.
- Water has many nuances/ niches may need someone to focus.
- Assurance of continual funding- how is one to three years funding long term or to get consistent people to run programs?

- Organizations (such as WPACs) need to build credibility and trust
- Youth education
- Cooperation between organizations willingness to share resources, programs, media releases, etc.
- This is hampered by people competing for funding and we need to be better than our neighbours.
- Share more good news stories.

#### Other

- We need to be sharing resources, news media releases, and get the *good* news out. Those in extension compete for funding so they don't always want to share because they want to be ahead to get that funding and avoid redundancy with others
- Urban users may know where the water's coming from, but the scary part is they don't know where it's going.
- We need to be moving beyond the first causal questions, which we are just getting into, but the synergistic and long term questions have no ideas, especially in antibiotic resistance, such as with pharmaceutical companies and their waste.
- In our area (i.e. Moose Lake) there is high arsenic and uranium levels, but people are not concerned enough because it's not showing damage yet, but we have no idea what the long term effects of this might be.

#### *Group two*

##### Management

- Forming commission (from the start up)
- Political barriers- stakeholders- territory/ ownership
- Federal- provincial regulations (what can you do, what can't you do, what you want to do and different opinions on that).
- North Sask and Athabasca Watersheds

##### Infrastructure

- Design issues/ priorities – different ideas and agreements with engineers.
- Source protection
- Time

##### Conservation

- Install water meters
- Price- increase cost (how to make money through conservation, rather than just spending?)
- Conservation is costly
- Rationing water (odd-even days)- (how do you effectively ration water and get people to ration water?)
- Conservation of wastewater (recycle water)- what is cost effective? How do you encourage people to do this? -golf course, irrigation, downstream use, spraying

##### Resource needed management capacity

- Government- grants, policy/regulation affects the ability of local management to make decision and changes.
- Engineering

## Information

- Seminars, webinars – talking to different communities is probably the best source.

## Research

- Water conservation
- Climate
- Wastewater- don't think of end product
- Use of grey water

## Professional Resources

- Money
- Engineering/ engineers
- Research
- Education/ training
- Employees
- Contractors
- Other communities!

## Conservation

- Not everybody knows everything – you can always learn something
- The use of grey water – take for granted that it has to be filtered, but it is still usable
- Climate effects on water sources and their depletion
- Money towards developing conservation is lacking
- Engineering resources towards conservation – no money to employ these needs
- Research – more needs to be done in the area of conservation
- Education and training in industry and public – schooling, farmers, teachers
- Education employees – need to make it a necessity in education to teach about water conservation
- Getting the right contractors – costs money to find people who have the expertise to do a good job.

## Feedback

Lisa - For example, Cochrane has a revenue neutral model for increasing water block rate (?)

The group that pays the most because they use the most cover the conservation costs – it's on the website – Rick Deans is in infrastructure management with interest in case study opportunities on the project

Bulk water is not included in the conservation program – irrigation is included

## *Group 3*

Management (Mountain View County, Athabasca, Grande Prairie)

- Riparian Protection and Management
- Livestock are doing damage to creeks and water falls.
- Remote areas have a lot of recreational activity (ATV's, MudBog), this affects riparian areas negatively.
- Water conservation- funding (paradox)- They put money into conserving water and the more water they conserve, but the more water you run, then the value of your system is met, so it's a bit of a paradox.
- Head waters- quality impacts

- Deforestation/ flash floods - Deforestation or clear cutting of the watersheds and flash floods happen at the start of the watershed, so it has an impact all the way down the watershed. These are issues of erosion and soil loss.
- Quantity declines
- Erosion/ soil loss
- The issue of gas exploration and development, as they use significant water resources.

#### Planning and Development

- Evidence and education (e.g. modeling as a tool to show potential impacts for different scenarios). There is a lack of evidence based decision making and a need for education for decision making.
- Commutative effects monitoring; analysis; adaptive management (clear cutting vs section cutting)
- Feedback loops- It needs to be a feedback loop so there is constant understanding of what is going on in the system with positive and negative feedback so you can monitor and analyze when development is happening too fast, for example.
- (Person B: Planning and development notes – what do you mean by evidence?  
Response: For example, if there is an assumption that clear cutting is upsetting storm water flow and causing erosion and effecting groundwater recharge, you can then work with the forestry companies to discuss methods on how to avoid these issues)

#### Resource Needs

- Don't reinvent the wheel – learn from experiences of other communities, regions
- Tools to communicate information to the decision makers.
- Knowledge to decision makers
- Administrative staff need access to professional expertise as they often lack knowledge and jurisdiction (consulting).
- Cultivate and create Civil society groups- grassroots involvement in decision making, not just top down.
- Provincial support/ leadership
- Mike's personal bias- new government approaches- not top down, but with mutual interest and collective input.

#### **Round Robin Feedback from Session Two:**

1) Which of these resources are most relevant to your resources needs?

##### *Group 1*

- Water management combines all resources- practical application
- Water management needs to reflect where watershed stems from (glacial fed vs. muskeg vs...etc.)
- Needs to reflect land use – confined feeding, oil and gas.
- Case studies (what they did, what they would do different etc.)

##### *Group 2*

- Water management e.g. Pembina – low flows

2) What is missing?

*Group 1*

- Capture of all land uses
- Not engaging all stakeholders
- First nations/ metis involvement/ input
- Historical perspective – traditional knowledge
- Federal support/ involvement/ commitment
- Synthesis how to combine the knowledge of multiple case studies.
- Map of website- what will work where.
- Defining the place- links to actual watershed councils.
- Networks page- search networks by organization or category of organization.

*Group 2*

- Educations and Awareness- how to educate - need to have a vested interest in understanding water systems- start with children. (grade 6 level documentary).

*Group 3*

- Grey literature
- Case studies
- Other jurisdictions
- Evaluation is often missing
- How have jurisdiction challenges been documented
- Inter jurisdiction implementation- case studies (successful partnerships, BC and Sask – why reinvent the wheel)
- Capture knowledge from other places- water litre exchange- profile other innovations- profile stories and people.
- Legal and governance issues (case studies on collaboration)
- Successful partnership reporting
- Alberta innovates- videos and reports on aboriginal perspective on water – Bear Paw research and Northern BC.

3) What level of detail would be helpful on the site?

*Group 1*

- Date of reference (how new is the document- put on thumbnail)
- Quick link to compare date between basins (Ph on lakes in Alberta)
- Start with layman terms on home page to engage general public then move into more detail that professionals want/need
- Include glossary on site- need definitions (what is a riparian area, what is a WPAC, what is a SOW)
- Visuals (videos)
- Keep in mind many rural residents don't have high speed internet and will not try to load a page for ½ hour.

*Group 2*

- Visual – photos, videos (what would the videos be like?)
- KISS method

*Group 3*

- Less information, limit information overload. List alert- notified as things change on the site. I can set the criteria.
- Thesaurus- did you know? List of common terms, guide, frequently asked questions.

4) What kinds of delivery options would you like to see?

*Group 1*

- Hard copies available- download or order.
- Place to order publications
- Show size when there is something to download
- webinars, facilitated workshops.
- Pre-packaged workshops available for extension staff
- Industry involvement and feedback/ dialogue with communities.

*Group 2*

- Webinar- to the point
- Show and tell
- Tours of watersheds- Hands- on/ interactive
- APPs
- Sims game, (Alberta tomorrow)
- WEHub- monitoring data not policy data.

*Group 3*

- List alert- emails- specific topics- similar to APPI (partnership for water sustainability BC)
- Filter criteria for twitter- tools to limit information overload.

5) What depth of content would be most useful?

*Group 1*

- KISS!
- Start as simple as possible to engage as many people as possible BUT have the technical information available for people to follow up more in depth
- Links
- Networks

*Group 2*

- Key points
- Abstract- peer- reviewed

Other comments

- AI
- Public education methods
- Ground water
- Conservation plans
- EGS – Public Education- water conservation- business case
- NY watersheds
- Fact sheets – hot topics
- Incentive programs- net gain- calculator
- How do we evaluate case studies, how do you synthesize it and work with it?
- Alberta Watershed Toolkit- expand the program beyond a research project.

**Project history:**

- Land stewardship centre – Alberta stewardship network.
- Needs assessment of AB watershed groups.
- Need to have someone and something to bring together the problems and the solutions.
- No connector of all the water groups in Alberta- how do we bring them together?
- Advisory committee- objectives- met with regional groups across the province- water advisory groups.

**Project outcomes:**

- What are we providing?
- Inventory of information, scientific, technical, case studies.
- Identify barriers, issues and capacity gaps.
- Inform recommendations regarding specific information resources curriculum for communities and decision makers
- Space for a water leadership team- encourage collaboration and resources exchange.
- Network of water leaders- having a person to be there 5 days a week to deal with questions, issues, posts- broker knowledge between communities.

**Forward- Next Steps**

- Baseline research- bringing it together. How can it be expanded.
- Where does this project go next? - Looking for partners and funding.

- How many of you have thought about or looked for a toolkit relating to your work with water? 1 person.
- Why haven't you looked? Narrow perspective on your job, or struggle with wide basis to cover, how to be knowledgeable and look for new tools. Didn't know where to look.
- Tool kits- hand book for water management planning for WPACs.
- Small towns and smaller cities- don't see the relevance of water resources. – rural water line, towns with water resource issues.
- Do urban communities have water on their radar as other communities do? Needs assessment – rural municipalities. Flagged water as an issue. Crisis will impact smaller communities more or faster than larger- question of capacity.
- How do we get those resources to those communities? Build capacity- specialized people with issues of water and waste, etc.
- Availability of water affects the culture of your community. Culturally acceptable to have a burnt lawn (victoria BC).
- Stories you share between yourselves means more than the case studies. Value is in connecting with the people.

#### **Key Questions:**

- Advise for ACSRC for research, community partnerships and studies?
- Express of interest – proposals – AB innovates- government of Alberta
- Figure out what is missing and fill gaps in terms of information. Improve there ways of development is impacted by what is there. What don't we know?
- Water use data- ground water data hard to get (on private land).
- How to education the people? – Educate water use, conservation and preservation and why (relevance) willingness to pay.
- Ecological goods and services- emerging theme in province- pubic education and business case (for decision makers)- eco value from natural resources, water.
- AMMDC- resolution – NY watershed- farmers get reimbursed- net benefits to farmer. Famers get benefits to fence their cattle out of watersheds.
- Fact sheets on hot topics- blue/green algae. Network of information- relevant and timely. Discussion board on the network.
- How incentive programs (correlation do they have, value net gain of using them) show the economic gain for conservation. Infrastructure calculator.
- Is this communicated to decision makers? AMMDC, AUMA?

## Appendix A: Allocation

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Closing the South Saskatchewan River Basin to New Water Licences: Effects on Municipal Water Supplies	David J. Pernitsky and Natalie D. Guy	This paper describes how closing the SSRB to new water allocations has affected water supply planning for municipalities in the Calgary region in southern Alberta. It also discusses water supply and license constraints and potential mitigation strategies, and examines the effects of the basin closure on water supply and land-use planning, and utility governance.	South Saskatchewan River	2010			allocation	academic	Canadian Water Resources Journal Vol. 35(1): 79–92
Modeling Water Rights Allocation in the South Saskatchewan River Basin in Canada	Lizhong Wang, Liping Fang, and Keith W. Hipel	Two multiple objective optimization methods for water rights allocation, the priority-based maximal multiperiod network flow programming (PMMNF) method and lexicographic minimax water shortage ratios (LMWSR) method are applied to the South Saskatchewan River Basin in southern Alberta	South Saskatchewan River	2006			allocation	academic	IEEE International Conference on Systems, Man, and Cybernetics, Taipei, Taiwan
Relaxing the Principle of Prior Appropriation: Stored Water and Sharing the Shortage in Alberta, Canada	Stewart B. Rood, Jenny W. Vandersteen	The discretionary use of stored water and sharing the shortage represent 'equitable allocation', an alternative to prior appropriation, which may benefit other jurisdictions facing water shortages	Oldman River	2010			allocation	academic	Water Resources Management, 24:1605–1620

## Appendix B: Conservation

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Athabasca River Basin Alliance Community Development Project	Alberta EcoTrust	to coordinate workshops, build the capacity of existing citizens' groups, and formally found and create a stable platform for Athabasca River Basin Alliance.	Athabasca	2007			education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Keepers of the Athabasca: Coordination and Community Development	Alberta EcoTrust	engage First Nations and Metis communities, watershed citizen groups and individual residents of the Athabasca Watershed in community outreach, education and advocacy to support the stewardship and protection of this watershed.	Athabasca	2008			education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Photovoice in the Watershed	Alberta EcoTrust	Photovoice is an emerging education tool that combines photography with grassroots social action. Subjects are asked to represent their community or point of view by taking photographs, which give insight into how people conceptualize their circumstances.	Battle River	2010			education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

Photovoice 2.0: Stewardship at Shutter Speed	Alberta EcoTrust	to give voice to the diversity of perspectives that exist across the watershed and explore people's connections to this place.	Battle River	2011	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Bow Valley Sustainability Hub	Alberta EcoTrust	to engage all sectors of the community in sustainability education and action.	Bow River	2007	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Living with Our Rivers: Building a Communications Plan	Alberta EcoTrust	an important community resource for conservation-related policy development and local civic engagement opportunities	Bow River	2010	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Lord Beaverbrook High School Water Squad	Alberta EcoTrust	to install motion sensors on school sinks and timers on showerheads to reduce water consumption	Bow River	2008	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

The Ripple Effect Water Stewardship	Alberta EcoTrust	A committed Youth Advisory Group, aged 13-20, whose primary objective is water education and outreach, will be formed, and they will build their own capacity through adopting critical thinking and research skills, gaining knowledge on local and global water issues, and finding paths to solutions on these issues	Bow River	2009	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
The Upper Bow River: Profiles and Perspectives	Alberta EcoTrust	to provide the community with the information and opportunity for dialogue surrounding the protection of this valuable area.	Bow River	2007	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Castle River Stewardship: On the Ground and on the Web	Alberta EcoTrust	an intensive outreach campaign about the value and importance of the Castle Wilderness and its urgent need for protection	Castle River	2008	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

Clear Hills Local Watershed Testing	Alberta EcoTrust	to raise awareness in the community about the quality of its water and the locations of environmentally sensitive areas	Clear Hills	2009	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Learning About Your Water	Alberta EcoTrust	By partnering with the local watershed group and schools we have the potential to engage and teach local students in the area about water quality sampling.	Hines Creek	2010	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Role of Beaver in Conserving Water and Riparian Habitat during Climate Change	Alberta EcoTrust	to engage representative stakeholders and prominent ranchers in restoring beaver in southwest Alberta to demonstrate the beneficial role of beaver in conserving water and riparian habitats during climate change	Oldman River	2009	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Alberta Water Learning Network	Alberta EcoTrust	The Alberta Water Learning Network will provide customized, carefully designed support to strengthen Alberta groups to more effectively protect Alberta's water resources	province-wide	2008	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

Educate and create public awareness about the Share the Water campain	Alberta EcoTrust	host events on campus where students can get informed and can take action by signing a petition and writing letters to the Environment Minister.	province-wide	2010	education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>
Go With The Flow	Alberta EcoTrust	Evergreen Theatre will bring their original musical theatre production, "Go With The Flow" into elementary schools across Alberta. This engaging show will raise audience awareness of watersheds in Alberta and inspire water conservation actions by Alberta's next generation	province-wide	2008	education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>
Ignite Change Now! Youth Leadership Program - Our World, Our Water	Alberta EcoTrust	a training program for 100 youth from across Alberta focusing on advancing their skills and capacity as engaged citizens	province-wide	2011	education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>

