OLDMAN WATERSHED PLANNING PRIORITIES:
Process Summary and Recommendations

OLDMAN WATERSHED COUNCIL

watershed management – watershed health

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ACKNOWLEDGEMENTS

After completing the State of the Watershed Report and Phase 1 of the Integrated Watershed Management Plan (IWMP), the Oldman Watershed Council (OWC) has continued on its journey to further understand and set targets for the watershed, based on sound science, social desires and economic considerations. During this second phase of the planning cycle, we heard from a group of well-informed and enthusiastic stakeholders who formed the Core Team. The objective of this Team was to develop a set of recommendations for planning priorities in the watershed. With these recommendations, the OWC Board of Directors will know how to proceed.

We would like to thank all of the volunteers who participated in this process; we are always amazed at the extensive knowledge that you possess and the tremendous enthusiasm that you demonstrate. First, the OWC IWMP Working Team, whose members spent countless hours discussing, planning and adapting to a 'risk and priority setting' process that, to be honest, none of us had any previous experience with; second, the OWC Board of Directors who gave initial direction and asked questions along the way; and third, the OWC Executive who spent additional time with the IWMP Working Team providing support, direction and problem-solving strategies that kept the 'wheels in motion'. And last, but certainly not least, our sincere thanks to the Core Team. Without their contributions, challenging questions, adaptability, and strength in passion, this process would not have yielded the robust data or stimulated the discussions that it did. The IWMP Working Team and the Oldman Watershed Council Board of Directors are grateful for your commitment to, and enthusiasm for, this important work.

As co-chairs for Phase 2 of the IWMP planning process, we recognize the value of this stage as both a great learning opportunity and a rewarding experience. Our efforts will now focus on the next Phases in the ongoing iterative planning process; implementation, evaluation and adaptation.

There is no question that the landscape is changing. The support of a strong community of passionate, enthusiastic, knowledgeable and dedicated people will help to ensure that future generations have the opportunity to appreciate and prosper in the Oldman watershed.

Cheryl Dash

Stephanie Palechek

Watershed Planning: Our Community Vision

"A healthy, resilient watershed where people, wildlife and habitat thrive."

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THE CORE TEAM

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Absent – Ron McMullin, Lenze Kuiper, Ian Dyson, Bunny Mah, Sarah Elmeligi, Kevin France, Kimberly Lyall, Marc Sabourin

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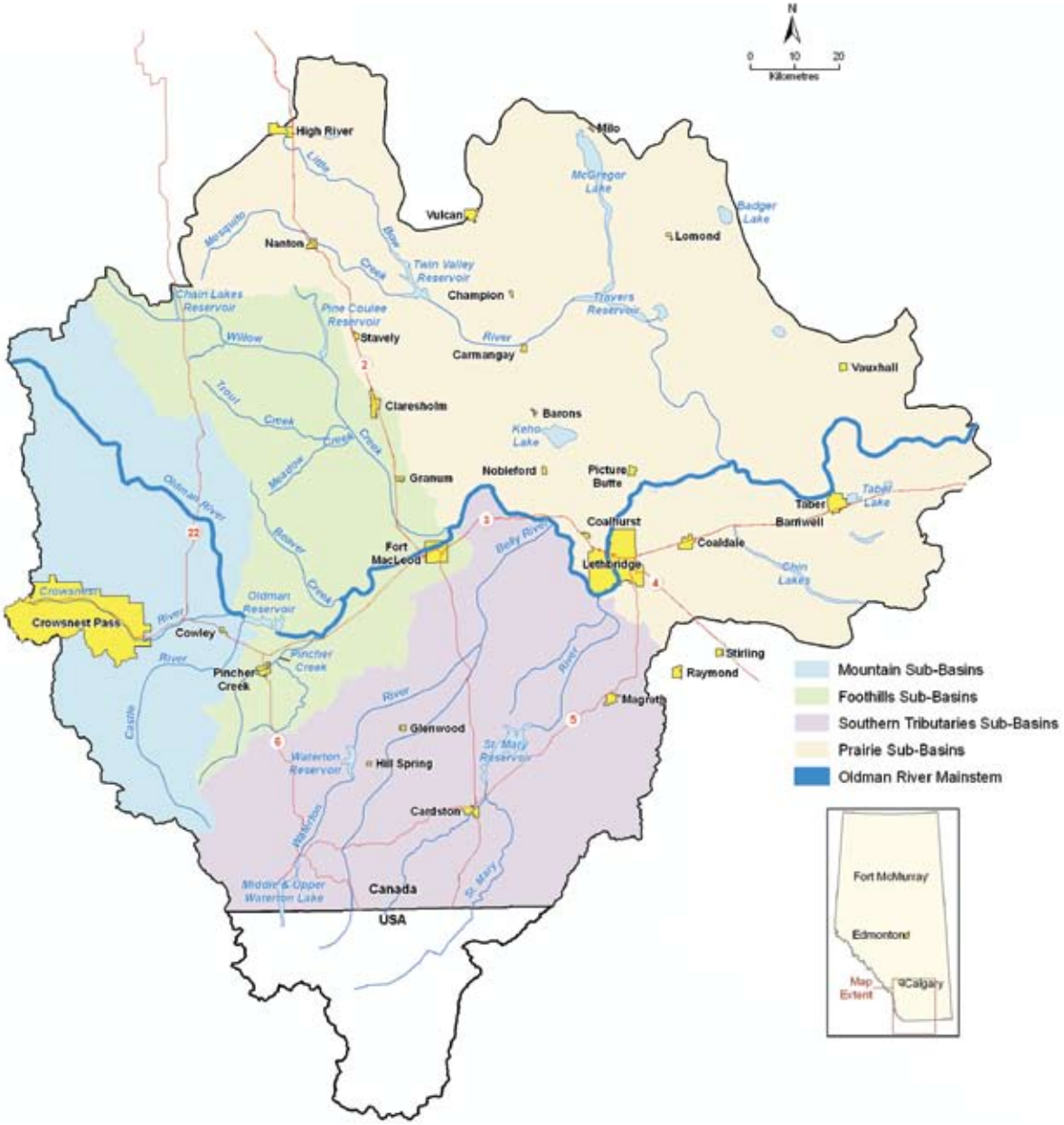


BACKGROUND

WHAT IS THE OLDMAN WATERSHED COUNCIL?

The Oldman Watershed Council (OWC) is a not-for-profit organization working in partnership with communities and residents to improve the Oldman watershed through sustainable water management and land use practices. Being one of eleven Watershed Planning and Advisory Councils (WPACs) in the province of Alberta, the OWC is working toward fulfilling the mandate of the *Water for Life* Strategy by providing recommendations and advice to the Alberta Government, and residents in the watershed, on issues related to land and water management.

The Oldman watershed is located in the southwest corner of southern Alberta. Its boundaries reach west along the border of British Columbia, north to High River, stretching east of Taber, and reaching across the 49th parallel into Montana, USA. The size of the watershed is approximately 25,000 km^2 and covers high alpine landscapes, rolling foothills, lush native grasslands, and productive agricultural land. The City of Lethbridge and several towns and hamlets are home to approximately 200,000 people within the watershed.

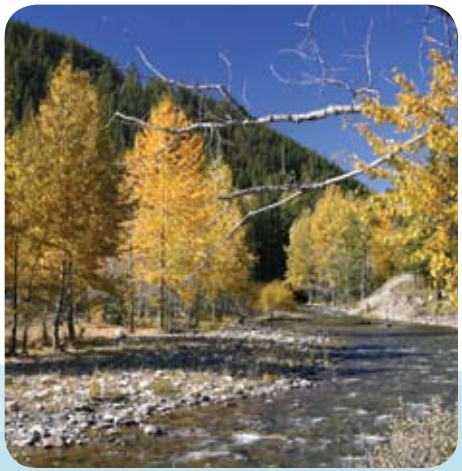
The OWC supports the responsible management of the watershed, while dealing with the challenges of a growing population and a vibrant economy, by partnering with stakeholders, planning for the future and adapting to the needs of the local communities.

OWC MISSION STATEMENT

To maintain and improve the Oldman River Watershed through partnerships, knowledge, and the implementation and integration of sustainable watershed management and land use practices.

OWC GOALS

- To understand our watershed.
- To keep residents well-informed and actively engaged.
- To define desired outcomes together with stakeholders that will form the basis of the Oldman Integrated Watershed Management Plan.
- To build capacity and commitment to achieve defined outcomes.
- To adopt practices that will benefit the health and function of the watershed.



INTEGRATED WATERSHED MANAGEMENT PLAN

There are increasing demands being placed on the landscapes in the Oldman watershed and the Alberta economy is driving competition for resource access and use. Various levels of government responsible for the management of these lands and resources are being challenged to meet and/or manage these demands while protecting the integrity and needs of the watershed.

With this complexity of issues evolving in the watershed, the OWC has set in motion a process to advance the understanding of watershed condition and enable its partners to make informed decisions and take responsible action.

Consequently, a logical and outcome-based environmental performance system has been developed and incorporated into the OWC Integrated Watershed Management Plan (IWMP) process.

The OWC IWMP process is a long-term commitment to the watershed and the OWC is in it for the duration. Each phase in the process will build off of, and interconnect with, the existing information gathered, while having the ability to adapt to changing priorities and issues in the watershed.

The key to success will be the identification and affirmation of clear goals or outcomes to be achieved in the watershed. In order to achieve these outcomes, the OWC must take steps to: understand the watershed condition; recognize past, present and future human demands; consider the values of basin residents; and, design an achievable implementation plan. The results will substantiate the need to make changes in the watershed and help to realize the goals of the Government of Alberta *Water for Life* Strategy.

The OWC has made great advances through this IWMP process and has achieved the following major milestones toward understanding the watershed and community needs:

- IWMP Phase 1: Qualitative Outcome Statements (2010)
- IWMP Phase 2: Risk and Priority Setting (2011)
- State of the Watershed Report (2010)

After the key priorities have been confirmed and a 10-Year Planning Framework is in place, the detailed outcome, strategy and implementation work begins.

What is an Integrated Watershed Management Plan? (USEPA, 2005).

- A tool in the integrated water management toolbox.
- A path from goal setting to issue identification leading to issue resolution.
- A philosophy that guides a community.
- The PLAN is not an end product – it is collaborative, iterative and adaptive to changing needs and conditions.

Planning Vision Statement

A healthy, resilient watershed where people, wildlife and habitat thrive.

Qualitative Outcome Statements

Environmentally aware, responsible and motivated watershed residents

A safe and secure water supply

- Clean ground and surface water, for safe drinking and healthy ecosystems
- Naturalized river flows for healthy aquatic and riparian ecosystems
- Aquifers are understood and sustained

Balanced allocations and wise management of water

- Efficient water use through improved urban, agricultural, and industrial conservation practices

Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas

- Reduce invasive species

Land managed for multiple-use with minimal impact on natural, cultural and historical assets

- Agriculture land base maintained
- Well planned, minimal impact developments along waterways
- Population growth that compliments watershed function
- Protects headwaters
- Low impact recreational public access to waterways and river valleys
- Responsible tourism and recreation opportunities

UNDERSTANDING COMMUNITY NEEDS

During Phase 1[1] of the IWMP process, the OWC obtained a sampling of social perspectives on how residents wanted to see the watershed look 10, 20 and 50 years from now. Through a series of one-on-one interviews, surveys, workshops, and discussions, information was gathered, sorted, and analyzed by the Phase 1 consultant, a social scientist.

The result of this work, with additional input from watershed residents, was a community Vision for the watershed and development of a set of qualitative Outcome Statements. These results recognize that by improving communication and awareness and dealing with assumptions and motivations, change strategies can be developed to address the complex cumulative issues in the watershed.

Residents who wish to be involved are empowered and become engaged, both individually and collectively, in their communities. These residents recognize that high-quality water is a necessity, and adequate water availability to sustain and enhance important ecosystem functions and the important services they provide – quality of life, recreational opportunities or economic benefits – is paramount.

UNDERSTANDING THE WATERSHED

The State of the Watershed (2010)[2] report provides a snapshot of the entire watershed under current land use and hydrologic conditions. In addition to current data and information, the report identifies areas of knowledge gaps, future trends and developments, and provides recommendations for action and best management practices. While preparing the State of the Watershed (SOW) report, it became increasingly apparent that the Oldman watershed is a highly influenced and complex environment.

As the Oldman watershed spans the prairies, foothills and mountain regions of southwestern Alberta, the report divided the watershed into four sub-basins (Mountain, Foothills, Southern Tributaries, and Prairie) based on natural drainage patterns and water management history. A fifth sub-basin was also identified, the Oldman Mainstem, because it is influenced by water in the other sub-basins.

The SOW report is a critical element in the overall planning process as it helps us understand the current health of the Oldman River watershed; ensures collaborative and educated decision-making; and identifies where future research is required.

To provide a brief background and additional perspectives on the information in the SOW report, a SOW Review Sub Team was quickly brought together through the OWC Watershed Science Team. Members of the OWC Board of Directors, State of the Watershed Team, Integrated Watershed Management Plan Working Team, and the Watershed Science Team reviewed the SOW report and provided comments on priorities, themes, and direction. This information was presented to the Core Team for consideration in their discussions. The summary can be found in Appendix B.

Three sets of indicators were chosen for reporting in the SOW to better understand the cause and effect relationship between human activities on the landscape and the environmental response to those activities. The chosen sets of indicators were:

1. Terrestrial and Riparian Ecology – land cover, soil erosion rates, riparian health, land use (linear development and total disturbances).

2. Water Quantity – trends in natural flow, licensed allocation and actual use vs. natural flow, performance in meeting instream objectives and water conservation objectives in recent years, and irrigation and municipal water use efficiency.

3. Water Quality – nutrients (nitrogen), nutrients (phosphorus), total suspended solids, and fecal coliforms.

Based on an evaluation of the combined rankings of the three indicators, the overall health of the Oldman watershed is rated as "Fair".

1 Results of Phase 1 Research and a Process Summary can be found on the OWC's website at www.oldmanbasin.org.
2 The State of the Watershed (SOW) report and Summary can be found on the OWC's website at www.oldmanbasin.org.

TABLE 1: OVERALL STATE OF THE WATERSHED FOR ALL INDICATORS BY SUB-BASINS

	Sub-Basins					
Indicator	Mountain	Foothills	Southern Tributaries	Prairie	Mainstem	Oldman Watershed
Terrestrial and Riparian	Good	Good	Fair	Poor	Good	Fair
Water Quantity	Good	Fair	Poor	Fair / Poor	Poor	Fair
Water Quality	Good	Fair	Fair	Fair / Poor	Good / Fair	Good / Fair
Overall	Good	Fair	Fair	Fair / Poor	Fair	Fair

The community Vision articulates how we want our future watershed to look; the State of the Watershed report tells us how near or far we are from our community Vision; and, the Integrated Watershed Management Plan will define what we need to do to reach our community Vision.

BUILDING A TEAM FOR PHASE 2

As Phase 1 was brought to a close, members of the IWMP Working Team were given the option to either conclude their volunteer work or carry on with Phase 2. Although several members were unable to commit to the next phase, the remaining Working Team members reconvened and moved on to the next phase in the IWMP process. Several deliverables[3], timelines and products were pulled together to begin Phase 2, the 'Risk and Priority Setting' process.

The IWMP Working Team and the OWC Board of Directors developed a preliminary list of potential participants representing numerous sectors in the watershed. The list was refined with the assistance of the OWC Executive, and letters of invitation were sent out to an initial contact list of 53 stakeholders. Based on response and interest, the final Core Team was formed with 38 members representing a multitude of stakeholders in the watershed.

Phase 2 Core Team members were primed with information in preparation for future workshops.

List of sectors considered for the Core Team:

- Agriculture – Irrigated
- Agriculture – Non-irrigated
- Business
- First Nations
- Health
- Recreation
- Academia/Education
- Industry – Renewable
- Industry – Non-Renewable
- Municipalities
- Provincial Government
- Federal Government
- ENGO's (Environmental Non-governmental Organizations)
- NGO's (Non-governmental Organizations)
- OWC BOD (Board of Directors)

3 The list of products developed by the Working Team and the Core Team during Phase 2 are listed in the Communication Product Table in Appendix C. A CD with all products are available by contacting the OWC.

DECIDING ON THE PROCESS

After completion of Phase 1 of the Integrated Watershed Management Plan (social) and the State of the Watershed report (science), the next logical step was to take a look at risks and develop a set of priorities. It was important at this point for all of the information gathered through the social and scientific components to be incorporated into the process and considered in the decisions with identifying priorities. The Working Team decided on a number of supplemental materials that would be developed for the Core Team to use as reference in their discussions. Some of these products would include:

- Engagement Strategy and Communication Plan,
- Beneficial Management Plan (BMP) Summary,
- SOW Report Review,
- Vision and Qualitative Outcome Summary, and
- Legislative Inventory.

As the Working Team continued discussing the process amongst themselves and with the OWC Executive, they quickly realized that there was an opportunity to take advantage of verified and existing process knowledge. The decision was made to use the risk and priority setting process utilized by the Bow River Basin Council. This chosen process would identify the outcomes and associated risks, examine the internal and external controls connected to the risks, and validate priorities and actions.

Now that the general process was confirmed, the Working Team discussed delivery. The OWC Executive felt that keeping the Core Team for more than three or four meetings would be asking too much of the participants. Therefore, three workshops were decided upon. At the request of the OWC Executive, Workshop 1 would include the OWC Board of Directors and the Core Team, in a discussion on consensus decision making. An additional component of Systems Mapping was added to prime the Core Team for the discussions and work to follow. Workshops 2 and 3 were used to assess risk and identify priorities following the risk management process outlined by Alberta Environment and utilized in the Bow River Basin Council's process. A fourth workshop was added once it was realized that further refinement of the information and a transition of information to the OWC Board of Directors was needed.

This summary report for Phase 2 will consolidate all of the Core Team discussions identifying risks and priorities for the Oldman watershed. The OWC Board of Directors will use this information to build a 10-Year Planning Framework for the Oldman Watershed Council.

Once the IWMP Core Team membership was confirmed, a poll was circulated to all members to determine the best days to hold the workshops. The following dates were chosen based on the availability of the majority:

Workshop 1 – October 1, 2010

Workshop 2 – October 29 & 30, 2010

Workshop 3 – November 19 & 20, 2010

Workshop 4[4] – February 2, 2011

The Working Team coordinated the workshop logistics, which included booking the facilities, provision of food services, and development of workshop materials.

Workshop 1 was held at the Windy Rafters Barn

For the first workshop, the Working Team booked the Windy Rafters Barn, located near Fort Macleod. For the other two workshops, Lethbridge College was chosen for its convenient location and amenities.

Since the Core Team membership represented a diverse group, a binder of background information was compiled and provided to each member as a reference package. The complete list of binder contents is provided in Appendix C.

With the limited 'horse power' and expertise in the risk management process, a consultant was hired to facilitate the workshops and gather the information. Alberta Environment Risk Management Section expertise was also used to review the consultant's proposals, guide the process and answer questions along the way. The Risk Management Prioritization Flow Process developed by Alberta Environment, and used by the Bow River Basin Council, can be found in Appendix D.

seawa
YOUR CONNECTION TO THE WATERSHED
South East Alberta Watershed Alliance

The South East Alberta Watershed Alliance (the downstream WPAC) was invited to participate in the risk assessment and planning priority workshops to foster communication and understanding of upstream issues and priorities.

4 Workshop 4 was added after the completion of Workshop 3 to refine input and transfer the information to the Board of Director's who would be tasked with finalizing a planning framework.

WORKSHOP 1 – SETTING THE FOUNDATION

OBJECTIVES AND INTRODUCTIONS

As discussed earlier, Workshop 1 was a one-day event designed to set the foundation for the upcoming workshops. The OWC Board of Directors was invited to this workshop primarily to participate in the consensus building session and connect with the Core Team. The objectives of the day were to bring the Core Team members together to initiate:

- Relationship Building
- Consensus Building
- Systems Mapping

The first workshop began with welcome messages to the Core Team participants from the Phase 2 Consultant, the OWC Integrated Watershed Management Plan Working Team and the OWC Board of Directors. Although some Core Team members knew one another a large majority did not, therefore a team-building exercise was used to introduce individuals to each other and the group.

