

**Agricultural Water
Futures Project Report**

A business case blueprint and framework for providing value to the agri-food supply chain through water stewardship

Submitted by:

Mike Nemeth, M.Sc., P.Ag., EP
Director, Environment and Sustainability
WaterSMART Solutions Ltd.
605, 839 5th Avenue SW
Calgary, Alberta T2P 3C8
michael.nemeth@watersmartsolutions.ca

Submitted to:

Michelle Nutting
Agriculture Sustainability Manager
Nutrien Ltd.
13131 Lake Fraser Dr. SE
Calgary, Alberta T2J 7E8

Dallas Johnson

Director, Integrated Land Management
Alberta Innovates
1500, 10104 – 103 Avenue
Edmonton, Alberta T5J 0H8

Submitted on:

March 21, 2019

The Agricultural Water Futures Project was enabled through continued funding provided by Nutrien Ltd., and matching funds contributed by Alberta Innovates.

Alberta Innovates (AI) and Her Majesty the Queen in right of Alberta make no warranty, express or implied, nor assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information contained in this publication, nor that use thereof infringe on privately owned rights. The views and opinions of the author expressed herein do not necessarily reflect those of AI or Her Majesty the Queen in right of Alberta. The directors, officers, employees, agents and consultants of AI and the Government of Alberta are exempted, excluded and absolved from all liability for damage or injury, howsoever caused, to any person in connection with or arising out of the use by that person for any purpose of this publication or its contents.

Suggested citation for this report:

WaterSMART Solutions Ltd. 2019. A business case blueprint and framework for providing value to the agri-food supply chain through water stewardship. Produced by WaterSMART Solutions Ltd. for Nutrien Ltd. and Alberta Innovates, Calgary, Alberta, Canada. 43 pages. Available online at <https://watersmartsolutions.ca/>.

Contents

Executive Summary.....	3
1.0 Introduction	5
1.1 Background	5
1.2 Agricultural Water Futures Project	6
1.3 Water management versus water stewardship.....	8
2.0 Process to advance water stewardship in the agri-food supply chain.....	12
2.1 Step 1: Set the watershed context.....	14
2.1.1 <i>Setting the watershed context for the SSRB</i>	16
2.1.2 <i>Creating a common dialogue</i>	18
2.2 Step 2: Build a business case for water stewardship.....	18
2.2.1 <i>Elements of a business case for water stewardship</i>	19
2.3 Step 3: Develop a water stewardship plan	22
2.3.1 <i>A framework for how to develop a water stewardship plan</i>	22
2.4 Step 4: Implement water stewardship actions and realize benefits	26
2.4.1 <i>Next steps: Implementation of water stewardship actions</i>	26
3.0 Testing the Process – A Case Study	26
Case study: Introduction to Sunny Farms and case study assumptions.....	26
3.1 Case study Step 1: Setting the watershed context for Sunny Farms	27
3.2 Case study Step 2: Building the business case for water stewardship for Sunny Farms	28
3.3 Case study Step 3: Applying the framework for Water Stewardship to Sunny Farms	30
3.4 Case study Step 4: Benefits and opportunities realized from implementation of water stewardship plan at Sunny Farms.....	31
4.0 Project learnings and next steps	32
4.1 Key learnings	32
4.2 Concluding thoughts and next steps.....	34
Appendices	36
A1. Connections between the agri-food value chain and water stewardship	36
A2. Participating organizations	38
A3. Data and information sources to support water stewardship in the agri-food supply chain.....	39
A4. Water-related risks and opportunities in the agri-food supply chain in Alberta.....	41
A5. Example metrics for water stewardship in the agri-food supply chain in Alberta	43

Executive Summary

Food marketers and consumers are increasingly valuing concepts of sustainability and environmental stewardship in the agri-food supply chain. Specifically, farmers and agri-food processors are becoming aware of the benefits of water stewardship practices and strategies to improve farm productivity and product marketability. However, Alberta's agri-food supply chain lacks a coordinated and practical way to take advantage of the opportunities of water stewardship.

To help fill this gap, the Agricultural Water Futures Project began in late 2017 to better define and prove the value of water stewardship across the agri-food supply chain in Alberta. It was co-funded by Nutrien and Alberta Innovates, and executed by WaterSMART Solutions Ltd. In addition to increasing awareness of the value of water stewardship, the project aimed to help position the province's agri-food sector as a global leader in this area.

This project focused on primary production systems in the South Saskatchewan River Basin (SSRB) in southern Alberta. The SSRB was chosen as a broadly representative watershed, characterized by dryland and irrigation crop production, commodity and specialty crops, limited water availability, and good economic growth opportunity. To accomplish the project objectives, a four-step process was developed that can be replicated in any watershed, for any sector, anywhere in the world.

Step 1 involves setting the watershed context, which means getting an understanding of the full watershed picture, including water availability, water quality, water source reliability, stakeholder concerns, and current management, stewardship and governance. Setting the watershed context requires collaboration between implementers and stakeholders to establish a common dialogue and identify water stewardship actions.

Step 2 requires building a business case to explain why a member of the supply chain that uses or manages water would invest in water stewardship. A business case for water stewardship is built on the principles that water risks are inherent to all operations that use water, and that addressing those risks brings value to the implementer and, more broadly, to the watershed. Rationale for investing in water stewardship requires, among other things, a clear financial incentive, mitigation of one or more water risks, and feasible and convenient implementation of the plan.

Step 3 entails developing a water stewardship plan to address the water-related risks and opportunities to operations and the watershed, and actions to reduce those risk and capitalize on opportunities. A framework to develop a water stewardship plan was created for this project by adapting work of the Alliance for Water Stewardship, which is a non-profit, multi-stakeholder organization that published a global standard for water stewardship applicable globally to all organizations and sectors, independent of size and operational complexity, including agriculture.

Step 4 is implementing the water stewardship plan by taking actions to reduce water related risks and capitalize on opportunities identified in the plan. This is where benefits to the sector, the watershed, and the individual implementer are realized. Step 4 will be further examined in the next phase to advance this work.

The report presents a detailed case study based on a fictional potato farm in the SSRB to illustrate how the four-step process could be applied.

Five key learnings emerged from the Agricultural Water Futures Project:

1. **Face-to-face communication is valuable.** Meeting face-to-face to share knowledge and build understanding of water issues and opportunities across sectors is extremely important. In the two working group meetings for the project, knowledge and expertise were readily shared among stakeholders in the agri-food supply chain and in the broader watershed to help establish a common dialogue around water stewardship. Budgets and timelines can prevent or inhibit this approach with larger groups. Future efforts of this nature should include resources for more in-person engagement.
2. **Cross-sectoral conversations are important.** Knowledge holders in the agri-food supply chain in southern Alberta may not be connected, and this siloed effect can limit opportunities that might be generated through cross-sectoral conversations. Project working group meetings allowed for connections to be made among different groups from inside and outside the supply chain.
3. **Water stewardship is a shared responsibility.** Water stewardship and sustained growth of the agriculture industry cannot rely solely on one member of the value chain to act to benefit the entire watershed. Implementers in the agriculture sector are crucial, but they cannot and should not bear the entire cost of stewardship.
4. **Common dialogue makes for positive change.** Risk can be mitigated in part by establishing a common dialogue among stakeholders in a watershed. Face-to-face discussions promote development of cross-sectoral solutions.
5. **There is often a disconnect between corporate goals and local needs.** Corporations often have company-wide sustainability goals that underestimate the value of implementing or supporting work at the local level, because the value and outcomes from local efforts might be small from an overall corporate perspective.

Water risk is a critical issue for Alberta's crop-based agri-food supply chain and the risks are likely to increase in the future. Proactive and holistic water stewardship, using tools described in this report, can create a competitive advantage by reducing water-related risk, identifying opportunities, attracting investment, and building trust through improved transparency.

This project created a structure for identifying and realizing tangible benefits that can be applied by any implementer in the agri-food sector. The next step involves working through the application of this structure with an implementer to fully develop the business case and identify their unique costs and benefits of water stewardship. WaterSMART is actively engaging potential partners and funders for a water stewardship pilot program that will expand on and refine the work undertaken here.

1.0 Introduction

1.1 Background

Food marketers and consumers are increasingly valuing concepts of sustainability and environmental stewardship in the agri-food supply chain. Specifically, farmers and agri-food processors are becoming more aware of the benefits of water stewardship practices and strategies to farm productivity and product marketability. Such practices include variety selection, soil conservation, low-water production techniques, and other agri-food best management practices. Today's production pressures and market shifts present an opportunity for Alberta to position itself as an attractive market and a global leader in agricultural water stewardship.

Several successful programs and policies like the Alberta Environmental Farm Plan and the *Water for Life* strategy already help manage water supplies and water-related risks. However, Alberta's agri-food supply chain lacks a coordinated and practical way to take advantage of the opportunities of water stewardship throughout the entire supply chain. Previous work by Agri-Food Economic Systems¹ identified several barriers to the advancement of sustainable practices in the agri-food system, with lack of coordination between those in the supply chain as one of the foremost challenges. In Alberta's agri-food supply chain, there is a continued need for a coordinated and practical approach to stewarding water resources because:

- Agriculture has the largest allocation of water in Alberta, and a commitment to water stewardship shows that the industry is using this water in a responsible and sustainable way.
- Water is a primary input to agriculture and, with a growing population and changing climate, water scarcity and water quality pose mounting operational risks.
- Consumers increasingly value the concepts of sustainability and environmental stewardship and many consumers want to support sustainability once they learn about it.
- Water stewardship requires coordination and dialogue among players inside and outside of the supply chain.
- There are benefits to improving communications generally and particularly with respect to water stewardship, in the agri-food supply chain.

The Agricultural Water Futures (AWF) Project is summarized in Section 1.2, which outlines the process and outcomes, including:

- The process undertaken to define water stewardship, and collaboratively develop information on applying water stewardship in the agri-food supply chain.
- A blueprint to define the critical elements of a business case for water stewardship and provide direction on how to establish those elements.
- A framework that outlines the steps and criteria for implementing water stewardship initiatives.

¹ See <http://www.agrifoodcon.ca/>

This report aims to enhance water stewardship in the agri-food supply chain in Alberta and present a scalable model for any agricultural watershed, which is defined as a watershed with agricultural activities taking place on the landscape. Proactive, holistic, and collaborative water stewardship can create a competitive advantage by reducing water-related risk, identifying opportunities, attracting investment, and building trust through improved transparency.