Protect Alberta's Watersheds (PAW)	Alberta EcoTrust	individualized training over the course of one year to 15 water leaders across the province	province-wide	2008	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Make a Splash Alberta: Protecting Water for People and the Environment	Alberta EcoTrust	create public dialogue through media, public forum and individualized workshops to ensure a level of public and decision maker understanding on water allocation processes while empowering people to engage in the decision making processes with regards to changes to water legislation.	province-wide	2009	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Securing Water for People and Rivers	Alberta EcoTrust	an education, awareness, and outreach program that will improve the "water literacy" of Albertans, encourage their participation in upcoming public consultations, and advance common sense proposals to conserve healthy water flows and meet basic human water needs.	province-wide	2009	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

WaterED West: 2009 Western Canada Water Education Conference	Alberta EcoTrust	bring together Alberta educators and water experts from industry, government and the non-profit sectors	province-wide	2008	education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>
Watershed Stewardship Group Progressive Support	Alberta EcoTrust	provide direct assistance and capacity building support to watershed stewardship groups	Red Deer	2008	education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>
Watershed Stewardship Group Support	Alberta EcoTrust	to provide 11 new and often inexperienced WSGs groups with a Stewardship Kit which will guide them through the development and successful completion of an action plan for water protection	Red Deer	2007	education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>
One Simple Act	Alberta Environment	A Government of Alberta public information and education program that aims to support and inspire Albertans to lead more environmentally friendly lifestyles	Province-wide		education	grey	<a href="http://www.environment.alberta.ca/01380.html">http://www.environment.alberta.ca/01380.html</a>

Education and outreach	Alberta Innovates	Launch of the Ideas Summit; Introduction of the Celebrating Fresh Ideas Expert Speaker Series; Inside Education partnership	province-wide	2009	participants develop new ways of looking at old problems.	education	grey	<a href="http://www.ai-ees.ca/home/initiatives/success-stories/water-resource">http://www.ai-ees.ca/home/initiatives/success-stories/water-resource</a>
Video Production of Best Water use Practices	ARDN	Four short videos will be created based on best water practices from agriculture, municipalities, individual residences, and industry with the purpose of informing and engaging residents and other stakeholders on water issues and best practises. It will also incorporate local research for rural education awareness	Province-wide			education	grey	<a href="http://www.ardn.ca/ardn-initiatives/ardn-projects-events/search-by-subject/119/">http://www.ardn.ca/ardn-initiatives/ardn-projects-events/search-by-subject/119/</a>
Where's the Waste: Calculating Infrastructure Leakage Index Webinar	AUMA	Calgary's Chris Huston takes viewers on a step-by-step walk through the AWWA's audit program and provides helpful tips on reducing water loss for municipalities big and small.	Province-wide			education	grey	<a href="http://www.auma.ca/live/MuniLink/Communications/Member+Notices?contentId=9019">http://www.auma.ca/live/MuniLink/Communications/Member+Notices?contentId=9019</a>

Eco-Vision, Ecole Secondaire Lacombe Composite High School	Battle River Watershed Alliance	student-directed club with recycling programs; raised \$45,000	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/publications</a>
Caring for our Watershed	Battle River Watershed Alliance	student contest of projects; with Agrium Inc.	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/publications</a>
Wetlands, Trees and Forest	Battle River Watershed Alliance	educational event for schools	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/publications</a>
Spirit of the Watershed: Art Workshop and Show	Battle River Watershed Alliance	educational for general public through painting	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/publications</a>
Photovoice : Stewardship at Shutter Speed	Battle River Watershed Alliance	educational for general public through cameras	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/publications</a>
City of Brooks - Water Use Scorecard	City of Brooks	The City of Brooks provides residents with the opportunity to assess where and how they use water and the efficiency of this use with a Water Use Scorecard. Citizens can then check out the City's brochure, 100 Ways to Conserve Water for ideas on how to improve their score.	Bow River	education	grey	<a href="http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=477">http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=477</a>

City of Brooks - Yellowfish Road Program	City of Brooks	The participants also go door to door handing out fish shaped brochures full of educational information about water quality and protecting the downstream habitats. The program is highly educational form both the children and residents.	Bow River	education	grey	<a href="http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=478">http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=478</a>
City of Brooks - Xeriscaping Demo Bed	City of Brooks	to design and plant a flower bed in a City Park that is filled with natural, water wise plants. The Xeriscaping Demo Bed is in a highly visible area and residents are encouraged to look at the bed and become aware of how easy xeriscaping can be, and how much water we can actually save.	Bow River	education	grey	<a href="http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=479">http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=479</a>

City of Camrose - Presentations	City of Camrose	The City of Camrose has an active outreach program. It provides its residents with a Guide to Water Conservation In Camrose. Groups can also book presentation to learn more about water conservation in Camrose	North Saskatchewan	education	grey	<a href="http://www.camrose.ca/index.aspx?NID=250">http://www.camrose.ca/index.aspx?NID=250</a>
City of Grande Prairie - Appealing to Dollars and Sense	City of Grande Prairie	The section of Aquatera's website dedicated to water conservation includes information on how many litres of water and how much money customers can save by changing behavior or installing efficient fixtures. Savings are based on Aquatera's water and wastewater rates.	Peace River	education	grey	<a href="http://www.gptx.org/index.aspx?page=869">http://www.gptx.org/index.aspx?page=869</a>

City of Medicine Hat - Household Guide to Water Efficiency	City of Medicine Hat	The City of Medicine Hat supplies a free booklet entitled Household Guide to Water Efficiency to interested individuals. It is packed with information on the wise use of water for both inside and outside the home	South Saskatchewan River	education	grey	<a href="http://www.hatsmart.ca/">http://www.hatsmart.ca/</a>
City of Medicine Hat - Steps to Xeriscaping and Xeriscape Demonstration Garden	City of Medicine Hat	to educate local and regional homeowners about alternatives to traditional landscaping while promoting practices that conserve water and protect the environment.	South Saskatchewan River	education	grey	<a href="http://www.hatsmart.ca/">http://www.hatsmart.ca/</a>
Annual school trip program	Elbow River Watershed Partnership	program run under Alberta Community Development with support from the Elbow River Watershed Partnership and Friends of Kananaskis Country in which students travel to the headwaters of the Elbow River, make observations about land use and measure water quality	Bow River	education	grey	<a href="http://www.erwp.org/index.php/events-and-projects/projects/current">http://www.erwp.org/index.php/events-and-projects/projects/current</a>

Junior Naturalists Summer Camp	Elbow River Watershed Partnership	A successful spin off from ADOPT-A-STREAM Project 2004, the summer camp for 9–12 year olds runs in Bragg Creek in July and August	Bow River	education	grey	<a href="http://www.erwp.org/index.php/events-and-projects/projects/current">http://www.erwp.org/index.php/events-and-projects/projects/current</a>
Water: No Time to Waste - A consumer's guide to water conservation	Environment Canada	An online guide that provides information on why water conservation is important, how the water cycle works and ways individuals and families can cut down on water use. The guide introduces 3 R's of water conservation	Canada-wide	education	grey	<a href="http://www.ec.gc.ca/eau-water/default.asp?lang=En&amp;n=344B115B-1">http://www.ec.gc.ca/eau-water/default.asp?lang=En&amp;n=344B115B-1</a>
“Water Pricing as a Tool for Conservation” - Webinar	FCM/GMF	The webinar focuses on sharing the practical steps, challenges and benefits of conservation-oriented price structures as a vital tool in sustainable water management. Speakers will examine research, trends and leading examples from across North America, including a case study of Toronto's experience with conservation-oriented water pricing	Canada-wide	education	grey	<a href="http://www.fcm.ca/home/events/past-events/2010/webinar-water-pricing-as-a-tool-for-conservation.htm">http://www.fcm.ca/home/events/past-events/2010/webinar-water-pricing-as-a-tool-for-conservation.htm</a>

Slowing the Flow: Low-impact Stormwater Management Webinar	FCM/GMF	an overview of municipal-level LID approaches to stormwater management, and preview upcoming LID training courses offered by the Canadian Standards Association through its Municipal Infrastructure Solutions Program	Canada-wide	education	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e</a>
Prairie Urban Garden Project	Oldman Watershed Council	The goal of the Prairie Urban Garden project is to demonstrate the beauty and benefits of having a xeriscaped garden in southern Alberta. The organization provides information on why and how to xeriscape, organizes an annual Prairie Urban Garden tour to showcase xeriscaped yards.	Oldman River	education	grey	<a href="http://www.prairieurban.org/about.html">http://www.prairieurban.org/about.html</a>

Strathcona County - Low Impact Development Workshop	Strathcona County	Share success stories; Address barriers to LID implementation; Develop next steps for LID implementation	North Saskatchewan	2011	education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Water/lid-workshop.aspx">http://www.strathcona.ca/departments/Utilities/Water/lid-workshop.aspx</a>
Strathcona County - Staff Education	Strathcona County	Water conservation is a key theme within Strathcona County's environmental framework tool for municipal services. "Tap water taste tests" and green gardening workshops held for staff at safety and health related events. Internal staff work to enhance water demand management measure across various departments and look for options to reuse, share and reduce water needs.	North Saskatchewan		education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx">http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx</a>
Strathcona County - Online Water Calculator	Strathcona County	An online water calculator compares residents to average household use in the community and shares tips for water saving	North Saskatchewan		education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Water/water-calculator.aspx">http://www.strathcona.ca/departments/Utilities/Water/water-calculator.aspx</a>

Strathcona County - Multifaceted Outreach	Strathcona County	<p>Strathcona County looks for opportunities such as events and public spaces to share information on conservation. Outdoor water use campaigns such as "water deep once a week" are advertised on public centre plasma screens, bus ads, retail store welcome mats, grocery store ad bars and in local newspapers. An annual rain barrel and composter sale along with spring ecoscaping workshops encourage sustainable landscape practices.</p>	North Saskatchewan	education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx">http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx</a>
Strathcona County - Ecoscaping	Strathcona County	<p>Every spring Strathcona county holds ecoscaping workshops. These workshops along with online information and brochures highlighting "how to" tips and local ecoscaping champions have increased the number residents adopting this water saving landscaping technique over the last several years</p>	North Saskatchewan	education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Water/Water_conservation/Outdoor_water_saving_tips/ecoscape-your-yard.aspx">http://www.strathcona.ca/departments/Utilities/Water/Water_conservation/Outdoor_water_saving_tips/ecoscape-your-yard.aspx</a>

Town of Canmore - Engineering Landscaping Standards	Town of Canmore	Canmore encourages developers to use native plants through its Engineering Landscaping Standards. Click here to view the standards.	Bow River	education	grey	<a href="http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html">http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html</a>	
Town of Cochrane - Naturescaping	Town of Cochrane	Both new and established residents are encouraged to reduce their lawn area with naturescaping or xeriscaping. A naturescaping demonstration site was established at a water pumping station in a residential neighbourhood, so residents can explore the possibilities up close.	Bow River	Under the Land Use Bylaw, the minimum naturescaping requirement for residential areas is 25%. Commercial properties must be 100% naturescaped.	education	grey	<a href="http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument">http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument</a>

Town of Cochrane - Water Matters Brochure	Town of Cochrane	In 2008 the Town published a brochure called "Water Matters" which explained how water is managed in Cochrane and outlined plans for ensuring an adequate water supply in the future. From time to time throughout the year, more information is published in local newspapers, sometimes in specific articles and sometimes in the "Municipal Matters" feature	Bow River	2008	education	grey	<a href="http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument">http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument</a>
Town of Olds - Water for All for Life	Town of Olds	Launched in May 2008, Water for All for Life strives to answer Frequently Asked Questions (FAQs) about the Town of Olds water and wastewater systems, water conservation, water use, water meters and billing, and other topics about water.	Red Deer	2008	education	grey	<a href="http://www.olds.ca/water.html">http://www.olds.ca/water.html</a>

## Appendix C: Ecosystems

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Protecting aquatic ecosystems in heavily allocated river systems: the case of the Oldman River Basin, Alberta	Bryan A. Poirier, Rob C. De Loe	This article reports on an investigation of the factors that shaped the development and implementation of policies for aquatic ecosystem protection in the Oldman River Basin (ORB), a crucial watershed in semi-arid southern Alberta.	Oldman River	2011			ecosystems	academic	Canadian Geographer, 55(2), 243–261
Influences of Human Stressors on Fish-Based Metrics for Assessing River Condition in Central Alberta	Cameron E. Stevens, Trevor Council, Michael G. Sullivan	Metric relationships with human stressors were quantified using regression and information theory methods.	Battle River	2010			ecosystems	academic	Water Quality Research Journal Canada, 45(1), 35-46

Appendix D: Education

Project	Agency /Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Athabasca River Basin Alliance Community Development Project	Alberta EcoTrust	to coordinate workshops, build the capacity of existing citizens' groups, and formally found and create a stable platform for Athabasca River Basin Alliance.	Athabasca	2007			education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Keepers of the Athabasca: Coordination and Community Development	Alberta EcoTrust	engage First Nations and Metis communities, watershed citizen groups and individual residents of the Athabasca Watershed in community outreach, education and advocacy to support the stewardship and protection of this watershed.	Athabasca	2008			education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

Photovoice in the Watershed	Alberta EcoTrust	Photovoice is an emerging education tool that combines photography with grassroots social action. Subjects are asked to represent their community or point of view by taking photographs, which give insight into how people conceptualize their circumstances.	Battle River	2010	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
Photovoice 2.0: Stewardship at Shutter Speed	Alberta EcoTrust	to give voice to the diversity of perspectives that exist across the watershed and explore people's connections to this place.	Battle River	2011	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
Bow Valley Sustainability Hub	Alberta EcoTrust	to engage all sectors of the community in sustainability education and action.	Bow River	2007	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
Living with Our Rivers: Building a Communications Plan	Alberta EcoTrust	an important community resource for conservation-related policy development and local civic engagement opportunities	Bow River	2010	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>

Lord Beaverbrook High School Water Squad	Alberta EcoTrust	to install motion sensors on school sinks and timers on showerheads to reduce water consumption	Bow River	2008	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
The Ripple Effect Water Stewardship	Alberta EcoTrust	A committed Youth Advisory Group, aged 13-20, whose primary objective is water education and outreach, will be formed, and they will build their own capacity through adopting critical thinking and research skills, gaining knowledge on local and global water issues, and finding paths to solutions on these issues	Bow River	2009	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
The Upper Bow River: Profiles and Perspectives	Alberta EcoTrust	to provide the community with the information and opportunity for dialogue surrounding the protection of this valuable area.	Bow River	2007	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
Castle River Stewardship: On the Ground and on the Web	Alberta EcoTrust	an intensive outreach campaign about the value and importance of the Castle Wilderness and its urgent need for protection	Castle River	2008	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>

Clear Hills Local Watershed Testing	Alberta EcoTrust	to raise awareness in the community about the quality of its water and the locations of environmentally sensitive areas	Clear Hills	2009		education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Learning About Your Water	Alberta EcoTrust	By partnering with the local watershed group and schools we have the potential to engage and teach local students in the area about water quality sampling.	Hines Creek	2010		education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Role of Beaver in Conserving Water and Riparian Habitat during Climate Change	Alberta EcoTrust	to engage representative stakeholders and prominent ranchers in restoring beaver in southwest Alberta to demonstrate the beneficial role of beaver in conserving water and riparian habitats during climate change	Oldman River	2009		education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Alberta Water Learning Network	Alberta EcoTrust	The Alberta Water Learning Network will provide customized, carefully designed support to strengthen Alberta groups to more effectively protect Alberta's water resources	province-wide	2008		education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