Each Core Team member was paired off with someone they did not know and the two interviewed each other asking the following set of questions:

1. If you were not here today, where would you choose to be?
2. What are three things that are important to you?
3. What do you hope to achieve through your work on this team?

When the Core Team reconvened, each member introduced his or her partner to the larger group. This exercise helped put the group at ease and all participants learned something about each other.

CONSENSUS-BASED APPROACH

A consensus-based approach was selected for this Phase of the Integrated Watershed Management Plan process to allow for open communication amongst the Core Team. It was important that the Core Team members could openly express their ideas, opinions and concerns about the Oldman watershed. This decision-making approach encouraged participation by all Team members and allowed the larger group to work together to determine which issues and concerns were the most significant.

The Phase 2 Consultant stressed that effective consensus agreements must include:

1. Self-management,
2. Use of excellent problem solving skills, and
3. Use of a consensus process for the agreement.

The Core Team was introduced to the Key Strategies for Reaching Effective Consensus Agreements:

1. Participants could have different approaches to negotiating or working through difficult situations.
2. Self-management is being able to manage your own reactions and respond appropriately to others.
3. Communication is fundamental to problem solving.
4. The group needs to understand that participants will have different communication styles.
5. Building agreement requires listening for and understanding interests, self-disclosure and assertive skills.

The consensus process would help to move the group toward agreement. It includes the following elements:

1. Establish a positive environment,
2. Determine the issue or concern,
3. Create an understanding of the underlying interests and background to the issue, and
4. Create and finalize agreement between the Core Team members.

The Core Team agreed to use an interest-based approach for achieving consensus. The following list of principles were created and endorsed by the Core Team and applied throughout the workshop process:

- There is a clear outcome that has value and is used.
- The process results in a clear plan with assurance of implementation.
- The process is purposeful.
- The outcome is owned by southern Albertans.
- Discussion is based on good communication.
- There is clear definition of the scope and the givens.
- There is balance between the groups represented at the table.
- Clarity about potential outcomes.
- Identify what is doable.
- Record process so it is defendable.
- Everyone is able to express opinions; get understanding of points of view.
- The process is efficient.

What is Consensus?

Consensus is general agreement among members of a group, so they can support the decisions they have achieved. Consensus does not mean everyone agrees to the same extent, but it does mean that all can support decisions without compromising important needs and values. Through the process of reaching consensus, people gain a better understanding of the concerns of others, explore a wide possibility of outcomes and gain a greater sense of trust. Most issues are resolved with easy accord. However, when values and interests differ achieving consensus agreement can be challenging (McNeil, 2010).

SYSTEMS MAPPING

The Systems Mapping exercise was used to get the Core Team to explore connections throughout the watershed and start thinking about risks and priorities. Learning how to explore and develop connections between issues and concerns became an important process during future workshops.

What is Systems Mapping?

A systems map represents a system, problem, issue, or challenge characterized by complex interactions. It's a way for a group of people to gain insight into problems or issues. A system is composed of any number of elements, anyone or thing that makes up the system. The map identifies this set of elements and the relationships or connections between those elements. It's a snapshot of the system developed from the thinking and discussions of a group of people (Woodward, 2010).

During this part of the workshop, participants were asked to link themselves with one of the four sub-basins identified in the SOW report according to their interest, knowledge and passion. Most of the groups were equally distributed, but a little self-sorting to even the groups was required. Working Team members were assigned to each of the groups to encourage discussion and take notes.

The first exercise started with each member of the Core Team telling a story, which was intended to describe their personal connection to the Oldman watershed. The goal of the story telling exercise was to understand and capture the elements of each sub-basin (Mountain, Foothills, Southern Tributaries, and Prairie) from the perspective of the participants. Participants were asked to respond to the question, "Describe your particular relationship/ understanding of the Oldman Watershed". As participants shared their thoughts, the Working Team captured the information on flip charts in category 'what' (the things in the watershed such as water, ecosystems, land use, etc.), and category 'who' (the people who have an impact on the what) elements of the sub-basin system.

After the story telling exercise, the smaller groups presented their discussion to the larger group. This allowed Core Team members who were not familiar with each sub-basin gain a better understanding of the watershed and the views and priorities of other participants.

The next step involved identifying the relationships between the different elements, the 'who' and 'what' elements of their sub-basin. Unfortunately, due to time constraints, the smaller groups were unable to reconvene and start identifying the relationships between the elements. The final step would have involved identifying leverage points, where attention and resources could be applied. Although incomplete, this exercise allowed Core Team members to begin thinking about the Oldman watershed and discuss elements as a group.

The raw data from this exercise can be found in Appendix E.

The Systems Mapping exercise work was compiled, summarized and grouped by the Phase 2 Consultant under the five qualitative Outcome Statements developed during the IWMP Phase 1 process. This information was then provided to the Core Team at Workshop 2 to be used as a starting place for the risk discussion.

WORKSHOP EVALUATION

After each workshop, the Working Team developed and circulated an online evaluation to the members of the Core Team. The purpose of each evaluation was to learn where clarity was needed and how the Working Team could make improvements for the next workshop. Twenty responses to the evaluation were received from participants of Workshop 1 (65 percent response rate).

Highlights from the Workshop Evaluation:

- Apprehension about the final products and process. Core Team members were unclear on what the end deliverables were and how we would get there. They were also unsure on what their role was in the process.
- The session on consensus provided a good overview of what consensus is but lacked clarity on how it was going to be used in the process. Some participants thought too much time was spent on consensus and that an overview would have been sufficient.
- Participants thought the session on Systems Mapping missed the mark and lacked focus. Some were unsure how this information would be used in the process and thought that it could have been better organized.
- Participants appreciated the introductions at the beginning of the day as they were able to get to know one another.

Lessons Learned From Workshop 1

More time needed to be allocated for group work and presenting back to the group (due to the large size of the Core Team).

Group introductions were important for everyone to meet each other, allowed everyone to learn where the others were from, and understand their point of view.

Ensure that facilitators all understand their role and what needs to be accomplished with an exercise. The lack of direction for the facilitators in the Systems Mapping exercise caused some confusion on what the outcome was for that exercise.

Since the Core Team was unable to reach the end stage of the systems mapping exercise, they were also unable to make the connections needed to understand the watershed and how all of the aspects are connected through relationships.

WORKSHOP 2 – RISK ASSESSMENT AND RISK CONTROLS

OBJECTIVES AND INTRODUCTIONS

Workshop 2 was the start to the risk and priority setting process. The Phase 2 Consultant adjusted the process used by the Bow River Basin Council to meet the OWC's needs and timeline. After reviewing the evaluations from Workshop 1, the Working Team (in consultation with the Phase 2 Consultant) made some adjustments to the process. One key component added to Workshop 2 was a presentation on the planning process and connection to existing planning activities in the watershed.

Workshop 2 objectives allowed the Core Team to build on their introduction to the watershed from Workshop 1 and begin the risk assessment process. The objectives of the two-day workshop were:

- To conduct a risk analysis of the Oldman watershed.
- To identify major risks to the watershed.
- To rate each risk on its degree of impact and likelihood.

Although Core Team members had a better understanding of the OWC IWMP process after the presentation, they were still concerned with how the IWMP would link into the Government of Alberta (GOA) *Land-use Framework* and the South Saskatchewan Regional Plan (SSRP). The Working Team assured the Core Team that they would do their best to relay information through the Watershed Planning and Advisory Council (WPAC) representative to the SSRP Regional Advisory Committee for their consideration.

The Core Team was also concerned that social and economic aspects were not given adequate consideration in this process. The Working Team recognized their concerns and encouraged the Core Team to consider all three aspects (social, environmental, and economic) during their discussions. The Working Team would continue to make the connections to the three pillars throughout the process and in future phases and research.

DAY 1 – RISK ASSESSMENT AND IDENTIFYING RISKS

The first step in conducting a risk assessment is to set Outcome Statements defining what you are trying to achieve. The Outcome Statements developed in Phase 1 of the IWMP process were considered appropriate for this purpose and utilized.

The Core Team was divided into smaller groups and given the IWMP Phase 1 Outcomes and Systems Mapping work completed in Workshop 1. The groups were asked to identify broad sources of risk for each Outcome Statement by answering the question "What can happen that will have a negative impact on reaching these outcomes?".

When reconvened, each of the smaller groups presented their work back to the larger group for discussion. Samples of those results are listed below. The complete set of broad sources of risk is listed in Appendix F.

Sample of Broad Sources of Risk

Environmentally aware, responsible and motivated watershed residents

- Differing views and interests
- Legislation hurdles
- Gap in knowledge/uninformed
- Lack of consistent messaging

Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas

- Lack of baseline data
- Native vs. introduced species
- Impact of actions
- Understanding of costs – social, environmental, economic

A safe and secure water supply

- Headwater protection
- Population growth
- Political factors
- Lack of resources

Balance allocation and wise management of water

- Entrenched users
- Competing users
- Groundwater and aquifers
- Understanding values

Land managed for multiple use with minimal impact on natural, cultural and historical assets

- Lack of enforcement/capacity/resources – incentives to better manage land
- Varying perceptions on what is impacted landscape
- Jurisdictional cooperation
- Cumulative effect

After the Core Team presented what they identified as the broad sources of risk, the Phase 2 Consultant provided a definition of "what is risk" and an explanation of how the next step in the process, the risk analysis, would be carried out.

The Core Team was divided into four smaller groups with the Working Team representing a fifth group. Each of these groups were provided with a different Outcome Statement and asked to consider the work from earlier in the day to develop risk type statements. In order to keep discussions focused and concise, the maximum number of risks that could be identified for each Outcome Statement was limited to 10. The smaller groups presented back to the whole group to discuss, provide clarity and confirm each Risk Statement.

Forty-two Risk Statements were developed during this stage in the process.

What is Risk?

"The product of the change that a specific undesired event will occur and the severity of the consequence of the event." (GOA, 2010a)

TABLE 2: INITIAL RISK STATEMENTS GROUPED WITH OUTCOME STATEMENTS

Outcome Statement	Risk Statement
Environmentally aware, responsible and motivated watershed residents	1. Personal level of connection to the watershed? 2. There is a variance in social values and interest 3. Insufficient understanding/knowledge of watershed 4. Not having effective tools to support action (regulatory and non regulatory) 5. Lack of human and fiscal resources 6. Lack of effective communication
Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas	7. Competing interests 8. Resistance to change 9. Lack of understanding of implications of change 10. Lack of education/knowledge 11. (Protection for/of ecosystems) Lack of legislation and regulation 12. Lack of understanding of cumulative effects 13. Unclear definitions of abundant, healthy 14. Lack of baseline data – scientific data 15. Current state of the watershed is considered acceptable? 16. The presence of invasive and/or non-native species 17. Habitat loss
A safe and secure water supply	18. Emerging contaminants 19. (Human) Population growth 20. Political factors 21. Shortage of supply 22. Failure to respond due to cost and lack of resources 23. Impaired water quality 24. Extreme weather events (climate variability)
Balanced allocation and wise management of water	25. Lack of knowledge around cumulative effects and consequences 26. Shortage of water lead to unwise management of decisions 27. Failing to define value of water (economic, social, environmental) 28. Quality of water being allocated won't meet the need of the user 29. Lack of knowledge of the relationship between groundwater and surface water 30. Ineffective legislation 31. Water supply variability over time 32. Lack of conservation/inefficient use of water
Land managed for multiple use with minimal impact on natural, cultural and historical assets *Manage multiple use demands to maintain/ restore health and function of terrestrial and riparian landscapes	33. Existing commitments; -leases – quotas – extraction 34. Changing ownership structures. i.e. small mixed farms to large corporate ranches; ranches to subdivisions 35. Financial incentive structures do not match our environmental objectives i.e. draining a wet land to increase crop production – more value to the landowner and less to the environment 36. Lack of knowledge (about the resource of water and land), awareness, and engagement at all levels 37. Risk of not knowing value of resources in the future 38. Lack of jurisdictional co-operation 39. Failure to consider climate change in management decisions 40. Failure to recognize impacts on the resource (cumulative effects) 41. Regulation and enforcement do not match intensity and complexity of use 42. Failure to recognize and manage intensity of use

During Workshop 2 discussions, uncertainty of meaning occurred around the Outcome Statement: **Land managed for multiple use with minimal impact on natural, cultural and historical assets.** As a result the Core Team developed an alternative statement to provide clarity to the original Outcome Statement: **Manage multiple use demands to maintain/ restore health and function of terrestrial and riparian landscapes.**

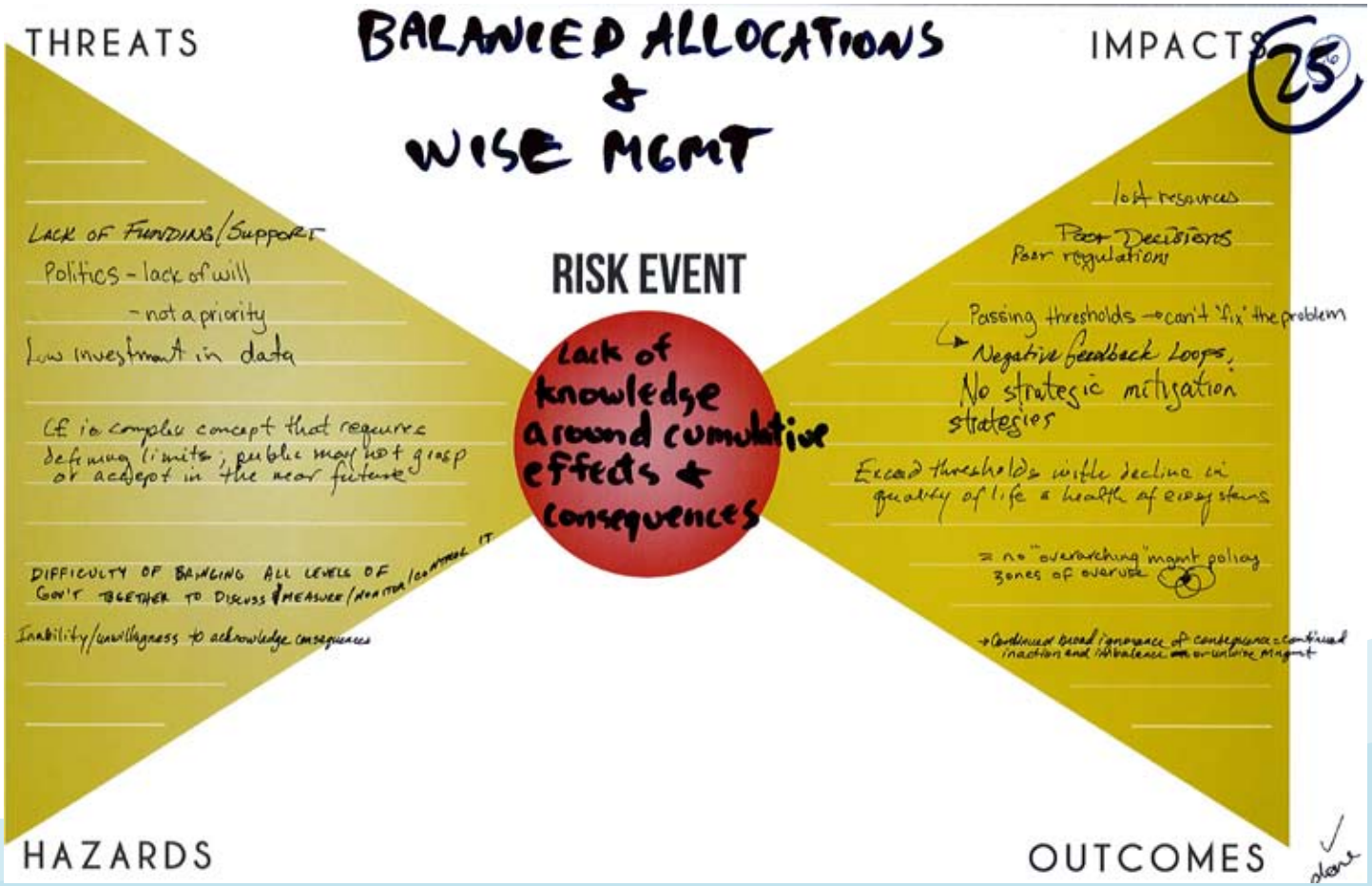
In order to be true to the Phase 1 process and not undervalue the contributions of the participants in that process, the IWMP Working Team decided not to remove the original Phase 1 Outcome Statement, but supplement it with the Phase 2 modified Outcome Statement.

After the Risk Statements were identified, the Bow-tie Method of Analysis was introduced. Bow-ties are a visual representation of the relationship between the cause and consequence for a risk event. What caused the risk to occur are identified as threats or hazards, while what the consequences are should the risk occur, are the impacts or outcomes.

To complete the Bow-tie Method of Analysis, each of the 42 Risk Statements identified by the Core Team were written on the centre of a separate Bow-tie poster and placed on the walls around the room. Core Team members then filled in the 'threats or hazards' and 'impacts or outcomes' for each Risk Statement, based on their experience and understanding of the risk. Core Team members were asked to focus on the Bow-ties they had an interest in or knowledge about, so were not required to visit each of the posted Bow-ties.

When the Bow-tie Method of Analysis exercise was completed, the Working Team transferred the Core Team's work onto smaller Bow-ties for use during Day 2 of the workshop.

FIGURE 2: AN EXAMPLE OF A COMPLETED BOW-TIE



DAY 2 – IDENTIFYING RISK CONTROLS AND CONDUCTING A RISK ANALYSIS

The second day of Workshop 2 began with a review of what had been accomplished the previous day and addressing any concerns the Core Team had about the process so far. **After a short discussion, the Core Team decided to include Headwaters Management as an additional Risk Statement under the Outcome: A safe and secure water supply**. This brought the total number of Risk Statements to 43.

Risk Controls: The next step for the Core Team was to identify controls for each risk. Controls can either be pre-risk or post-risk. Pre-controls are barriers currently in place to help prevent the threats from becoming a risk; while Post-controls are barriers currently in place to help prevent the consequences of the risk.

Core Team members were again divided into smaller groups, with each group responsible for a set of Risk Statements. Each group was asked to identify pre- and post-controls for each of the Risk Statements. The smaller groups came back together to present their identified controls to the larger group.

During this discussion, it became apparent that there was miscommunication over the assigned task, as the majority of groups focused on mitigation of the risks (i.e., what could/should be put in place to prevent the risks) instead of focusing on what is currently in place to prevent the risks. Although the work accomplished was not required at this stage in the process, the Phase 2 Consultant indicated that this work was still valuable and would be useful for the third workshop. Raw data can be found in Appendix G.

Risk Analysis: The final step to conducting a Risk Assessment is completion of a Risk Analysis. This step involves rating risks on their level of impact and the likelihood that the risk will occur considering existing controls.

It was important to consider an individual's aversion to risk while completing this exercise; it could have an impact on how they rated a risk and what they thought the impact of that risk could be.

Impact: How severe the consequence would be if the risk were to take place (insignificant, minor, significant, major, extreme)

Likelihood: How probable the risk is to occur in the next 10 years (remote, unlikely, possible, likely, almost certain)

To complete this step, an electronic rating/voting tool was used. The electronic system pooled participants, and gave real-time responses with a visual representation of the results. This tool provided participants' anonymity to voice their true opinion. Each Risk Statement was discussed before voting to ensure everyone clearly understood the statement. Since real-time responses were given, Core Team members were able to discuss the results right away. If there had been a major discrepancy in the voting, Core Team members would have discussed that particular Risk Statement then all would have voted again. The second vote would have overrided the first vote.

The software used for the electronic rating/voting tools was Sharpe Decisions® Executive Workshop®. Alberta Environment lent the OWC the software for Workshop 2.