1.2 Agricultural Water Futures Project

The Agricultural Water Futures (AWF) Project began in late 2017 to better define and prove the value of water stewardship across the agri-food supply chain in Alberta. The AWF Project was co-funded by Nutrien and Alberta Innovates, and executed by WaterSMART Solutions Ltd. (WaterSMART). This project builds on previous water stewardship work between Nutrien and WaterSMART.² The prior work examined the need for watershed action in the agricultural community, the range of water quality and water quantity trading programs that exist in other parts of the world, and some of the ways data technology could be harnessed to inform a trading system. That work brought land use and water management together for producers, underpinned by consistent economic values. Its goal was to inform a trading system to provide water stewardship incentives in a way that is accommodating and relevant for each producer, contributes to the economic and social priorities of a rural community, and improves overall watershed health. That work also recommended that producers be enabled to contribute to these goals through integrated technologies. It envisioned a system that builds in incentives for producers, including ecosystem services valuation, effective monitoring, and credits management.

The objectives of the AWF Project were to:

1. Help position Alberta's agri-food sector as a global leader in water stewardship.
2. Increase awareness of other users of the watershed to invest in water stewardship across the agri-food chain.

These objectives were accomplished by achieving three core outcomes that will provide several benefits:

1. Create a common dialogue between agri-food and other users of the watershed to manage risk (e.g., regulatory, reputational) to the agri-food sector through a better awareness of water resources. A common dialogue means having a mutual understanding of a particular topic to improve communication in a multi-sectoral group, which then allows for more productive discussion of challenges and opportunities.
2. Define and advance water stewardship in the South Saskatchewan River Basin (SSRB) to:
 - Position Alberta's agri-food sector as a global leader in water stewardship, enabling it to realize the economic benefits of access to new markets and to support diversification of Alberta's economy.

² See <https://watersmartsolutions.ca/knowledge-base/water-stewardship-and-incentives-report-of-programs-and-project-options-2016/>

- Create recognition and support for the agri-food community and its water stewardship efforts that align with society's values for clean, abundant water.³
3. Develop the business case for water stewardship to:
- Advance the uptake of water stewardship actions across the agri-food supply chain in Alberta to improve the health of watersheds and water resources across the province and beyond.
 - Uncover and communicate the value of water stewardship to instill a sense of urgency for the practice across the entire supply chain.

This project focused on the crop-based agri-food supply chain in the South Saskatchewan River Basin (SSRB) in southern Alberta. The supply chain includes input suppliers, crop producers, food processors, distributors and sellers. Any watershed will have many groups and individuals with diverse interests, including municipalities, environmental and other non-governmental organizations, industrial and commercial water users, regulators, researchers, and the general public. All have the potential to contribute solutions to shared water challenges.

Water stewardship provides value to all members of the agri-food supply chain. Participating in a watershed discussion with the full supply chain may uncover shared values or benefits and identify partners willing to invest in watershed improvements that provide value back to their enterprise. Benefits that arise from water stewardship at the level of an individual supply chain member can be shared by the implementer, stakeholders within their watershed, and the entire agri-food industry. These shared benefits will be unique to each combination of supply chain member, watershed, and agri-food sector. This report outlines a process for identifying and realizing shared benefits that can be applied for different supply chain members in Alberta watersheds, and around the world, where the agri-food industry operates. Appendix A1 illustrates the agri-food supply chain as defined by this project, how it connects to water stewardship, where the benefits can be realized, and the opportunity for the agri-food sector.

This project focused on primary production systems in the SSRB, including irrigated and dryland cereal, oil seeds, and specialty crops. Although manure management regulations and sustainable livestock and pasture or range management have an important role in water stewardship, they were outside the scope of this project. Nevertheless, the project work is scalable and transferable to livestock and other agricultural activities, as well as other sectors.

The SSRB was chosen as a broadly representative watershed with water challenges for agriculture. Because it is characterized by dryland and irrigated crop production, commodity and specialty crops, limited water availability as a water scarce region, and good economic growth opportunity, it is a microcosm of global primary production systems. Therefore, the water stewardship principles presented here should apply anywhere in the world.

³ See <http://aep.alberta.ca/water/programs-and-services/water-for-life/strategy/default.aspx> or <https://a4ws.org/about/the-aws-standard/> as examples.

1.3 Water management versus water stewardship

At the beginning of the project, phone and in-person interviews were conducted with stakeholders to gather the perspectives of supply chain members and other users of the watershed on agricultural water use and water stewardship, and how these concepts influence them and their operations. In general, the interviews helped to inform a key component in creating a common dialogue: defining water management and water stewardship.

Water stewardship, defined in the box, is distinct from water management but also encompasses water management as local or site-based actions impact the larger watershed picture, as shown in Figure 1. For the purposes of this report, water management is considered to be site-limited and operationally-focused, and includes management of water use and demand, quality of supply, conflict management, and basin wide initiatives such as allocation and storage that are relative to a site's operations. Water management does not necessarily involve understanding the watershed beyond the site in question and is driven by internal goals and decisions, with no expectation of stakeholder engagement. Water stewardship includes an expectation of external reporting and communication with respect to water. It is important to recognize that *water stewardship is intended to support and contribute to watershed management, not replace existing efforts*, of which there are several in the agri-food supply chain in Alberta.⁴

Water Stewardship

Water stewardship is the use and safeguarding of water in a way that is socially equitable, environmentally sustainable, and economically beneficial. Water stewardship considers water governance, water balance, water quality, and important water-related areas (areas that provide environmental, social, cultural, or economic value (e.g., wetlands)). It requires an understanding of how you fit into the watershed as a whole, and is achieved through a stakeholder-inclusive process that involves both site- and watershed-based actions.

Adapted from the *Alliance for Water Stewardship, International Water Stewardship Standard (2014)*

⁴ Water for Life strategy management principles <https://open.alberta.ca/dataset/77189444-7456-47f7-944c-085272b1a79c/resource/17c41dc3-1692-4cf9-b931-2892c57a62b1/download/2003-water-life-albertas-strategy-sustainability-november-2003.pdf>

Watershed Planning and Advisory Councils and programs (e.g., Oldman Watershed Council's Watershed Legacy Program) <https://oldmanwatershed.ca/wlp-overview/>

Alberta Irrigation District Association's "Thanks to Irrigation" project <http://www.thankstoirrigation.ca/>
The Alberta Wetland Policy <https://open.alberta.ca/dataset/5250f98b-2e1e-43e7-947f-62c14747e3b3/resource/43677a60-3503-4509-acfd-6918e8b8ec0a/download/6249018-2013-alberta-wetland-policy-2013-09.pdf>

Small group efforts (e.g., Lower Mosquito Creek Water Users Association) http://cowsandfish.org/pdfs/mosquito_creek.pdf

Agricultural Water Stewardship



Figure 1 Water management is generally considered to be within the operational boundary and is operationally-focused, while water stewardship encompasses water management within the boundary of the watershed.

Interviews generated the following feedback on water stewardship and water management:

- There is not always a clear line between the terms “water stewardship” and “water management,” and the differences between them need to be well understood.
- There is a strong connection between agriculture and water stewardship because water in the crop-based agri-food supply chain is explicitly linked to having sufficient water supply of adequate quality.
- Most of what people recognized as water stewardship in the agri-food supply chain was actually water management (e.g., water use efficiency, water treatment technology). Examples of water

stewardship included awareness, engagement with stakeholders, and broader understanding of watershed conditions.

- There was consensus that stakeholder engagement is important to water stewardship.
- Some interviewees chose to work with or were influenced by suppliers and distributors that practiced water stewardship, while others did not see the need to extend their water stewardship programs into the supply chain.
- Organizations reported a mix of water stewardship activities, with several mentions of education, awareness, communication, and effective stakeholder engagement. Most responses were actually water management.
- Human and financial resources presented a major barrier to organizations implementing water stewardship programs.
- If barriers could be removed, interviewees expressed a desire to undertake conversations with the agri-food sector, industry, and municipalities concerning prioritization of water in dry versus wet years, to develop a framework for making water use decisions in a timely fashion in a problematic climatic year.

Water management and water stewardship are not new to Alberta or the SSRB. Many activities and initiatives are underway in government organizations, non-government organizations, and the agri-food sector. Project interviewees reiterated that both water management (e.g., water allocation and licensing system) and water stewardship activities (e.g., formal and informal water sharing agreements) were already taking place in the SSRB.

Research was undertaken on water management and water stewardship activities in the agri-food supply chain and SSRB watershed, and a few examples are provided below.

Within government organizations:

- The *Water for Life* strategy's management principles, such as: "Citizens, communities, industry, and government must share responsibility for water management in Alberta and work together to improve conditions within their local watershed."⁵
- Ducks Unlimited Canada (DUC) projects under Alberta's Wetland Policy to minimize loss and degradation of wetlands.
- Alberta Environment and Parks' (AEP) Watershed Resiliency and Restoration Program to increase the natural ability of watersheds to reduce intensity of flood and drought.
- Agricultural Research and Extension Council of Alberta's (ARECA) delivery of the Environmental Farm Plan (EFP) program to minimize impact on the environment, including water resources.

⁵ Water for life: Alberta's strategy for sustainability. Government of Alberta. 2003. Page 6. ISBN No. 0-7785-3058-2, accessed March 14, 2019 from <https://open.alberta.ca/dataset/77189444-7456-47f7-944c-085272b1a79c/resource/17c41dc3-1692-4cf9-b931-2892c57a62b1/download/2003-water-life-albertas-strategy-sustainability-november-2003.pdf>

Within non-government organizations:

- Watershed Planning and Advisory Councils (WPACs) work at the local and regional level; e.g., Bow River Basin Council's mandate: "... [T]o promote awareness, improvement, and protection of Bow River water quality, foster cooperation among agencies with water quality responsibilities, and provide communication links among governments, interest groups, and the general public."
- Oldman Watershed Council's Watershed Legacy program.
- Lower Mosquito Creek Water Users Association's work to improve water quality and quantity through sustainable agriculture practices.
- Alternative Land Use Services (ALUS) project funding for on-farm landscape improvements.
- Alberta Water Council Conservation, Efficiency, and Productivity Plans to support *Water for Life* outcomes.

Within the agri-food sector:

- Alberta Irrigation Districts Association's⁶ (AIDA) "Thanks to Irrigation" initiative to communicate and raise awareness of irrigation in Alberta.
- EFPs that support and promote environmental stewardship and sustainability.
- Verified Beef Production Plus training and support for on-farm environmental stewardship as part of sustainable beef production.