Educate and create public awareness about the Share the Water campaign	Alberta EcoTrust	host events on campus where students can get informed and can take action by signing a petition and writing letters to the Environment Minister.	province-wide	2010	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
Go With The Flow	Alberta EcoTrust	Evergreen Theatre will bring their original musical theatre production, "Go With The Flow" into elementary schools across Alberta. This engaging show will raise audience awareness of watersheds in Alberta and inspire water conservation actions by Alberta's next generation	province-wide	2008	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
Ignite Change Now! Youth Leadership Program - Our World, Our Water	Alberta EcoTrust	a training program for 100 youth from across Alberta focusing on advancing their skills and capacity as engaged citizens	province-wide	2011	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>
Protect Alberta's Watersheds (PAW)	Alberta EcoTrust	individualized training over the course of one year to 15 water leaders across the province	province-wide	2008	education	grey	<a href="http://www.albertaecotrust.com/results/archive">http://www.albertaecotrust.com/results/archive</a>

Make a Splash Alberta: Protecting Water for People and the Environment	Alberta EcoTrust	create public dialogue through media, public forum and individualized workshops to ensure a level of public and decision maker understanding on water allocation processes while empowering people to engage in the decision making processes with regards to changes to water legislation.	province -wide	2009	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
Securing Water for People and Rivers	Alberta EcoTrust	an education, awareness, and outreach program that will improve the “water literacy” of Albertans, encourage their participation in upcoming public consultations, and advance common sense proposals to conserve healthy water flows and meet basic human water needs.	province -wide	2009	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>
WaterEDWest: 2009 Western Canada Water	Alberta EcoTrust	bring together Alberta educators and water experts	province -wide	2008	education	grey	<a href="http://www.albertaecotrusted.com/results/archive">http://www.albertaecotrusted.com/results/archive</a>

Education Conference		from industry, government and the non-profit sectors						
Watershed Stewardship Group Progressive Support	Alberta EcoTrust	provide direct assistance and capacity building support to watershed stewardship groups	Red Deer	2008		education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>
Watershed Stewardship Group Support	Alberta EcoTrust	to provide 11 new and often inexperienced WSGs groups with a Stewardship Kit which will guide them through the development and successful completion of an action plan for water protection	Red Deer	2007		education	grey	<a href="http://www.albertaecotruster.com/results/archive">http://www.albertaecotruster.com/results/archive</a>
One Simple Act	Alberta Environment	A Government of Alberta public information and education program that aims to support and inspire Albertans to lead more environmentally friendly lifestyles	Province-wide			education	grey	<a href="http://www.environment.alberta.ca/01380.html">http://www.environment.alberta.ca/01380.html</a>

Education and outreach	Alberta Innovates	Launch of the Ideas Summit; Introduction of the Celebrating Fresh Ideas Expert Speaker Series; Inside Education partnership	province-wide	2009	participants develop new ways of looking at old problems.	education	grey	<a href="http://www.ai-ees.ca/home/initiatives/success-stories/water-resource">http://www.ai-ees.ca/home/initiatives/success-stories/water-resource</a>
Video Production of Best Water use Practices	ARDN	Four short videos will be created based on best water practices from agriculture, municipalities, individual residences, and industry with the purpose of informing and engaging residents and other stakeholders on water issues and best practises. It will also incorporate local research for rural education awareness	Province-wide			education	grey	<a href="http://www.ardn.ca/ardn-initiatives/ardn-projects-events/search-by-subject/119/">http://www.ardn.ca/ardn-initiatives/ardn-projects-events/search-by-subject/119/</a>
Where's the Waste: Calculating Infrastructure Leakage Index Webinar	AUMA	Calgary's Chris Huston takes viewers on a step-by-step walk through the AWWA's audit program and provides helpful tips on reducing water loss for municipalities big and small.	Province-wide			education	grey	<a href="http://www.auma.ca/live/MuniLink/Communications/Member+Notices?contentId=9019">http://www.auma.ca/live/MuniLink/Communications/Member+Notices?contentId=9019</a>

Eco-Vision, Ecole Secondaire Lacombe Composite High School	Battle River Watersh ed Allianc e	student-directed club with recycling programs; raised \$45,000	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/p ublications</a>
Caring for our Watershed	Battle River Watersh ed Allianc e	student contest of projects; with Agrium Inc.	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/p ublications</a>
Wetlands, Trees and Forest	Battle River Watersh ed Allianc e	educational event for schools	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/p ublications</a>
Spirit of the Watershed: Art Workshopw and Show	Battle River Watersh ed Allianc e	educational for general public through painting	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/p ublications</a>
Photovoice: Stewardship at Shutter Speed	Battle River Watersh ed Allianc e	educational for general public through cameras	Battle River	education	grey	<a href="http://www.battleriverwatershed.ca/publications">http://www.battleriverwatershed.ca/p ublications</a>

City of Brooks - Water Use Scorecard	City of Brooks	The City of Brooks provides residents with the opportunity to assess where and how they use water and the efficiency of this use with a Water Use Scorecard. Citizens can then check out the City's brochure, 100 Ways to Conserve Water for ideas on how to improve their score.	Bow River	education	grey	<a href="http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=477">http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=477</a>
City of Brooks - Yellowfish Road Program	City of Brooks	The participants also go door to door handing out fish shaped brochures full of educational information about water quality and protecting the downstream habitats. The program is highly educational form both the children and residents.	Bow River	education	grey	<a href="http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=478">http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=478</a>

City of Brooks - Xeriscaping Demo Bed	City of Brooks	to design and plant a flower bed in a City Park that is filled with natural, water wise plants. The Xeriscaping Demo Bed is in a highly visible area and residents are encouraged to look at the bed and become aware of how easy xeriscaping can be, and how much water we can actually save.	Bow River	education	grey	<a href="http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=479">http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=479</a>
City of Camrose - Presentations	City of Camrose	The City of Camrose has an active outreach program. It provides its residents with a Guide to Water Conservation In Camrose. Groups can also book presentation to learn more about water conservation in Camrose	North Saskatchewan	education	grey	<a href="http://www.camrose.ca/index.aspx?NID=250">http://www.camrose.ca/index.aspx?NID=250</a>

City of Grande Prairie - Appealing to Dollars and Sense	City of Grande Prairie	The section of Aquatera's website dedicated to water conservation includes information on how many litres of water and how much money customers can save by changing behavior or installing efficient fixtures. Savings are based on Aquatera's water and wastewater rates.	Peace River	education	grey	<a href="http://www.gptx.org/index.aspx?page=869">http://www.gptx.org/index.aspx?page=869</a>
City of Medicine Hat - Household Guide to Water Efficiency	City of Medicine Hat	The City of Medicine Hat supplies a free booklet entitled Household Guide to Water Efficiency to interested individuals. It is packed with information on the wise use of water for both inside and outside the home	South Saskatchewan River	education	grey	<a href="http://www.hatsmart.ca/">http://www.hatsmart.ca/</a>
City of Medicine Hat - Steps to Xeriscaping and Xeriscape Demonstration Garden	City of Medicine Hat	to educate local and regional homeowners about alternatives to traditional landscaping while promoting practices that conserve water and protect the environment.	South Saskatchewan River	education	grey	<a href="http://www.hatsmart.ca/">http://www.hatsmart.ca/</a>

Annual school trip program	Elbow River Watershed Partnership	program run under Alberta Community Development with support from the Elbow River Watershed Partnership and Friends of Kananaskis Country in which students travel to the headwaters of the Elbow River, make observations about land use and measure water quality	Bow River	education	grey	<a href="http://www.erwp.org/index.php/events-and-projects/projects/current">http://www.erwp.org/index.php/events-and-projects/projects/current</a>
Junior Naturalists Summer Camp	Elbow River Watershed Partnership	A successful spin off from ADOPT-A-STREAM Project 2004, the summer camp for 9-12 year olds runs in Bragg Creek in July and August	Bow River	education	grey	<a href="http://www.erwp.org/index.php/events-and-projects/projects/current">http://www.erwp.org/index.php/events-and-projects/projects/current</a>
Water: No Time to Waste - A consumer's guide to water conservation	Environment Canada	An online guide that provides information on why water conservation is important, how the water cycle works and ways individuals and families can cut down on water use. The guide introduces 3 R's of water conservation	Canada-wide	education	grey	<a href="http://www.ec.gc.ca/eau-water/default.asp?lang=En&amp;n=344B115B-1">http://www.ec.gc.ca/eau-water/default.asp?lang=En&amp;n=344B115B-1</a>

<p>“Water Pricing as a Tool for Conservation” - Webinar</p>	<p>FCM/G MF</p>	<p>The webinar focuses on sharing the practical steps, challenges and benefits of conservation-oriented price structures as a vital tool in sustainable water management. Speakers will examine research, trends and leading examples from across North America, including a case study of Toronto’s experience with conservation-oriented water pricing</p>	<p>Canada-wide</p>	<p>education</p>	<p>grey</p>	<p><a href="http://www.fcm.ca/home/events/past-events/2010/webinar-water-pricing-as-a-tool-for-conservation.htm">http://www.fcm.ca/home/events/past-events/2010/webinar-water-pricing-as-a-tool-for-conservation.htm</a></p>
<p>Slowing the Flow: Low-impact Stormwater Management Webinar</p>	<p>FCM/G MF</p>	<p>an overview of municipal-level LID approaches to stormwater management, and preview upcoming LID training courses offered by the Canadian Standards Association through its Municipal Infrastructure Solutions Program</p>	<p>Canada-wide</p>	<p>education</p>	<p>grey</p>	<p><a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e</a></p>

Prairie Urban Garden Project	Oldman Watershed Council	The goal of the Prairie Urban Garden project is to demonstrate the beauty and benefits of having a xeriscaped garden in southern Alberta. The organization provides information on why and how to xeriscape, organizes an annual Prairie Urban Garden tour to showcase xeriscaped yards.	Oldman River		education	grey	<a href="http://www.prairieurbangarden.ca/about.html">http://www.prairieurbangarden.ca/about.html</a>
Strathcona County - Low Impact Development Workshop	Strathcona County	Share success stories; Address barriers to LID implementation; Develop next steps for LID implementation	North Saskatchewan	2011	education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Water/lid-workshop.aspx">http://www.strathcona.ca/departments/Utilities/Water/lid-workshop.aspx</a>
Strathcona County - Staff Education	Strathcona County	Water conservation is a key theme within Strathcona County's environmental framework tool for municipal services. "Tap water taste tests" and green gardening workshops held for staff at safety and health related events. Internal staff work to enhance water demand management measure across various departments and look for options to reuse, share and reduce water needs.	North Saskatchewan		education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx">http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx</a>

Strathcona County - Online Water Calculator	Strathcona County	An online water calculator compares residents to average household use in the community and shares tips for water saving	North Saskatchewan	education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Water/water-calculator.aspx">http://www.strathcona.ca/departments/Utilities/Water/water-calculator.aspx</a>
Strathcona County - Multifaceted Outreach	Strathcona County	Strathcona County looks for opportunities such as events and public spaces to share information on conservation. Outdoor water use campaigns such as "water deep once a week" are advertised on public centre plasma screens, bus ads, retail store welcome mats, grocery store ad bars and in local newspapers. An annual rain barrel and composter sale along with spring ecoscaping workshops encourage sustainable landscape practices.	North Saskatchewan	education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx">http://www.strathcona.ca/departments/Utilities/Reduce_your_footprint/Green-gardening-workshops.aspx</a>
Strathcona County - Ecoscaping	Strathcona County	Every spring Strathcona county holds ecoscaping workshops. These workshops along with online information and brochures highlighting "how to" tips and local ecoscaping champions have increased the number residents adopting this water saving landscaping technique over the last several years	North Saskatchewan	education	grey	<a href="http://www.strathcona.ca/departments/Utilities/Water/Water_conservation/Outdoor_water_saving_tips/ecoscape-your-yard.aspx">http://www.strathcona.ca/departments/Utilities/Water/Water_conservation/Outdoor_water_saving_tips/ecoscape-your-yard.aspx</a>

Town of Canmore - Engineering Landscaping Standards	Town of Canmore	Canmore encourages developers to use native plants through its Engineer Landscaping Standards. Click here to view the standards.	Bow River		education	grey	<a href="http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html">http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html</a>
Town of Cochrane - Naturescaping	Town of Cochrane	Both new and established residents are encouraged to reduce their lawn area with naturescaping or xeriscaping. A naturescaping demonstration site was established at a water pumping station in a residential neighbourhood, so residents can explore the possibilities up close.	Bow River	Under the Land Use Bylaw, the minimum naturescaping requirement for residential areas is 25%. Commercial properties must be 100% naturescaped.	education	grey	<a href="http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument">http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument</a>

Town of Cochrane - Water Matters Brochure	Town of Cochrane	In 2008 the Town published a brochure called "Water Matters" which explained how water is managed in Cochrane and outlined plans for ensuring an adequate water supply in the future. From time to time throughout the year, more information is published in local newspapers, sometimes in specific articles and sometimes in the "Municipal Matters" feature	Bow River	2008	education	grey	<a href="http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument">http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument</a>
Town of Olds - Water for All for Life	Town of Olds	Launched in May 2008, Water for All for Life strives to answer Frequently Asked Questions (FAQs) about the Town of Olds water and wastewater systems, water conservation, water use, water meters and billing, and other topics about water.	Red Deer	2008	education	grey	<a href="http://www.olds.ca/water.html">http://www.olds.ca/water.html</a>

## Appendix E: Infrastructure

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Waterworks Facility Assessment Study	Alberta Environment	This report summarizes the findings of the Waterworks Facility Assessment Study that was undertaken to identify short-term and long-term solutions to source, treatment and operational challenges in the supply of safe, secure drinking water in the Province of Alberta.	Province-wide	2004			infrastructure	grey	<a href="http://www.environment.alberta.ca/documents/Waterworks_Facility_Assessment_Summary_Report.pdf">http://www.environment.alberta.ca/documents/Waterworks_Facility_Assessment_Summary_Report.pdf</a>
Banff Wastewater Treatment Plant Upgrade	FCM/GMF	to construct nutrient-removal facilities	Bow River	2002			infrastructure	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=e</a>
Water Line	Shirley McClellan Regional Water Services Commission	\$45 mln regional water line from the Town of Stettler to the Village of Consort	North Saskatchewan	2007		to supply potable water to its member communities	infrastructure	grey	<a href="http://www.albertalocalnews.com/news/local/Water_project_moves_ahead_despite_costs.html">http://www.albertalocalnews.com/news/local/Water_project_moves_ahead_despite_costs.html</a>

## Appendix F: Management

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished /In progress	Impacts	Subject Area	Academic / Grey	Source
State of the Watershed Report 2010	Alberta EcoTrust	create a comprehensive information and scientific analysis of the Bow Watershed for the internet.	Bow River	2010		This is the first time such a report has been produced online in Alberta. In addition to accomplishing everything they set out in their initial plan, they've included video footage of water experts speaking about issues online. This is the first such a tool introduced in Alberta and they are expecting a tremendous response and feedback from the users.	management	grey	<a href="http://www.albertaecotrurst.com/node/322">http://www.albertaecotrurst.com/node/322</a>
Air, Land and Water Leadership in Integrated Environmental Management Conference	Alberta EcoTrust	Connecting, empowering and educating local landowners	Beaver Hills	2008			management	grey	<a href="http://www.albertaecotrurst.com/results/archive">http://www.albertaecotrurst.com/results/archive</a>
Cumulative Effects Study for the Ghost Watershed	Alberta EcoTrust	study of the watershed that looks at the impacts of all existing lands uses	Bow River	2010			management	grey	<a href="http://www.albertaecotrurst.com/results/archive">http://www.albertaecotrurst.com/results/archive</a>
Cumulative effects study for the Ghost Watershed - Phase 2	Alberta EcoTrust	assess the value of alternative land use management strategies	Bow River	2011			management	grey	<a href="http://www.albertaecotrurst.com/results/archive">http://www.albertaecotrurst.com/results/archive</a>
Addressing Practical and	Alberta EcoTrust	improve watershed	province-	2008			management	grey	<a href="http://www.albertaecotrurst.com/results/archive">http://www.albertaecotrurst.com/results/archive</a>