During the voting exercise, all of the Risk Statements fell into either the 'high severity' or 'critical severity' impact rating. This was predictable as the Core Team identified risks that were of importance to the current state of the watershed. Figure 3 provides a visual presentation for the Risk Analysis of all 43 Risk Statements. Analysis of all individual 43 Risk Statements can be found in Appendix H. The Risk Analysis of each Outcome Statement grouping can be found in Appendix I.

WORKSHOP EVALUATION

Once again an online workshop evaluation was emailed to Core Team participants to assess activities and make adjustment to the upcoming workshop if required. Twenty-one Core Team members responded (a response rate of 62 percent). The following are some highlights from the evaluations:

- Some Core Team Members were unclear on how the State of the Watershed report was tied into this process and some felt there was not enough emphasis on the SOW report.
- There seemed to be a tendency to focus on the solutions as opposed to the risks during the workshop.
- There was still a concern that the environment was receiving more consideration then the economic and social aspects of watershed management.
- Participants feel that there is a lack of political will and implementation will not be supported.
- Terminology was confusing to some participants as they were new to the process.
- Core Team members understood the deliverables better than (at) the first workshop but it was still unclear to some.
- (This) workshop was more focused than the last.

Pros and Cons of Using Voting Tools:

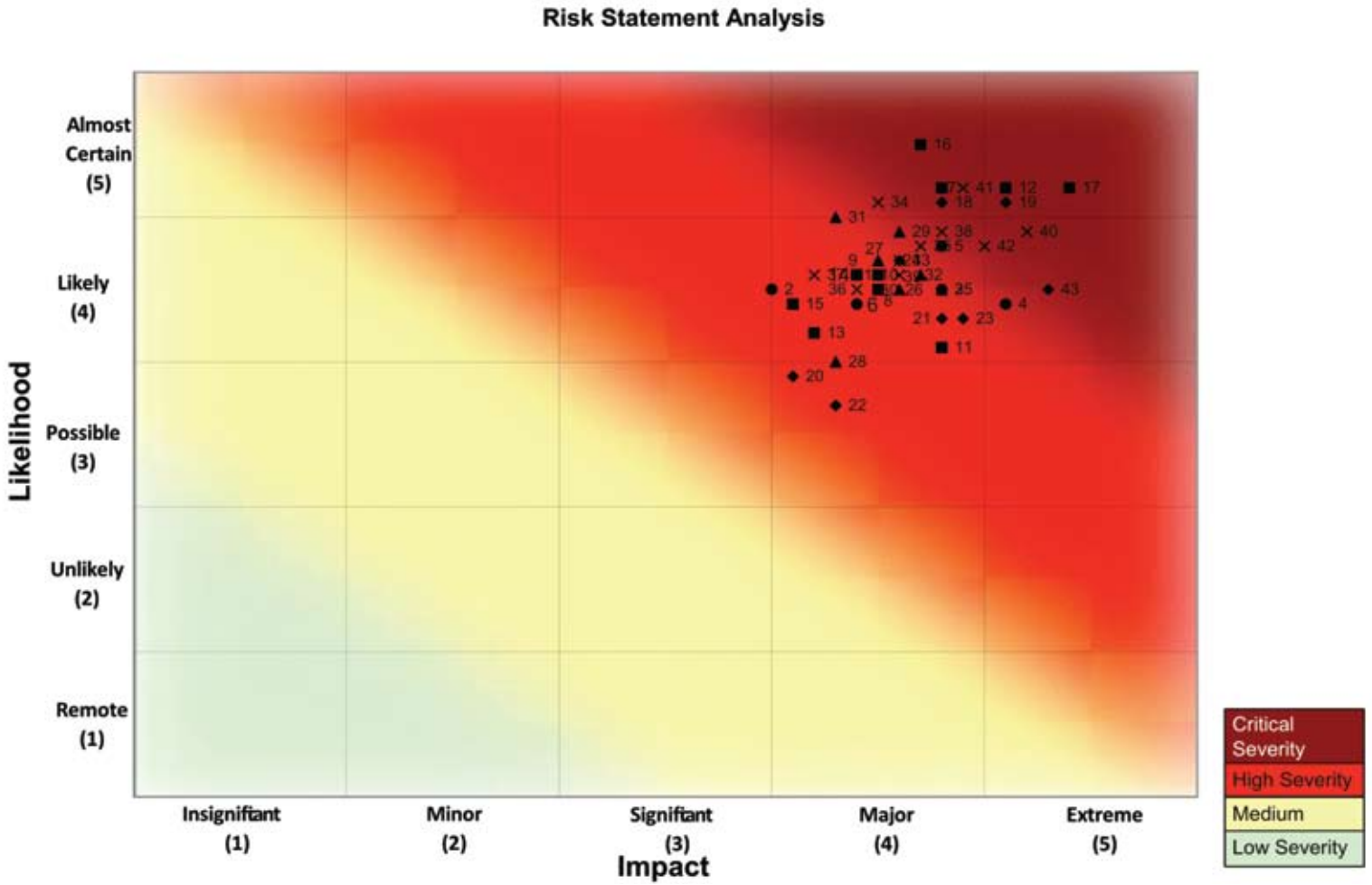
Pros:

- Allowed for instant results so the Core Team could see how people were ranking the Risk Statement.
- Core Team members did not feel swayed to vote a certain way since voting was anonymous.

Cons:

- The large number of Risk Statements resulted in a lengthy voting process; Core Team members may have become disengaged.
- There was less discussion for some of the Risk Statements towards the end of the process.
- Content may have been too complex to use the voting tools effectively.

FIGURE 3: RESULTS OF RISK ASSESSMENT



WORKSHOP 3 – PRIORITY SETTING

OBJECTIVES AND INTRODUCTIONS

Workshop 3 was intended to focus on identifying priorities. The main objectives of the two-day workshop were as follows:

- To review the Risk Statements produced during Workshop 2.
- To discuss treatment options.
- To decide on planning priorities for the watershed, and possibly the sub-basins.

Before the priorities could be discussed, an overview of previous accomplishments and a brief small group activity was initiated by the Phase 2 Consultant. Core Team members were placed into five small breakout groups to review their work completed in the earlier workshops. A list of all 43 Risk Statements and the visual presentation (Figure 3) from the risk analysis exercise in Workshop 2 were handed out to each participant. They were asked to focus on the following questions:

- What stands out here for you?
- Does this line up with what you might have predicted?
- Is there overlap of some risks?

When the Core Team reconvened and discussed their findings, there were several themes that emerged in the discussions and recognition that some of the Risk Statements overlapped and could possibly be merged. The common themes were: cumulative effects; education/knowledge, and; legislation/regulation. In addition, the Core Team acknowledged that the ranking was not a surprise to them but wondered if the public would view the risks the same way.

DAY 1 – RISK STATEMENT REVIEW AND RANKING

When the Core Team recognized the overlap of several of the original Risk Statements, the Phase 2 Consultant led the large group in an exercise to combine the similar statements. As a result, the 43 Risk Statements developed in Workshop 2 were combined and restated in 34 Risk Statements (see Table 3).

The following five original Risk Statements were merged to create one Risk Statement: ***Lack of understanding and management of cumulative effects***

12. Lack of understanding of cumulative effects
19. (Human) Population growth
25. Lack of knowledge around cumulative effects and consequences
40. Failure to recognize impacts on the resource (cumulative effects)
42. Failure to recognize and manage intensity of use

The following four original Risk Statements were merged to create one Risk Statement: ***Lack of effective legislation***

4. Not having effective tools to support action (regulatory and non regulatory)
11. (Protection for/of ecosystems) Lack of legislation and regulation
30. Ineffective legislation
41. Regulation and enforcement do not match intensity and complexity of use

The following three original Risk Statements were merged to create one Risk Statement: ***Insufficient understanding and knowledge of the watershed***

3. Insufficient understanding/ knowledge of watershed
10. Lack of education/knowledge
36. Lack of knowledge (about the resource of water and land), awareness, and engagement at all levels

TABLE 3: COMBINED RISK STATEMENTS AND ASSOCIATED OUTCOME STATEMENT

Outcome Statement	Risk Statement
Environmentally aware, responsible and motivated watershed residents	1. What if people don't have a personal level of connection to the watershed? 2. There is a variance in social values and interest 3. Insufficient understanding/knowledge of watershed 4. Lack of effective legislation 5. Lack of human and fiscal resources 6. Lack of effective communication
Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas	7. Competing interests 8. Resistance to change 9. Lack of understanding of implications of change 10. Lack of understanding and management of cumulative effects 11. Unclear definitions of abundant healthy 12. Lack of baseline data - scientific data 13. Current state of the watershed is considered acceptable? 14. The presence of invasive and/or non-native species 15. Degradation and loss of aquatic and terrestrial habitat
A safe and secure water supply	16. Emerging contaminants 17. Political factors 18. Shortage of supply 19. Failure to respond due to cost and lack of resources 20. Impaired water quality 21. Extreme weather events (climate variability) 22. Headwater degradation
Balanced allocation and wise management of water	23. Shortage of water leads to unwise management of decisions 24. Failing to define value of water (economic, social, environmental) 25. Quality of water being allocated won't meet the need of the user 26. Lack of knowledge of the relationship between groundwater and surface water 27. Water supply variability over time 28. Lack of conservation/inefficient use of water
Land managed for multiple use with minimal impact on natural, cultural and historical assets *Manage multiple use demands to maintain/ restore health and function of terrestrial and riparian landscapes respecting cultural and historical assets	29. Existing commitments; -leases – quotas – extraction 30. Changing ownership structures. i.e., small mixed farms to large corporate ranches; ranches to subdivisions 31. Financial incentive structures do not match our environmental objectives i.e. draining a wet land to increase crop production – more value to the landowner and less to the environment 32. Risk of not knowing value of resources in the future 33. Lack of jurisdictional co-operation 34. Failure to consider climate change in management decisions

During the discussion on which Risk Statements were duplicates, the Core Team recognized that the Risk Statement ***Habitat loss*** was limiting and did not encompass the full intent of its meaning, therefore they rephrased the Risk Statement to ***Degradation and loss of aquatic and terrestrial habitat (#15)***.

On the first day of Workshop 3, the Core Team revisited the modified Outcome Statement discussion from Workshop 2. The Team agreed with the rationale to keep the original Phase 1 Qualitative Outcome Statement and, after some group discussion and word-smithing, reached consensus on the following IWMP Phase 2 modified Outcome Statement:

*Manage multiple use demands to maintain/restore health and function of terrestrial and riparian landscapes respecting cultural and historical assets

Once the original list of Risk Statements had been reduced into a more manageable list of 34 Risk Statements, Core Team members were asked to do an independent ranking based on the Core Team's subjective assessment.

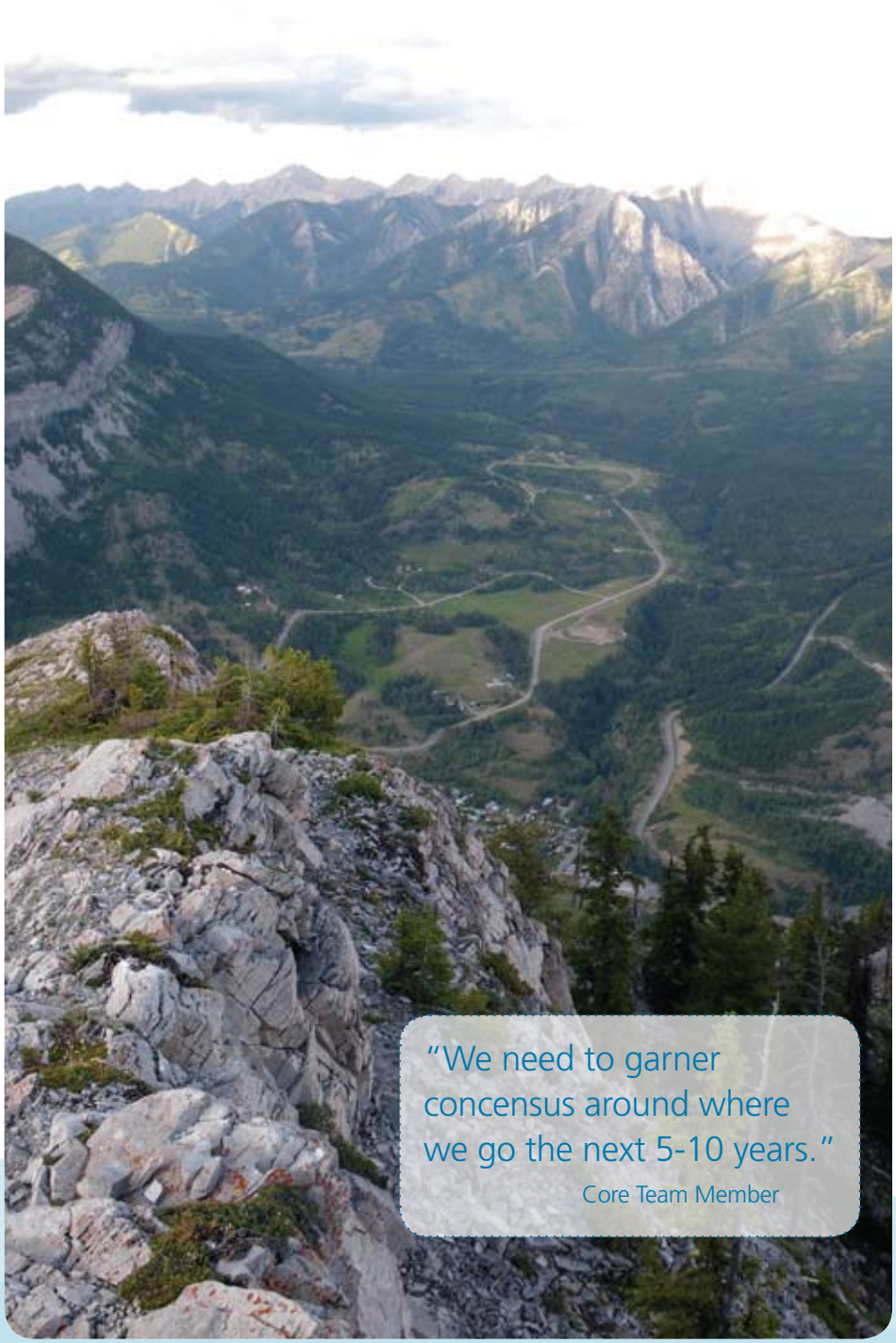
Each of the Risk Statements were placed under the appropriate Outcome Statement on a display panel and posted around the meeting room. Each Core Team member was given 10 sticker dots and asked to place a dot on 10 Risk Statements they believed were in most need of treatment. Their assessment was to be based on the following criteria:

- The "significance" of the risk.
- Your "appetite" for the risk.
- Your "attitude" towards the risk.

The results of the sticker dot ranking exercise were then reviewed with the whole group (see Table 4). Through this process, it became visually apparent that members of the Core Team agreed strongly on the Risk Statements in most need of attention.

In total, there were 29 Risk Statements identified as being most in need of attention. More than half of the Core Team agreed on the ranking of the top 4 Risk Statements (each of these Risk Statements received more than 18 votes).

The ranking exercise also provided a priority ranking of the identified risks (i.e., the higher the total number of sticker dots on the Risk Statement, the higher the priority of the risk).



"We need to garner concensus around where we go the next 5-10 years."

Core Team Member

TABLE 4: RISK STATEMENT STICKER RANKING

Risk Statement	Number of Stickers	Priority
10. Lack of understanding and management of cumulative effects	35	1
15. Degradation and loss of aquatic and terrestrial habitat	26	2
22. Headwater degradation	25	3
31. Financial incentive structures do not match our environmental objectives e.g., draining a wetland to increase crop production; more value to the landowner and decrease in value to the environment	18	4
3. Insufficient understanding/knowledge of watershed	17	5
20. Impaired water quality	16	6
28. Lack of conservation/inefficient use of water	16	7
26. Lack of knowledge of the relationship between groundwater and surface water	15	8
14. The presence of invasive and/or non-native species	12	9
24. Failing to define value of water (economic, social, environmental)	10	10
32. Risk of not knowing value of resources in the future	10	11
12. Lack of baseline data - scientific data	8	12
18. Shortage of supply	8	13
23. Shortage of water lead to unwise management of decisions	6	14
4. Lack of effective legislation	6	15
16. Emerging contaminants	5	16
5. Lack of human and fiscal resources	5	17
6. Lack of effective communication	5	18
29. Existing commitments; -leases – quotas – extraction	4	19
33. Lack of jurisdictional co-operation	4	20
34. Failure to consider climate change in management decisions	4	21
1. What if people don't have a personal level of connection to the watershed?	2	22
2. There is a variance in social values and interest	2	23
9. Lack of understanding of implications of change	2	24
17. Political factors	1	25
19. Failure to respond due to cost and lack of resources	1	26
27. Water supply variability over time	1	27
30. Changing ownership structures. i.e. small mixed farms to large corporate ranches; ranches to subdivisions	1	28
7. Competing interests	1	29
11. Unclear definitions of abundant healthy	0	30
13. Current state of the watershed is considered acceptable?	0	31
21. Extreme weather events (climate variability)	0	32
25. Quality of water being allocated won't meet the need of the user	0	33
8. Resistance to change	0	34

DAY 2 – RISK STATEMENT MANAGEMENT, TREATMENT AND PRIORITY SETTING

Day 2 started with an overview of the activities of the previous day and outlined the final stages of the process. It was at this point that the Working Team and the Phase 2 Consultant realized that an additional one-day workshop might be required. The Core Team was asked at the beginning of the day about the possibility of returning for another day. This would be decided at the end of the day.

The Core Team proceeded to identify Risk Treatment Options for the Risk Statements. The Core Team recognized that identifying Risk Treatment Options for the list of 34 Risk Statements would be an unmanageable task, so they agreed to focus on the prioritized Top 10 Risk Statements. The Core Team felt it was important to acknowledge that the remaining 24 Risk Statements would not be discarded, but would be kept on record for future consideration (34 original Risk Statements minus the 10 prioritized Risk Statements).

Risk Treatment: What can be done to reduce the risk? (GOA, 2010b)

Building on the Pre- and Post- event controls completed at Workshop 2, the Core Team members were asked to develop Risk Treatment Options for the Top 10 Risks. The Core Team was divided into five small groups for this next set of activities. During Session 1, each group was given one of the top 5 Risks; the second Session focused on Risks 6 through 10. The Core Team members' familiarity with the watershed and the sub-basins encouraged them to consider the appropriate scale of the 'risk' as well as the Risk Treatment Options.

While developing the Risk Treatment Options, participants were asked to consider the level of importance and achievability.

Importance: how effectively will the proposed option reduce the risk? (insignificant, moderate, significant)

Achievability: identify limiting factors (time, money, skills, and scope of authority) how likely is it the option will achieve its risk-reduction objectives? (less likely, likely, more likely)

Each of the groups presented back to the larger group with their information. The Core Team deliberated over each of the proposed Risk Treatments and additional concerns or factors were discussed. During the discussion, the concepts of balancing costs and benefits, and values and perceptions were recognized as important points for consideration and should be discussed in the future.

The next step was to take the information and develop a Risk Treatment Plan. A Risk Treatment Plan was developed for each Risk Statement or Risk Treatment case.

Table 5 is a list of the top ten prioritized Risk Statements and the Risk Treatment Options identified by the Core Team. The raw flip chart notes can be found in Appendix J.

The Agenda for Workshop 3 was ambitious, to say the least, and the Core Team was thoroughly engaged in discussions that were constructive and enlightening. Regrettably, there was no time available at the end of the Workshop to deal with the last agenda item: "to determine priority planning and rate the Treatment Plans for importance and achievability".

One of the steps in the process was to consider the following options for modifying the risks. We were short on time so the Phase 2 Consultant decided not to proceed with this level of activity.