Despite the numerous initiatives in Alberta that support water stewardship, interviews indicated that dialogue and understanding around water stewardship is lacking. This feedback shaped the agendas and discussion topics for the working group meetings for this project, which focused on creating dialogue to improve understanding of the importance of water stewardship for individual supply chain members, and how water stewardship can be implemented by individual members.

A working group was established by identifying and reaching out to stakeholders in the watershed to create a collaborative group that included representatives from the agri-food supply chain as well as other users of the watershed (e.g., representatives from other industrial sectors, governments, municipalities, watershed and environmental groups, non-governmental organizations, other water users, researchers, and the public). A full list of participants appears in Appendix A2. The working group met twice over the course of the project to help inform the case studies, the business case for investing in water stewardship, and the framework for how to do water stewardship. To get balanced representation, potential stakeholders were categorized by types (i.e., private sector, non-profit, industry association, Indigenous, academic, government, municipal) and contacted via email, phone, or in person. Outcomes from the working group meetings informed the following sections of this document, which outline the steps needed to understand the "why" and "how" of water stewardship in the agri-food sector.

⁶ Formerly the Alberta Irrigation Projects Association (AIPA)

2.0 Process to advance water stewardship in the agri-food supply chain

To accomplish the project objectives, a process was developed that can be replicated in any watershed, for any sector, anywhere in the world. The four key steps in this process are described below and illustrated in Figure 2; they address WHY one would pursue water stewardship (Steps 1 and 2) and HOW to do so (Steps 3 and 4). The first three steps were the focus of this work, while the fourth is envisioned to be the focus of the next phase of work and is explored further in Section 2.4.1.

Step 1. Set the watershed context: Understand the watershed picture (e.g., hydrological, social and economic aspects related to water and the sector of interest) through research on the agri-food supply chain, watershed activities, and work done in relation to water management and water stewardship. This step also includes stakeholder engagement and identifying groups and organizations in both the supply chain and the watershed (e.g., watershed and environmental groups, municipalities, other sectors) that are willing to participate in a collaborative fashion in a working group setting.

Step 2. Build a business case for water stewardship: Draft a business case for why a member of the supply chain would invest resources in water stewardship using a business case blueprint and information collected from setting the watershed context. A business case for water stewardship is built on the principles that water risks are inherent to all operations that use water, and that addressing those risks brings value.

Step 3. Develop a water stewardship plan: By using a globally recognized and credited framework and adapting it for the agricultural sector, develop a water stewardship plan to address the water-related risks and opportunities to operations and the watershed, and actions to be taken to reduce risk and capitalize on opportunities.

Step 4. Implement the water stewardship plan: Implement the water stewardship plan by taking actions that reduce water-related risks and/or capitalize on opportunities identified in the plan. This is where benefits to the sector, the watershed, and the individual implementer are realized. Step 4 is the next phase to advance this work in Alberta, which is also transferable anywhere in the world.

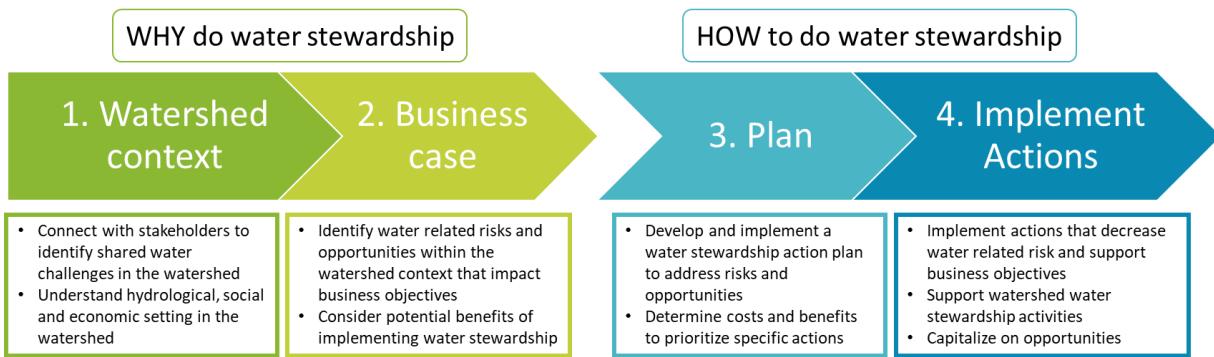


Figure 2 Connecting the business case for WHY an agri-food supply chain member would implement water stewardship with HOW an agri-food supply chain member would implement water stewardship.

Watershed stewardship involves three key roles, filled by those in the agri-food supply chain and by others in the watershed:

- The **implementer** is the entity implementing water stewardship. It works beyond its own operational boundaries with other stakeholders to create a water stewardship plan. The water stewardship efforts of the implementer are supported by many stakeholders in the agri-food supply chain.
- **Stakeholders** are individuals, groups of individuals, organizations, or other entities that affect and/or could be affected by an implementer's water stewardship activities, products, services, or associated performance (Figure).
- **Promoters** are a subset of stakeholders that encourage others to implement stewardship because they see the potential shared benefits from water stewardship actions. Promoters are not implementers, but they see water stewardship as meeting their interests and goals. They can promote with direct support or indirect encouragement. In general, promoters contribute to implementation of water stewardship by providing financial incentives, data, information, or other resources.

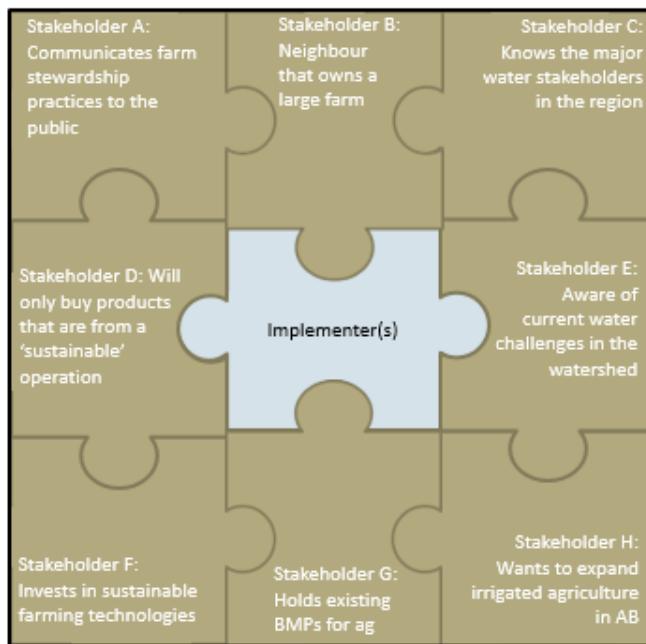


Figure 3 Implementers are a central piece of the water stewardship “puzzle.” The efforts of implementers are supported by and contribute to stakeholder efforts.

The remainder of this section goes into more detail on the four steps described in Figure 2. Each section begins with an explanation of the step and how it was developed through this project. Section 3 introduces a case study that illustrates how the process might be carried out by an implementer. The case study is a fictional example, created to show how an implementer could gain an understanding of why water stewardship is worth the investment (by identifying risks and developing a business case for water stewardship), and then how water stewardship might be done to reduce risks and capitalize on opportunities (building a water stewardship plan using the framework).

2.1 Step 1: Set the watershed context

Step 1 informs the business case but would not be sufficient to develop an implementation plan. It involves understanding the watershed picture (e.g., hydrological, social and economic aspects related to water and the sector of interest) and how a site (e.g., farm, processing facility) fits into that picture. The watershed context is established by understanding key elements in relation to:

- **Water availability** – the water available for allocation considering already allocated volumes and environmental needs.
- **Water quality** – the quality of a water source for consumption, use, and environmental needs.
- **Water source reliability** – the amount and quality of water coming in to a site or operation considering:
 - The hydrological conditions in the watershed.
 - The presence of other water users in the watershed.
 - The potential impact of the site or operation on other water users on the watershed.

- **Stakeholder concerns** – parties that have an interest in this operation because they are directly affected by it or because their actions could affect the operation.
- **Frameworks, current management and stewardship activities, and governance in the watershed**

Setting the watershed context also aligns with the first step of implementing the Alliance for Water Stewardship⁷ International Water Stewardship Standard (AWS Standard) if that is the desired path (see Section 2.3.1).

Setting the watershed context requires collaboration between implementers and stakeholders. Water stewardship in agriculture and sustainability of the industry cannot depend solely on one member of the supply chain, such as individual producers, to take actions that benefit the entire watershed. Nor should one member of the supply chain pay the full cost of water stewardship. A common dialogue is critical to effectively engage different members of the supply chain with other users of the watershed to identify actions with shared costs and shared benefits and reinforce the widespread positive impacts of water stewardship. This step encourages implementers to consider risks and opportunities for those outside their operational boundary and engage early with stakeholders. Stakeholders and shared water challenges identified in setting the watershed context inform the risks and opportunities within and outside the operational boundary, ensuring that both cost and value of water stewardship are considered for the implementer and the stakeholders. This reflects the concept of shared responsibility for solutions to water stewardship, which was raised at the project workshops by several working group participants.

An implementer's watershed context, informed by the data and information collected and that provided by stakeholders, allows for the identification of water-related risks and opportunities. Requisite data and information likely already exist. The key is to make them accessible to implementers, which can be a challenge as data are often held in many forms by many entities. Stakeholders may be aware of available data and can be a useful local resource to build the watershed context if communication channels enable effective information sharing. Connecting the key strengths of stakeholders should be done without overburdening or misplacing responsibilities for information and management activities.

There is an opportunity and a need to develop an information hub that connects the agri-food supply chain with other users of the watershed and information relevant to water stewardship. A list highlighting some of the types of data and information that can be used by implementers to generate their watershed context is provided in Appendix A3. Not all data types are available in every region, but SSRB examples are provided for guidance.

It is important to note that the watershed context that is in place today is not the same as it will be in the future. Changes in policy, climate, public perception, learnings from ongoing science and monitoring, and societal values can all influence the watershed context.

⁷ See <https://a4ws.org/>

Setting the watershed context for this project began with defining water management and water stewardship to help stakeholders identify where they fit in the watershed, what their responsibilities are, and opportunities in relation to the watershed context. When this work is applied in other watersheds, these definitions can be used to accelerate the process.