Legal Barriers to Implementing Watershed Management Plans (2008)		management planning in Alberta by informing participation and proposing law reforms	wide					
Lake Management Framework for Alberta	Alberta EcoTrust	Once completed, the Lake Management Framework will act as a guidance document for lake stewardship groups and lake managers who are developing management plans for their basins	provin ce-wide	2009		management	grey	<a href="http://www.albertaecotrurst.com/results/archive">http://www.albertaecotrurst.com/results/archive</a>
Practical and Legal Barriers to Implementing Watershed Management Plans	Alberta EcoTrust	The Environmental Law Centre will improve watershed management planning in Alberta by informing participation and proposing law reforms	provin ce-wide	2008		management	grey	<a href="http://www.albertaecotrurst.com/results/archive">http://www.albertaecotrurst.com/results/archive</a>

State of the Basin Report	Alberta EcoTrust	to produce and publish the State of the Saskatchewan River Basin Report, a comprehensive document detailing current information about this river basin	provinci ce- wide	2007		management	grey	<a href="http://www.albertaecotr&lt;br/&gt;st.com/results/archive">http://www.albertaecotr st.com/results/archive</a>
Maintaining Healthy Aquatic Ecosystems: Policy Recommendations for Instream Flow Needs	Alberta EcoTrust	Water Matters will: 1) assess various scientific criteria and methods for determining IFNs, and identify the most robust model(s) to use; 2) determine policy frameworks and options for incorporating IFN protection into water management; and 3) find the most effective means to help stakeholders support IFN-based water management, including market-based instruments such as tradable water rights.	provinci ce- wide	2010		management	grey	<a href="http://www.albertaecotr&lt;br/&gt;st.com/results/archive">http://www.albertaecotr st.com/results/archive</a>
State of the Watershed Report	Alberta EcoTrust	allow the Wizard Lake Watershed and Lake Stewardship Association to summarize all currently available watershed information, which will feed into the development of an integrated watershed management plan	Wizard Lake Waters hed	2010		management	grey	<a href="http://www.albertaecotr&lt;br/&gt;st.com/results/archive">http://www.albertaecotr st.com/results/archive</a>

Water Data Accessibility Project	Alberta Innovates	making water data easy to find	provin ce-wide	2009		In the second phase of this project, increased site flexibility and usability will be enhanced and a feature that enables other watershed stewardship groups to contribute their own data will be added.	management	grey	<a href="http://www.ai-ees.ca/home/initiatives/success-stories/water-resource">http://www.ai-ees.ca/home/initiatives/success-stories/water-resource</a>
Wetland research	Alberta Innovates	to inform policy and provide planners with valuable assessment tools	Beaver Hills	2009	in progress	The true success in this project is the resulting integration between the research team, policy makers and the science personnel at Alberta Agriculture, Environment, and Sustainable Resource Development, alongside five rural municipalities in the Beaver Hills Initiative	management	grey	<a href="http://www.ai-ees.ca/home/initiatives/success-stories/water-resource">http://www.ai-ees.ca/home/initiatives/success-stories/water-resource</a>
Balancing Act: Water Conservation and Economic Growth	Canada West Foundation	discusses a variety of water conservation policy options + identifies barriers	provin ce-wide	2005			management	grey	<a href="http://cwf.ca/publications/">http://cwf.ca/publications/</a>
Maintaining the Flow	Canada West Foundation	explore a variety of “stress-points” + engage stakeholders	Western Canada				management	grey	<a href="http://cwf.ca/publications/">http://cwf.ca/publications/</a>
Water Pricing: Seizing a Public Policy Dilemma by the Horns	Canada West Foundation	explores the current state of water pricing in Canada	Western Canada				management	grey	<a href="http://cwf.ca/publications/">http://cwf.ca/publications/</a>
From H2O Turning Albertas Water Headache to Opportunity	Canada West Foundation (Alberta Water Research Institute)	research on financial and market-based instruments	provin ce-wide	2010			management	grey	<a href="http://cwf.ca/publications/">http://cwf.ca/publications/</a>

City of Brooks - Rain Barrel Pilot Program	City of Brooks	Brooks launched a Rain Barrel Pilot Program in Spring of 2010 where the City sold 300 discounted rain barrels.	Bow River	2007	The response was great and we followed up with everyone that purchased a barrel through a mail out survey. So far, of the people that responded, 92% installed their barrel and 91% feel that using their rain barrel either definitely or somewhat reduced their water consumption this summer	management	grey	<a href="http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=476">http://brooks.ca/index.php?option=com_content&amp;view=article&amp;id=409&amp;Itemid=476</a>
City of Grande Prairie - industrial monitoring program (IMP)	City of Grande Prairie	By working alongside Car Wash businesses and educating them on Bylaw requirements for acceptable TSS limits Aquatera is also educating them on how this compliance is an important step in water conservation. Decreasing the amount of TSS entering the sanitary system prevents sewer backups and reduces the need for excessive flushing procedures that uses freshwater. It also decreases wear to the system and reduces inorganic loads, which in turn decreases maintenance and treatment costs.	Peace River	2007		management	grey	<a href="http://www.gptx.org/index.aspx?page=869">http://www.gptx.org/index.aspx?page=869</a>

City of Medicine Hat - Underground irrigation timers	City of Medicine Hat	A large percentage of Medicine Hat households have installed underground irrigation systems with timers. Automatic home irrigation systems are promoted as one of the best actions to control outdoor water usage.	South Saskatchewan River	Through efficient use, water consumption may be reduced by up to 50 percent as it is designed to put the water only where it's needed	management	grey	<a href="http://www.hatsmart.ca/">http://www.hatsmart.ca/</a>
City of Medicine Hat - Annual Audit	City of Medicine Hat	The City of Medicine Hat carries out an annual water audit in order to quantify potential loss due to leaks. This information supports further leak detection strategies to reduce loss and thereby conserve water.	South Saskatchewan River		management	grey	<a href="http://www.hatsmart.ca/">http://www.hatsmart.ca/</a>

City of Medicine Hat - Water Meters	City of Medicine Hat	All Medicine Hat municipal water customers have required water meters since 1985. The comprehensive use of meters along with the elimination of a declining step rate and further public education has helped consumers to better recognize their direct control over their water usage habits.	South Saskat chewa n River		management	grey	<a href="http://www.hatsmart.ca/">http://www.hatsmart.ca/</a>
Camrose Uni- Directional Flushing Program Development	FCM/GMF	a feasibility study to explore the ways that it can reduce the amount of water wasted and minimize the environmental impact that occurs annually when water is flushed through the pipes, valves and hydrants in the water distribution system. When the system is flushed—which occurs to scour sediment from pipes - water is discharged onto roads and then enters the environment through roadway storm sewers. A uni-directional flushing program would cut the volume of water required by as much as 50 per cent.	North Saskat chewa n	2002	management	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>

<p>Alberta's Industrial Heartland Process Water Feasibility Study – Strathcona County</p>	<p>FCM/GMF</p>	<p>study to assess the feasibility of providing a consolidated process water system in Alberta's Industrial Heartland in order to minimize the current number of private water intakes and treatment facilities. The study will be considering an ultimate "closed-loop" system option that would incorporate an Eco-Industrial Area philosophy and promote responsible water management to assist the Heartland to meet industrial servicing needs where limited water resources exist.</p>	<p>North Saskatchewan</p>	<p>2008</p>	<p>management</p>	<p>grey</p>	<p><a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=</a></p>
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Regional Wastewater Study - Innisfail / Central Alberta Regional Wastewater Committee	FCM/GMF	This study will examine options for the collection and treatment of sewage in an 80-kilometre area from the Town of Olds to the City of Red Deer. Currently, wastewater effluent flows into the Red Deer River through a series of rivers and creeks.	Red Deer	2002		management	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>
Alternative Methods of Sanitary Servicing for the City of Airdrie	FCM/GMF	study the feasibility of alternate wastewater processing methods in order to identify the best wastewater servicing scheme for new residential, commercial, industrial and institutional development.	Red Deer	2010		management	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>

<p>The adoption of improved irrigation technology and management practices-A study of two irrigation districts in Alberta, Canada</p>	<p>Henning Bjornlund, Lorraine Nicol, K.K. Klein</p>	<p>A survey of two irrigation districts was undertaken to determine the measures irrigators have taken and plan to take in the future to improve irrigation technologies and management practices to enhance water use efficiency and which factors facilitate or impede the adoption of such measures.</p>	<p>South Saskatchewan River</p>	<p>2009</p>	<p>management</p>	<p>academic</p>	<p>Agricultural Water Management 96, 121–131</p>
<p>Development and implementation of a watershed management plan for Lac la Biche, Alberta, Canada</p>	<p>J. White and M. Rawles</p>	<p>Lakeland County is experiencing increasing developmental pressures arising from the oil and gas boom at nearby Fort McMurray. a multidisciplinary research study which includes a baseline water quality study, riparian health assessments, land use mapping and ground-truthing and projects with the local health authority.</p>	<p>Lac la Biche</p>	<p>2006</p>	<p>management</p>	<p>academic</p>	<p>Water Science &amp; Technology Vol 53 No 10 pp 261–267</p>

In Situ Ground Water Remediation Using the Trench and Gate System	Marc W. Bowles, L.R. Bentley, B. Hoyne, and D.A. Thomas	The trench and gate remediation system is a funnel and gate design modified for installation in tills and other low permeability sediments	East Garrington	2000	management	academic	Ground Water, 38(2), 172-181
Town of Canmore - Water Loss Audit	Town of Canmore	annually since 2000. The purpose of the audit is to determine the volume of water that cannot be accounted for via the water metering program or other known water uses.	Bow River		management	grey	<a href="http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html">http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html</a>
Town of Canmore - Rain Barrel Program In Bloom	Town of Canmore	Canmore in Bloom volunteers make rain barrels that are sold for \$60.00, with the proceeds going back to Canmore in Bloom enhancement initiatives	Bow River		management	grey	<a href="http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html">http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html</a>

Town of Canmore - Leading by Example	Town of Canmore	<p>A Water Fixture Retrofit Program was completed at the Recreation Centre and Environmental Services Centre in 2004. This program involved the installation of dual flush toilets, waterless urinals and low flow shower heads. The repair of a water line leak under the pool foundation at the Rec Centre was completed at the same time as the toilet retrofit, and water use for the overall facility has been reduced by almost one third. All park irrigation systems are metered and water consumption is tracked to ensure efficient watering practices are employed. In addition, the Town's new Civic Centre has been certified as a Silver Leeds Building and as such uses water efficient fixtures throughout.</p>	Bow River	2004	<p>total water consumption by Town of Canmore owned and operated facilities was 11 % lower in 2008 than in 2000 despite the Town providing service to a much larger population in 2008 than in 2000.</p>	management	grey	<p><a href="http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html">http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html</a></p>
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Town of Canmore - Full Metering	Town of Canmore	1998 Canmore became a Fully Metered Community. By installing water meters in every home and business, Canmore achieved a 20% reduction in per capita water consumption between the years 1998 and 2000.	Bow River	management	grey	<a href="http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html">http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html</a>
Town of Olds - Meter Replacement Program	Town of Olds	The Town of Olds completed their Meter Replacement Program in January 2009. The Town of Olds Operations staff is now able to read meters remotely using radio technology, getting actual reads for all the town's meters every month.	Red Deer	management	grey	<a href="http://www.olds.ca/water.html">http://www.olds.ca/water.html</a>

Village of Alliance - Meters to Manage Consumption	Village of Alliance	<p>Between 2002 and 2005 the Village of Alliance replaced meters throughout the municipality as older meters were in hard to access locations and had fallen into disuse. The new reader pads were installed on the outside of buildings in easy to access locations. Just installing the meters led to a 30% drop in water use. The Village was then able to begin more conservation oriented pricing as described in the session on conservation pricing.</p>	North Saskatchewan	management	grey	<a href="http://albertacommunityprofiles.com/Profile/Alliance/255">http://albertacommunityprofiles.com/Profile/Alliance/255</a>
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Appendix G: Market-Based Tools

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Full Cost Accounting for Municipal Drinking Water Facilities	Alberta Environment	Alberta Environment has developed a Full Cost Accounting Program to promote fiscal planning amongst municipal waterworks systems. The program's website provides information on generally accepted full cost accounting methods.	Province-wide				market-based tools	grey	<a href="http://environment.alberta.ca/01963.html">http://environment.alberta.ca/01963.html</a>
Challenges in implementing economic instruments to manage irrigation water on farms in southern Alberta	Henning Bjornlund, Lorraine Nicol, K.K. Klein	Through a survey of irrigation officials, this study explores irrigators' views on the likelihood of attaining one of the strategy's main goals—a 30% increase in water use efficiency by 2015 over 2005 levels. Irrigators' views vary significantly as to the extent and means by which the 30% goal can be achieved and their views reflect the heterogeneity of farming conditions within the area.	South Saskatchewan River	2007			market-based tools	academic	Agricultural Water Management 92, 131–141

<p>Market-Based Policy Instruments, Irrigation Water Demand, and Crop Diversification in the Bow River Basin of Southern Alberta</p>	<p>Lixia He and Theodore M. Horbulyk</p>	<p>This paper investigates two market-based policy instruments, short-term water trading and volumetric water pricing, in a jurisdiction where historical water allocations are based on the seniority of appropriative water rights. The analysis identifies the potential effects of alternative surface water allocations on crop choices and on producer incomes in three irrigation districts in the Bow River Sub-basin of the South Saskatchewan River</p>	<p>Bow River</p>	<p>2010</p>	<p>market-based tools</p>	<p>academic</p>	<p>Canadian Journal of Agricultural Economics 58, 191–213</p>
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<p>Worth Every Penny: A Primer on Conservation Oriented Water Pricing</p>	<p>POLIS Project on Ecological Governance</p>	<p>provides an overview of conservation-oriented water pricing for decision makers, water utilities and service providers in Canada. It explains how water pricing works, what the benefits are, and how water utilities can implement conservation-oriented water pricing structures as a key tool in the water manager's toolkit. As well, it offers advice on how to address implementation challenges, including how to avoid penalizing low-income families and how to maintain revenue stability for water utilities.</p>	<p>Canada-wide</p>	<p>market-based tools</p>	<p>grey</p>	<p><a href="http://poliswaterproject.org/publication/344">http://poliswaterproject.org/publication/344</a></p>
<p>Strathcona County - Two Part Rate</p>	<p>Strathcona County</p>	<p>The rate includes a fixed charge which does not vary by volume of water consumed and a variable charge which increases with the amount of water consumed</p>	<p>North Saskatchewan</p>	<p>market-based tools</p>	<p>grey</p>	<p><a href="http://www.strathcona.ca/departments/Utilities/Waste_collection_recycling/utility-rates.aspx">http://www.strathcona.ca/departments/Utilities/Waste_collection_recycling/utility-rates.aspx</a></p>