ACCEPT (with existing controls)
REDUCE (likelihood and consequences)
SHARE (with others)
AVOID (discontinue or do not start)

Workshop 3 ended with a group discussion on 'Next Steps' for the OWC Integrated Watershed Management Plan process and the future involvement of the Core Team. Recognizing that their work was not complete, the Core Team agreed to meet as a group for an additional one-day workshop.

The Core Team was aware that a report would be produced to document the Phase 2 – Risk Assessment and Priority Setting process. It was mutually agreed that a draft report would be provided to the Core Team prior to Workshop 4.

The Core Team elected to invite the OWC Board of Directors to Workshop 4 as they needed to be 'brought up to speed' on the accomplishments of the Core Team. In addition, the OWC Board of Directors needed to be transitioned into the conversations as they are ultimately responsible for the next steps in the IWMP process.

WORKSHOP EVALUATION

Another online evaluation was circulated to the Core Team with sixteen participants responding (a response rate of 53 percent). Highlights from the evaluation are as follows:

- Core Team members were really starting to understand the process and what the deliverables would be at the end of the process.
- Some Core Team members feel that they have learned a great deal about this process from the other members involved. This experience has helped them understand the complexity of the watershed and all the challenges various stakeholders face.
- Core Team members feel that they have accomplished something significant.
- Further work is needed to refine what has been accomplished.
- Although Core Team members had made attempts to link the SOW report recommendations, some Core Team members thought that not enough connections to the SOW report had been made.

Throughout the process Core Team members were concerned that the SOW report and IWMP Phase 1 were not being considered enough during the discussions. To start addressing this concern, the Working Team completed a comparison of the Risk Statements with the SOW report and IWMP Phase 1 to ensure that all issues and recommendations made during the previous work had been considered during Phase 2. To view the SOW report, IWMP Phase 1 and Risk Statements comparison see Appendix K.

TABLE 5: PRIORITIZED RISK STATEMENTS

Risk Statement	Risk Treatment Options
10. Lack of understanding and management of cumulative effects Priority 1	• Research needs: contaminants we don't know about yet • Defining the current state • Need to define cumulative effects • Adaptation is key • All processes need to be linked – economic, social, environmental – there will be tradeoffs of a social and economic nature • Does this group see the role of the OWC to set these objectives? • Any work that OWC does will contribute to the *Land-use Framework* (LUF) process; outcomes will be driven by SOW, LUF, etc. • The real issues will be in the tributaries, the OWC will play a major role with this • Continued community involvement: need to incorporate social, economic and environmental change to whatever outcomes are set; need to have a clear direction on how to get there
15. Degradation and loss of aquatic and terrestrial habitat Priority 2	• Understanding and defining what are the concerns; there are different levels of management, are there different levels of concern? • What agencies are responsible for what (Implementation) • Different land management practices: proper grazing management and minimizing disturbances • What has been lost, what has not been lost has not been quantified, need to set baseline, what standard do we want to compare to? • Priority: aquatic aspects in data collection; we least understand the aquatics and recognize there are huge data gaps on water itself; start with aquatics and move out from there • Needs to be measuring what's happening with biodiversity • Over-allocation and degradation; addressing over-allocation in the southern tributaries as identified in the SOW report
22. Headwater degradation Priority 3	• Better monitoring of factors contributing to water quality/quantity • Each user/manager needs to recognize their impact and obligations • Apply zoning to headwaters and identify high risk areas • Determine balance between forest and grassland areas • Define headwaters – broader than green zone • Need to quantify land use indicators: edge density, range health, riparian health, land cover, disturbed vs undisturbed lands • How to link users to land tenure/ownership vs non-tenure • Need to identify user and their impacts
31. Financial incentive structures do not match our environmental objectives Priority 4	• Monetary incentives for water conservation; driving force is equity or rewards • Need to identify the people who live in the regional area to identify the appropriate solution • Regional level cost-sharing for incentives • Need analysis of benefits • Allow environmental protection without cost to the individual who benefits society by their actions • Need to use the SOW report to recognize the environmental objectives already identified • Provide examples of costs and benefits in protecting streams/riparian areas • Improved efficiency contributes to conservation • Rewarding innovation • Recognition of benefits, not regulation • Has to be a level of equity or reward, same rules apply to everyone • Land stewardship should not be limited to private lands

TABLE 5: PRIORITIZED RISK STATEMENTS continued

Risk Statement	Risk Treatment Options
3. Insufficient understanding/ knowledge of the watershed Priority 5	• Research traditional and historic knowledge of the watershed (understand what is there and what we're trying to achieve over time) • Maintain and improve linkages between OWC groups and the public; increase understanding of what the OWC is doing • Incentives: there are both positive and negative incentives: • Positive/proactive incentives: financial; social; environmental; educational • Negative: regulations; fear/peer pressure • Increase public awareness; understand public perspective • Create programs for new residents, educate groups • Work with school curriculum – youth engagement
20. Impaired water quality Priority 6	• Need water quality guidelines • Education is a precursor to reduce/mitigate risk • Continue to manage erosion risk on cropland • Need to secure water in the aquatic system • Need to achieve riparian area health • Source water protection • Need for enforcement (pre and post event) • Promote further research and analysis (e.g., technical and cost issues: impacts of over-application of nutrients, cattle in streams, etc.)
28. Lack of conservation/ inefficient use of water Priority 7	• We all have room to improve (individuals and consumers) • Motivation to conserve: in-stream flow needs; drought mitigation • Charge for water needs to be enough to encourage conservation • Need to understand the water requirements for development • Develop champions for each step of improvement • What motivates the change – how much will it cost (weigh economic, social or environmental costs) • Municipal has some room to improve • Irrigation sector has some economic room to move • Savings available and needs to be quantified for each group/sector and then presented to that group/sector for action • There are a variety of tools available depending on the reason to use or choose (efficiency) • Change due to costs or because there is not enough to go around • Conservation means leaving it in the stream for aquatic benefits now and a reserve for future and new economic development (1/3, 1/3, 1/3) • Water re-allocation is available today, but can not use this as a hedge for the future/unable to hoard water supply

Risk Statement	Risk Treatment Options
26. Lack of knowledge of the relationship between groundwater and surface water Priority 8	• Know fair amount about surface water; know far less about groundwater; know even less about the relationship between the two • Groundwater information gaps: volumes of uses; unlicensed use; does groundwater feed into surface water and aquifers; what is the total availability? • Advocate that groundwater mapping be done in the Oldman watershed • Coordinate data management: existing and new accessed data • Educate on reporting: to create a better database • Promote adequate testing and metering (i.e., wells) • Identified as a priority by government: expensive but doable
14. The presence of invasive and/or non-native species Priority 9	• Consideration around vegetation, animals, climate change, etc. could influence invasive and non-invasive species; need to distinguish between non-invasive and invasive species • Education and awareness • Spatial component is missing: need to define where, what and levels of concern • Need baseline data and monitoring • Proper grazing management • Consider climate change influences and adaptation to those changes • Minimize disturbance • Resources (monetary and manpower) to deal with invasive species • Advocacy role of OWC: knowledge/sharing; examples and demonstrations; community engagement; weed pulls; asking government to put money into prevention/control of invasive in their recreation sites

24. Failing to define the value of water (economic, social, environmental)
 	
Priority 10
	• Need to address perception of value of water:
	  • Consumptive view: if not being used, it has no value
	  • Instill intrinsic value: conserve because it should be there
	  • Only understand the value of water when there is a problem
	  • Water is a public resource and needs to be allocated on behalf of the public
	• Water costs currently based on economics; more consideration to social and environmental values over long term
	• Set thresholds of quality and quantity based on economics, social and environmental values
	• As part of a true market value – need to include water going back into system
	• Education/engagement to change views:
	  • Instill a stewardship ethic: value and importance of water
	  • Start early: educate the younger generation
	  • Engage stakeholders about the value of water: set values and priorities
	• More planning for water management may create impacts/have consequences on the value of water e.g., during drought periods
	• Aboriginal/cultural values; the intrinsic value of water to the people
	• Best Management Practices: manage erosion risk on croplands; over-applied nutrients; secure water – aquatic system is over-allocated
	• Soften the edges to slow flow: water retention, improve filtration, reduce impact of flood events
	• Source water protection
	• Need to address groundwater: quantity and value
	• Water storage and variability: need to start mimicking a natural process/system

WORKSHOP 4 – TRANSITIONING TO THE BOARD

OBJECTIVES AND INTRODUCTIONS

By the end of Workshop 3, there was general consensus between members of the Core Team that an incredible amount of work had been accomplished, significant information gathered and the key issues and priorities facing the Oldman watershed had been recognized.

The Working Team recommended that an additional session be held with the Core Team to pull all of the pieces together and review the Phase 2 draft report as a group. Regrettably, the draft report was not ready to send out to the Core Team for review, so the Working Team considered their options:

- Send out the incomplete report for review by the Core Team;
- Hold a half-day meeting with the Core Team to close the work off and transition information to the OWC Board of Directors; or
- Revisit the Risk Statements at the lower sub-basin level and identify management actions, stakeholder needs and potential activities.

After a thorough discussion, the Working Team decided to move forward with Workshop 4. Discussions were held with the Phase 2 Consultant to clearly define objectives for the workshop. The workshop objectives were as follows:

- To transition the discussion and information to the OWC Board of Directors.
- To define Risk Statements.
- To confirm categories for the planning framework.
- To refine treatment options.
- To confirm participant interest in the next steps.

In order to ensure continuity and an effective transfer of knowledge and information, the Core Team requested the OWC Board of Directors be involved in the fourth workshop. Consequently, 11 Board members participated in the final workshop (6 regular Board members and 5 Board members).

At the end of the workshop, an hour was reserved for an informal question and answer period. Board members were encouraged to participate throughout the workshop.

From the outset, the Working Team wanted to ensure continuity and knowledge transfer, so several OWC Board members were actively pursued to participate on the IWMP Phase 2 Core Team.

DEFINE RISK STATEMENTS

Between Workshops 3 and 4, the Working Team began pulling the materials together from the previous workshops. It became apparent that individual members of the Working Team were interpreting the Risk Statements differently, and perhaps members of the Core Team were as well. If the work of the Core Team was going to be effectively used by the OWC Board of Directors and scrutinized by stakeholders, clarity around the meaning of each Risk Statement was essential.

To ensure that the intent and meaning of each Risk Statement was clearly understood, the Working Team reviewed notes and discussion points from Workshop 2 where the Risk Statements were developed. The Working Team then drafted a definition/descriptor for each Risk Statement for the Core Team to review and corroborate.

Example:
Risk Statement: *What if people don't have a personal level of connection to the watershed*

Definition/Descriptor drafted by the Working Team: *The level of connection to the watershed is based on personal experience, land tenure/ ownership, family history, and personal interest.*

The first activity of Workshop 4 involved defining the Risk Statements. The Core Team was divided into five small groups with a Working Team member as the group facilitator. Each group reviewed a set of Risk Statements and the corresponding draft definition/descriptors developed by the Working Team. After completion of the smaller group review and discussion, the Core Team produced definition/descriptors for each Risk Statement that watershed stakeholders and residents could identify with. Table 6 summarizes that work.

TABLE 6: RISK STATEMENT DEFINITIONS

Outcome Statement	DRAFT definition/descriptor of the Risk Statements as prepared by Working Team	FINAL definition/descriptor of the Risk Statements as discussed by Core Team
Environmentally aware, responsible and motivated watershed residents	*What if people don't have a personal level of connection to the watershed* The level of connection to the watershed is based on personal experience, land tenure/ownership, family history, and personal interest.	*What if people don't have personal level of connection to the watershed* The level of connection to the watershed is based on personal experience, land tenure/ownership, family history, and personal interest. Many individuals don't have this personal connection, and therefore have different levels of understanding on how their activities/actions individually or collectively influence the watershed.
	There is a variance in social values and interest Social responsibility surpasses the differing views, values and interests of the individual. Individuals have different social values and interest which impact how they behave in the watershed. These differences need to be taken into consideration when planning programs.	*There is a variance in social values and interest* Individuals have different social values and interest which impact how they behave in the watershed. These diverse perspectives need to be brought together and taken into consideration when planning programs.
	Insufficient understanding/knowledge of watershed Due to gaps in knowledge and an uninformed public, there is a general lack of understanding and awareness of the Oldman watershed on a regional level.	*Insufficient understanding/knowledge of watershed* There is a general lack of understanding and awareness of the Oldman watershed on a regional level.
	Lack of effective legislation Legislation should provide both regulations and enforcement (hurdles), as well as incentives to be effective.	*Lack of effective legislation* There is lack of a coordinated coherent suite of regulatory and non-regulatory mechanisms effectively applied to address watershed risks. To provide effective legislation and enforcement, financial incentives and instill a stewardship ethic are needed.
	Lack of human and fiscal resources The allocation of human and fiscal resources is insufficient to meet current needs.	*Lack of human and fiscal resources* Human and fiscal resources are not sufficiently focused to achieve the watershed plan.
	Lack of effective communication There is need to improve the level of effective communications.	*Lack of effective communication* There is need to improve the level of effective communications.

TABLE 6: RISK STATEMENT DEFINITIONS continued

Outcome Statement	DRAFT definition/descriptor of the Risk Statements as prepared by Working Team	FINAL definition/descriptor of the Risk Statements as discussed by Core Team
Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas	*Competing interests* There are many competing interests that necessitate collaborative processes.	*Competing interests* There are many competing interests that need to be addressed in a structured form to create shared outcomes.
	Resistance to change Resistance to change can result from lack of knowledge, strong leadership and/or attainable goals.	*Resistance to change* Strong leadership, attainable goals and knowledge can overcome resistance to change. e.g., Headwater protection, ecological services.
	Lack of understanding of implications of change There is a lack of understanding that there are costs and benefits when changes are made through actions and choices.	*Lack of understanding of implications of change* There are costs to acting or not acting. We need to integrate the costs and benefits into our/the decision making process.
	Lack of understanding and management of cumulative effects There is need to be aware of and adaptive to cumulative effects.	*Lack of understanding and management of cumulative effects* Our plan needs to incorporate the cumulative effects management approach as it unfolds.
	Unclear definitions of abundant healthy There is need to define abundant and healthy as it relates to the Oldman watershed.	*Unclear definitions of abundant healthy* There is a need to define, measure and achieve abundant and healthy as they relate to the Oldman watershed.
	Lack of baseline data - scientific data There is need for more scientific research (i.e., baseline data, inventories) to confirm priorities and the costs and benefits of actions.	*Lack of baseline data - scientific data* There is need for more scientific research (i.e., baseline data, inventories) to confirm priorities and the costs and benefits of actions.
	Current state of the watershed is considered acceptable? There is need to validate the current state of the watershed to make sound management recommendations. Individuals consider the current state of the watershed ok, while in reality certain areas need improvement.	*Current state of the watershed is considered acceptable?* There is need to validate the current state of the watershed to make sound management recommendations. Individuals consider the current state of the watershed ok, while in reality certain areas need improvement.
	The presence of invasive and/or non-native species The presence (or absence) of invasive and/or non-native species is an indicator of the health of the watershed.	*The presence of invasive and/or non-native species* The presence of invasive non-native species is an indicator of the health of the watershed.
	Degradation and loss of aquatic and terrestrial habitat The degradation and loss of aquatic and terrestrial habitat are a known threat.	*Degradation and loss of aquatic and terrestrial habitat* The degradation and loss of aquatic and terrestrial habitat are a known threat.

Outcome Statement	DRAFT definition/descriptor of the Risk Statements as prepared by Working Team	FINAL definition/descriptor of the Risk Statements as discussed by Core Team
A safe, secure water supply	*Emerging contaminants* Due to anthropological pressures there are an increased number of contaminants entering the watershed and a lack of monitoring of contaminants. These contaminants have the potential to damage the aquatic ecosystem and cause diseases. Solutions are needed beyond technical capabilities.	*Emerging contaminants* There are an increased number of contaminants entering the watershed that may not currently be monitored. These contaminants have the potential to impact human and animal health and ecosystems.
	Political factors There is jurisdictional uncertainty and lack of collaboration with the various jurisdictions, often there are multiple or duplicate efforts, which creates inefficiency or confusion about which agency has jurisdiction. If there was more leadership and enforcement of existing legislation these issues would not be as big of a concern.	*Political factors* There is jurisdictional uncertainty and lack of collaboration with the various jurisdictions, often there are multiple or duplicate efforts, which creates inefficiency or confusion about which agency has jurisdiction. If there was more leadership and enforcement of existing legislation these issues would not be as big of a concern.
	Shortage of supply There is a lack of storage in the Oldman watershed. There is also conflict associated with allocations.	*Shortage of supply* There is limited storage/supply in the Oldman watershed. Unmonitored water use is a concern. There is also conflict associated with allocations.
	Failure to respond due to cost and lack of resources There is insufficient allocation of funding, causing a lack of funding and resources.	*Failure to respond due to cost and lack of resources* There is insufficient allocation of funding for monitoring and developing solutions.
	Impaired water quality There is a concern about water quality and waste water disposal in the Oldman watershed, to help alleviate this concern there are water quality standards and guidelines to follow. There is also technology available to respond to water quality concerns.	*Impaired water quality* There is a concern about current and future water quality in the Oldman watershed, in particular non-point and unregulated sources of contamination.
	Extreme weather events (climate variability) Due to extreme and unpredictable weather conditions we tend to be reactive rather then proactive.	*Extreme weather events (climate variability)* Due to extreme and unpredictable weather conditions we tend to be reactive rather then proactive.
	Headwater degradation There is a lack of headwater management and protection in the Oldman watershed.	*Headwater degradation* With current headwater management and protection in the Oldman watershed there is a risk of further headwater degradation.

TABLE 6: RISK STATEMENT DEFINITIONS continued

Outcome Statement	DRAFT definition/descriptor of the Risk Statements as prepared by Working Team	FINAL definition/descriptor of the Risk Statements as discussed by Core Team
Balanced allocation and wise management of water	*Shortage of water lead to unwise management of decisions* The demand for water surpasses the supply we have in the Oldman watershed as there is an increased need for human consumption as well as industrial and agriculture needs. This has an effect on supplying the basic water needs as well as limits our growth possibilities.	*Shortage of water lead to unwise management of decisions* In dry years the demand for water surpasses the supply we have in the Oldman watershed. This has the potential to limit our growth possibilities and impact ecosystem health.
	Failing to define value of water (economic, social, environmental) There is difficulty in defining the value of water, it goes beyond the economic value and should include the social and the environmental values as well.	*Failing to define value of water (economic, social, environmental)* There is a failure to value, recognize and integrate the economic, social and environmental implications of watershed management, decisions and use. This includes failure to recognize/value First Nations cultural and spiritual values.
	Quality of water being allocated won't meet the need of the user Due to the long term effect of pollution the quality of water being allocated may have limited use as there would be health implications. This also increases the cost to treat the water.	*Quality of water being allocated won't meet the need of the user* There is a concern about current and future water quality in the Oldman watershed, in particular non-point and unregulated sources of contamination.
	Lack of knowledge of the relationship between groundwater and surface water With the South Saskatchewan River Basin (SSRB) being closed to surface water allocations there is an increased need to understand groundwater. Since surface water can have an impact on aquifers and groundwater there is a need to understand this relationship better. How does surface water affect groundwater? Groundwater knowledge needs to be increased in general as very little is know about groundwater.	*Lack of knowledge of the relationship between groundwater and surface water* Since surface water can have an impact on aquifers and groundwater, there is a need to understand these relationships better to protect groundwater from further contamination and over use.
	Water supply variability over time The supply of water in the Oldman watershed is uncertain as the amount of water we receive depends on weather. This causes some issues as it's hard to plan for either extremes, an abundance or a shortage. When there is a shortage there is an inability to meet the demand of all users.	*Water supply variability over time* The supply of water in the Oldman watershed is uncertain as the amount we receive depends on climate and seasonal variability. Planning for extremes (shortage or flood) requires cooperation.
	Lack of conservation/inefficient use of water There is a perception that there is an abundance of water in the Oldman watershed. This has caused a lack of conservation with water users. Users are also inefficient in their use.	*Lack of conservation/inefficient use of water* There is a need to be efficient with the use of water. Users need to focus on conservation in their behaviours and operations.