2.1.1 Setting the watershed context for the SSRB

The SSRB was chosen for this project because it is broadly representative of water challenges in agriculture. Water is the critical input for all activities in the SSRB, as well as for many downstream residents and water users in neighbouring provinces. For many years, the SSRB has had active water management practices, plans, and actions in place, and the concepts of water management and water stewardship are familiar. It was important to draw out the elements of the SSRB that would make this work applicable to any watershed in the world, and to understand and communicate why the SSRB was chosen as the starting point.

In setting the watershed context for the SSRB, some aspects were informed by desktop research (collecting data from existing resources), and other aspects were informed by discussion with project participants in the working group meetings. The box on the next page provides more contextual details on the SSRB.

The SSRB Watershed

The SSRB comprises four major sub-basins: the Red Deer, Bow, Oldman, and South Saskatchewan. The three main rivers (Red Deer, Bow, and Oldman) originate in the Rocky Mountains, and protecting headwater sources is a high priority for the Province of Alberta. The area has complex geography (mountains, foothills, prairie) with a variety of land uses and growing water needs. A system of major reservoirs and diversions regulates river flows and diverts water to areas of high demand. About 90% of the streamflow in the SSRB is generated from snow and glacier melt in the Rocky Mountains.

Soil moisture conditions and local runoff in the agricultural portion of the basin depend on local snowfall and rainfall. Summers tend to be quite dry in this semi-arid region; 66% of the irrigated agriculture in Canada is found in the SSRB. The SSRB is characterized by dryland and irrigated crop production, commodity and specialty crops, and good economic growth opportunity, but water availability can be limited. These features make it a microcosm of global primary production systems.

Water resources in the basin are under growing pressure due to increasing population, more demand for water for economic activity, changes in climate and streamflow in the SSRB, and the fact that most of the SSRB (Bow, Oldman, and South Saskatchewan sub-basins) is closed to new allocations of water. This situation means that water users, and particularly agriculture (estimated to account for about 85% of the water used in the SSRB), must manage water in the best way possible. Water supplies in the SSRB have historically been, and continue to be, under serious pressure and scrutiny. In much of the basin, water management has focused on drought mitigation, but the floods of 1995, 2005, and 2013 are a reminder of the diverse hydrological conditions experienced in the region.

Water quality in the SSRB changes as it moves from mountain headwaters and passes through urban and rural landscapes. In general, water quality decreases gradually as the water flows east away from the headwaters. Water quality on mainstem rivers and tributaries is usually good to fair, with local issues coming up now and again based on the quantity of flows and other compounding factors.

AEP is responsible for regulatory decisions on developments (other than oil, gas and coal) that affect water management in the SSRB. Several policy and regulatory considerations provide added context for water management in the SSRB, including but not limited to:

- The *Water for Life* strategy and action plan (2009), which reaffirm Alberta's commitment to the wise management of the province's water resources for the benefit of all Albertans
- The existing priority system of water allocation based on licence seniority. The *Water Act* provides considerable flexibility in terms of water reallocation among licence holders for new or existing purposes
- The closing of new water allocations in the Bow, Oldman, and South Saskatchewan sub-basins since 2006 when the South Saskatchewan River Basin Water Management Plan was approved by the Lieutenant Governor in Council
- The Master Agreement on Apportionment (1969) between the Governments of Alberta, Saskatchewan, Manitoba, and Canada, which requires that approximately 50% of the annual flow by volume of eastward-flowing provincial watercourses must be passed from Alberta to Saskatchewan
- The Boundary Waters Treaty (1909), which governs the sharing of international streams between Canada and the United States

Stakeholder engagement is a critical component of setting the watershed context and reaching a common understanding. Stakeholders in the watershed were identified and invited to create a collaborative group that included representatives from the agri-food supply chain as well as other users of the watershed (e.g., representatives from other industrial sectors, governments, municipalities, watershed and environmental groups, non-governmental organizations, other water users, researchers, and the public). To get balanced representation, potential stakeholders were categorized by types (i.e., private sector, non-profit, industry association, Indigenous, academic, government, municipal) and contacted via email, phone, or in person (see Appendix A2). The working group helped inform the case studies, the business case for investing in water stewardship, and the framework for how to do water stewardship. Through engagement with the working group, a more detailed understanding of water concerns specific to the supply chain emerged. The project outcomes greatly benefited from the collective knowledge, experience, and expertise contributed by these individuals in meetings and interviews.

2.1.2 Creating a common dialogue

An outcome of the project was creating a common dialogue for agri-food and other users of the watershed that will support risk management. This was done by:

1. defining water management and water stewardship to help stakeholders identify where they fit in the watershed and their responsibilities and opportunities
2. crafting an example of a business case and a draft water stewardship plan through a collaborative working group to understand how value can be added by identifying and communicating key needs around water stewardship in the supply chain

Creating the common dialogue relied on face-to-face interaction and discussion with stakeholders, which occurred in the two working group meetings on setting the watershed context and in interviews prior to the meetings. Face-to-face sharing of knowledge and understanding of cross sector water issues and opportunities is a valuable and critical step that cannot be replaced by technology or data.

2.2 Step 2: Build a business case for water stewardship

A business case applies to the entity (the implementer) that is using or managing water (e.g., withdrawing, consuming, diverting, managing, discharging) and will be implementing a water stewardship framework to develop a water stewardship plan (see Section 2.4). The business case for water stewardship includes collaboration and shared responsibility for solutions with support from multiple stakeholders. The business case should seek to allocate the cost and the benefits for water stewardship appropriately among all stakeholders. This differs from water management where the action and benefits occur primarily within the boundaries of an operation (e.g., a farm). The responsibility of a given implementer is influenced by several factors, including from where water is drawn, how large the operation is, and the watershed context (e.g., number of stakeholders, size of watershed). The AWF Project involved the collaborative working group in developing a blueprint for determining what information is needed to build a business case for investing in water stewardship.

2.2.1 Elements of a business case for water stewardship

The term “business case” is used in this report to capture the concept of developing and documenting justification for why an entity would implement water stewardship. The first questions a producer or other member of the supply chain must answer when developing a business case for water stewardship is: why would I do this, and what are my drivers and reasons for changing what I do now? The response can be complex, will vary across the agri-food supply chain, and will be unique to each entity. There also need to be one or more motivating factors that would make water stewardship easier to sell, either to family members on a farm, or to a large food processing company. To gather insight on what is needed to support a business case, working group participants were asked, “What needs to be shown to prove the business case for investing resources and effort in water stewardship?” The responses included the following:

- There needs to be clear financial incentive.
- One or more water risks need to be mitigated (social licence, public assurance, financial risk due to water emergencies, etc.).
- Implementation needs to be feasible and convenient.
- A credible system or body needs to be in place that raises awareness and recognition of efforts on water stewardship initiatives.
- Roles and responsibilities of the different players need to be clearly identified.

Not all of these points need to be in place to invest in implementing water stewardship, but they would help make the case to invest. Implementing water stewardship can support immediate improvement on the ground and inform long-term, broad-scale (watershed) actions. However, many producers, associations, and other bodies lack the knowledge and resources to implement water stewardship actions. Elements from the list above may be missing or incomplete, adding to the implementation challenge.

This section provides a blueprint (see Table 1) to help a potential implementer demonstrate the benefits of water stewardship and identify specific actions that bring measurable value to their operation. This systematic approach also aims to ensure that connections are made between implementers and stakeholders and that efforts are not duplicated. Many aspects of water stewardship are being addressed through provincial objectives, agri-food best management practices, Environmental Non-Governmental Organization (ENGO) efforts, and other initiatives. These can and should be leveraged by implementers, which is why stakeholder engagement is a core part of setting the watershed context in Step 1. Individual stewardship activities by implementers within the sector may require some sort of central coordination (e.g., an agri-food stewardship plan for the basin) to be optimally beneficial for the industry.

The blueprint for developing the business case for water stewardship assumes that the context of the watershed within which the implementer is working has already been set (see Section 2.1). Information gathered while setting the watershed context is used to identify and assess risks and opportunities related to water for the site and the surrounding watershed. Although many of the risks are shared challenges at the watershed scale, they may translate into different risks for different water users. This approach for understanding “why I should do water stewardship” is built on the principle that water risks are inherent to all operations that use water and addressing them brings shared value.

Table 1 presents a simple blueprint to guide implementers in framing their business case for water stewardship based on their watershed context. The questions in the blueprint enable a logical flow of information for an implementer to determine if an investment in water stewardship makes sense for the business. The second column provides guidance to help implementers answer the questions more thoroughly. The third column notes learnings that emerged from stakeholder discussions during the course of this project.

The full set of information needed to develop a business case (e.g., water risk profiles, social and environmental benefits) will be unique to a given operation and not all aspects are covered here. More detailed guidance for developing a business case for water stewardship will be developed as part of future work to build on the outcomes of this project.

Table 1 Blueprint for building a business case for water stewardship.

Based on my watershed context (see Section 2.1), I need to understand why and to what level I should invest in water stewardship by answering the following questions:		
Question	Guidance	Learnings from the project
What are my water risks and opportunities?	<ul style="list-style-type: none"> Water risks and opportunities are defined by the data and information provided by stakeholders (the watershed context). Be aware of as many risks as possible but focus on risks that an implementer can mitigate. Opportunities can include anything that is meant to mitigate risk or improve water management on-site or water stewardship activities that support operational goals. See Appendix A4 for a list of water risks and opportunities. This list was generated by information collected through the second workshop with the working group from the agri-food supply chain and other stakeholders in the SSRB. 	<ul style="list-style-type: none"> <i>Consider risks and opportunities broadly; e.g., economic development opportunities for the community that require water stewardship and could deliver economic value to the community. The stakeholders may be willing funders/partners of farm management actions.</i>
What am I going to do to mitigate my water risks and capitalize on opportunities?	<ul style="list-style-type: none"> Risk should be avoided, reduced, or retained. Risks that are severe enough or highly likely should be urgently addressed. Best management practices (BMPs), communication, adaptive monitoring and management are some of the ways risk can be mitigated. Understand how actions from an implementer complement the actions of others within the context of water stewardship and desired outcomes. 	<ul style="list-style-type: none"> <i>Risks can be operational, regulatory, financial, or reputational.</i> <i>There are opportunities for sharing information between implementers and other users of the watershed to help implementers identify risks and potential solutions.</i> <i>Some BMPs are easier to adopt than others, not all BMPs will fit with every implementer.</i>
How much will the actions I take cost? What are the potential benefits?	<ul style="list-style-type: none"> Only undertake actions whose benefits exceed cost. Benefits to an implementer could include: <ul style="list-style-type: none"> increased brand value access to new markets and product premiums profitability and growth of the business risk mitigation increased resiliency and support network 	<ul style="list-style-type: none"> <i>Costs and benefits of specific actions related to water stewardship are unique to each site.</i> <i>Cumulative benefits of site-level water stewardship actions are shared by all members of the agri-food supply chain and stakeholders.</i> <i>Co-benefits with other agri-food goals strengthen the entire sector.</i>
How will I measure the results?	<ul style="list-style-type: none"> Metrics are a way to measure if set goals are achieved by defining, comparing, or tracking performance. Metrics require data at the site and watershed level. Metrics can be used internally and externally. Metrics are chosen to demonstrate how actions address stakeholder concerns, to monitor and measure actions taken to mitigate water risks, and to track improvements in operational efficiency and resilience. See Appendix A5 for a draft list of business case metrics for water stewardship in the agri-food supply chain in Alberta. 	<ul style="list-style-type: none"> <i>Metrics should be related to consumer/customer expectations</i> <i>It is important to understand whether metrics are being measured at the site level or at the watershed level.</i> <i>There could be an opportunity to use a watershed-level water supply metric to support water sharing between agriculture and other uses in the watershed</i>