Town of Cochrane - Three Tier Rate Incentive Program	Town of Cochrane	the more potable water you use, the more you pay	Bow River	market-based tools	grey	<a href="http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument">http://www.cochrane.ca/municipal/toc/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument</a>
Village of Alliance - Conservation Oriented Pricing	Village of Alliance	after replacing all water meters in the village between 2002 and 2005 began implementing water conservation pricing.	North Saskatchewan	market-based tools	grey	<a href="http://www.allianceforwaterefficiency.org/uploadedFiles/Resource_Center/Library/rates/POLIS-Primer-on-Conservation-Rate-Structures-May-2010.pdf">http://www.allianceforwaterefficiency.org/uploadedFiles/Resource_Center/Library/rates/POLIS-Primer-on-Conservation-Rate-Structures-May-2010.pdf</a>

## Appendix H: Modeling

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
The Alberta dilemma: Optimal sharing of a water resource by an agricultural and an oil sector	Ge' rard Gaudet, Michel Moreaux, Cees Withagen	We show that for any given water stock, if the oil stock is sufficiently large, it will become optimal to have a phase during which the agricultural sector is inactive, followed by a phase during which both sectors are active again. The agricultural sector will always be active in the end as the oil stock is depleted.	Province-wide	2006			modeling	academic	Journal of Environmental Economics and Management 52, 548–566
Integrated modelling for river basin management: the influence of temporal and spatial scale in economic models of water allocation	I.M. Cutlac, L. He and T.M. Horbulyk	The basin management alternatives and choices generated by models on each scale are likely to vary considerably. The paper provides specific illustrative examples from recent models of Alberta's Bow River Basin.	Bow River	2006			modeling	academic	Water Science & Technology Vol 53 No 10 pp 55–63
Optimal Water Allocation under Short-Run Water Scarcity in the South Saskatchewan River Basin	Ioan-Marius Cutlac and Theodore M. Horbulyk	This paper examines the effect on economic welfare of alternative surface water allocations in the Alberta portion of the South Saskatchewan River Basin in Canada	South Saskatchewan River	2011			modeling	academic	Journal Of Water Resources Planning And Management, 92-100
Environmental and Economic Evaluation of Cow-Calf Wintering Site Runoff Control as a Beneficial Management Practice to Improve Surface Water Quality	James J. Wuite, David S. Chanasyk, and Muhammad A. Akbar	A runoff diversion-collection system was evaluated as a beneficial management practice (BMP) for minimizing the impact of wintering site runoff on the water quality of an adjacent reach in the headwaters sub-basin of the Haynes Creek	Haynes Creek	2007			modeling	academic	Water Quality Research Journal Canada, Volume 42, No. 4, 240-251

Watershed in central Alberta								
Integrated Hydrologic-Economic Modeling of Coalitions of Stakeholders for Water Allocation in the South Saskatchewan River Basin	Lizhong Wang, Liping Fang, and Keith W. Hipel	a useful approach, called the integrated hydrologic-economic river basin model, is developed for computing the optimal benefits of water for various coalitions of stakeholders by allocating available water to the members of a given coalition without reducing specified allocations to those outside of the coalition with respect to both water quantity and quality.	South Saskatchewan River	2008		modeling	academic	Journal Of Hydrologic Engineering, 781-792
Basin-wide cooperative water resources allocation	Lizhong Wang, Liping Fang, and Keith W. Hipel	The Cooperative Water Allocation Model (CWAM) is designed within a general mathematical programming framework for modeling equitable and efficient water allocation among competing users at the basin level and applied to a large-scale water allocation problem in the South Saskatchewan River Basin	South Saskatchewan River	2008		modeling	academic	European Journal of Operational Research 190, 798-817
Implications of land disturbance on drinking water treatability in a changing climate: Demonstrating the need for "source water supply and protection" strategies	Monica B. Emelko, Uldis Silins, Kevin D. Bladon, Micheal Stone	To investigate potential implications of changing climate and wildfire on drinking water treatment, the 2003 Lost Creek Wildfire in Alberta, Canada was studied. Four years of comprehensive hydrology and water quality data from seven watersheds were evaluated and synthesized to assess the implications of wildfire and postfire intervention (salvage-logging) on downstream drinking water treatment.	Oldman River	2011		modeling	academic	Water Research, 45, 461 -472

Cumulative effects management and the role of predictive models in the new policy for regulating land disturbance in Alberta	Preston McEachern	This contribution describes the recent evolution from sector-based environmental management to cumulative effects management (CEM) in Alberta under a new policy direction titled the Alberta Land-use Framework. This paper focuses on the role of models and hypothesis testing in a CEM and performance assurance framework rather than a critique of CEM itself	Province-wide	2008	modeling	academic	Journal of Environmental Engineering Sci. Vol. 7 (Suppl. 1), 13-21
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Appendix I: Policy

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Reclaimed Water Working Group	Alberta Municipal Affairs	The Government of Alberta has established a Reclaimed Water Working Group to develop a framework to facilitate the safe use of reclaimed water for domestic applications, such as toilet flushing and landscape irrigation, in Alberta. This framework will include new standards and guidelines to mitigate potential health risks associated with using reclaimed water for domestic applications.	Province-wide				policy	grey	<a href="http://www.municipalaffairs.alberta.ca/1171.cfm">http://www.municipalaffairs.alberta.ca/1171.cfm</a>
Sturgeon River Watershed Study	ARDN	this study will ask: how do citizens understand and relate to their watershed; what do citizens understand to be the principle challenges and opportunities for watershed management; and what avenues for watershed research do citizens view as most pressing and most productive?	North Saskatchewan				policy	grey	<a href="http://www.ardn.ca/ardn-initiatives/ardn-led-projects/">http://www.ardn.ca/ardn-initiatives/ardn-led-projects/</a>
Our Water and NAFTA	Canada West Foundation	This study is one in a series of reports exploring market-based instruments for water management.	Province-wide	2011			policy	grey	<a href="http://cwf.ca/publications/">http://cwf.ca/publications/</a>

Emergencies and Outdoor Water Use Restrictions	City of Calgary	The bylaw outlines four stages of mandatory restrictions based on the severity of the water shortage	South Saskatchewan River	2006	policy	grey	<a href="http://www.calgary.ca/layouts/cocis/sitemap.aspx#/UEP/WATER/Pages/Water+conservation/">http://www.calgary.ca/layouts/cocis/sitemap.aspx#/UEP/WATER/Pages/Water+conservation/</a>
City of Fort Saskatchewan - Community Sustainability Plan	City of Fort Saskatchewan	to provide a high level, overarching strategic plan to guide decision-making towards a sustainable future	North Saskatchewan	2009	policy	grey	<a href="http://www.fortsask.ca/ftsk_City_Government/ftsk_Reports_Studies.aspx?id=9182">http://www.fortsask.ca/ftsk_City_Government/ftsk_Reports_Studies.aspx?id=9182</a>
City of Red Deer - Water Conservation Strategy	City of Red Deer	to serve more people within our existing allocation, defer, delay or avoid expensive water and wastewater infrastructure upgrades, and enhance our negotiation position when requesting additional water allocations	Red Deer	2007	policy	grey	<a href="http://www.reddeer.ca/City+Government/City+Services+and+Departments/Environmental+Services/Environmental+Initiatives/Water/Low+Flow+Toilet+Rebate+Program+coming+July+1+2008.htm">http://www.reddeer.ca/City+Government/City+Services+and+Departments/Environmental+Services/Environmental+Initiatives/Water/Low+Flow+Toilet+Rebate+Program+coming+July+1+2008.htm</a>
Current and Emerging Water Issues in Agriculture: An Overview	Elwin G. Smith, Mark E. Eiswerth and Terrence S. Veeman	to present current water issues and solutions	Canada-wide	2010	policy	academic	Canadian Journal of Agricultural Economics 58, 403-409

Canadian Guidelines for Household Reclaimed Water for Use in Toilet and Urinal Flushing - Draft Document for Consultation	Health Canada	a working group was established by the Federal-Provincial-Territorial Committee on Health and the Environment (CHE) to develop guidelines for using household reclaimed water for toilet and urinal flushing.	Canada-wide			policy	grey	<a href="http://www.hc-sc.gc.ca/ewh-semt/consult/2007/reclaim-recycle/index-eng.php">http://www.hc-sc.gc.ca/ewh-semt/consult/2007/reclaim-recycle/index-eng.php</a>
Current and future water issues in the Oldman River Basin of Alberta, Canada	J. Byrne, S. Kienzle, D. Johnson, G. Duke, V. Gannon, B. Selinger and J. Thomas	In this study we look at changing environment within the Oldman River Basin and its impact on water quality and quantity. The cumulative effects include a decline in net water supplies, and declining quality resulting in increased risk of disease.	Oldman River	2006		policy	academic	Water Science & Technology Vol 53 No 10 pp 327–334
Influence of natural vs. anthropogenic stresses on water resource sustainability: a case study	J. Fennell, A. Zawadzki and C. Cadman	Climate change has been identified as a major influence on basin water balances. However, land use and water use practices have also been identified as players. This case study was completed to better understand a changing water balance affecting a major basin in Alberta.	Beaver River	2006		policy	academic	Water Science & Technology Vol 53 No 10 pp 21–27

Nose Creek Watershed Water Management Plan	Nose Creek Watershed Partnership	to help protect riparian areas and improve water quality in the Nose Creek watershed	Bow River	2007		policy	grey	<a href="http://nosecreekpartnership.com/our-plan/nose-creek-watershed-water-management-plan">http://nosecreekpartnership.com/our-plan/nose-creek-watershed-water-management-plan</a>
Town of Canmore - Water Demand Management Plan	Town of Canmore	the next step in the Town's water reduction planning process	Bow River	2004		policy	grey	<a href="http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html">http://www.canmore.ca/Municipal-Sustainability/Environmental/Conservation.html</a>
Water Conservation Officers	Town of Cochrane	hiring seasonal WCO's who focus 75% of their time on education and communication and 25% of their time on bylaw enforcement	Bow River	2008		policy	grey	<a href="http://www.cochrane.ca/municipal/to/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument">http://www.cochrane.ca/municipal/to/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument</a>
Water Conservation Strategy	Town of Cochrane	this report describes the background, objectives, programs and projects, results, and proposed future actions under the Water Conservation Strategy for 2008 - 2009.	Bow River	2008		policy	grey	<a href="http://www.cochrane.ca/municipal/to/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument">http://www.cochrane.ca/municipal/to/webcms.nsf/AllDoc/5629B8CAF8671ED287257737006A0C03?OpenDocument</a>
Town of Okotoks - Outdoor Watering Schedule	Town of Okotoks	Outdoor watering is permitted two days a week	Bow River	2004		policy	grey	<a href="http://www.okotoks.ca/default.aspx?cid=323&amp;lang=1">http://www.okotoks.ca/default.aspx?cid=323&amp;lang=1</a>
Town of Okotoks - Water Management Plan	Town of Okotoks	to ensure provision of quality potable water to residents, institutions and businesses	Bow River	2002		policy	grey	<a href="http://www.okotoks.ca/default.aspx?cid=1681&amp;lang=1">http://www.okotoks.ca/default.aspx?cid=1681&amp;lang=1</a>

Town of Olds - Water Conservation Strategy: Policy Statement	Town of Olds	The Town of Olds will develop and implement a water conservation strategy to ensure a reduction in daily usage and consumption by all water users	Red Deer	2007		policy	grey	<a href="http://www.olds.ca/water.html">http://www.olds.ca/water.html</a>
Slave Lake 2035 - Municipal Sustainability Plan	Town of Slave Lake	created an outlet for the wisdom and expertise of community members to discover innovative solutions that addressed social and cultural, economic, natural and built environment challenges that exist in the Town today	Slave Lake	2007		policy	grey	<a href="http://www.slavelake.ca/siteengine/activepage.asp?PageID=135">http://www.slavelake.ca/siteengine/activepage.asp?PageID=135</a>
Community Planning in Faust: A Collaborative Approach	University of Calgary	developed at the request of municipal district of Big Lakes to ensure future development within the hamlet of Faust is undertaken in orderly manner	Big Lakes	2005		policy	grey	<a href="http://www.ucalgary.ca/cities/files/cities/CommunityPlanning.pdf">http://www.ucalgary.ca/cities/files/cities/CommunityPlanning.pdf</a>
Implementation of the Alberta Water for Life Strategy: strategic partnerships in action	W.E. Berzins, R. Harrison and P. Watson	The Government of Alberta has established a framework of partnerships charged with implementation of the strategy: the province-wide Alberta Water Council, watershed planning and advisory councils that work on a basin-wide basis and watershed stewardship groups that deliver on-the-ground programs at the local and community level. The authors discuss the mandate(s) of each partnership group, key actions and deliverables.	Province-wide	2006		policy	academic	Water Science & Technology Vol 53 No 10 pp 255-260

## Appendix J: Quality

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Impacts on water quality in the upper Elbow River	A. Sosiak and J. Dixon	Recent work has found evidence of deterioration in water quality in the Elbow River upstream from Calgary, Alberta, Canada. We sampled this basin to describe spatial and temporal trends and factors that could be contributing to this deterioration	Elbow River	2006			quality	academic	Water Science & Technology, Vol 53 No 10 pp 309–316
Farmstead drinking water sources, concerns and safety practices of livestock farm families in southern Alberta, Canada	Acharya, M.P.; Grant Kalischuk, R; Klein, K.K. and Bjornlund, H.	Surprisingly little information is available on the farmstead drinking water safety practices of livestock farm families in southern Alberta. An in-person survey of feedlot farm families was carried out in Lethbridge Northern Irrigation District	Oldman River	2008			quality	academic	In Rico, D.P.; Brebbia, C.A. and Esteve, Y.V. Water Pollution IX, 627-63
Lower Tawatinaw /Little Pine Watershed Assessment and Restoration Project	Alberta EcoTrust	a community ecological health assessment of the Lower Tawatinaw River and its Little Pine Creek tributary, facilitate the development of a draft State of the Tawatinaw Report and Watershed Management Plan and begin a phased restoration process	Athabasca	2009			quality	grey	<a href="http://www.albertaecotrustermsandconditions.com/resulsts/archive">http://www.albertaecotrustermsandconditions.com/resulsts/archive</a>
Groundwater Monitoring Plan for the Elbow Watershed	Alberta EcoTrust	a two-phase project to implement a groundwater monitoring plan	Elbow River	2008			quality	grey	<a href="http://www.albertaecotrustermsandconditions.com/resulsts/archive">http://www.albertaecotrustermsandconditions.com/resulsts/archive</a>

Lee Creek Remediation Work Plan	Alberta EcoTrust	to identify sites requiring remediation and develop work plans for priority sites. As an educational component to the project, recruit and train environmental science students to assist with data collection	Lee Creek	2008	quality	grey	<a href="http://www.albertaecotrustermsults/archive">http://www.albertaecotrustermsults/archive</a>
Lesser Slave Watershed Fishing Line Recycling Program	Alberta EcoTrust	to actively address the collection of old or discarded fishing line as well as educate the public about the dangers to fish, wildlife and the environment	Lesser Slave Watershed	2010	quality	grey	<a href="http://www.albertaecotrustermsults/archive">http://www.albertaecotrustermsults/archive</a>
Riparian Assessment Tool: Development and Application to Agricultural Streams in the Edmonton Area	Alberta EcoTrust	produce a riparian assessment tool to support watershed planning	North Saskatchewan	2008	quality	grey	<a href="http://www.albertaecotrustermsults/archive">http://www.albertaecotrustermsults/archive</a>
Reducing Ecological Footprint of First Nations and Rural Communities in Alberta	Alberta EcoTrust	helping the Safe Drinking Water Foundation to advocate for and implement biological treatment technology to substantially improve drinking water quality in these communities, while reducing environmental and ecological costs.	province-wide	2007	quality	grey	<a href="http://www.albertaecotrustermsults/archive">http://www.albertaecotrustermsults/archive</a>