Outcome Statement	DRAFT definition/descriptor of the Risk Statements as prepared by Working Team	FINAL definition/descriptor of the Risk Statements as discussed by Core Team
Land managed for multiple use with minimal impact on natural, cultural and historical assets *Manage multiple use demands to maintain/restore health and function of terrestrial and riparian landscapes respecting cultural and historical assets	*Existing commitments; -leases – quotas – extraction* There are leases for agricultural practices on public lands; individuals who have leases are concerned that changes as a result of planning activities may impact their lease or their economic opportunities.	*Existing commitments; -leases – quotas – extraction* Leaseholders on public lands are concerned that changes due to planning and a multiple use philosophy may impact their economic opportunities. There may be a risk of acceptance if their concerns are not addressed.
	Changing ownership structures. i.e. small mixed farms to large corporate ranches; ranches to subdivisions There has been a change in ownership structures; little is understood how this change in ownership structure is impacting the landscape as there are unintended consequences on the local economy and the ecosystem.	*Changing ownership structures. i.e. small mixed farms to large corporate ranches; ranches to subdivisions* There have been an increased number of changes in ownership (land, business, corporate or small). As a result the social networks and structures are changing. Little is known how this will affect the overall economic, social and environmental foundations in the community.
	Financial incentive structures do not match our environmental objectives i.e. draining a wet land to increase crop production – more value to the landowner and less to the environment Incentives structures (financial and non-financial) do not support environmental behaviours but instead promotes economic gain. Short-term goals tend to benefit self interest rather than the collective good of society. This approach leads to long-term costs and causes confusion and mixed messages.	*Financial incentive structures do not match our environmental objectives i.e. draining a wet land to increase crop production – more value to the landowner and less to the environment* Incentives structures (financial and non-financial) may not support environmental behaviours but instead promotes economic gain. Careful thought must be given to these programs to avoid negative consequences and consider cumulative effects.
	Risk of not knowing value of resources in the future Since we are unable to know the value of something in the future it creates challenges for planning.	*Risk of not knowing value of resources in the future* Not recognizing the potential value of natural resources will make planning a challenge in the future. We will need to have the ability to adapt to the changes but may end up being out of our control.
	Lack of jurisdictional co-operation There is a lack of planning coordination with the various jurisdictions, which causes haphazard development.	*Lack of jurisdictional co-operation* A lack of planning coordination with the various jurisdictions may result in unintended affects or impacts.
	Failure to consider climate change in management decisions The lack of knowledge and understanding around climate change inhibits the development of proactive management options.	*Failure to consider climate change in management decisions* The lack of knowledge and understanding around climate change inhibits the development of proactive management options.

Note: One of the concerns identified with adding a definition/descriptor to the Risk Statement was that the two parts would be separated and would lose their association. The intent was to provide the two statements concurrently.

CONFIRMATION OF CATEGORIES FOR THE PLANNING FRAMEWORK

It became apparent during discussions at Workshop 3 that the Risk Statements should be categorized. The Working Team discussed grouping the Risk Statements to help separate operational, strategic, scientific, and management approaches. These groupings would bring focus, narrow the scope and help build a well-structured planning framework. The separation of the Risk Statements into categories did not imply that each Statement would be dealt with in an independent manner; there are natural connections and overlaps that occur. When examining a Risk Statement for planning and outcome setting, the OWC would be expected to look critically at the other Risk Statements to see HOW and WHERE they might connect. It was not a linear process.

The following categories and brief descriptions were prepared by the Working Team and Risk Statements were placed in the most appropriate category. The complete Risk Statement grouping into categories is found in Appendix L.

Approach to Watershed Management
Cumulative effects management is an approach to environmental management based on an adaptive management cycle of identifying outcomes, setting targets and limits, identifying actions for implementation and assessing performance through monitoring, evaluation and reporting. Basically, it is developing and delivering outcomes to meet environmental, social and economic needs of the watershed.

Scientific
These Risk Statements have a higher scientific data need requirement and can be defended through setting specific targets and limits. The primary focus of these statements is environmental, however, social and economic implications need to be considered when identifying treatment options and implementing.

OWC Strategic and Operational
These Risk Statements correlate with the broad operational activities of the OWC; they become the 'to-do' list to better inform, educate, engage and empower watershed residents.

In addition, certain statements could be taken to the next level of political influence or involvement through potential policy changes and legislation. A team could be formed within the OWC to assess and analyze existing and pending legislation.

There may be opportunity to quantify some of this information, but it is primarily the social and/or behaviour change activities that will affect the watershed.

Out of the Council's Control
The following Risk Statements may be considered out of the Council's control or scope. However, there may be opportunity for further education or risk management planning to alleviate the potential impact on residents and the watershed.

When the Working Team presented these categories to the Core Team, the responses were overwhelmingly negative, so, the Working Team brought the discussion to a close. Further discussions at the OWC Board level and a comparison with the OWC's strategic plan would be needed prior to revisiting the categories.

The Core Team agreed to move on to the next activity that was aimed at getting closer to setting measureable outcomes, identifying indicators and setting thresholds and targets. After this component was completed, several comments were received that the group understood why the Risk Statements were placed into the four categories (Approach to Watershed Management, Scientific, OWC Strategic and Operational and Out of the Council's Control).

REFINEMENT OF TREATMENT OPTIONS

The Core Team was divided up into seven small working groups with specific Core Team members assigned to lead and facilitate the group discussions. These Core Team facilitators were identified and chosen based on the Phase 2 Consultant's knowledge of their skill set, interest, and passion in a particular topic area. The seven Risk Statements that were used for further refinement were from the 'Scientific' category. They were chosen in order to begin narrowing discussions to environmental considerations. The selected Risk Statements were:

- Degradation and loss of aquatic and terrestrial habitat – Priority 2
- Headwater degradation – Priority 3
- Lack of knowledge of the relationship between groundwater and surface water – Priority 8
- The presence of invasive and/or non-native species – Priority 9
- Impaired water quality – Priority 6
- Emerging contaminants – Priority 16
- Current state of the watershed is considered acceptable – Priority 31

All background materials developed during the previous Workshops which pertained to the Risk Statements were given to the seven groups. The following questions were prepared and shared with the groups to draw out details and further refine the existing Risk Treatment Options.

1. Identify broad implementation needs and strategies?
2. What agencies/organizations need to be there? Person specific.
3. Are there additional treatment options you can think of?
4. Prioritize the existing & added treatment options.
5. What information (data, research, measurements of change, etc.) is needed to make an informed decision? Does it exist (that you know of)?
6. Are there other initiatives, guidelines, legislation, or policies that need to be considered and reviewed with the treatment options?
7. Are any particular areas in the watershed in which there is a greater need or interest to be involved?

As this was an information gathering activity, there was no discussion or presentation back to the full group. The notes and information from this activity are located in Appendix M.

The feedback received for this exercise was quite positive. The detail of information that was gathered in this step amazed some members of the Core Team and the group could see how this was a logical next step.

TRANSITION TO THE OWC BOARD OF DIRECTORS

The final item on the agenda for the day was a candid discussion with the OWC Board of Directors; making the transition and seeing where the Council might take the information.

The following is a list of some of the key points that the Core Team wanted to leave with the Board of Directors:

- The plan needs to involve all sectors, be simple and understandable by every citizen.
- There has been a lot of information gathered during this process and the OWC needs to take the ball and run with it.
- More time and critical thinking is needed to develop sound outcomes, targets and thresholds that are achievable and resonate with the stakeholders in the watershed.
- Start some actions even if you are uncertain where it will end up. Do a few things well to build credibility and momentum.
- The OWC Board of Directors needs to be serious and recognize that decisions and trade-offs will need to be made.
- Work with other organizations/ initiatives that are involved with setting outcomes and find the complimentary fit.

Comments made by an OWC Board representative indicated that the information resulting from the work of the IWMP Phase 2 Core Team would be taken seriously. He also acknowledged that the OWC Board of Directors needed to answer some key operational questions before moving forward.

A series of open houses were considered in the overall process to share the IWMP Phase 2 work with the public. As the IWMP Phase 2 report was not completed within the timeframe for the open houses, the Core Team, Working Team and OWC Board of Directors agreed that the report could be presented at the upcoming OWC Annual General Meeting as an alternative to the open houses. The open houses were cancelled.

Workshop 4 was intended to conclude the IWMP Phase 2 process and the Core Team was to be officially dissolved. However, several outstanding items needed to be completed and reviewed:

- Preparation of the IWMP Phase 2 Strategic Watershed Risk Assessment and Planning Priorities Summary Report.
- Development of a set of questions to help the Core Team provide focused review and input.
- Circulation of the Summary Report to the Core Team for review and comment.

It was decided that the Core Team would not meet again unless necessary to make significant changes/contributions to the Summary Report before it was submitted to the OWC Board of Directors.

Next Steps!

Before Workshop 4, the Working Team met with the OWC Board of Directors to provide an update and outline the next steps in the IWMP process. The BOD was receptive to this process and agreed to move forward.

1. When the OWC IWMP Phase 2: Strategic Watershed Risk Assessment and Planning Priorities report is completed, a Steering Committee will be formed (comprised of 10 – 12 OWC Board of Directors and former Core Team members).
2. The Steering Committee will be responsible for the development of a 10-Year Planning Framework to guide the Oldman Watershed Council in its planning efforts.
3. In addition, the Steering Committee will identify the first outcome-based planning activity.

WORKSHOP EVALUATION

An online evaluation was sent out to the Core Team and the participating members of the OWC Board of Directors with nine participants responding (a response rate of 31 percent). The following are highlights from the evaluation:

- The Risk Statements are very general. I would have appreciated having the results of the South Saskatchewan River Basin (SSRB) and State of the Watershed (SOW) report worked into the Risk Statements to help us focus better on priorities.
- I always feel my time is productive and well spent with the OWC workshops. They have all been a good use of my time.
- Good work guys! This is the best multi-stakeholder process I'm part of!
- Appreciate the time and effort of the Working Group on this process. I do however think we could have been more issue- and place-focused at the outset given the SOW report and all the other good work done to date by the Oldman River Basin Water Quality Initiative (ORBWQI) and the OWC.

Final *Thank You* letters were prepared and sent to the members of the Core Team in appreciation of their time and input into the process.

SUMMARY AND RECOMMENDATIONS

SUMMARY OF WORKSHOPS

From October 2010 to February 2011, a dedicated group of stakeholders in the Oldman watershed met during a series of workshops to discuss and develop recommendations for the OWC Board of Directors to consider as they move forward with the Integrated Watershed Management Plan. The Core Team was tasked with developing a preliminary set of risks, identifying priorities and management actions. See Appendix N for a summary of Scientific Category and Top 10 Risk Statements.

Workshop 1 was used to build a foundation of common ground, an understanding of meeting protocol and a respect of the breadth of knowledge on the Core Team. With a large number of participants on the Core Team, an understanding and acceptance of meeting decision making was needed, hence the overview of consensus decision making. The Systems Mapping work gave participants an opportunity to share personal knowledge pieces and information about the watershed. It soon became clear that the room was filled with passionate and extremely knowledgeable people.

Workshop 2 built on those discussions by introducing the risk management process and combining the Core Team members' personal knowledge, social research from Phase 1, and the State of the Watershed report, to develop a set of 43 preliminary Risk Statements. Great discussions occurred as everyone felt comfortable sharing their opinions and voicing their concerns. The Core Team took those 43 Risk Statements and proceeded to analyze their potential impact and likelihood of occurring. The work accomplished during this workshop was carried over to Workshop 3 for further analysis and direction.

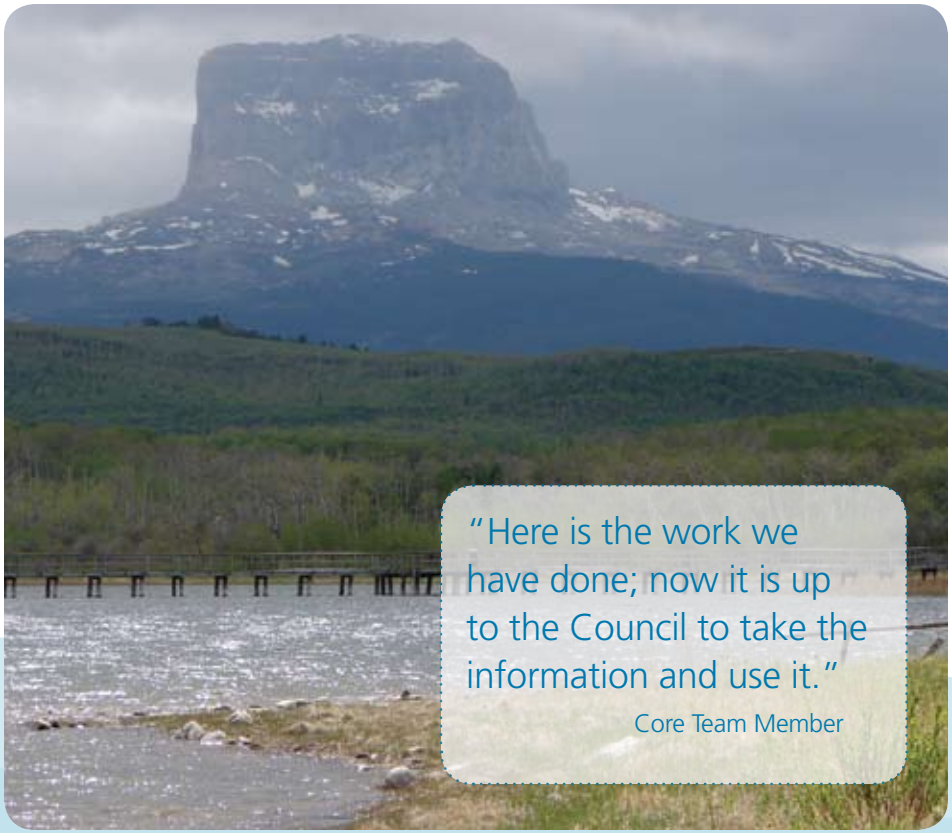
During **Workshop 3** the Core Team further refined the 43 Risk Statements identified at Workshop 2 into a more manageable list of 34 Risk Statements. A subjective ranking of the Risk Statements occurred, where the Core Team identified the Top 10 Risk Statements in most need of action:

1. Lack of understanding and management of cumulative effects
2. Degradation and loss of aquatic and terrestrial habitat
3. Headwater degradation
4. Financial incentive structure do not match out environment objectives
5. Insufficient understanding/ knowledge of watershed
6. Impaired water quality
7. Lack of conservation/inefficient use of water
8. Lack of knowledge of the relationship between groundwater and surface water
9. The presence of invasive and/or non-native species
10. Failing to define value of water (economic, social, environmental)

Once again, valuable discussions occurred within the Core Team as the members proceeded to take the Top 10 Risk Statements and developed preliminary Risk Treatment options. The Working Team acknowledged that consensus was working, as there was a growing understanding and commitment by the Core Team.

A wealth of knowledge and personal experience was shared amongst the Core Team, which had a significant impact on the quality of work being accomplished. The decision to have a fourth workshop provided another opportunity to come together and complete what the Core Team had set out to accomplish.

Originally **Workshop 4** was going to be used as an opportunity to review the draft report with the Working Team and the OWC Board of Directors. However, the time was spent further discussing and refining the Risk Statements to ensure the OWC Board of Directors understood the intent of the original statements. The key component to Workshop 4 was the transfer of knowledge and ideas from the Core Team to the OWC Board of Directors. With 11 members of the OWC Board of Directors attending, there was a tremendous opportunity for this information to be passed on in a logical, credible and powerful way. The Core Team empowered and challenged the OWC Board of Directors to move in a meaningful, focused way in the planning process and to seriously consider the input given and comments generated by the multi-stakeholder, 38 member Core Team.



BROAD RECOMMENDATIONS TO THE OWC BOARD OF DIRECTORS

At the beginning of the IWMP Phase 2 Risk and Priorities process, the goals were to develop a set of planning priorities, identify potential risks and delve into management actions. The Core Team diligently worked their way through the process managed by the Phase 2 Consultant, but in the end fell short of achieving the goals set out at the onset. At times the process was not disciplined enough to allow the development of clear and concise risks and priorities. That by no means diminishes the robust discussions and work the Core Team did; it only lengthens the process a bit longer in order for the Oldman Watershed Council to reach the final goals and develop a planning framework.

> "The 'what' is clear, the 'how' can be a challenge."
>
> Core Team Member

The challenge now will be to pull this information together with the State of the Watershed Report Recommendations (Appendix O), the results from Phase 1 of the IWMP, and the Oldman Watershed Council's Strategic Plan, to develop the planning priorities for the watershed. This compilation will build the 10-Year Planning Framework and will set the direction for planning in the Oldman watershed.

The following broad recommendations were pulled together by the IWMP Working Team after reviewing the multitude of flip-chart notes, discussion tables and notes taken at all of the workshops, in order to summarize Core Team activities and identify general directions for the Oldman Watershed Council Board of Directors.

These broad recommendations may not be as detailed as originally anticipated, but do solidify the direction and represent a general agreement from the Core Team of needs for the watershed.

- Use these recommendations to guide your decisions in future planning processes. We are confident in the OWC Board of Director's abilities to take the information that was provided and move in the right direction.
- The State of the Watershed (SOW) report provides the OWC with a tremendous amount of information on the current state of the watershed. There was a considerable amount of time, effort and money spent on this fine piece of work. Please ensure that the State of the Watershed report is incorporated into decision making.
- The SOW report identifies a number of gaps and priorities. Use this information in developing the priorities further.
- When going through the process and coming up with management actions and supplemental information, they need to be simple and understandable by the typical citizen.
- There are a number of broad scale organizations currently involved in setting environmental outcomes. The OWC needs to be strategic and see how these organizations can link and complement each other to reduce possible conflicts and overlap to increase productivity.
- Recognize what the public wants and make the decision on how to move forward accordingly. Initiate some action even if uncertain. Motivate stakeholders and residents in the watershed.
- When addressing outcomes and developing strategies, decide on a process and move forward. There may be a need to look at the risk as it relates to the whole watershed or on a sub-basin by sub-basin level.
- Some of the risks identified in our work are actually more operational or strategic in nature. They need to be considered in planning, but should be linked back to the OWC's overall strategic plan.
- Be strategic by measuring the important things; not getting lost in the importance of measuring.
- The OWC is often seen as an environmental group, yet there are other considerations to stakeholder and resident livelihood. The three pillars – environmental, social, and economic – must be considered when making decisions on management actions. There will be trade-offs.
- The OWC will need to have a clear direction on how to achieve the outcomes set through the planning process. Set thresholds based on economic, social, and environmental values.
- The real issues will be associated with the tributaries in the Oldman watershed. The OWC could play a leadership role in communicating and taking action in these areas.
- Education and outreach are important tools to use in moving forward. As residents become aware of the issues and the actions being taken, they will be motivated to participate and cooperate. The OWC has an opportunity to reward innovation and participation.
- Develop programs to educate and inform new residents and the youth of the watershed.
- Additional work needs to go into connecting with and understanding First Nations' traditional use and intrinsic value of water.
- Cumulative effects management is paramount to making this process work. Understanding what cumulative effects is and how it will guide the process is key for the Board as they move forward.
- There are a number of activities occurring on the landscape at any one time. If the OWC is to be successful they must build in the capacity to adapt to changes and priorities.
- The planning aspects and the SOW report in tandem, need to be managed, evaluated and updated on a regular basis. This cycle should be clearly outlined and resources allocated to meet the timelines.
- Balancing costs and benefits, and values and perceptions need to be considered in future discussions.
- When determining which planning priority to address it's important to look at the level of importance and achievability for that particular planning priority.