2.3 Step 3: Develop a water stewardship plan

A water stewardship plan is developed after the watershed context is defined, stakeholders are engaged, and the business case outlining the net benefit for investing in a water stewardship plan has been developed. The decision to proceed with specific actions to meet objectives of a water stewardship plan will be informed by subsequent cost-benefit analysis that is unique to each implementer. A framework for how to develop a water stewardship plan was created as part of this work and is described below.

2.3.1 A framework for how to develop a water stewardship plan

This project leveraged the water stewardship standard developed by the Alliance for Water Stewardship (AWS), which is a non-profit, multi-stakeholder organization. In 2014, AWS published a global standard for water stewardship that is applicable globally to all organizations and sectors, independent of size and operational complexity, including agriculture.⁸ On March 22, 2019, AWS launched version 2.0 (V2.0) of the AWS Standard.⁹ Information in this section is based on AWS's V2.0, including the new five-step process and updated graphic (Figure 4).

There are five steps in the Alliance for Water Stewardship International Water Stewardship Standard (AWS Standard) that describe how to develop and implement a water stewardship plan. The AWS Standard is intended to encourage continuous improvement and should be implemented as suitable for the user's or site's purposes and may require adaptive, iterative and, in some cases, non-sequential use of the steps and criteria. Implementers can be independently verified and certified by AWS, but certification is not required to use the framework.

⁸ See <http://a4ws.org/about/>

⁹ See <https://a4ws.org/about/the-aws-standard/>

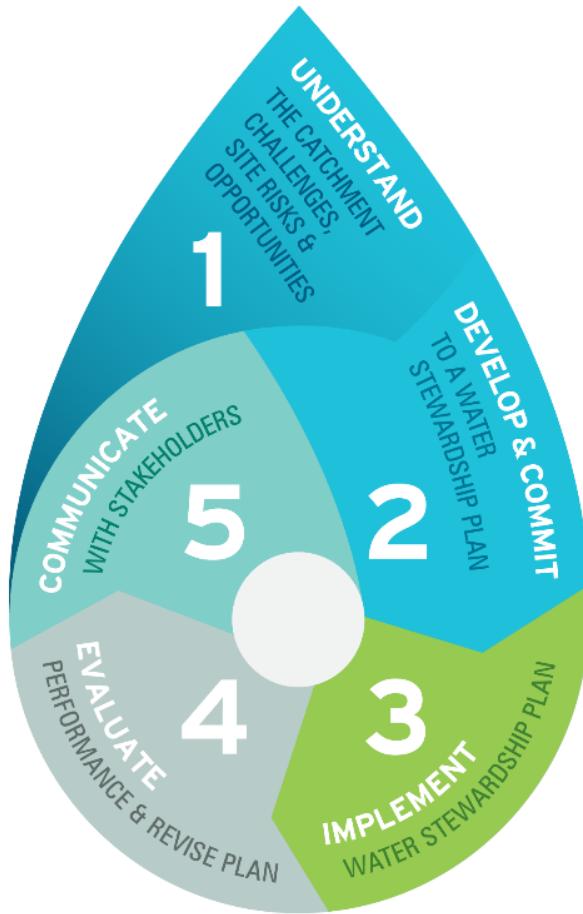


Figure 4 Water users can conform to the AWS Standard by fulfilling a set of criteria centered around five steps.

The AWS Standard comprises steps, criteria, and indicators, and also provides guidance to develop and implement a water stewardship plan. The AWS Standard allows water users to understand their water use and impacts, and to work collaboratively and transparently for sustainable water stewardship within a watershed context. The Standard is intended to drive water-related social, environmental, and economic benefits at the watershed scale.

The objective of this project was not to implement the AWS Standard, but rather to use it as a guide to create a framework for how to do water stewardship in the agri-food supply chain. The AWS Standard was a logical choice to adapt and use for an agri-food water stewardship framework in Alberta because it:

- is globally recognized and can be independently verified and certified if desired by the user
- provides a framework, steps, criteria, and guidance to develop and implement a plan
- is supported by many food, beverage, and agricultural-related companies (e.g., Nestlé, Coca-Cola, Mars, Unilever, McDonalds, Olam)
- provides opportunity for Alberta agriculture to be recognized in water stewardship

- creates possible market advantage and access, and reputational benefits
- is a verifiable, transparent framework for water stewardship efforts
- is useful for any type of water user, in any sector, anywhere in the world – not specific to agriculture
- is highly adaptable to specific customization

Implementers can take the framework from this project and use the AWS guidance document to support water stewardship plans and actions. Part of the next phase of this work will be to develop more agriculture-specific guidance to accompany the framework.

The framework that was created for the agri-food sector in Alberta (Figure 5) was reviewed and adapted by the project working group in October 2018. The framework is a tool to identify water-related risks and opportunities through the development of a water stewardship plan.

In general, the benefits of water stewardship are gained by (i) recognizing, understanding, and either directly addressing or having the knowledge and capacity to address water-related risks and capitalize on opportunities, and (ii) investing in technologies, practices, information, or data that increase efficiency and decrease costs or increase revenue. Although not all benefits can be measured, it is important to measure and, where possible, quantify outcomes from water stewardship plans. Metrics are a way to measure if goals are achieved by defining, comparing, or tracking performance. They are chosen to demonstrate how actions address stakeholder concerns, to monitor and measure actions taken to mitigate water risks, and to track improvements in operational efficiency and resilience. A list of some of the more commonly used water stewardship metrics that could be considered for use in Alberta appears in Appendix A5.

While metrics require data, not all watersheds and sites will have the requisite data and information available, and not all best practices are financially and logically reasonable to implement in every situation. Nevertheless, considerable information and data do exist and helping implementers connect with these resources can contribute to improved water stewardship outcomes.

Some of the actions in the framework of this project overlap with elements of existing initiatives, such as the Alberta Environmental Farm Plan (EFP)¹⁰ and Verified Beef.¹¹ WaterSMART is actively exploring ways to integrate the work from this project into existing programs, where possible.

¹⁰ See <http://www.albertaefp.com/>

¹¹ See <http://verifiedbeefproductionplus.ca/>

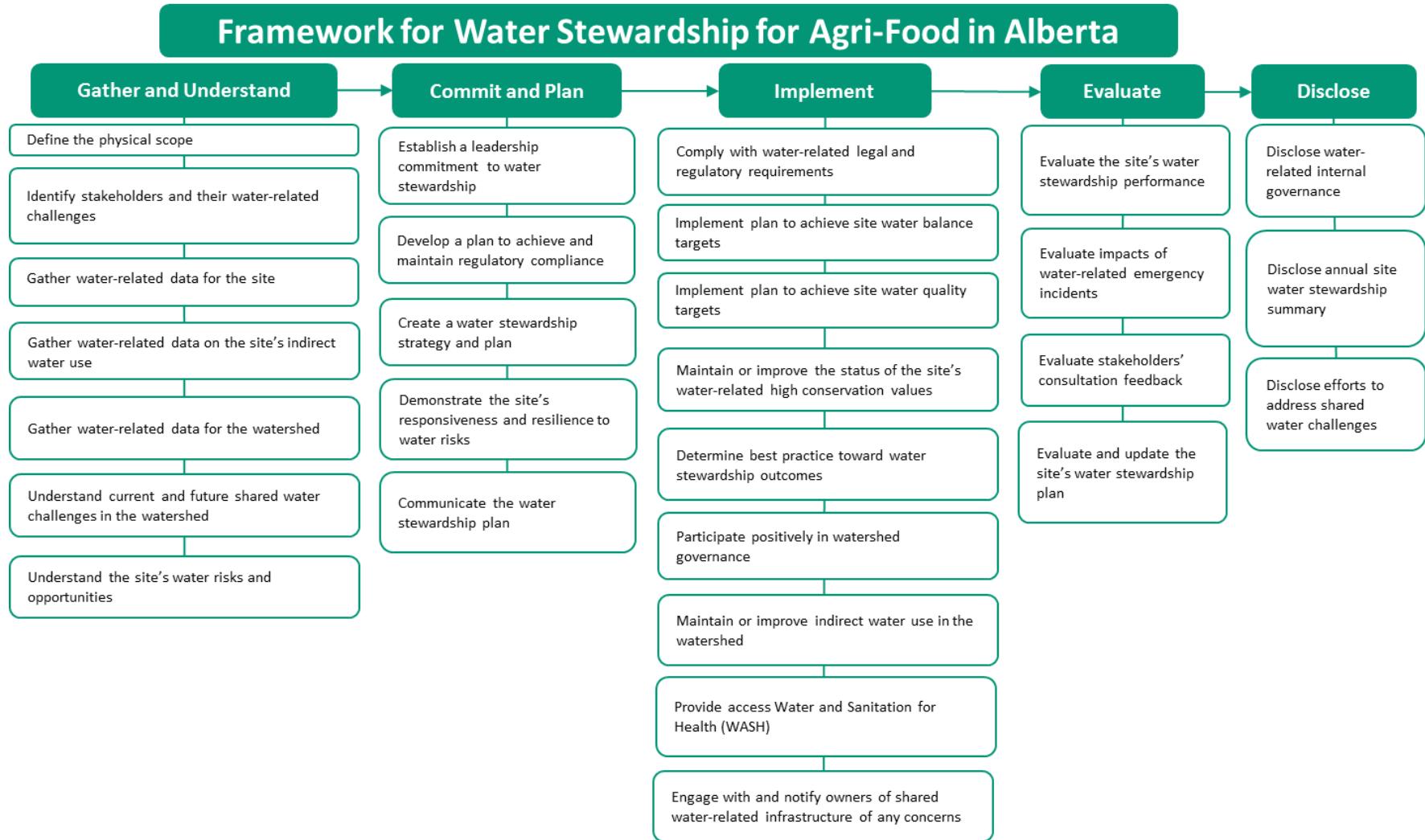


Figure 5 Framework for agri-food water stewardship in Alberta (based on Alliance for Water Stewardship v2.0 2019).