Water quality assurance in Alberta	Alberta Innovates	protection of water quality	province-wide	2009	in progress	Through this project the Alberta Water Research Institute and Alberta Innovates - Energy and Environment Solutions have brought together a range of disciplines from landscape management, to those concerned about public health and aquatic health issues.	quality	grey	<a href="http://www.aiees.ca/home/initiatives/success-stories/water-resource">http://www.aiees.ca/home/initiatives/success-stories/water-resource</a>
Evaluation of cattle bedding and grazing	Barry M. Olson, Andrea R. Kalischuk, Janna P.	This paper highlights the environmental impacts of implementing beneficial management practices to address cattle	Oldman River	2011			quality	academic	Water Science & Technology, 64(2), 326-333

BMPs in an agricultural watershed in Alberta	Casson and Colleen A. Phelan	bedding and direct access to the creek in a study watershed in southern Alberta, Canada.						
Soil and Groundwater Quality under a Cattle Feedlot in Southern Alberta	Barry M. Olson, Jim J. Miller, S. Joan Rodvang and L. Jay Yanke	The objective of this study was to determine if a newly constructed feedlot in southern Alberta would change soil and groundwater quality under the feedlot within the first four years of operation.	South Saskatchewan River	2005	quality	academic	Water Quality Research Journal Canada, 40(2), 131-144	
Water quality monitoring: the basis for watershed management in the Oldman River Basin, Canada	C.W. Koning, K.A. Saffran, J.L. Little and L. Fent	Based on the perception of basin residents that water quality was declining and of human health concern, the Oldman River Basin Water Quality Initiative was formed in 1997 to address the concerns.	Oldman River	2006	quality	academic	Water Science & Technology Vol 53 No 10 pp 153-161	
Farm Well Water Quality in Alberta	Darcy Fitzgerald, David S. Chanasyk, R. David Neilson, Dave Kiely and Robert Audette	On-farm groundwater supplies in Alberta were evaluated for chemical (routine chemistry, trace metals), herbicides and microbiological (total and fecal coliforms) parameters to determine the suitability of domestic drinking water usage based on the Guidelines for Canadian Drinking Water Quality (GCDWQ)	Province-wide	2001	quality	academic	Water Quality Research Journal Canada, 36, No. 3, 565-588	
Perspectives On Potable Groundwater Quality Monitoring In Rural Alberta	Dena W. McMartin, John V. Headley and Jon A. Gillies	In this paper we provide a perspective on the analytical programs for monitoring groundwater quality in rural regions of the Canadian Prairies and compare them to those of rural regions in the United States and Australia/New Zealand	Province-wide	1999	quality	academic	Canadian Water Resources Journal Vol. 24(3): 253-261	

Community monitoring program	Elbow River Watershed Partnership	volunteers measuring water quality and making site observations along Bragg Creek including evidence of disturbance and the potential impact to aquatic habitat.	Bow River		quality	grey	<a href="http://www.erwp.org/index.php/ev-ents-and-projects/projects/current">http://www.erwp.org/index.php/ev-ents-and-projects/projects/current</a>
Annual river cleanup	Elbow River Watershed Partnership	partnered with the Sierra Club of Canada – Chinook Chapter, Mountain Equipment Co-op and residents of Bragg Creek	Bow River		quality	grey	<a href="http://www.erwp.org/index.php/ev-ents-and-projects/projects/current">http://www.erwp.org/index.php/ev-ents-and-projects/projects/current</a>
Improving Water Quality East Lake Storm Pond – Airdrie	FCM/GMF	This field test study presents an opportunity to demonstrate 'closing the circle' by both treating stormwater prior to discharge and re-using the storm water as an irrigation source. In the study, the City of Airdrie will investigate improvements in water quality and odour control at its East Lake storm pond and the potential for using the storm water for irrigation of the adjacent East Lake Park.	Bow River	2005	quality	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>
Okotoks Integrated Wastewater Treatment/Composting System	FCM/GMF	develop an innovative solids separation and composting technology to completely eliminate sludge as a by-product of its sewage treatment process.	Bow River	2002	quality	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>

Ammonia Reduction Strategy – Edmonton	FCM/GMF	<p>The discharge of ammonia from the City of Edmonton's Gold Bar Wastewater Treatment Plant is significant, compared to background concentrations in the receiving water of the North Saskatchewan River. This feasibility study will assess options for removing the ammonia. Environment Canada has identified municipal wastewater as the largest source of ammonia releases to the environment. A scientific panel has recommended that ammonia be declared a toxic substance under the Canadian Environmental Protection Act (CEPA). This project aims to cut ammonia levels by at least 50 per cent, although the project team will explore if even higher reductions are possible. This project will provide good information if CEPA proposals are adopted and implemented.</p>	North Saskatchewan	2002	quality	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>
Wetland Storm Water Quality Enhancement – Edmonton	FCM/GMF	<p>This study will monitor the effectiveness of the Fulton Creek Regional Wetland, a wetland that was constructed to treat urban storm water runoff. The runoff contains contaminants washed off streets and land, including suspended solids, metals, petroleum products, nutrients and some organic chemicals.</p>	North Saskatchewan	2002	quality	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>

Feasibility Study of Indoor Super Efficient Waste Water Processing Facility - Brazeau County	FCM/GMF	Brazeau County will study the use of a Solar Aquatics System (SAS) as a wastewater treatment method to replace the Hamlet of Cynthia's existing single-cell wastewater lagoon. SAS technology combines the energy of the sun and the natural functions of plants and animals to purify human waste	North Saskatchewan	2005	quality	grey	<a href="http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en">http://gmf.fcm.ca/Search/Search/Search.aspx?lang=en</a>
Influence of streambank fencing with a cattle crossing on riparian health and water quality of the Lower Little Bow River in Southern Alberta, Canada	J. Miller, D. Chanasyk, T. Curtis, T. Entz, W. Willms	The goal of beneficial management practices (BMPs) such as streambank fencing is to prevent or reduce water pollution of surface water bodies. We conducted a four year (2004-2007) study on a fenced 800-m reach of the Lower Little Bow (LLB) River in southern Alberta, Canada	Oldman River	2010	quality	academic	Agricultural Water Management 97, 247-258
Environmental quality of Lower Little Bow River and riparian zone along an unfenced reach with off-stream watering	J. Miller, D. Chanasyk, T. Curtis, T. Entz, W. Willms	three off-stream watering systems were installed 290 to 730 m from the river in August, 2005. Our hypothesis was that off-stream watering would reduce cattle activity at the river, improve riparian health, prevent river pollution by cattle, and improve the soil, vegetative, and rainfall simulation runoff variables at a cattle access site near the river.	Oldman River	2011	quality	academic	Agricultural Water Management 98, 1505- 1515

Disinfection By-Products In Small Alberta Community Drinking-Water Supplies	Jeffrey W. A. Charrois, David Graham, Steve E. Hrudey, Kenneth L. Froese	A survey of selected DBPs was conducted in 11 rural Alberta communities, with populations ranging from 60 to 2300. The objectives were to evaluate source water quality, as measured by total organic carbon	Province-wide	2004	quality	academic	Journal of Toxicology and Environmental Health, Part A, 67:1797-1803
Water Quality Assessment in the Application of Stormwater Reuse for Irrigating Public Lands	Jianxun He, Caterina Valeo, Angus Chu, and Norman F. Neumann	Water quality in a stormwater retention pond in the City of Calgary, Alberta, was examined in order to assess the feasibility of reusing stormwater for irrigation purposes. Field campaigns were conducted in the 2004-2006 irrigation seasons.	Bow River	2008	quality	academic	Water Quality Research Journal Canada, Volume 43, No. 2/3, 145-159
Land Use and Water Quality Relationships in the Lower Little Bow River Watershed, Alberta, Canada	Joanne L. Little, Karen A. Saffran and Livio Fent	Water quality in the Lower Little Bow River was monitored to determine if irrigation return flow streams had a significant impact on river water quality and to examine relationships between land use and water quality in this diverse agricultural watershed	Oldman River	2003	quality	academic	Water Quality Research Journal Canada, Volume 38, No. 4, 563-584
Development, Construction, and Use of Lime and Alum Application Systems in Alberta, Canada	Mark S. Serediak, Ellie E. Prepas, Tom P. Murphy & Jay Babin	Application systems were used both experimentally, to determine the effectiveness of lime and alum in reducing phosphorus and algae, and commercially, for the treatment of water bodies with excessive algal growth	Province-wide	2002	quality	academic	Lake and Reservoir Management, 18(1), 66-74

Bacterial Pathogens In Rural Water Supplies In Southern Alberta, Canada	V. P. J. Gannon, T. A. Graham, Susan Read, Kim Ziebell, Ann Muckle, J. Mori, J. Thomas, B. Selinger, I. Townshend, J. Byrne	Raw river and irrigation water in the Oldman River Basin in southern Alberta was tested for the presence of two bacterial pathogens, Escherichia coli and Salmonella spp., over the 2000-2001	Oldman River	2004	quality	academic	Journal of Toxicology and Environmental Health, Part A, 67:1643-1653
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Appendix K: Quantity

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
Economic Instruments and Irrigation Water Management - A Comparative Study of Private and District Irrigators in Alberta, Canada	Bjornlund, H. Nicol, L. and Klein, K.	The differences in the production activity and water management practices between private and district irrigators are striking. This study attempts to identify these distinguishing characteristics relating specifically to the adoption of irrigation technology and management practices and ascertain the effect of economic instruments which Alberta, until recently, has largely avoided using	South Saskatchewan River	2008			quantity	academic	In Esteve, Y.V.; Brebbia, C.A. and Rico, C.P Eds. Sustainable Irrigation - Management Technologies and Policies II, 3-14
County of Athabasca tank-loading facilities	CAWSEP	"(The program) covered 100 per cent of the groundwater investigation and 33 per cent of the construction of the facility	Athabasca	2005			quantity	grey	<a href="http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182361302936&amp;lang=eng">http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182361302936&amp;lang=eng</a>

Badland Hills pasture pipeline	CAWSEP	the \$115000 system draws water from a large-capacity dugout supplied by the Bow River Irrigation District canal and then pumps it to 14 rubber-tire water troughs positioned around the pasture	Bow River	2005	quantity	grey	<a href="http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182355218425&amp;lang=eng">http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182355218425&amp;lang=eng</a>
County of Vermilion Regional water study	CAWSEP	The \$96,000 study to create an inventory of the region's surface and groundwater resources, identify existing water demands and propose mechanisms for expanding water services to meet future needs.	North Saskatchewan	2004	quantity	grey	<a href="http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182355720129&amp;lang=eng">http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1182355720129&amp;lang=eng</a>
Improved Technologies and Management Practices in Irrigation - Implications for Water Savings in Southern Alberta	Lorraine A. Nicol, Henning Bjornlund and K. K. Klein	Study examines the rate at which water use efficiencies have been, and plan to be increased by employing improved technologies and management practices	South Saskatchewan River	2008	quantity	academic	Canadian Water Resources Journal, 33(3), 283-294

<p>Private Irrigators in Southern Alberta: A Survey of Their Adoption of Improved Irrigation Technologies and Management Practices</p>	<p>Lorraine A. Nicol, Henning Bjornlund and K. K. Klein</p>	<p>Private irrigators account for about one-quarter of total irrigated area in southern Alberta with the balance of irrigation taking place within 13 irrigation districts. Based on a random survey of private irrigators, it was found that they are grounded in family farm traditions, have been slow to adopt improved irrigation technologies and management practices in the past, and have even less intention of doing so in the future.</p>	<p>South Saskatchewan River</p>	<p>2010</p>	<p>quantity academic</p>	<p>Canadian Water Resources Journal, 35(3), 339-350</p>
<p>Water savings in irrigated potato production by varying hill-furrow or bed-furrow configuration</p>	<p>T.E. Harms, M.N. Korschuh</p>	<p>A three-year project began in 2006 to quantify the potential irrigation water savings of altered hill shapes for potato production. The three treatments (standard hill, flat-topped hill, and double-planted wide-bed) were arranged in a randomized strip plot design replicated four times</p>	<p>Bow River</p>	<p>2010</p>	<p>quantity academic</p>	<p>Agricultural Water Management 97, 1399–1404</p>

Appendix L: Reuse

Project	Agency/Jurisdiction	Description	Basin	Commencement Year	Finished/In progress	Impacts	Subject Area	Academic / Grey	Source
A Review of Water Reuse and Recycling, with Reference to Canadian Practice and Potential: 2. Applications	Kirsten Exall	Groundwater recharge and potable reuse are practised to some extent in extremely dry regions of the world, but public health concerns with respect to emerging trace contaminants may limit the spread of these reuse applications. The main issues associated with each of the above applications are reviewed, and the state of Canadian water reuse and recycling is described.	Canada-wide	2004			Reuse	academic	Water Quality Research Journal Canada, Volume 39, No. 1, 13-28
A Review of Water Reuse and Recycling, with Reference to Canadian Practice and Potential: 1. Incentives and Implementation	Kirsten Exall, Jiri Marsalek and Karl Schaefer	Alberta and British Columbia have recently produced guidance documents for water reuse projects; the permitted applications are discussed and the water quality criteria are compared with other standards and guidelines. Various treatment technologies for on-site and central wastewater reclamation facilities are described.	Canada-wide	2004			Reuse	academic	Water Quality Research Journal Canada, Volume 39, No. 1, 1-12

**Appendix M: Rural Water Management Resources Workshop – PowerPoint Presentation**

# Rural Water Management Resources Workshop

September 11<sup>th</sup>, 2012  
Executive Royal Inn, Nisku

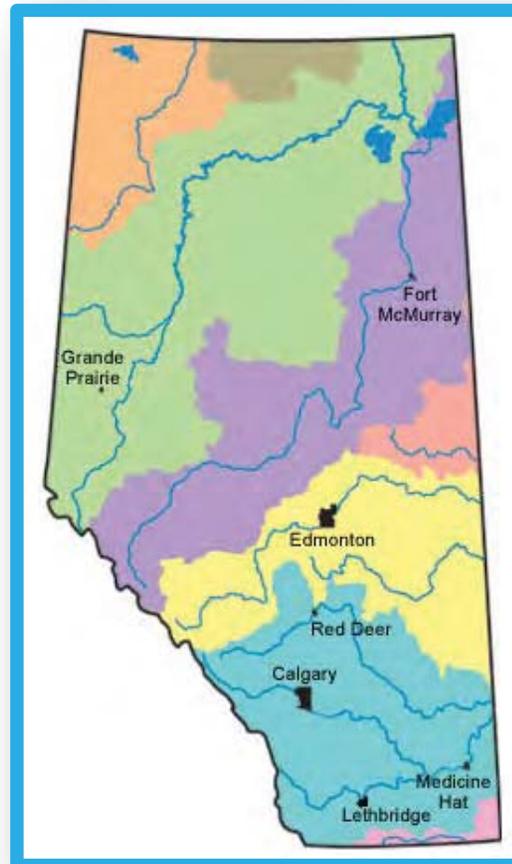
Facilitated by:

Sustainability Resources Ltd

# Welcome!

## Introductions:

- 🟢 Your Name
- 🟢 Your Community
- 🟢 Your Role
- 🟢 Your Watershed



# Workshop Objectives

- ◆ Introduce the ARDN Scoping Review Project
- ◆ Share Knowledge of Resources Available
- ◆ Understand Rural Water Management Issues & Resource Needs
- ◆ Identify Further Resources and Delivery Mechanisms



# Project Background

- ◆ ARDN Rural Research Needs and Priorities Workshop - Water
- ◆ University of Alberta (ACSRC) and Sustainability Resources – Scoping Review & Rural Community Engagement
- ◆ Research: Nurlan Iseav, Master's Student at University of Alberta
- ◆ 1437 Resources in Project Inventory with 1226 Infrastructure Related Resources
- ◆ 201 Resources Posted on Website between 1998-2012
- ◆  $\frac{3}{4}$  of Resources are Grey Literature



# Categories & Descriptions

- Infrastructure (1236)
- Conservation (33)
- Allocation (3)
- Education (55)
- Management (36)
- Modelling (9)
- Policy (21)
- Quality (29)
- Quantity (8)
- Reuse (2)
- Market Based Instruments (10)



# Overview of Resources

Background Resources Network



## What do you think?

This base inventory of resources has been developed for and by rural communities in Alberta specific to interventions around water quality and water quantity. We are looking to **YOU** to help us define the utility of these resources. Please **log in, add resources, comment, and discuss these Water Resources** and help us to understand what resources your rural Alberta community needs to be an effective water manager!