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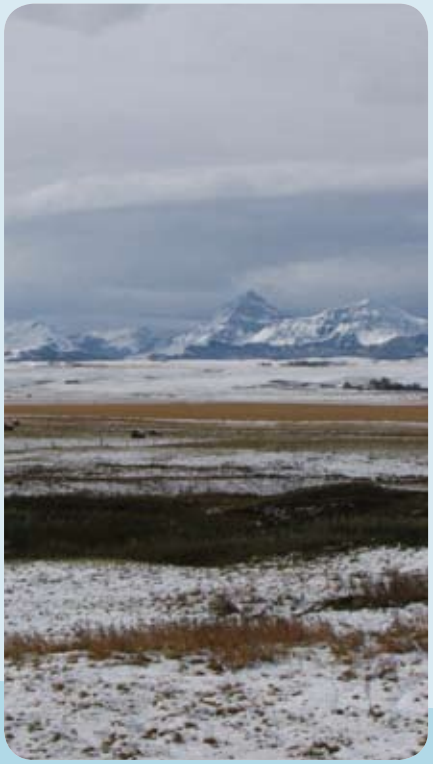

APPENDICES

APPENDICES

APPENDIX A: INTEGRATED WATERSHED MANAGEMENT PLAN – PHASE 2 BUDGET

Item	Expense
Meetings	$133.94
Core Team Workshops	$6,124.30
Consultants	$76,110.00
Core Team Appreciation	$1,784.00
TOTAL	$84,152.24

Note: report printing and design not included.

APPENDIX B: STATE OF THE WATERSHED REPORT REVIEW

State of the Watershed Review Background Information for the Core Team

Introduction

The Oldman Watershed Council is currently in the process of developing a Strategic Watershed Assessment and Planning Priorities Summary document through Phase Two of the Integrated Watershed Management Plan. This is the process you are currently involved with.

One of the key foundational documents that you will be reviewing and familiar with for the risk and priority discussions is the State of the Watershed report (SOW). The report is quite long and has a tremendous amount of information in it. In the report, Chapters 8, 9 and 10 provide an overview of the watershed and a synopsis of the issues, gaps and trends.

SOW Review Sub Team Process

In an attempt to assist the Core Team, the OWC Watershed Science Team was approached to provide additional perspectives on the information in the SOW report. In addition to the Watershed Science Team, members of the OWC Board of Directors, State of the Watershed Team and Integrated Watershed Management Plan Working Team were also approached to provide input. The SOW Review Sub Team had the choice to read the entire SOW or focus on Chapters 8, 9 and 10. There were a set of questions on risk and priorities that were provided to focus reading and input.

The following people participated in this review.

Natalie Kromrey Alberta Environment	Water Quality OWC Watershed Science Team
Wendell Koning Alberta Environment	Limnologist OWC Watershed Science Team Former State of the Watershed Team
Cheryl Fujikawa SAGE	OWC Board of Directors OWC Watershed Science Team
Jim Fujikawa NRCB	Volunteer
Barry Olson Alberta Agriculture and Rural Development	Water Quality Section Former Watershed Science Team
Richard Burke Trout Unlimited	OWC Board of Directors
Stephanie Palecheck Oldman Watershed Council	Executive Director OWC Integrated Watershed Management Plan Team Former State of the Watershed Team
Cheryl Dash Alberta Environment	Planner OWC Integrated Watershed Management Plan Team
Cathy Aspen Oldman Watershed Council	Planning Coordinator OWC Integrated Watershed Management Plan Team
Katie Burles University of Lethbridge	Grad Student Integrated Watershed Management Plan Team
Rosemary Jones Alberta Tourism, Parks and Recreation	Planner OWC Integrated Watershed Management Plan Team

Overall Summary From Participants

The Oldman watershed is a highly influenced and complex environment. During the SOW Review Sub Team discussions several common themes developed. These themes focussed around planning aspects, indicators, knowledge/ research gaps and direction for future SOW's.

From the information received, it was clear that:

- The Mountain Sub Basin and the Prairie Sub Basin generated the most comments and questions; identifying a higher priority for management or future planning;
- Terrestrial and Riparian indicators along with Water Quality indicators were also substantially higher than the Water Quantity indicators; and
- Within the Terrestrial and Riparian indicators, Land Use was the most obvious 'need' with Riparian coming in a close second (based on the number of questions/comments listed by participants).

The most common themes for gaps in knowledge and research could be summarized as:

- Groundwater information;
- Mountain sub basin recreation and forestry information;
- A coordinated approach to water quality information; and
- Data collection and understanding water quantity in terms of actual use compared with licensed use.

For other comments and considerations rated high amongst areas of concern for the SOW Review Sub Team were:

- Climate change uncertainties;
- The SOW sub basin ranking system (poor, fair, good), monitoring; and
- Land use and overall water quality.

In the interest of transparency the following Appendices will provide you with the raw data input (comments) received from the SOW Review Sub Team. This information gathered is for you to consider in your discussions and rankings of risk and priorities during the upcoming workshops for Phase Two of the Integrated Watershed Management Planning process and the development of the Strategic Watershed Assessment and Planning Priorities document.

If you have any questions about the information shown here, please contact Natalie Kromrey or Cheryl Dash.

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OVERALL SUB BASIN RANKING

Chapter 2 Mountain Sub Basin	Chapter 3 Foothills Sub Basin	Chapter 4 Southern Tributaries Sub Basin	Chapter 5 Prairies Sub Basin	Chapter 6 Mainstem
19	4	3	15	8

Ranking is based on the number of comments received by the SOW Review Sub Team according to sub basin.

INDICATOR RANKING	
Overall Terrestrial and Riparian Indicators Ranking	**44**
Land Cover	1
Soil Erosion	3
Riparian Health	13
Land Use	22
Alternative Land Use Indicator	5
Overall Water Quantity Indicators Ranking	**19**
Water Quantity General	6
Trends in Natural Flow	5
Licensed Allocation versus Actual Use	4
Instream Flow Requirements vs. Recorded Flow	4
Irrigation & Municipal Water Use Efficiency	0
Alternative water quantity indicators	0
Overall Water Quality Indicators Ranking	**35**
Water Quality General	27
Nitrogen	1
Phosphorus	1
Total Suspended Solids (TSS)	1
E.coli/Fecal Coliform	2
Alternate water quality indicators	3

Ranking is based on the number of comments received by the SOW Review Sub Team according to the indicator.

DATA GAPS AND COMMENT RANKING	
Data Gaps	41
Groundwater	2
Surface-Groundwater relationships	5
Riparian Health	3
Land Use (CFO, livestock, forest, recreation, random camping, roads)	11
First Nations	1
Economic	1
Biodiversity	1
Water Quantity	7
Water Quality	6
Climate Change	1
Data Sharing	3
Other Comments	9
Poor Rankings (Good, Fair, Poor)	4
Update the SOW every 5 yrs	1
Support for stewardship groups	2
Consultant to develop watershed monitoring program	1
Efforts on Prairies Sub-basin where all indicators ranked poor	1
	0

Ranking is based on the number of comments received by the SOW Review Sub Team according to the data gap and comments.

APPENDIX C: COMMUNICATION PRODUCT TABLE

Stage	Product	Description
Background - Process and Team Development	DRAFT Process Plan for Terms of Reference Development	Developed to introduce the OWC Board of Directors to the process for Phase 2.
	Process Overview	A visual representation of the process for Phase 2.
	GOA Risk Management Prioritization Flow Process	An overview of the steps needed to complete the risk assessment and priority setting.
	OWC Board of Director's Background Information	A list of background information provided to the OWC Board of Directors to help explain the process. All documents are available on the CD.
	Core Team Invite Letter	A letter sent to potential Core Team members inviting them to be on the Team.
	Team List	Contact Information for Teams Members (Working & Core).
	IWMP Phase 2 - Terms of Reference	Provides an overview of Phase 2, the process, who's on the team and what the deliverables will be.
	SOW Report Review Project Plan	Describes how the SOW Review will be conducted and what the end deliverable is.
	SOW Report Review Summary	The SOW Report Review provide to the Core Team.
	Legislative Review Project Plan	Describes how the Legislative Review will be conducted and what the end deliverable is.
	Legislative Inventory	Inventory of related legislation, policies, etc. Ongoing.
	Engagement Strategy & Communication Plan Project Plan	Describes what the Engagement Strategy & Communication Plan will entail and what the end deliverables are (these were 2 projects).
	Engagement Strategy	The Engagement Strategy developed for the IWMP process for the IWMP Teams and OWC Board of Directors
	Communication Plan	The Communication Plan developed for the IWMP Process for the IWMP Teams and OWC Board of Directors.
	Vision & Qualitative Outcome Summary Project Plan	Describes how the Vision & Qualitative Outcome Summary will be conducted and what the end deliverable is.
	Vision & Qualitative Outcome Summary	The Vision & Qualitative Outcome Summary provided to the Core Team.

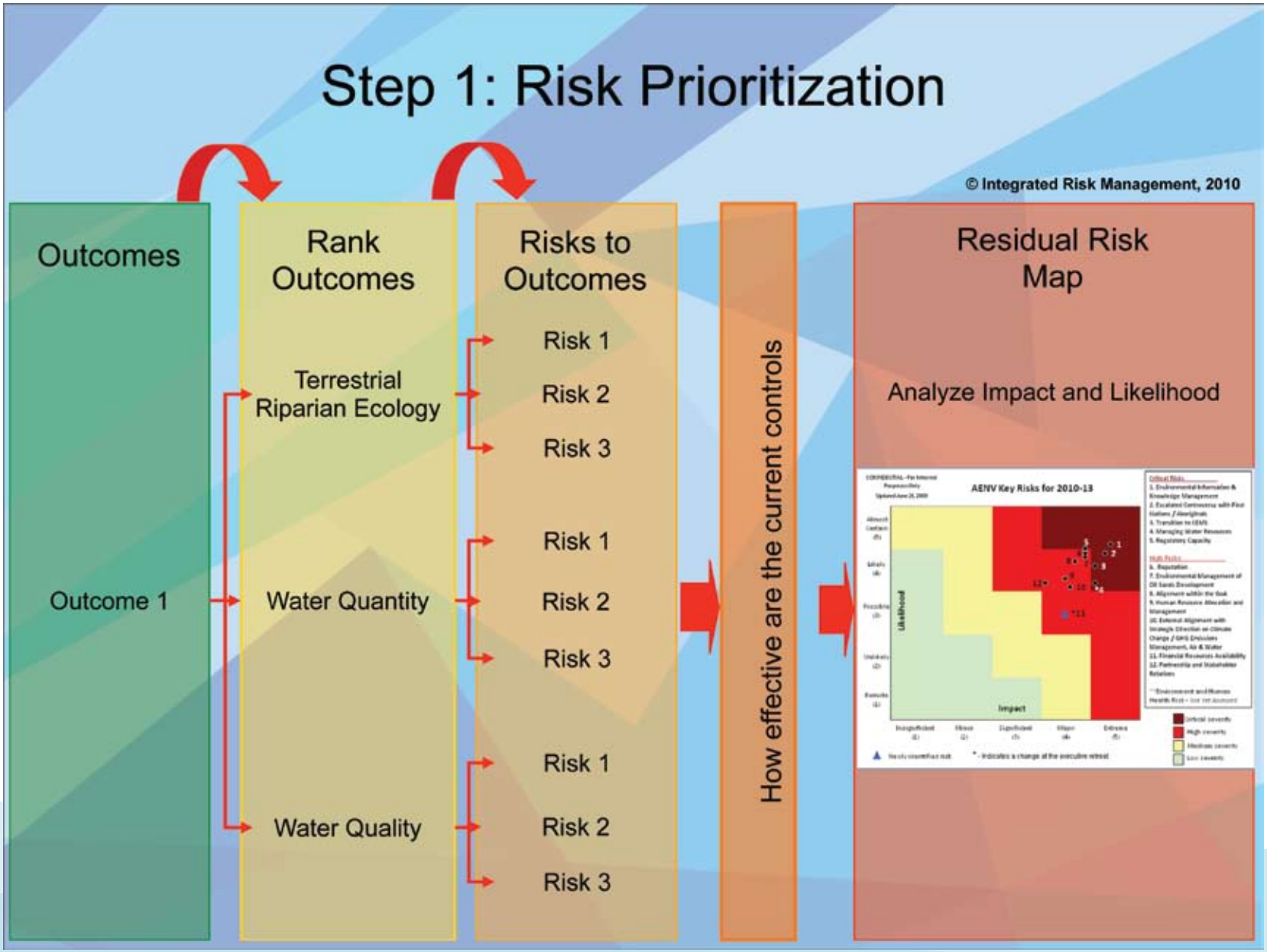
Stage	Product	Description
	Beneficial Management Practices Inventory and Project Plan (version 1) Beneficial Management Practices Summary Project Plan (version 2)	Describes how the BMP Summary will be conducted and what the end deliverable is. *Originally a BMP Inventory and Summary was the intent of this project, however due to time constraints and the complexity of completing a project of this scope the project was modified.
	Beneficial Management Practices Summary	The Beneficial Management Practices Summary completed for IWMP Phase 2.
	Website	Introduce project and team members.
	Facebook	A Facebook page was created to keep residents up to date on the process.
Workshop 1	Core Team Welcome Letter	A letter to Core Team members welcoming them to the team.
	Core Team Binder Table of Contents	A list of background information provided to the Core Team. All documents are available on CD.
	Workshop 1 Agenda	Outlines the activities for the day.
	IWMP Phase 2 – Fact Sheet – Sept 2010	Provide background to watershed management planning and outline the overall process.
	OWC E-newsletter	A bi-weekly e-newsletter is sent out to all members of the Oldman Watershed Council. This was used to announce the project and keep members informed.
	Website Update	Posted fact sheet.
	Consensus Handout	An information package given to the Core Team on Consensus Building.
	Systems Mapping Handout	A break down on the Systems Mapping exercise.
	Workshop 1 Evaluation Questions	The online evaluation sent to Core Team members after Workshop 1.
	Workshop 1 Evaluation Responses	The Core Team's responses to the evaluation for Workshop 1.
	OWC Board of Director's Presentation	Provided project updates.

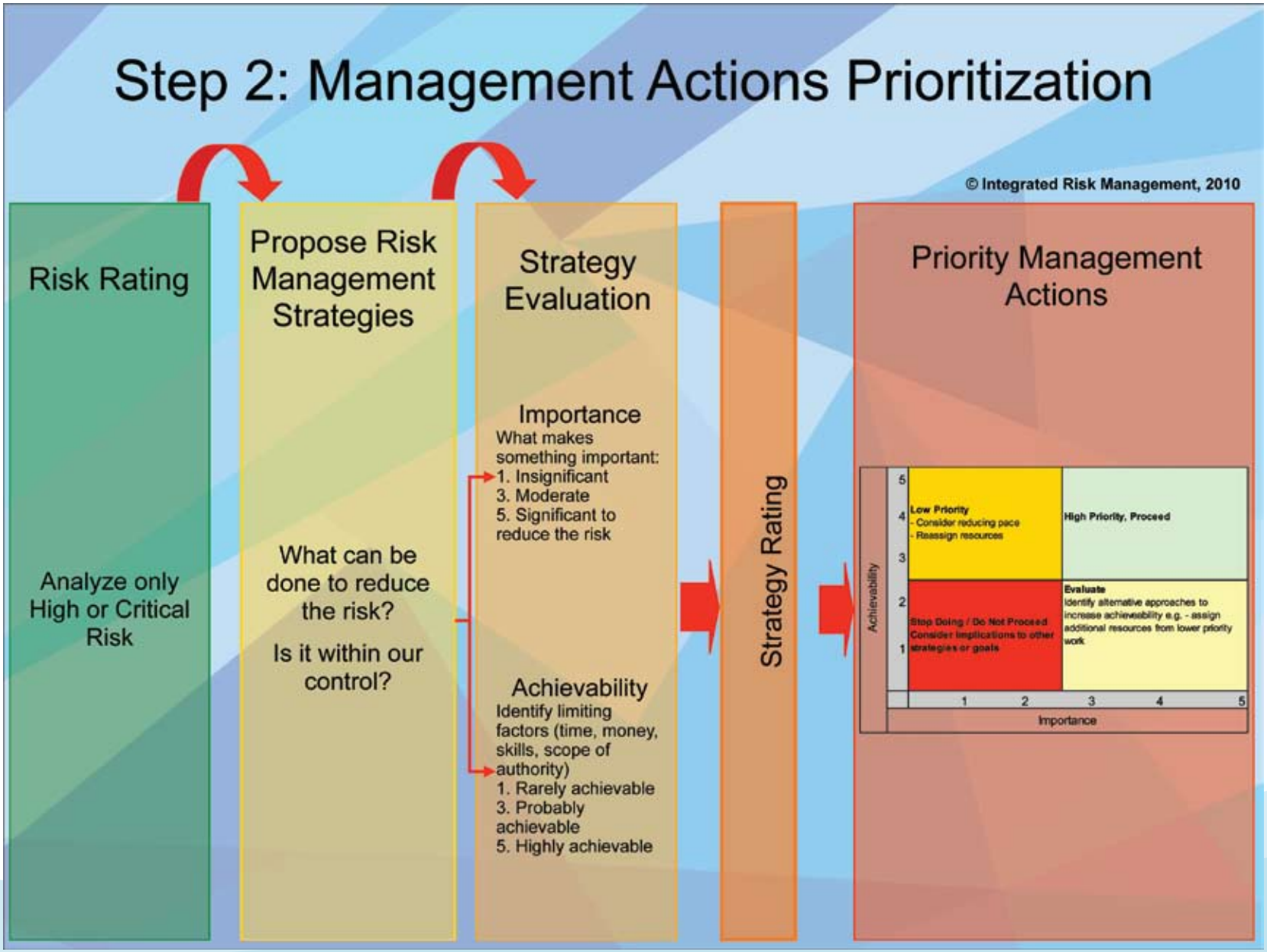
Stage	Product	Description
Workshop 2	Workshop 2 Agenda	Outlines the activities for the 2 days.
	IWMP Phase 2 – Frequently Asked Questions Fact Sheet	A fact sheet developed for Core Team members to answer some frequently asked questions.
	Website Update	Posted Frequently Asked Questions fact sheet.
	Overview Presentation	Provided context to the process, an idea of where the OWC is going with the planning activities, how it will be achieved, and what it might entail in the future.
	Systems Mapping – Summary	A summary of the Systems Mapping exercise completed at Workshop 1 – prepared by the Phase 2 Consultant.
	Risk Presentation	An overview of the risk analysis process
	Risk Management Process – Handout	A visual presentation summarizing the risk analysis process.
	Bow-tie Exercise	A blank copy of a Bow-tie.
	Bow-tie Exercise Handout	A copy of the work accomplished during the Bow-tie Exercise.
	Impact & Likelihood Table	A handout with further explanation to the Impact and Likelihood ratings.
	Workshop 2 Evaluation Questions	The evaluation sent to Core Team members after Workshop 2.
	Workshop 2 Evaluation Responses	The Core Team's responses to the evaluation for Workshop 2.
	OWC Board of Director's Presentation	Provided project updates.

Stage	Product	Description
Workshop 3	Workshop 3 Agenda	Outlines the activities for the 2 days.
	Workshop 2 Evaluation & Outcome Revision Presentation	A recap of workshop 2 evaluation comments and how to address the outcome modification.
	Workshop 3 Agenda – Updated	An updated agenda based on what was accomplished the first day.
	Pre & Post Event Controls from Workshop 2	The Pre & Post Controls that the Core Team brainstormed at Workshop 2.
	Workshop 3 Evaluation Questions	The evaluation sent to Core Team members after Workshop 3.
	Workshop 3 Evaluation Responses	The Core Team's responses to the evaluation for Workshop 3.
	OWC Board of Director's Presentation	Provided project updates.
	IWMP Phase 2 – Process Update – Dec 2010	Provided an update of the project and what's been accomplished so far.
	Website Update	Posted Process Update fact sheet.
Workshop 4	Workshop 4 Agenda	Outlines the activities for the day.
	OWC Overview Presentation	A reminder about the process and where we're heading with this process.
	Risk Statements Definition – Handout	The definitions developed by the Working Team.
	Risk Statements Groupings – Handout	Categories for the Planning Framework handout.
	Treatment Options – Handout	The Treatment options developed at Workshop 3 (raw notes).
	Workshop 4 Evaluation Questions	The evaluation sent to Core Team members after Workshop 4.
	Workshop 4 Evaluation Responses	The Core Team's responses to the evaluation for Workshop 4.