2.4 Step 4: Implement water stewardship actions and realize benefits

The final step in the framework is implementing a water stewardship plan. Implementation is where benefits to the sector, the watershed, and individual implementer are realized.

2.4.1 Next steps: Implementation of water stewardship actions

Implementation of water stewardship actions by an implementer in the SSRB will be part of the next phase to advance this work. Implementing a water stewardship plan creates value by reducing water-related risk, identifying opportunities, attracting investment, and building trust through improved transparency. Benefits are seen by the individual implementer, and the process is designed to align with agri-food goals (Figure A1.1 in Appendix A1).

More work is needed to make the business case that clearly defines both the costs of engaging in water stewardship and, importantly, the value derived from it. This might help to shift the conversation away from a primary focus on risk mitigation to that of seizing opportunities. This report has focused on risk mitigation as the primary benefit of implementing water stewardship. Tangible benefits will be different for each implementer in each watershed. This project created a structure for identifying and realizing tangible benefits for the actual implementer, and this will be part of the next phase of work.

WaterSMART is actively engaging potential partners and funders for a water stewardship pilot program to expand on and refine the work undertaken here. The goal for the next phase is to work with interested parties in the supply chain to pilot the blueprint for developing a business case and framework for water stewardship.

3.0 Testing the Process – A Case Study

Case study: Introduction to Sunny Farms and case study assumptions

“Sunny Farms” is a fictional producer operation, created to demonstrate the applicability of water stewardship concepts discussed in this report. Several case studies were developed during the project and discussed at collaborative workshops with industry representatives and other users of the watershed to test the blueprint for developing a business case (Section 3.2) and the framework for implementing water stewardship (Section 3.3). The “Sunny Farms” example is used to demonstrate the concepts described in each section, and how benefits might be realized by an entity who uses and manages water and implements water stewardship actions and plans. This case study is an amalgamation of the case studies developed during the project and it captures the key learnings from the workshops. The following assumptions for the case study were carried throughout the exercise:

- Primary economic driver is production of Russet Burbank process potatoes.
- Total operation ~4,000 acres; ~1,000 acres of potatoes annually.
- Member of the Potato Growers of Alberta (PGA).
- Located in the Oldman River Basin of the SSRB, near Monarch, Alberta.

3.1 Case study Step 1: Setting the watershed context for Sunny Farms

Sunny Farms contacted its local irrigation district, the Lethbridge Northern Irrigation District (LNID) and asked who they should talk to about what is going on in the watershed. The LNID put Sunny Farms in touch with the Oldman Watershed Council (OWC), who invited them to attend a local open house. Over several months Sunny Farms gathered information on the watershed by making phone calls, attending local events, and reading resources that were supplied by the stakeholders they contacted. When the Sunny Farms owners ran into their neighbours at a local conference, they talked about their different on-farm water management practices. In setting their watershed context, Sunny Farms gained a large amount of information on water availability, reliability of water supplies, and stakeholder concerns in the SSRB and the Oldman River Basin, which is one of four sub-basins of the SSRB. Only the Oldman Basin context is included in this section.

Water reliability in the Oldman River Basin

Water conservation objectives (WCOs) are in place for the Oldman River Basin and can limit water withdrawals if minimum WCO flows are not met. Allocation volume exceeds natural flow at times in the Oldman River Basin, which means that during low-flow years there may be restrictions on the amount of water that can be taken from the river to ensure the WCOs are met. The total allocation reaches about 70% of the median flow around Lethbridge.¹² Consequently, applications for any new water withdrawals from the Oldman River Basin are not being considered unless the applications fit within the purposes specified in the Water Allocation Policy for Closed River Basins in the SSRB.¹³

Water availability in the Oldman River Basin

Sunny Farms receives irrigation water from the LNID. In 2001, the LNID diverted 89.2% of its water licences on the Oldman River¹⁴ as it was a record dry year, and one of several consecutive dry years. Irrigation accounts for 87% of allocations in the Oldman River Basin, with water management and commercial purposes accounting for an additional 4.2% and 3.7%, respectively. The City of Lethbridge is upstream of Sunny Farms. The LNID diversion for the LNID water supply (Sunny Farms' water source) is upstream of the City of Lethbridge. The LNID diversion is downstream of the Oldman Dam, which provides a measure of drought mitigation for water supplies on the Oldman River. However, trends for the Oldman River are showing significant decreases in annual, late summer/fall, and early spring streamflows.¹⁵

Sunny Farms upgraded to wheelmove irrigation from flood irrigation 15 years ago and realized a large savings in water use, which eventually helped to pay for the new infrastructure. Now the reliability of

¹² See <https://open.alberta.ca/publications/south-saskatchewan-river-basin-water-allocation>

¹³ See <https://open.alberta.ca/publications/water-allocation-policy-for-closed-river-basins-in-the-south-saskatchewan-river-basin>

¹⁴ See https://www.lnid.ca/2017_lnid_annual.pdf

¹⁵ See <https://oldmanwatershed.ca/publications-list/state-of-the-watershed>

the wheelmove system is failing, and new center pivots and pipelines represent major investments. Some neighbouring farms are also considering upgrading to center pivots.

Sunny Farms' stakeholders in the Oldman River Basin

Water conservation and water use efficiency are important to the LNID because in dry years a large portion of its licence is used to supply water to irrigators and other water users (e.g., in 2001, LNID diverted about 90% of its allocation). The LNID is also concerned about runoff quantity and quality entering the open channel delivery system.

In 2011, as part of the Integrated Watershed Management Planning process, the OWC identified eight priority goals for the watershed:

1. Improve the understanding and strengthen the commitment of residents to the health of the Oldman watershed.
2. Optimize the availability of water for the natural ecosystem while supporting the social and economic needs of the community.
3. Manage and protect the integrity of headwaters and source waters.
4. Identify and prioritize thresholds to manage threats and impacts on terrestrial and aquatic habitat.
5. Understand groundwater and how it interacts with surface water.
6. Identify water quality outcomes and assess factors impacting them for adaptive watershed management.
7. Prevent and control invasive species.
8. Understand the status and implications of emerging contaminants.

Sunny Farms is particularly interested in whether goal number 2 might have a negative effect on its operations. Its producer association, the PGA, is committed to maintaining a successful and sustainable potato industry in what can be a water scarce area. Wetland conservation and restoration in the watershed is of interest to AEP.

Jagged Edge Farms is a neighbouring farm that has been using flood irrigation for 75 years and is concerned about water supplies. Specifically, this operation is concerned about being able to apply enough water to future corn and potato crops because there have been so many dry summers that flood irrigation is not yielding the results the farm would like to see.

3.2 Case study Step 2: Building the business case for water stewardship for Sunny Farms

Throughout the process of setting the watershed context and engaging with stakeholders (i.e., the OWC, the PGA, the LNID, AEP, and Jagged Edge Farms), Sunny Farms identified several risks and some opportunities that are relevant to its specific operation. As part of the next step, watershed risks and opportunities would be discussed with stakeholders to identify any shared water challenges and

opportunities to collaborate with other groups to reduce risk to their operations and improve the watershed.

What will Sunny Farms do to mitigate these water risks and capitalize on these opportunities?

Sunny Farms recognizes that the risks and opportunities identified through setting the watershed context (Table 2) are complex and not yet defined in the context of its operation. Sunny Farms decided that working through the water stewardship framework for agri-food in Alberta (illustrated in Figure) would be an effective way to understand and define the risks and opportunities and address them through specific actions. The business case for Sunny Farms will focus on the cost of working through the framework and on expected benefits to the operation. Identifying specific actions for addressing risks and capitalizing on opportunities will form part of the water stewardship plan, as will individual cost-benefit analysis on those actions. The decision to proceed with some or all of the actions in the plan could be based on an updated business case that includes more detailed estimates of cost and benefits to Sunny Farms.

Table 2 Risks and opportunities for Sunny Farms in the context of the Oldman River Basin (List not exhaustive, for example purposes only).

Potential risks to Sunny Farms	Potential opportunities
Future low flows (changes in natural flow)	
No additional water being available for growth through a new allocation	
WCOs in place for the Oldman River Basin cause limits in water withdrawals if those minimum WCO flows are not met	The Oldman Dam is a form of risk mitigation, as is being part of the LNID as they have very senior licences and good infrastructure. However, putting in a pivot is a significant opportunity to reduce water use and pumping costs.
The wheelmove irrigation system reliability is failing, and new center pivots and pipelines are major investments	
Decreased irrigation water quality from runoff into the canals upstream of Sunny Farms	Collaboration between regional partners such as municipalities and irrigation districts to implement long term stormwater management strategies for new and existing development
	Wetland on Sunny Farms property could be eligible for a wetland compensation project with DUC
	Increase brand value of Alberta potatoes by being leaders in water stewardship

How much will it cost for Sunny Farms to advance water stewardship in its operation?

Sunny Farms decided to commit 40 hours to developing its water stewardship plan over the next year. Additional actions for addressing risk and capitalizing on opportunity in the more detailed plan will have a separate cost-benefit analysis. When making the decision to commit resources to water stewardship, Sunny Farms considered that the cost and effort associated with developing the water stewardship plan would be equal to or less than the cost and effort associated with potential lost income due to multi-

year water shortages, a high likelihood and high consequence risk identified for the operation while setting the watershed context.

How will Sunny Farms measure the results of its efforts to advance water stewardship?

In this simplified business case, Sunny Farms is looking at potential results of investing in a water stewardship action plan. The simplest metric to track performance against the commitment to develop a plan is the presence of a water stewardship action plan at the end of a year, with specific actions for advancing water stewardship and a cost-benefit analysis for each. This analysis can be used to update the business case and rationalize implementation of specific actions.