HOME WATER RESOURCES WATER DISCUSSION FORUM WORKSHOPS WATER LEADERS NETWORK CONTACT

in Share Tweet +1 Like Send f Lisa M. Fox and 26 others like this.

## Water & Watershed Management Resources

Join the Water Leader's Network – network with community water leaders, share resources, build relationships

Post Comments & Resources – help identify new resources, provide your feedback on those already posted

Start or Contribute to Discussions in the Forum – help us identify issues, and we will knowledge broker solutions

## Rural Alberta Watershed Resources Workshop

### Latest Members



Show All

### Watershed Resources Login

Username



Background

Resources

Network



## WIN AN IPAD!

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HOME

WATER RESOURCES

WATER DISCUSSION FORUM

WORKSHOPS

WATER LEADERS NETWORK

CONTACT

## Search By Category

ALL QUALITY MARKETBASED REUSE QUANTITY ECOSYSTEM POLICY CONSERVATION ALLOCATION EDUCATION MODELING MANAGEMENT INFRASTRUCTURE

TITLE RANDOM



The Alberta Environmental Farm Plan Company

Progressive Stewardship

### Environmental Farm Plan

Farmers and Ranchers in Alberta can still complete or update their Environmental Farm Plans. An Environmental Farm Plan (EFP) is...

[Read More +](#)



### Mayatan Lake State of the Watershed Report

Mayatan Lake State of the Watershed Report The purpose of this report is to summarize all available environmental



### Metagenomics to Improve Watershed Health

Our goal is to change the way we monitor water quality in our watersheds. The new science of metagenomics will...

## Search Resources

View by Basin

View by Category

## Search Resources by Keyword

Enter Search Term

Search...

GO

[Advanced Search](#)

## Network Login

Do you know of a missing resource? Please register/login and share it with others in the



## Search By Category

ALL QUALITY MARKETBASED REUSE QUANTITY ECOSYSTEM POLICY CONSERVATION  
ALLOCATION EDUCATION MODELING MANAGEMENT **INFRASTRUCTURE**

TITLE RANDOM



### Banff Wastewater Treatment Plant Upgrade

To construct nutrient-removal facilities. Source: FCM/GMF, 2002.

[Read More +](#)



### Water Line

545 mln regional water line from the Town of Stettler to the Village of Consort. Source: Shirley McClellan Regional Water Services...

[Read More +](#)



## Search Resources by Keyword

Enter Search Term

GO

[Advanced Search](#)

## Network Login

Welcome to the Watershed Network! Please use the 'add new item' selection below to add a new or missing resource to the database!



**Sustainability Resources Ltd.**

You have 0 published comments

- › [Add new item](#)
- › [My page](#)
- › [My account](#)
- › [Moderate comments to my published items](#)

LOGOUT

[Share](#) [Tweet](#) [+1](#) [Like](#) [Send](#) [Be the first of your friends to like this.](#)



## Member Comments

## Search By Category

ALL QUALITY MARKETBASED REUSE QUANTITY ECOSYSTEM POLICY CONSERVATION

ALLOCATION EDUCATION MODELING MANAGEMENT INFRASTRUCTURE

TITLE RANDOM

### Brooks

#### Citizen Engagement - Conservation

City of Brooks - Water Use Scorecard City of Brooks The City of Brooks provides residents with the opportunity to assess...

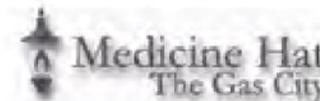
[Read More +](#)



#### City of Grande Prairie - Appealing to Dollars and Sense

The section of Aquatera's website dedicated to water conservation includes information on how many litres of water and how much...

[Read More +](#)



#### City of Medicine Hat - HAT Smart Rebate Program/Climate Change Central

\$75 for ENERGY STAR @ qualified Clothes Washers. \$75 for ENERGY STAR @ qualified Clothes Washers. Source: City of Medicine Hat.

[Read More +](#)



**AWRA**

Community, Conservation, Connections

#### On-Farm Water Conservation Practices in Southern Alberta

Based on a survey of 183 irrigation farmers conducted over the summer and early fall of 1998, we found that...

[Read More +](#)



#### Youth Water Education - Kananaskis

Annual school trip program Elbow River Watershed Partnership program run under Alberta Community Development with support from the Elbow River...

[Read More +](#)

## Search Resources by Keyword

Enter Search Term

Search...

GO

[Advanced Search](#)

## Network Login

Welcome to the Watershed Network! Please use the 'add new item' selection below to add a new or missing resource to the database!



**Sustainability Resources Ltd.**

You have 0 published

comments

- › [Add new item](#)
- › [My page](#)
- › [My account](#)
- › [Moderate comments to my published items](#)

LOGOUT

## Member Comments

› [Grade 8 is to late to introduce water management to...](#)

Written by Debra Smith

on Sunday, 19 August 2012

22:41

Water Quest (Education)



# Crowdsourcing

Background

Resources

Network



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[Forgot your password?](#) [Forgot your username?](#) [Create an account](#)

2 Topics

Month

Board Categories

Go

Page: 1

### Recent Topics

0 Replies	 <b>Rural Water Supplies &amp; Community EconomDevelopment</b> Category: Water Network Forum   Topic started 2 weeks, 1 day ago by <a href="#">lisafox</a>	12 Views	Last Post by <a href="#">lisafox</a> 2 weeks, 1 day ago
1 Replies	 <b>Watershed Planning</b> Category: Natural Gas & Water Security   Topic started 1 month ago by <a href="#">Sustainability</a>	96 Views	Last Post by <a href="#">Robhersey</a> 4 weeks, 1 day ago

2 Topics

Page: 1

### Who is online

In total there are 6 users Online :: 0 Members and 6 Guests

Legend :: [Site Administrator](#), [Global Moderator](#), [Moderator](#), [User](#), [Guest](#)

### WaterShed Resources Forum Statistics

Total Messages: 3 | Total Subjects: 2  
Total Sections: 3 | Total Categories: 4

Total Users: 76 | Latest Member: [Michael MacIntyre](#)

## Member Comments

› Grade 8 is to late to introduce water management to...

Written by [Debra Smith](#)

on Sunday, 19 August 2012  
22:41

[Water Quest \(Education\)](#)

› The water calculator is a useful tool to raise awareness...

Written by [Don Newlin](#)

on Thursday, 09 August 2012  
23:04

[Strathcona County – Online Water Calculator \(Education\)](#)

› Good to see some info on reuse! I think this...

Written by [Alan](#)

on Thursday, 09 August 2012  
21:44

[Alternative Methods of Sanitary Servicing for the City of Airdrie \(Reuse\)](#)





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## Get Connected!

- [Connect with Alberta Water Leaders](#)
- [Contribute to Water Inventory](#)
- [Participate in Toolkit Discussions](#)
- [Learn From Your Peers](#)

[JOIN THE NETWORK!](#)

### Members Login

Username

Password

Remember me

[LOGIN](#)[in Login With LinkedIn](#)[f Login With Facebook](#)[Forgot your Password?](#)[Forgot your Username?](#)[Resend activation code?](#)

## Recent activities

 [Michael MacIntyre](#) is attending [Rural Alberta Watershed Resources Workshop](#).

 [Tim Whitford](#)

Search

[Advanced Search](#)

[Profile](#)[Friends](#)[Groups](#)[Photos](#)[Videos](#)[Events](#)[Forum](#)

## Recent activities

[SHARE](#)[Status](#)[Photos](#)[Videos](#)[Events](#)

Say what is on your mind...

Public

[SHARE](#)[View all](#) | [Me & Friends](#)

**Michael MacIntyre** is attending Rural Alberta Watershed Resources Workshop.



**Tim Whitford**

Unable to attend Sept. 11, expect to attend Oct. 1, very interested in seeing best leverage of resources both money and talent once stakeholders have a chance to develop agreement on desired outcomes, this will likely take some time to share and understand each others agenda

2 days ago • [Unlike](#)

**Harry Keess** is attending Rural Alberta Watershed Resources Workshop.

**Dwayne Rogness** is attending Rural Alberta Watershed Resources Workshop.

**Don Hamilton** is attending Rural Alberta Watershed Resources Workshop.

**Alberta Centre for Sustainable Rural Communities** is attending Rural Alberta Watershed Resources Workshop.



**Lisa M. Fox**

Did you know we have a "Watershed Weekly" newspaper - if you are too busy to read

### Search

[Advanced Search](#)

### Members

[Newest](#) | [Featured](#) | [Active](#) | [Popular](#)





This is an online community network hosted for the development of relationships between rural community leaders, watershed councils, stewards, and citizens interested in advancing water & watershed management in Alberta. Once you join the Water Network and provide your feedback on Alberta's Water Resources you will be entered into a draw to take place at the Rural Water Resource Workshop on September 11th in Nisku to win a NEW IPAD!

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[in](#) Share [T](#) Tweet [+](#) Like [S](#) Send [f](#) Lisa M. Fox likes this.



## Rural Alberta Watershed Resources Workshop

One of the key priorities of this initiative is the communication of available resources to Alberta stewards and managers!

**When:** September 11<sup>th</sup>, 2012 9:30-3:30pm Executive Royal Inn (8450 Sparrow Drive, Leduc, AB)

This workshop is being hosted by the Alberta Center for Sustainable Rural Communities and Sustainability Resources Ltd. with funding from the *Alberta Rural Development Network* to invite community input into the base inventory of Water Resources compiled here on this website.



### Upcoming Events

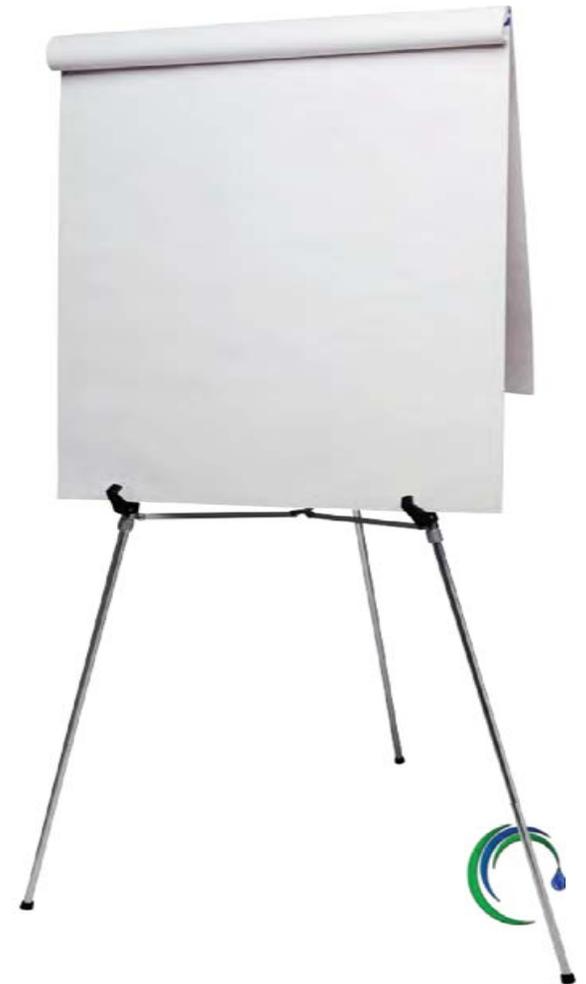
 Rural Alberta Watershed Resources Workshop  
11.09.2012 | 350 Rural Alberta Watershed Resources Workshop  
One of the key priorities of this...  
Leduc, Alberta

[READ MORE...](#)

 Water Sustainability in Canada's West  
01.10.2012 | 16 Water Sustainability in Canada's West October 1st, 2012 hosted by Oldman...  
Lethbridge, Alberta

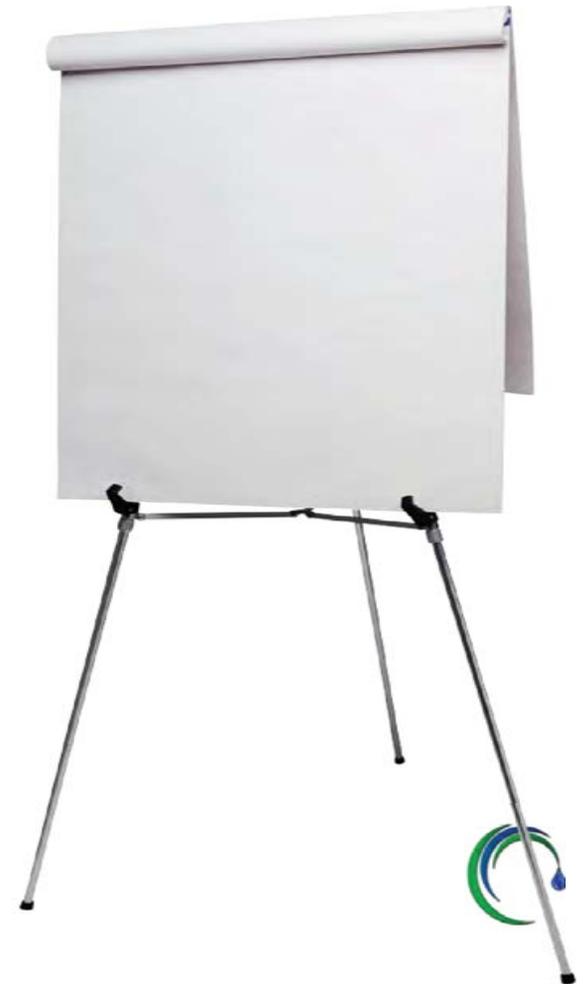
# Feedback Session #1

- ◆ What are your Water Management Issues?
  - ◆ Management
  - ◆ Infrastructure
  - ◆ Conservation
  - ◆ Other?