Note: All products listed in this table are available on a CD. Contact the OWC if you would like a copy.

APPENDIX D: RISK MANAGEMENT PRIORITIZATION FLOW PROCESS




Step 2: Management Actions Prioritization
© Integrated Risk Management, 2010
Risk Rating
Analyze only High or Critical Risk
Propose Risk Management Strategies
What can be done to reduce the risk?
Is it within our control?
Strategy Evaluation
Importance
What makes something important:
1. Insignificant
3. Moderate
5. Significant to reduce the risk
Achievability
Identify limiting factors (time, money, skills, scope of authority)
1. Rarely achievable
3. Probably achievable
5. Highly achievable
Strategy Rating
Priority Management Actions
Achievability
Low Priority
- Consider reducing pace
- Reassign resources
High Priority, Proceed
Stop Doing / Do Not Proceed
Consider implications to other strategies or goals
Evaluate
Identify alternative approaches to increase achievability e.g. - assign additional resources from lower priority work
Importance

APPENDIX E: SYSTEMS MAPPING EXERCISE

Sub-basin	Who	What
Mountain **The Who & What are not linked**	• Livestock Producers: confined feedlot operators & grazing lease holders	• Water for Life • Water Act • Parks and Protected Areas • Alberta Environmental Protection and Enhancement Act

	• Recreation & Tourism
	  • Foot, equestrian, motorized/non-motorized, campers, guides (business), skiers, hunters, fisher, hikers, tourists, birdwatchers, trap lines (business)
	• Consumptive/non-consumptive
		• Water
		  • Understanding groundwater, quantity (water supply to downstream), quality (salting roadways), biodiversity (bugs & fish)

	• Industry: forest product & folks • Sawmill (spray lake), small quota holders	• Groundwater (recharging) • Surface water

	• Federal
	  • Department of Oceans and Fisheries
	  • Environment Canada
		• Biodiversity
		  • Species at risks , Species At Risk Act

	• Crown
	  • Alberta Sustainable Resource Development (Fish and Wildlife, Lands, Forestry), Alberta Tourism, Parks and Recreation, Alberta Environment, Alberta Transportation
		• Highest yield area
		  • Snow pack, no glaciers, rain

	• Municipal Districts	• Eastern slopes policy
	• Town's • Businesses within the town boundaries	• Legislation, policies, forest reserve

	• Homeowners
	  • Primary, secondary, cabins, acreages
	  • Sub-divisions
		• Appointment Agreements

	• Transportation	• Natural processes/impacts • Fire, climate change

	• Industry
	  • Oil & gas, mining, wind farms
		• Land use in general
		  • Impacts of recreation, random recreation, industry, municipal growth, agriculture, native range

	• Resort
	  • Castle Mountain, Crowsnest (future)
		• Transportation Corridors
		  • Roadways, expansion, linear disturbance

	• First Nations • Piikani, Blood, Kooteney	• Alberta Land Stewardship Act, Public Lands Act, Forest Act, Forest Land Use Zones, South Saskatchewan Regional Plan
	• Hutterites	• Culture • Diversity of values, different desires based on core values, heritage, sustainable lifestyle, multiple generational, cut across professions

Sub-basin	Who	What

	• Environmental Non-Government Organization
	  • Canada Parks and Wilderness Society, Crowsnest Conservation Society, Ducks Unlimited, Trout Unlimited, Cows and Fish, Fish and Game Association, Castle Crown Working Committee, Alberta Conservation Association
		• Money drives
		  • Funding, capacity, economics

	• Land Trusts • Nature Conservancy of Canada, Southern Alberta Land Trust Society	• Flora/Fauna - invasive
	• Cross Boundary Groups • USA/BC/Alberta, forestry, mining, tourism, etc .	• Population shifts
	• Crown of the Continent Groups	• Lack of common vision
	• Downstream Users	
	The group started discussing linkages but did not have time to finish the discussion – these are their incomplete notes • Government (links to all) • Agriculture (Economic) • Recreation/Recreation Industry • Industry Resource • Transboundary Users • First Nations • Non-government Organizations • Research/Education • Residential	• Land use – social, environmental, economic • Water – environmental • Air – environmental • Biodiversity – environmental • Cultural/values – social • Economic – social, economic • Legislation - social
Foothills **The Who & What are linked**	• Municipalities • Towns, villages, rural, MDs	• Services (water, sewer) • Manage development; housing, industrial, commercial • Safety: police, fire • Roads – residential needs • Recreation: residents, pools, parks, arenas
	• Government • Provincial, Federal	• Public lands management • Land use management • Resource management • Recreation: tourists, ATV, camping, what affects landscape • Regulate: drinking water, environmental, land use, waste water, water allocation • Development; Energy Resources Conservation Board • Energy • Agriculture • First Nations • Fisheries and Oceans Canada • National parks (Mountain & Southern Tributaries)

Sub-basin	Who	What
	• Industry • Oil and Gas, wind, health care, food processing, tourism, forestry, mining, manufacturing, small businesses, guest ranching, camping, irrigation, golf course, construction	• Use water • Need land space • Use resources • Provide employment • Economic development • Transportation corridors • Infrastructure • What can exist without destroying? • Water shortage • Reclamation • Short term vs. long term motivation • Stewardship
	• Agriculture • Ranching, basic use and maintenance, intensive operations, dry land, irrigated farming, acreage (small farm and residential green), specialty (bees, bison)	• Depend on land • Use for food – grazing • Soil to produce crops • Stewards of land • Fertilizers • Irrigate • Harvest/compact soil • Changes structure of industry eg/assembly line, work on scale • Transportation in and out • High water usage • Manure management • Beneficial Management Practices: help land recover • Fence/storage
	• Wildlife • Birds, ungulates (deer, moose, elk), predators (wolves, fish)	• Habitat • Recreation • Tourism • General quality of life
	• Environment • Trees (maintain water), grasslands, water bodies, riparian	• Fire • Floods • Droughts • Winds • Snow

Sub-basin	Who	What
	• Residents – lifestyle	• Live • Recreate • Densities – patterns • Work • Infrastructure • Water use - ground and surface • Perspective change • Cumulative management of residents
	• Visitors	• Tourism • Arts and culture • Economic • Interest
	• Education/Academia • Research, teaching	• Impacts lifestyle, sells education • Research - new evidence • Education leads to stewardship • Impacts legislation and land use • Employment & economic
	• Historic First Nations • Blood, Piikani	• Pressure and maintenance while finding out story
	• Outside of watershed impacts • Environmental groups, business, global	• Greater impact have influence on decision makers • New outlook – perspective • Other corporate policies • Change in land use
	• Arts & Culture	
	• Recreation • Fishing, boating, ATV (mudding), hunting, hiking, horseback	
	• ENGOs • Ducks Unlimited, Nature Conservatory of Canada	
	• Hutterites	

Sub-basin	Who	What
Southern Tributaries **The Who & What are linked**	• Southern Alberta Group for the Environment (SAGE) – Alberta Native Plant Council • Voice for environment sustainability, worked on environmental issues in Oldman basin, water quality, livestock operation, diversion, landowner, biologists (cottonwoods) • Prairie Conservation Forum • Foothills Restoration Forum	• Water quality – quantity • Xeriscaping – water and pest reduction • Works with intensive livestock operators • Rare plant species support awareness of native plants • Concerns with non-native species • Dams and diversions
	• Students, First Nations, Alberta Environment, oil and gas industry	• Public Health • Education • Environmental Studies • Water Quality • Natural and non natural pollution • Environmental Indictors • Microbial Indicators • Public Surveys
	• First Nations: • Kainai/Blood Tribe, Piikani, part of Blackfoot Confederacy, landowners (Blood Reserve), farmers, irrigators, Department of Indian and Northern Affairs	• Traditional territory • Surrounded by water (Belly, Oldman, St. Mary) • Timberland • Knowledge on landscape • Cultural belief; Water and waterspecies are powerful; Traditional significance • Plants for sustenance, ceremonial, hunting • One of largest First Nation population • Primary land use is agriculture • 140 acres of prairie • Irrigation • Rental to non-tribal member farmers • Large area and lack of human resources to monitor • Lack of data on reserve; need more inventory on land • Education on Beneficial Management Practices (BMP's) for farmers • Sustain water and land resource; more data and inventory • Subsurface groundwater • Existing treaties honored. Productive resolutions and solutions
	• Board member OWC • Southern Alberta Groups for the Environment • Other Environmental Non-Government Organizations (ENGOs) • Volunteers on OWC • Microbiology, medical • Instructor at college	• Public surveys on knowledge of river and people's interaction • Public education • Invasive species • BMP's • Wildlife, plant life

Sub-basin	Who	What
	• Cows & Fish • Science & Biologists • Landowners • Local community • Counties and MD's • Sustainable Resource Development (SRD), Alberta Parks, Department of Fisheries and Oceans, Agri-Environment Services Branch (Prairie Farm Rehabilitation Administration), Alberta Environment • First Nations • Towns & Cities • Recreationalists • Producers • Watershed Stewardship Groups (WSGs), Watershed Planning and Advisory Councils (WPACs) • ENGO's • Parks (Provincial, Federal)	• Practical wisdom • Community based action • Education and extension • Ecological processes • Sustainable management • Healthy riparian areas • Healthy landscapes • Monitoring and measuring • Evaluation and social monitoring • Building tools and programs to feedback into action and education • Helping them to make change • Support good change • Fishing, camping, hiking • Provide guidance and expertise • Long term vision
	• Parks (Canada, Government of Canada) • Wildlife & natural resident, fish, plants • Small community (Waterton) • 375,000-400,000 visitors • School groups • Visitors • Legislative mandate • Nature Conservancy of Canada (NCC) • Waterton front project • Transboundary (USA & Canada)	• Education • Visitor experience • Providing information • Camping, hiking • Wilderness experience • Different levels of experience • Resource management • Prescribed fire • Human/animal conflict • Aquatic systems (fish etc) • Restoration – Non-native plant control (knap weed rodeo); white bark pine & pathogens • Salamander tunnels (wildlife corridors) • "Class 2" development
	• Crown Managers Partnerships	• Work externally from park so things don't stop at the border

Sub-basin	Who	What
	• Irrigation Districts, Alberta Irrigation Projects Association • Tourism, Parks and Recreation; parks on reservoirs • MD's , Counties, communities • Irrigators, water co-ops • Committees • Regional Advisory Council • Alberta Agriculture and Rural Development • Alberta Water Council (AWC), WPACs • Ducks Unlimited • Food Processors	• 645,000 acres in Oldman basin • Endangered species • Land use; irrigation for agriculture, domestic use, greenhouses, golf courses • Recreation • Largest water license holders and users • Water quality (receiving and drainage) • Conservation of water
	• Alberta Agriculture and Rural Development • Engineers and biologists, environmental specialists, soil scientist, field specialists • Environment, Municipal Affairs, SRD • Irrigation districts, Alberta Irrigation Projects Association • Producers (irrigation and dry land), producer organizations • WPAC's, AWC, WSGs • USA	• Agriculture and water issues in province • Water quality, managements and supply • Issues of water supply for agriculture in balance with environment, urban • Impacts on water quality from agriculture; finding solutions • Negotiating international water systems • Flood damage
Prairies **The Who & What are not linked**	• Ranchers, farmers (irrigation), livestock, industry agriculture, feedlots, groundwater, crop farms, livestock farms, ranching, greenhouses	• Grassland (cattle, grazing, pastures)
	• Residents, senior citizens, consumer & customers, oil & gas, food processors (Lays, Sugar)	• Transportation, gas lines, power lines, wind farms, power plants
	• Scientists, academics, researchers	• Dams
	• Outside Market	
	• Administration, politicians, regulators, municipalities, government (federal & provincial), inter-provincial	
	• Recreation, hunters, boaters, ATV, hikers, fishers	• Riparian areas & wetlands • Rivers & tributaries
	• Extractive industry	
	• Irrigation districts, parks (national, provincial), protected areas	• Canals, ditches, drains, irrigation
	• Urban areas	• Treatment facilities – waste water • Water Quality
	• First Nations	

APPENDIX F: BROAD SOURCES OF RISK

Environmentally aware, responsible and motivated watershed residents

- Information understanding
- Residents (new, old) immigrants
- Uninformed – gap in knowledge
- Participation, self motivated
- Not empowered
- Prospectors vs speculators
  - Incentives
- Regulation, enforcement
- Legislative hurdles
- Not empowered
- Lack of social responsibility
- Self motivated
- Short tem vs long term views
- Unaware of personal impact
- Ownership issues (user/visitor) – succession of stewards on land
- Different perspectives
- Human instinct
- Reactive vs proactive
- Motivation
- Cost vs benefit (social, environmental, economic)
- Prospectors vs speculators
- External influences/cycle
- Succession of stewards on land
- Lack of consistent messaging
- Effective communication
- Definition

Group #1

- New residents/immigrants
- Gap in knowledge/uninformed
- Prospectors/speculators
- Unaware of personal impacts – collective
- Communication
- Legislation hurdles
  - Incentives
- Lack of regional perspective/awareness
- Succession of stewards on land
  - Historical used- management systems
  - Generational knowledge passed down
- Short tem vs long term views
- Connections between producers and users
  - Nature connection

Group #2

- People feeling not empowered
- Differing views and interests
- Lack of understanding
- Capacity to inform
- Shifting social factors
- Tools to support participation
- Regulation and enforcement (lack of)
- Cost vs benefit
  - social/cultural
  - economic
  - emotional

Group # 3

- Lack of motivation (reactive) awareness, information
- Effective communication
- Human instinct (reactive not proactive)
- Risk
- Lack of incentive
- Lack of social responsibility
- Lack of consistent messaging
- Different values (social, econ, env)
- Lack of definition of what is environmentally aware
- External influences/cycle (political/seasonal)

Group #4

- Ownership issues (user/visitor)
- Connection to use vs responsibility

A safe and secure water supply

Group # 1

- Extreme and unpredictable weather conditions
- Costs
- Individual responsibility
- Reactive rather than proactive

Group # 2

- Headwater protection (activities threaten)
- Water quality standards and guidelines
- Monitoring systems

Group # 3

- Special interests drive process
- Understanding of costs
- No buy in from public
- Other outcomes and risk
- Uncertainty of adaptive management
- Do nothing
- Lack of education/knowledge
- Lack of headwater management
- Enforcement of existing legislation
- Unattainable goals
- Implications of choices
- Lack of resources
- Lack of collaboration
- Lack of leadership (political will)

Group #5

- Population growth
- Economic driver/development
- Technology to respond to water quality
- Waste water disposal
- Allocation risk for communities
- Lack of storage

Balanced allocation and wise management of water

Defining the balance and the change of that balance due to the environmental, social, economic issues

Potential lack of flexibility

Ground aquifers (surface - subsurface)

- Inventory of quantity, allocations
- Data records
- Contamination/quality
- Lack of knowledge between groundwater and aquifers
- Understanding value of in stream flows
- Water licensing legislation – first in time – first in line and other allocation methods
- Climate change
- Cumulative effects – comprehensive value
- Entrenched users – unwillingness to compromise
- Evaporation
- Conservation
- First in time, first in right (FITFIR) – history
- Political barriers
- Instream need – Intensive Livestock Operations (IFO)/etc. - science to support
- Existing commitments

- Competing uses
- Pricing/low cost of water
- Future shortages/climate
- No water trust allocations
  - unclear
  - not a 'use'

Risk and priority of allocation – response to shortages

Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwater, native fish, and forested areas

- Loss of ditches to pipes – value of seepage (habitat)
- Failure to fully adopt beneficial practices (cows and fish)
- Access roads/fragmentation
- Introduced species (i.e mussels)
- Personal responsibilities
- Impact of actions
- Good scientific information to back benefits
- Special interests drive process
- No buy in from public
- Other outcomes at risk

- Do nothing
- Lack of headwater management
- Enforcement of existing legislation
- Unattainable goals/thresholds
- Implication of choices
- Non - implementation of …
- Lack of resources
- Lack of collaboration and communication
- Lack of leadership (political will)
- Understanding of costs – social, environmental, economic
- Lack of education – lack of knowledge
- Uncertainty of adaptive management

- Different definitions of abundant/ healthy etc
- Lack of baseline data
  - What is the end goal?
- Lack of awareness of benefits of healthy ecosystems

- Loss of grassland – more trees
- See # 2 on nature
- Lack of measuring and valuation (inventories)
- Native vs introduced
- Current state – unhealthy
- Resistance to change
- Wetlands (not included)
- Huge effort required

Land managed for multiple use with minimal impact on natural, cultural and historical asset

Risk Events

1. Lack of a framework
   Legislation/standards
   Regulations
   Enforcement

2. Intensity of use
   Cumulative impact – over use
   Oil & Gas/energy
   Logging
   Agriculture/ranching
   Recreation
   Residential development
   Density
   Limits to resource

3. Lack of jurisdictional cooperation (jurisdictional complexity)

4. Climate change managing more complex

5. Changing ownership structures – scale

6. Engagement vary perception

7. Lack of agreement of defining outcome

8. Lack of knowledge & awareness
   State of the resource
   Best practices

9. Incentives – valuation external influences (motivators) environmental good & services

10. Past – current future value of resources

11. Existing commitments
    Leases
    Quotas
    Extraction

12. Failure to recognize limits

13. Regulation enforcement do not match intensity of use

- Cumulative effects – tools and systems
- Too many roads/access
- Appreciation of natural, cultural and historical (respect)
- Existing commitment
- Jurisdictional cooperation
- Public lands not respected
- Required indicators
- Enforcement
- Define 'minimal' (accepted conditions)

- Climate – floods and drought
- Lack of planning coordination – multi jurisdictional
- Cumulative effects
- Measurement – monitoring
- No acceptance of economic valuation of environmental, social, historical cultural capital
- Correctly valuing i.e (wetlands) assets on private/public lands that benefit greater region (transfer credits)
- Multiple overlapping demands
- Public lands more susceptible to pressures
- Lack of legislation/regulation
- Lack of framework
  - Agreements
  - Social norms
  - Tools
- Motivated population
- Diverse objectives from stakeholders
  - Different motivations
- Few mechanisms for achieving balanced choice
- Engagement of citizens
- Education/communication
- Lack of incentives

- Varying perceptions on what is impacted landscape
- Multiple users
- Jurisdictional complexities
- Don't fully understand impacts of climate change
- Lack of enforcement/capacity/resources – incentives to better manage land
- Self interests vs collective good
- External influences – transportation/ pipelines etc – cross boundary

APPENDIX G: PRE AND POST CONTROLS

Outcome Statement	Risk Statement	Pre-Controls	Post-Controls
Environmentally aware, responsible and motivated watershed residents	1. *What if people don't have a personal level of connection to the watershed*	• Social marketing • Water metering for everyone – awareness and cost • Increased connection to the watershed-access, quality experiences • Private land owner incentives for access	• Social marketing • Legislation/regulation

	2. *There is variance in social values and interest*	• Understanding values
		  • Social diversity
		  • Age
		  • Culture
		• Curriculum
		  • Put issues in schools
		• Explaining the costs and benefits of participation in watershed planning process
		• For new Canadians, provide context of the watershed
		• Place-based education (urban/rural) but create common understanding
		• Inclusive, open and fair processes to involve in planning decisions that influence
			• Target
			  • Messages and media
			• Make sure all stakeholders have had voice in decision making
			• Have conflict resolution process in place
			• Involve youth enjoyment and educational experience
			• Stewardship