Sunny Farms is also interested in tracking metrics that relate to its business outcomes, such as profitability, size and growth of the business. As it works through the steps of the framework and develops specific actions, Sunny Farms will consider how the actions could impact business outcomes to ensure a worthwhile investment in water stewardship. When these steps were completed, Sunny Farms decided it was worth the investment to develop a water stewardship plan.

3.3 Case study Step 3: Applying the framework for Water Stewardship to Sunny Farms

The framework starts with gathering and understanding information about the site, the relevant stakeholders, and the watershed. Much of this information was collected by Sunny Farms while setting the watershed context, but some gaps remained to be filled, especially with respect to data from its own site. Given its limited capacity, Sunny Farms chose to focus on certain elements of the framework that would inform actions to address the risks and opportunities identified in the business case.

Water stewardship action plan

Table 3 Sunny Farms Water Stewardship Action Plan Rev.01

Objective	Target	Metric(s)	Action	Cost/Benefit to Sunny Farms	Benefits to shared water challenge(s) within the watershed context
Participate in wetland compensation program	Meet with DUC to initiate wetland compensation program by July 2019	Meeting booked with DUC Presence of Agreement with DUC	Find local DUC representative and book meeting	The DUC compensation program requires minimal time investment by producers, while the benefits are increased revenue for the next 10 years	Contribute to restoring riparian health in watershed; overall increase in watershed surface water quality; contribute to restoring ecosystem health and biodiversity; increased social licence of agriculture to operate in wetland rich areas
Reduce on-farm irrigation water consumption	Upgrade to center pivot at the same time as Jagged Edge Farms	Percent increase in water use efficiency over time Water use per unit crop yield	Initiate installation of center pivot	By upgrading at the same time, both farms will save 8% on installation costs. Benefits to Sunny Farms: reduction in water use and costs of pumping; more reliable yield; access to grants through LNID for on-farm irrigation equipment upgrades	Supports LNID water conservation priorities and could help the watershed meet WCO during low flow years; OWC asked to do a story on their farm for the newsletter and how their actions support OWC goals 1 and 2, furthering public education about ongoing water stewardship in agriculture and recognizing accomplishments; increasing brand value of Alberta potatoes by being leaders in water stewardship

3.4 Case study Step 4: Benefits and opportunities realized from implementation of water stewardship plan at Sunny Farms

Implementing a water stewardship plan for Sunny Farms led to many benefits and opportunities that created value for the farm and the broader watershed. Some of these benefits were not quantified, but Sunny Farms did adopt two metrics to quantify water use efficiency in relation to profits and crop yields:

1. Water use per unit crop yield
2. Percent increase in water use efficiency over time

The metrics were obtained from sources that had already developed them (see Appendix A5 for other metrics). Their use enabled Sunny Farms to understand financial savings from water use efficiencies and include those savings in the economic analysis of the proposed changes (e.g., maintenance of old irrigation equipment, increased sales from increases in yield, reduced pumping costs).

Another benefit was an enhanced wetland on the farm property that was eligible for a wetland compensation project with DUC. This arrangement was facilitated by AEP staff, who contacted DUC when it was realized that a compensation project was possible at the same time that such a project was being sought as an offset from an oil and gas company developing assets in the region. The project created wetland habitat and brought a new type of environment to the farm that is enjoyed by farm workers.

In speaking with stakeholders, Sunny Farms worked out a deal with a neighbouring farm that saw both operators upgrade to center pivots at the same time and save 8% off the costs of installing the pivots. Also, a reduction in water use resulted in lower pumping costs, more reliable yields, and a quicker-than-planned payoff of the infrastructure. The water efficiency gains from using center pivots helped the LNID, so it provided access to grants¹⁶ and the LNID also benefited from the reduced chance of runoff into neighbouring canals.

The OWC brought positive publicity to the farm, which has resulted in a new contract with a large processing company who heard the story and wanted to source potatoes from Sunny Farms. The OWC was happy to do the story to show how the changes at both Sunny Farms and the neighbouring farm supported OWC's priority goal #2.

Although there were costs to the actions taken, Sunny Farms recognized that, from a business perspective, the benefits to its operations and the watershed were likely to outweigh the costs. In this instance they benefited more than they had expected, as did the watershed.

4.0 Project learnings and next steps

4.1 Key learnings

Several key learnings emerged during the project, from working group conversations and elsewhere:

1. Face-to-face communication is valuable.

- Meeting face-to-face to share knowledge and build understanding of water issues and opportunities across sectors is extremely valuable. This was seen in the two working group meetings, where knowledge and expertise were readily shared among stakeholders in the agri-food supply chain and in the broader watershed. Conversations among stakeholders advanced the development of a common dialogue around water stewardship.
- This was also highlighted during stakeholder engagement efforts, as it was more challenging to encourage participation over the phone or in an email. Face-to-face

¹⁶ The Canadian Agricultural Partnership funding program offers several grants for on-farm irrigation equipment upgrades; see

communication establishes relationships and builds trust. Budgets and timelines can prevent or inhibit this approach with larger groups, even though face-to-face communication has proven to be highly effective. Future efforts of this nature should include resources for in-person meetings and engagement.

2. Cross-sectoral conversations are important.

- Knowledge holders in the agri-food supply chain in southern Alberta may not be connected, and this siloed effect can limit opportunities that might be generated through cross-sectoral conversations. Project working group meetings allowed for connections to be made between different groups from inside and outside the supply chain (e.g., WPACs and crop associations).

3. Water stewardship is a shared responsibility.

- Water stewardship in agriculture and sustainability of the industry cannot rely solely on one member of the supply chain, such as producers, to act to benefit the entire watershed. Implementers in the agriculture sector are crucial, but they cannot and should not bear the entire cost of stewardship.

4. Common dialogue makes for positive change.

- Risk (e.g., regulatory, reputational) can be mitigated in part by establishing a common dialogue among stakeholders in a watershed. Having stakeholders in the same room creating a common dialogue promotes development of cross-sectoral solutions through face-to-face discussions. This was evident in the working group meetings where broad stakeholder discussions started to create such common dialogue around water stewardship.

5. There is often a disconnect between corporate goals and local needs.

- Corporate sustainability goals are not always written with a local context. Corporations often have company-wide goals that underestimate the value of implementing or supporting work at local facilities. For example, corporate contacts for large food processors that operate in the SSRB were unable to participate or were unresponsive to invitations from this project, although they may have been able to support and advance their corporate goals for water and sustainability by attending the working group meetings. The value and outcomes from local efforts might be small from a corporate perspective, resulting in underestimation of their importance in a local context. In the case of this project, decisions at head office, made with limited knowledge of local operational needs or considerations, may have inhibited participation. Availability of resources to send to meetings may have also been an issue.

4.2 Concluding thoughts and next steps

Water risk is a critical issue for Alberta's crop-based agri-food supply chain and the risks are likely to increase in the future. Proactive and holistic water stewardship can create a competitive advantage by reducing water-related risk, identifying opportunities, attracting investment, and building trust through improved transparency. The water stewardship approach, structure, information, and tools developed through this project and outlined in this report offer a process to respond to water related-risks in a structured and coordinated way. Coordinating the actions and activities of water stewardship implementers while leveraging existing knowledge is critical because of resource constraints often encountered at the implementer level. Promoters will play a significant role coordinating this effort and supporting implementers. Benefits to the sector could be seen if a sectoral water stewardship plan was first developed so that agri-food supply members could adopt similar guidance, leverage collaborative efforts and work from a common platform.

This report has focused on risk mitigation as the primary benefit of implementing water stewardship. To fully develop the business case, more work is needed to determine the costs of engaging in water stewardship and the value derived from it. Tangible benefits will be unique to each implementer in each watershed. This project created a structure for identifying and realizing tangible benefits that can be applied by any implementer in the agri-food sector. The next step involves working through the application of this structure with an implementer to fully develop the business case and identify their unique costs and benefits of water stewardship. WaterSMART is actively engaging potential partners and funders for a water stewardship pilot program that will expand on and refine the work undertaken here.

The goal for the next phase is to work with interested parties in the supply chain to pilot the blueprint for developing a business case and framework for water stewardship. To do this, WaterSMART will continue to reach out to and work with interested parties to:

- Engage the full supply chain to create the cross-sector solutions and discussion leading to opportunities for using technologies that are outside the norm for the agriculture sector.
- Explore additional support that stakeholders in the watershed might be interested in contributing as they see how participating in water stewardship for the supply chain can add value.
- Leverage the learnings and outcomes from the AWF project to pilot developing business cases for and implementation of water stewardship across the supply chain.
- Work with other initiatives (e.g., Environmental Farm Plan (EFP) and Verified Beef Production Plus (VBP+)) to outline how water stewardship fits in and where overlaps exist to harmonize with existing initiatives, where appropriate. This will highlight any additional effort that might be needed if there was a desire or need to implement the framework or work towards certification.

The Agricultural Water Futures Project was enabled through continued and core funding from Nutrien Ltd., and matching funds provided by Alberta Innovates. WaterSMART would like to thank the sponsors

of this work for their financial and in-kind support in helping to advance water stewardship in the agri-food supply chain, to the benefit of all in the watershed.

Appendices

A1. Connections between the agri-food value chain and water stewardship

This diagram begins with the agri-food “Supply chain member,” in this case a “Producer,” undertaking the development and implementation of “Water stewardship plan and actions” in the center circle. The outer circle represents the other “Stakeholders/other users of the watershed” that are specific to the “Watershed context,” in this case the SSRB. The stakeholders and other users of the watershed in the outer circle represent the watershed groups, municipalities, irrigation districts, and others located in the SSRB.