# Feedback Session #1

- ◆ What are your Resource Needs?
  - ◆ Management Capacity
  - ◆ Information
  - ◆ Research
  - ◆ Professional Resources



Wednesday, 11 July 2012 20:26

## Canadian prairie rural communities: their vulnerabilities and adaptive capacities to drought

[EDIT ITEM](#)

Written by Super User

font size  | [Print](#) | [Email](#) | [Be the first to comment!](#)

Rate this item  (0 votes)



This paper examines physical and social vulnerabilities and associated adaptation measures undertaken and the adaptive capacity in communities in the South Saskatchewan River Basin. Virginia Wittrock & Suren N. Kulshreshtha & Elaine Wheaton. 2011. Source: [Mitigation and Adaptation Strategies for Global Change, vol. 16, issue 3, pages 267-290](#)

Read 8 times

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### Related items

- › [City of Medicine Hat – HAT Smart Rebate Program/Climate Change Central](#)
- › [On-Farm Water Conservation Practices In Southern Alberta](#)
- › [City of Medicine Hat – Household Guide to Water Efficiency](#)
- › [City of Medicine Hat – Steps to Xeriscaping and Xeriscape Demonstration Garden](#)
- › [City of Medicine Hat – Underground Irrigation timers](#)

More in this category: [« City of Brooks – Rain Barrel Pilot Program](#) [Village of Alliance – Meters to Manage Consumption »](#)





Fig. 1 Six communities selected for study in the South Saskatchewan River Basin for the Institutional Adaptation to Climate Change Project (map created by L. Patino Nov 2008)

# Management – Adaptation

- ◆ Research paper on adaptive capacity of small rural communities in the South Saskatchewan River Basin
- ◆ Key points – reliance on surface water in fluctuating drought scenarios can put a severe strain on the economic and social adaptability of rural communities
- ◆ **Basin:** South Saskatchewan **Year:** 2011 **Source:** Mitigation and Adaptation Strategies for Global Change, vol. 16, issue 3, pages 267-290



# Water Quantity - Vermilion

- ◆ The development of hydrology modeling to understand impacts to surface water supplies with increased development and climate scenarios
- ◆ Future focused modeling revealed 40% decrease in seasonal flows by 2040 – impacting water license withdrawals and license security
- ◆ **Basin:** Vermilion River sub-basin. **Source:** North Saskatchewan Watershed Alliance (NSWA)  
[http://nswa.ab.ca/resources/nswa\\_publications/vrwsd](http://nswa.ab.ca/resources/nswa_publications/vrwsd)



## Fun with Facts

# How many domestic water wells are there in Alberta?

- 100,000
- 250,000
- 500,000



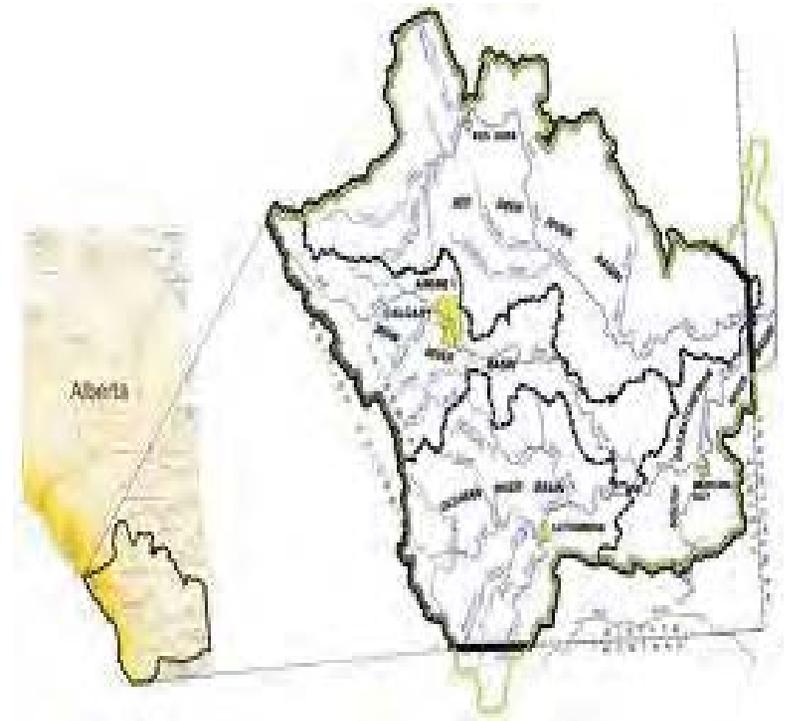
# Management - Wastewater

- ◆ Feasibility Study – FCM
- ◆ City sewage capacity expanding infrastructure demands
- ◆ Recommendation to use “Solar Aquatics”
- ◆ Recommendation to re-use wastewater for irrigation, commercial and industrial uses
- ◆ **Basin:** Red Deer River **Year:** 2010. **Source:** <http://gmf.fcm.ca/>



# Modeling – South Sask

- ◆ Research paper on the impacts of the approved water management plan for the SSRB – basin closure
- ◆ Affects to southern municipalities for economic growth, regional planning, conservation efforts, and license transfers.
- ◆ **Basin:** South Saskatchewan  
**Source:** Canadian Water Resources Journal Vol. 35(1): 79–92  
<http://pubs.cwra.org/doi/abs/10.4296/cwrj3501079>



# Modeling - Metagenomics

- ◆ The creation of “novel” indicators for water pollution in watersheds
- ◆ The use of metagenomics to measure the impact of pollution on communities of micro-organisms to pinpoint specific sources of pollution
- ◆ **Source:** <http://www.watersheddiscovery.ca/>



## Fun with Facts

# How many domestic water wells are there in Alberta?

- 100,000
- 250,000
- 500,000



3% of all water licenced for use in Alberta is groundwater, but this does NOT include domestic water wells (no licence required). About 3,000 new domestic water wells are added each year.

*Alberta Water Book*

# Water Quality - EFP

- ◆ Alberta Environmental Farm Plan is funded through Growing Forward (Agriculture) and offers support for producers to manage operations to benefit healthy watersheds.
- ◆ Funding programs for projects related to water are available through Growing Forward and Wheatland County
- ◆ **Basin:** Province **Source:**  
<http://www.albertaefp.com/>



# Summary

- ◆ Research and Science Based Information Resources
- ◆ Case Study/Feasibility Resources
- ◆ Programmatic Resources
- ◆ Content on the site vs. links to source



# Feedback Session #2

- ◆ Which of these resources are most relevant to your resources needs?
- ◆ What is missing?
- ◆ What level of detail would be helpful on the site?
- ◆ What kinds of delivery options would you like to see?
- ◆ What depth of Content would be most useful?





# Alberta Watershed Toolkit

[www.watershedresources.ca](http://www.watershedresources.ca)



Shell  
**FuellingChange™**



UNIVERSITY OF ALBERTA  
ALBERTA CENTRE FOR SUSTAINABLE  
RURAL COMMUNITIES

alberta  
**ecotrust**

Sustainability Resources Ltd



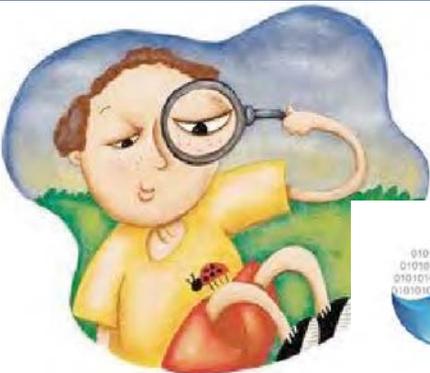
# Project History

Over the last decade, watershed managers and stewardship groups have identified “needs” to better help them be successful implementing watershed management.

- ◆ 2005 & 2011 – Alberta Stewardship Network (LSCC) undertook a needs assessment of WSGs
- ◆ 2008 – Watershed Planning and Advisory Councils identified their needs as WPACs
- ◆ 2011 – Alberta Water Council undertook a needs assessment of the 3 partners in Water For Life (AWC, WPACs, WSGs)



# At the same time .....



WATER AND ENVIRONMENTAL HUB



Government of Alberta  
Environment and Water

Alberta.ca > Environment and Water

- Oil Sands Projects
- Climate Change
- Water
- Land Disturbance and Reclamation
- Tailings Ponds
- Air
- Wildlife and Conservation

Oil sands data available to public

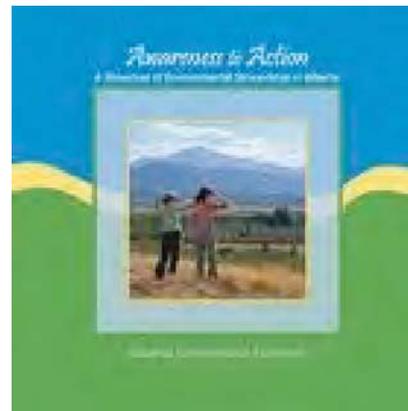
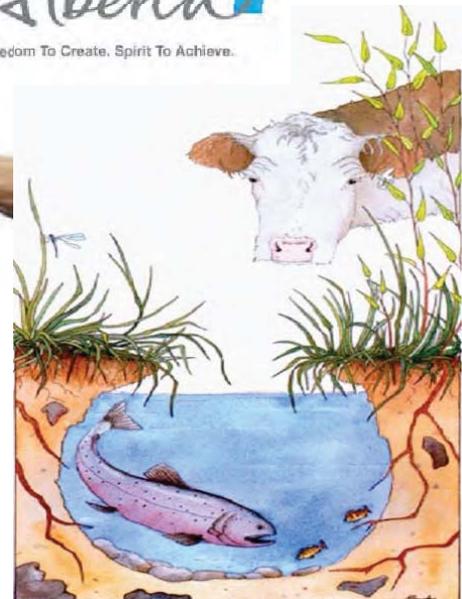
Where ideas flow



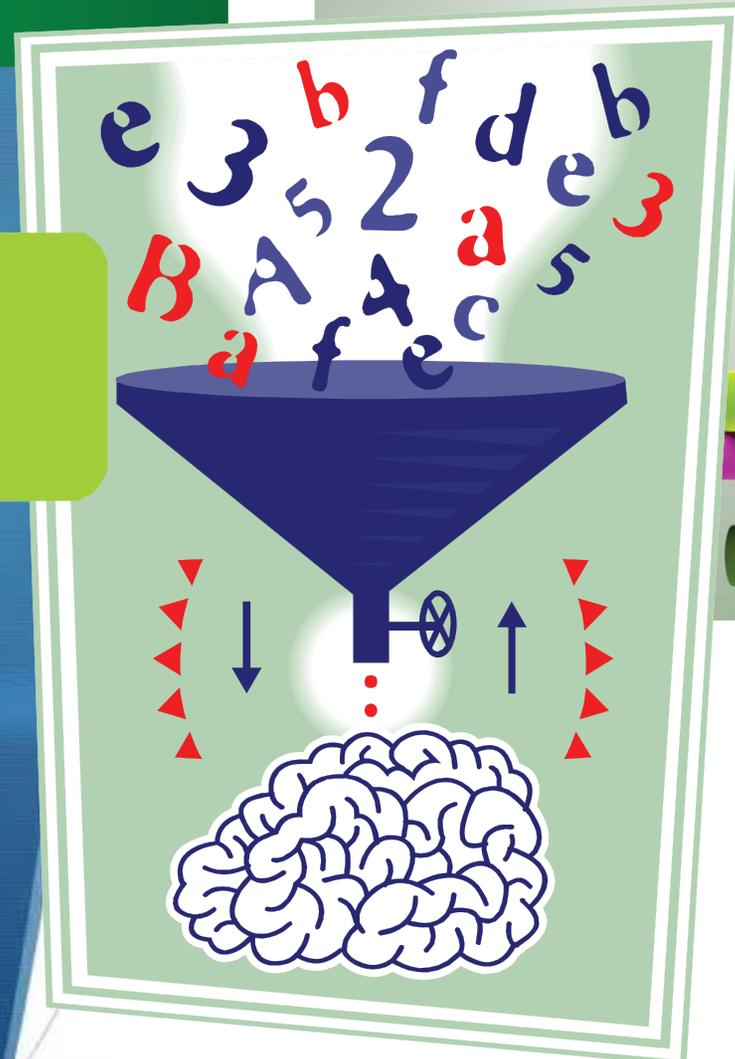
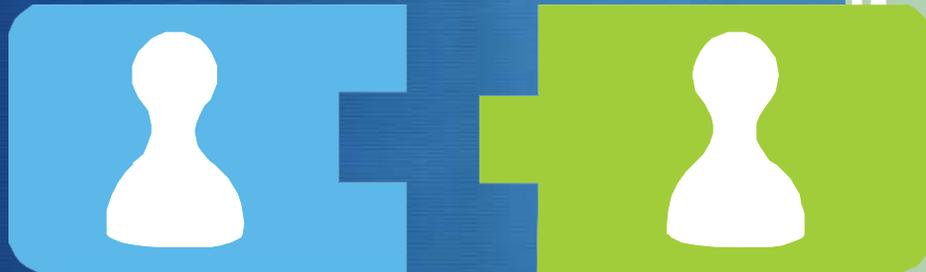
Alberta  
Freedom To Create. Spirit To Achieve.



- Buffalo River Basin
- Hay River Basin
- Peace/Slave River Basin
- Athabasca River Basin
- Beaver River Basin
- North Saskatchewan River Basin
- South Saskatchewan River Basin
- Milk River Basin



Lack of connection  
between resources and  
those that need the  
resources



# Alberta Watershed Toolbox Objectives

- ◆ Increased understanding of specific water, watershed, and stewardship **needs** of community decision makers, stewards, and water managers relating to:
- ◆ Information and research
- ◆ Intervention based tools
- ◆ Learning and capacity building



# Project Outcomes

- ◆ Inventory of information, scientific and technical resources
- ◆ Identify barriers, issues, and capacity gaps
- ◆ Informed recommendations regarding specific information resources (Curriculum)
- ◆ A space and a water leadership team that can encourage collaboration on delivery of tools and resources for water managers & stewards
- ◆ Network of Water Leaders - share ideas, knowledge broker solutions to issues, and promote best management practices



# Toolkit Project Process

- ◆ **Baseline Research** – inventory of practical and peer reviewed literature, case studies and reports of interventions (BMPS) for water management in rural Alberta
- ◆ **Regional Committees** - specific input into baseline research – identify information/data gaps and opportunities for additional resources & collaboration points
- ◆ **Regional Workshops** - deliver specific resources, tools through capacity building learning sessions with water managers & stewards.



# Toolkit Advisory Committee

- ◆ Bob Phillips – SEAWA
- ◆ Connie Simmons – Athabasca Watershed Council
- ◆ Stuart Peters – Alberta Ecotrust
- ◆ Amanda Bogen Halawell – Cows & Fish
- ◆ Michelle Riopel – Alberta Land Stewardship Center (ASN)
- ◆ Curtis Horning – Alberta Environment & Water
- ◆ Lars Hallstrom – University of Alberta (ACSRC)
- ◆ Erin McMahon – Nose Creek Watershed Partnership\
- ◆ Meghan Payne – Lesser Slave Watershed Council

Lisa Maria Fox – Project Advisor / Beverly Anderson – Project Manager



# Upcoming Toolkit Workshops

- ◆ October 15<sup>th</sup> – Red Deer “**Natural Gas Development & Rural Water Management**”
- ◆ October 22<sup>nd</sup> – Lethbridge “**Watershed Hydrology & Risk Management**”
- ◆ October 29<sup>th</sup> – Athabasca “**Traditional Knowledge & Watershed Management Planning**”
- ◆ November 12<sup>th</sup> – Medicine Hat (SEAWA) “**Municipal Policy & Water Management**”
- ◆ November 19<sup>th</sup> – Edmonton “**Natural Gas Development & Rural Water Management**”



# Potential for the Future

## Feedback on future resources for water management in Alberta?

- ◆ What would you advise the Alberta Center for Sustainable Rural Communities and other Academic Institutions to focus on in terms of:
  - ◆ research projects, community partnerships, studies, etc.
- ◆ What would you advise Sustainability Resources and partner organizations (Watershed Toolkit) to focus on in terms of:
  - ◆ capacity building, networking, case study showcases, etc.



Thank you!

Lars Hallstrom, ACSRC

[lars.hallstrom@ualberta.ca](mailto:lars.hallstrom@ualberta.ca)



UNIVERSITY OF ALBERTA  
ALBERTA CENTRE FOR SUSTAINABLE  
RURAL COMMUNITIES

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[www.watershedresources.ca](http://www.watershedresources.ca)



This workshop was gratefully funded by the Alberta Rural Development Network



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