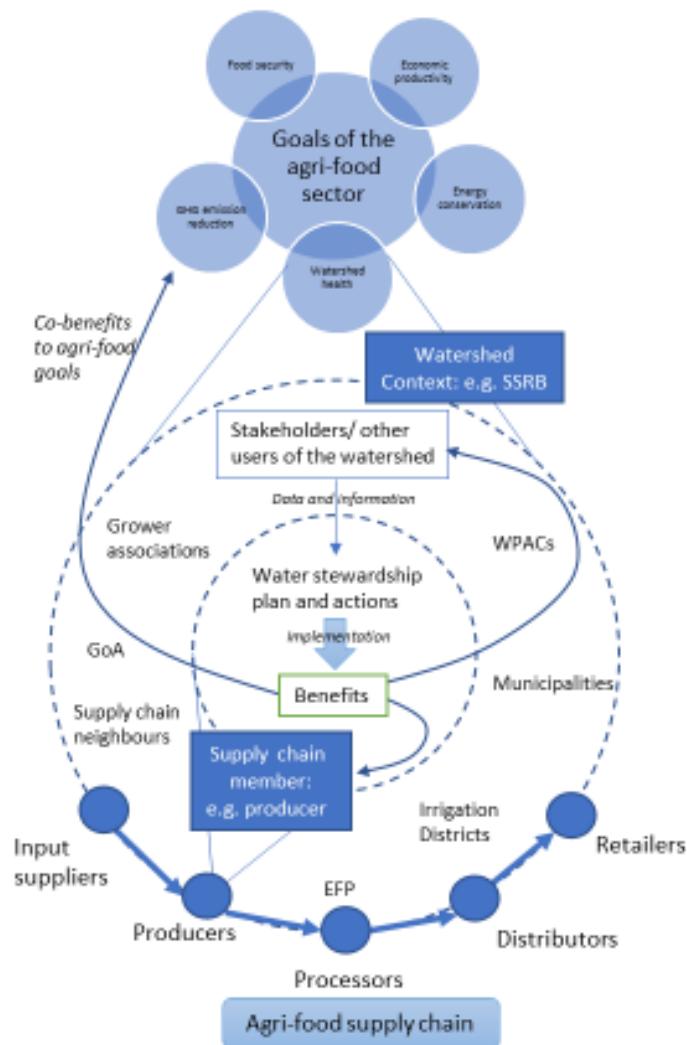


Figure A1.1: Shared benefits to the supply chain and the agriculture industry are realized when site-level water stewardship plans, and actions are implemented in the watershed context.

Since the SSRB is a very large watershed, not all stakeholders are listed in this diagram but a subset that is relevant to the individual producer would be developed as part of the process described in this report. The stakeholders and other users of the watershed contribute to the individual supply chain member's water stewardship plan and actions by providing the relevant "data and information" needed to identify water risks and opportunities that form the basis for the water stewardship plan. By working with other users of the watershed, the supply chain member is more likely to develop and implement actions that produce "Benefits" to their operation as well as the entire watershed. By working with stakeholders in their industry, the supply chain member can help further overall goals of the agri-food sector through their water stewardship plan and actions by seeking out opportunities to mitigate water risk that also benefit their sector. For instance, a water stewardship action that ensures a producer has access to a reliable, long-term water source could also be considered an increase in food security, which is a goal of the agri-food sector. If multiple producers are pursuing the same water stewardship action, such as access to long-term reliable water source, the collective benefits of increased food security will have an even greater impact on the overall agri-food sector.

A2. Participating organizations

Below is a list of organizations that attended the working group meetings and/or were interviewed as part of this project to help inform the final deliverables.

Participating organizations
Agricultural Research and Extension Council of Alberta
Agriculture and Agri-Food Canada
Alberta Agriculture and Forestry
Alberta Barley and Wheat
Alberta Cattle Feeders' Association
Alberta Innovates
Alberta Irrigation Districts Association
Alberta Pulse Growers
Alberta Sugar Beet Growers
ALUS Canada
ATB Financial
Bow River Basin Council
Canadian Canola Growers Association
Canola Council of Canada
City of Lethbridge
Cows and Fish
Crop Sector Working Group
Ducks Unlimited
Eastern Irrigation District
Grace Feedyards
Innotech Alberta
Lamb Weston
Nutrien
Oldman Watershed Alliance
Olds College
Potato Growers of Alberta
Red Deer River Municipal Users Group
Red Deer River Watershed Alliance
Sundre Petroleum Operators Group
WaterSMART Solutions

A3. Data and information sources to support water stewardship in the agri-food supply chain

The two tables below were developed from feedback gained in the workshop on November 29, 2018 with working group participants. The gaps (Table A2.2) identified are not significant enough to stall water stewardship efforts but filling them would be beneficial, as noted by stakeholders in the working group meeting.

Table A3.1: Data and information to support water stewardship and potential sources.

Data/ information topic	Potential source(s)
Status of the watershed	State of the Watershed Reports, snowpack data, historical water data, models that predict water supply and demand, Water Management Plans. This would be available via local WPAC websites, and through the AEP website.
Information on farm water management so that efficiency can be measured and tracked	Individual farm operators may know this information and in some cases it may be tracked as part of an EFP.
Groundwater data/ information	Local groundwater studies might be available, also regional maps and information, including the Groundwater Observation Well Network available through AEP. Some municipalities hold this information.
Evaluation of water-related trends	Peer-reviewed literature, academic research, Environment Canada data sets and the Alberta Climate records
Knowledge of which watershed you are in	Alberta rivers website, and local WPAC websites
Water use and efficiencies of the entire sector	AIDA
River or water body data	Alberta rivers website, and AEP's Environmental Monitoring and Science Division
Productivity, yield, other industry specific statistics	Industry associations
Water wells and drinking water	Alberta Health, Alberta Water Allocation Viewer
Soil and land-use data (how land practices and soil contribute to water quality)	Academic research, AGRISID database, ALCES landscape tool, ABMI land cover data sets
Invasive species data	Geographically and temporally sparse, best available information would be through Alberta Agriculture and Forestry or AEP websites
Climate change	Prairie Adaptation Research Collaborative (PARC)

Table A3.2: Gaps in the data and information available to stakeholders

Gap	Comments
Understanding of what the customer is willing to pay for stewardship	Information to understand how water stewardship actions within the supply chain are paid for by consumers.
Determining how the value-added product can be segregated in the supply chain	This information would be needed if a product grown under a water stewardship banner commanded a market premium, but could it be segregated in the supply chain?
Understand who owns the data, how do I track it, use it, where does it go, and why?	This information relates to data collected in relation to farms, especially on farm data, and should be understood and explained prior to data collection and use.
Understand what motivation or incentive there is to do water stewardship differently than is currently being done	This should be explored and communicated to implementers and stakeholders. Overall benefits can be communicated (e.g., increased profitability, return on investments, market access), and more specifics like support from NGOs (e.g., Cows and Fish can provide scientific expertise and funding to help implementers).

A4. Water-related risks and opportunities in the agri-food supply chain in Alberta

This information is based on feedback provided in the workshop on November 29, 2018 with working group participants.

Water-related risks	Water-related opportunities
Paperwork fatigue from members of the supply chain from yet another good thing to do but requires more paperwork to be done	Streamline water stewardship into existing efforts such as EFP and VBP+.
Irrigation water to grow more food or higher value crops in the SSRB	Look at additional storage opportunities and on farm efficiencies to be able to do more with less.
Changes in regulations on water, water use, water quality, and crops	Effectively engage all stakeholders through water stewardship framework to communicate value and needs of water use for agriculture.
Not having cross-sector conversations to advance interests	Host meetings involving different players of the agri-food sector, including other relevant stakeholders (e.g., WPACs) to discuss water issues.
Inefficiency and miscommunication with government	Enable achievement of regulatory objectives through individual, regional and collaborative efforts instead of prescriptive rules that may vary with regional directors. This will unleash innovation and create solutions that provide benefits for all.
Water use/ reuse	Facilitation and/or financial help from government or others to implement challenging or expensive BMPs.
Flood/ drought	Facilitation and/or financial help from government or others to implement challenging or expensive BMPs.
Contamination of groundwater	Facilitation and/or financial help from government or others to implement challenging or expensive BMPs.
Reciprocity – manage your own operations so that your neighbour's water is clean	Have conversations with neighbours, other water users in the watershed.
Climate change	Effectively engage all stakeholders through water stewardship framework to understand the impacts of potential changes in climate for a watershed, and work with stakeholders to develop and implement appropriate adaptation measures.
Reputation (social licence)	Tell the story of production practices and current stewardship activities. Garner recognition that Canada is a world leader in food quality and food safety.

Water-related risks	Water-related opportunities
	<p>Education and training to enhance the knowledge base related to management of water and understanding of water stewardship.</p> <p>Third party certification for transparency and external validation.</p> <p>Leverage relationships and trust with WPACs, ENGOs, etc.</p>

A5. Example metrics for water stewardship in the agri-food supply chain in Alberta

List of metrics discussed by workshop participants on November 29, 2018.

NOTE: Metrics are numbered for reference only.

List of metrics for water stewardship in the agri-food supply chain in Alberta	
<ol style="list-style-type: none"> 1. Total water applied to crops throughout growing season 2. Number of irrigation events 3. Water applied vs. crop need 4. Soil moisture at planting 5. Presence of irrigation schedule 6. Water use per unit crop yield 7. Water footprint (liters x kg production) 8. Water use per unit food processed 9. Water use per year on waste disposal 10. Water scarcity (water falling on crops per year and expected change in rainfall due to climate change) 11. Percent increase in water use efficiency over time 12. Number of extreme events per year (e.g., flooding) 13. Irrigated water use vs. watershed water availability limits (allocated volume limits or river flows) 14. Number of water quality samples taken per year 15. Unit chemical/ L water (e.g., grams of nitrogen per litre of water) 16. Change in water quality parameter of interest over time due to change in practice (e.g., show less degradation of water quality over time after implementation of a BMP such as use of low-phosphorous fertilizer) 17. Number of emergency events per year (pesticide spill, herbicide spill) 18. Number of abandoned wells 	<ol style="list-style-type: none"> 19. Expected change in water quality due to climate change for water quality parameters of concern 20. Size of buffer zone surrounding water body 21. Number of water quality violations per year 22. Number of water volume violations per year (i.e., number of times the allocated amount was exceeded) 23. Price of water 24. Cost of regulatory compliance or cost of service charges 25. Number of stakeholders engaged 26. Number of viewers on sustainability page on website 27. \$ spent on shared infrastructure repairs (e.g., dams, pipelines, canals) 28. Number of watershed meetings attended 29. Number of stakeholder complaints (emails, phone calls, etc.) 30. Change in government or other funding over time for water-related projects (e.g., for irrigation infrastructure improvements) 31. Existing intact wetlands (area and total number) 32. Drained wetlands (area and total number) 33. Restored wetlands (area and total number) 34. Riparian Health Assessment Score 35. Water turbidity 36. Crop water export 37. Exceedances and violations, by how much 38. Percent of consumers aware of water stewardship efforts pursued in operations 39. Water supply deficit forecast

Sources: Environmental Farm Plan, Cool Farm Tool, AWS Standard, Field to Market, comments from the Working Group meetings.