	3. *Insufficient understanding/ knowledge of watershed*	• Get specifics of SOW in school curriculum • Use education and communication programs to get people inspired and connected • Blend watershed stewardship activities with other activities people are already doing • Promote Cows and Fish model	• Constant communication - after impact as well before and during • Carrots and sticks: commitment to compliance • Using gentle peer pressure to influence values/actions (watershed groups)
	4. *Not having effective tools to support action (regulatory and non regulatory)*	• Free and targeted education access to information/web • Effective (enforced) regulations • Understanding motivation by communities	• Enforcement • Incentives (negative/positive) • Post event education

Outcome Statement	Risk Statement	Pre-Controls	Post-Controls
Environmentally aware, responsible and motivated watershed residents	5. *Lack of human and fiscal resources*	• Increase awareness – better story telling • Lobby • Collaboration among agencies/groups • Highlight crisis • Prioritize and focus on critical areas • Identify alternative funding	• Monitor and report on progress • Look for alternative funding sources • Regulatory and non-regulatory incentives • Re-visit messaging, story telling
	6. *Lack of effective communication*	• People aware of resources potentially available for (new use and limiting factors) • Sector/public discussion • Communication plan/strategy	• Evaluate effectiveness of pre-controls • Adapt and communicate re: plan
Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas	7. *Competing interests*	• Integrated planning • Shared accepted priorities • Policy commitment (at political level)	• Stringent regulation and enforcement • Non regulatory tools and incentives
	8. *Resistance to change*	• Identify risks of not changing • Help people understand the link of their personal actions to impacts on the watershed and other people • Give examples of positive results from change in behaviour • Gain understanding of barriers to change and incentives for change • Raising awareness of ecosystems of the watershed	• Bylaws and legislation to require change • Peer pressure/social expectation for action • Defining ecosystem thresholds and plans to not exceed them
	9. *Lack of understanding of implications of change*	• Research around understanding implications/ effects of changes • Communication stems from research results • Communicate unintended consequences we're experiencing already • Promote more thorough evaluation of <u>whole</u> issue and less emergency reaction (encourage more proactive than reactive)	• Revisit (monitoring), revise (adaptive management) • Based on social, economic, environmental measures/factors
	10. *Lack of education/knowledge*	None identified	None identified

Outcome Statement	Risk Statement	Pre-Controls	Post-Controls
Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas	11. *(Protection for/of ecosystems) Legislation and regulation*	• Payment for environmental goods and services (EGS) • Address and support property right concerns in legislation and policy • Education/awareness raising • Targeted enforcement/progressive application	• Fines pay for habitat compensation
	12. *Lack of understanding of cumulative effects*	• Communicating info • Setting thresholds (density of activity/ development) • Plan, eg. *Land-use Framework* (regional plans) • Approvals and planning with cumulative effects in mind, with multi–sectoral approach (and multi–jurisdictional inclusion) • Control/oversight of high level discretionary powers (including litigation)	• Consider moratoriums/limits to further use of some areas/resources • Apply reclamation/restoration • Appropriate comprehensive research on cumulative effects (requires funding/ resources) • Support for implementation/change (incentive/reward/compensate/plan/assist) • Fund and develop cumulative effects research for better decision making
	13. *Unclear definitions of abundant healthy*	• Science based research to characterize current state • Clear definition of terms- science based 'how much is abundant' • Social acceptance (i.e. a choice by society) of targets	• See pre-controls • More of the above with pictures and examples
	14. *Lack of baseline data - scientific data*	• Identify and address data gaps • Ensure politician understanding and support • Royalty or fees from industry to support data collection/research/and reporting • Monitoring the environmental effects of projects as part of approval • Establish science forum - ie. a collective of the scientific capability that meets regularly to set priorities and review results and reset priorities • Better communication of the baseline data we do have, eg. Instream flow needs and the quality of the data	• Identify risks of the data gap and any of the associated decisions and actions that are data deficient • Develop a contingency plan – in case 'wreck' happens

Outcome Statement	Risk Statement	Pre-Controls	Post-Controls
Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas	15. *Current state of the watershed is considered acceptable*	• Numerical and historical credibility available and communicated • Easy to implement programs/tools that visually demonstrate/measure level of impact • Empower personal responsibility	• Monitoring and demonstration of progress to show what improvement looks like and compare to before • Compliance/enforcement measures
	16. *The presence of invasive and/or non-native species*	• Education/awareness • Screening/inspection/wash equipment • Minimize disturbance/access • Multi-jurisdictional cooperation/action	• Controlled programs • Enforcement • Restoration

	17. *Habitat loss*	• Manage land use activities to maintain habitat
		  • Appropriate activities
		  • Appropriate locations
		  • Appropriate intensity
		• Implement cumulative effects – based management
			None identified

A safe and secure water supply	18. *Emerging contaminants*	• Research and monitoring (properly funded) and data compilation • Better understanding of unintended/ cumulative effects of otherwise approved chemicals/pharmaceuticals (i.e. environmental impact) including recognition of synergistic/additive consequences • Ability to change or add to monitoring • Reduction of release of chemicals/ contaminants eg via water quality treatment • Reliance/consideration of precautionary principle - avoid	• Epidemiological/long- term/animal and human and plant health studies look at long term impacts • Improve water quality treatment (and other controls (air quality)
	19. *(Human) Population growth*	• Planning for population growth • Eg. Zoning, water conservation targets • Regional plans	• Zoning, water conservation targets • Regulation • Municipal planning

Outcome Statement	Risk Statement	Pre-Controls	Post-Controls
A safe and secure water supply	20. *Political factors*	• Regional plans • Ensure transparency • Educate MLA's and councilors and other decision makers • Science–based decision making • Cooperation/sharing of information by various agencies working on drinking water and all aspects of the watershed • Use OWC	• Stakeholder/public review sessions
	21. *Shortage of supply*	• More accurate measurements of supply • Protect the headwaters with combination of conservation tools (eg. Parks, market instruments, conservation areas, best practices) • Managing for a high level of riparian health and forest health • Off stream storage facilitates • Drought contingency planning at all levels (irrigation districts, municipalities) • Include climate change models and information in planning	• Land use changes (eg. Crop to permanent cover) • Change crops to more drought resistant • Temporary re-allocation to water • Adaptive management • Adjust expectations to be happier with less • Programs to address food security
	22. *Failure to respond due to cost and lack of resources*	• Water shortage strategy with broad support • Scenario planning • Ensure efficient and effective monitoring program (attention to risk) across watershed • Build awareness/social consensus • Political will	• Public dialogue around unwanted outcomes • Enforcement • Managing (conflict) reallocation
	23. *Impaired water quality*	• Conservation and efficient use • Source water protection • Riparian protection • Waste water treatment • Land use management beneficial management practices • Education	• Research – keep up with issues • Monitor and report

Outcome Statement	Risk Statement	Pre-Controls	Post-Controls
A safe and secure water supply	24. *Extreme weather events*	• Acknowledge cumulative effects and research on climate (develop model and monitor actual) • Maintain functioning watershed to increase resiliency/ability to adapt to extreme events • Use of beneficial management practices that increase health/function • Avoid use/management to maximum and leave buffer/precautionary principle – don't push to 'max' all the time	• Do same as in pre-list more of these than we currently are • Technology change (flood control) • Use of resources, etc. • Change approaches: some will be very expensive
	43. *Headwater degradation*	None identified	None identified
Balanced allocations and wise management of water	25. *Lack of knowledge around cumulative effects and consequences*	• Research, monitoring, assessment • Current state and trajectories • Integrated decision making • Communication amongst all levels – scientists, public, policy makers	• Crisis management, tougher choices • Regulation • See pre-controls
	26. *Shortage of water lead to unwise management of decisions*	None identified	None identified
	27. *Failing to define value of water (economic, social, environmental)*	• Functioning water market subject to environmental and social controls • Incent people to attach greater value to water • Identify pre planning for water allocation during drought	• Balance allocation by demand • Public pressure to change policy and regulations • Adaptive management
	28. *Quality of water being allocated won't meet the need of the user*	• Value ecosystem services • Effective regulations • Maintain source water quality - headwaters • Risk assess and prioritize mitigation strategies other reaches • Regional planning	• Upgrade treatment facilities • Prioritize uses of varying water quality

	29. *Lack of knowledge of the relationship between groundwater and surface water*	• Develop the knowledge base
		  • Priority areas
		  • Collaboration among parties/coordination
		• Share information
		• Raise awareness
		• Precautionary principles considered in decisions until more is known
			None identified

Outcome Statement	Risk Statement	Pre-Controls	Post-Controls

A safe and secure water supply	30. *Ineffective legislation*	• Better alignment of legislation/regulation, including across jurisdictions
		  • For both topic (eg. fish) as well as activity (eg. different land uses)
		  • But still allow some flexibility/diversity (with thought/planning)
		• Threat of litigation (penalty clear and consistent and consistently applied)
		• Change/review fines/penalties
			• Minimize political involvement/interference of application of legislation/regulation
			• Timely application (enforcement) of regulation/fines, etc
			• Educate and inform judiciary regarding the environment

	31. *Water supply variability over time*	• Science and planning • Adaptation risk management • Water storage – dams • Conservation of use • Conservative allocation • Conservation of land base to capture and hold more water	• Allocation policy – many options • Adaptation planning/regulation – really Tough decisions
	32. *Lack of conservation/inefficient use of water*	(Velvet glove) • Science and technology – all sectors of use • Social marketing of conservation • Integrated water use planning • Pricing/valuing of water	(Iron fist) • Regulations incentives/fines
Land managed for multiple use with minimal impact on natural, cultural and historical assets. *Manage multiple use demands to maintain/restore health and function of terrestrial and riparian landscape	33. *Existing commitments; leases – quotas – extraction*	• Cumulative effects review of existing leases • Incentives for best management practices (BMP's)	• Incentives in place to mitigate and reduce existing/future impacts • Compensation programs for leases that haven't been fulfilled yet • Incentives for enterprise changes
	34. *Changing ownership structures. i.e small mixed farms to large corporate ranches; ranches to subdivisions*	• Easements with incentives/transfer credits • Zoning and planning tools (*Land-use Framework*, local government)	• Stewardship programs (Cows and Fish etc) • Consolidation land
	35. *Financial incentive structures do not match our environmental objectives i.e draining a wet land to increase crop production – more value to the landowner*	• Recognition of environmental goods and services (EGS) values in policies • Compensation for EGS values	• Revision/implementation of policy that considers EGS values

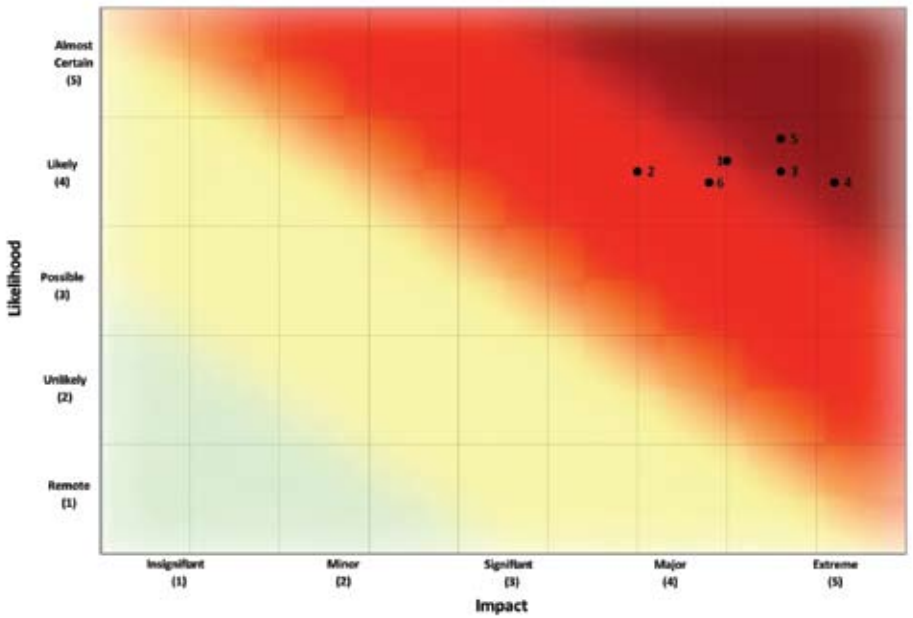
Outcome Statement	Risk Statement	Pre-Controls	Post-Controls
Land managed for multiple use with minimal impact on natural, cultural and historical assets. *Manage multiple use demands to maintain/restore health and function of terrestrial and riparian landscape	36. *Lack of knowledge (about the resource) Awareness and engagement at all levels*	• Communication and education • Funding: adequate research and long term approach for communication • Involve people - hands on experiences with resources (include this in research, too)	• Evaluation of efforts of communication and research and adopt • Use research to direct ways to increase knowledge
	37. *Risk of not knowing value of resources in the future*	• Precautionary principle – don't use it all • Assume all resources have value	• Oops!! • More expensive alternative solutions
	38. *Lack of jurisdictional co-operation*	• Effective *Land-use Framework*/planning that incorporates/considers/aligns/ensures jurisdictional differences • Implements/ensure regional planning (at multiple scales - South Saskatchewan Regional Plan and at a finer scale, too) • Put in resources (expertise and funding) so jurisdictions can spend more time to work together	• Implement/consider moderator/ mediator in lieu of planning commission begin in existence • Encourage more cooperation between jurisdictions, even if informal
	39. *Failure to consider climate change in management decisions*	• Have some flexibility/adaptability built into decisions • Move from disaster assistance to more pro-active investments • Awareness of potential implications (scenarios)	None identified
	40. F*ailure to recognize impacts on the resource (cumulative effects)*	None identified	None identified
	41. *Regulation and enforcement do not match intensity and complexity of use*	• Solidify and implement cumulative effects based management • Better integration between regulators/policies and jurisdictions • Agreement on priorities/focus on those highest risks	None identified
	42. *Failure to recognize and manage intensity of use*	• Communication/education citizenry that demands that management occurs • Research cumulative effects (both to resources, economy, social side) • Plan (eg. *Land-use Framework*) to identify and plan uses • Monitor use/access • Establish control mechanisms • Review/ improve legislation – some people don't have to comply – identify loopholes	• Better understanding of ramifications of decisions through research/educate • Legislate/regulate use (must have enforcement) • Set thresholds/caps on use (or users) (eg. max numbers using forest reserve area)

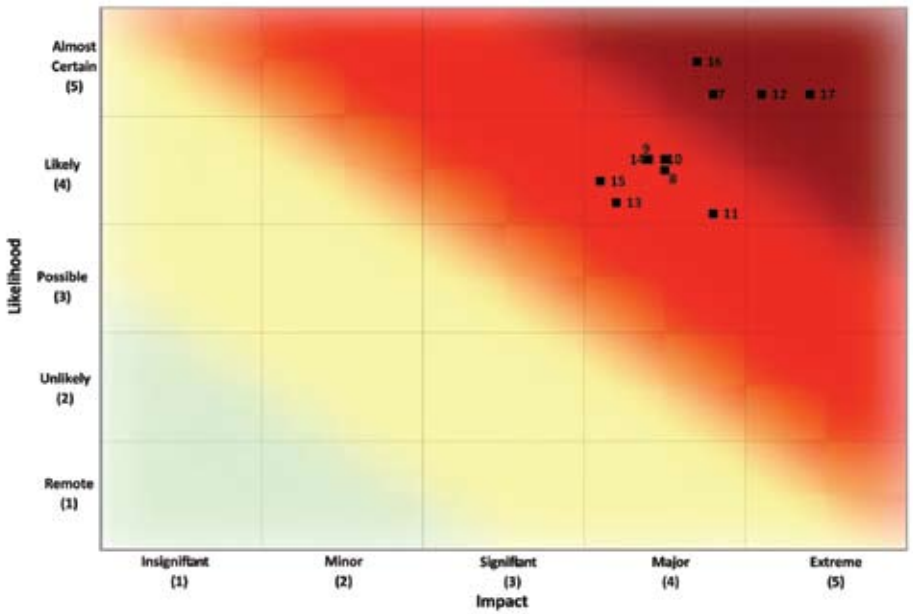
APPENDIX H: RISK ANALYSIS OF ALL FORTY-THREE RISK STATEMENTS

Risk #	Risk Statement	Impact	Likelihood	Rating
Environmentally aware, responsible and motivated watershed residents				
1	What if people don't have a personal level of connection to the watershed?	3.5	3.6	High to Critical Severity
2	There is a variance in social values and interest	3.0	3.5	High Severity
3	Insufficient understanding/knowledge of watershed	3.8	3.5	High to Critical Severity
4	Not having effective tools to support action (regulatory and non regulatory)	4.1	3.4	Critical Severity
5	Lack of human and fiscal resources	3.8	3.8	Critical Severity
6	Lack of effective communication	3.4	3.4	High Severity
Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas				
7	Competing interests	3.8	4.2	Critical Severity
8	Resistance to change	3.5	3.5	High Severity
9	Lack of understanding of implications of change	3.4	3.6	High Severity
10	Lack of education/knowledge	3.5	3.6	High Severity
11	(Protection for/of ecosystems) Lack of legislation and regulation	3.8	3.1	High Severity
12	Lack of understanding of cumulative effects	4.1	4.2	Critical Severity
13	Unclear definitions of abundant healthy	3.2	3.2	High Severity
14	Lack of baseline data - scientific data	3.4	3.6	High Severity
15	Current state of the watershed is considered acceptable?	3.1	3.4	High Severity
16	The presence of invasive and/or non-native species	3.7	4.5	Critical Severity
17	Habitat loss	4.4	4.2	Critical Severity
A safe and secure water supply				
18	Emerging contaminants	3.8	4.1	Critical Severity
19	(Human) Population growth	4.1	4.1	Critical Severity
20	Political factors	3.1	2.9	Medium to High Severity
21	Shortage of supply	3.8	3.3	High Severity
22	Failure to respond due to cost and lack of resources	3.3	2.7	Medium to High Severity
23	Impaired water quality	3.9	3.3	High Severity

Risk #	Risk Statement	Impact	Likelihood	Rating
24	Extreme weather events (climate variability)	3.6	3.7	High to Critical Severity
43	Headwater degradation	4.3	3.5	High to Critical Severity
Balanced allocation and wise management of water				
25	Lack of knowledge around cumulative effects and consequences	3.8	3.5	High to Critical Severity
26	Shortage of water lead to unwise management of decisions	3.6	3.5	High Severity
27	Failing to define value of water (economic, social, environmental)	3.5	3.7	High to Critical Severity
28	Quality of water being allocated won't meet the need of the user	3.3	3.0	High Severity
29	Lack of knowledge of the relationship between groundwater and surface water	3.6	3.9	High to Critical Severity
30	Ineffective legislation	3.5	3.5	High Severity
31	Water supply variability over time	3.3	4	High to Critical Severity
32	Lack of conservation/inefficient use of water	3.7	3.6	High to Critical Severity
Land managed for multiple use with minimal impact on natural, cultural and historical assets *Manage multiple use demands to maintain/restore health and function of terrestrial and riparian landscapes				
33	Existing commitments; -leases – quotas – extraction	3.6	3.7	High to Critical Severity
34	Changing ownership structures. i.e. small mixed farms to large corporate ranches; ranches to subdivisions	3.5	4.1	High to Critical Severity
35	Financial incentive structures do not match our environmental objectives i.e. draining a wet land to increase crop production – more value to the landowner and less to the environment	3.7	3.8	High to Critical Severity
36	Lack of knowledge (about the resource of water and land), awareness, and engagement at all levels	3.4	3.5	High Severity
37	Risk of not knowing value of resources in the future	3.2	3.6	High Severity
38	Lack of jurisdictional co-operation	3.8	3.9	High to Critical Severity
39	Failure to consider climate change in management decisions	3.6	3.6	High Severity
40	Failure to recognizes impacts on the resource (cumulative effects)	4.2	3.9	Critical Severity
41	Regulation and enforcement do not match intensity and complexity of use	3.9	4.2	Critical Severity
42	Failure to recognize and manage intensity of use	4	3.8	High to Critical Severity

APPENDIX I: RISK ANALYSIS OF EACH OUTCOME STATEMENT GROUPING



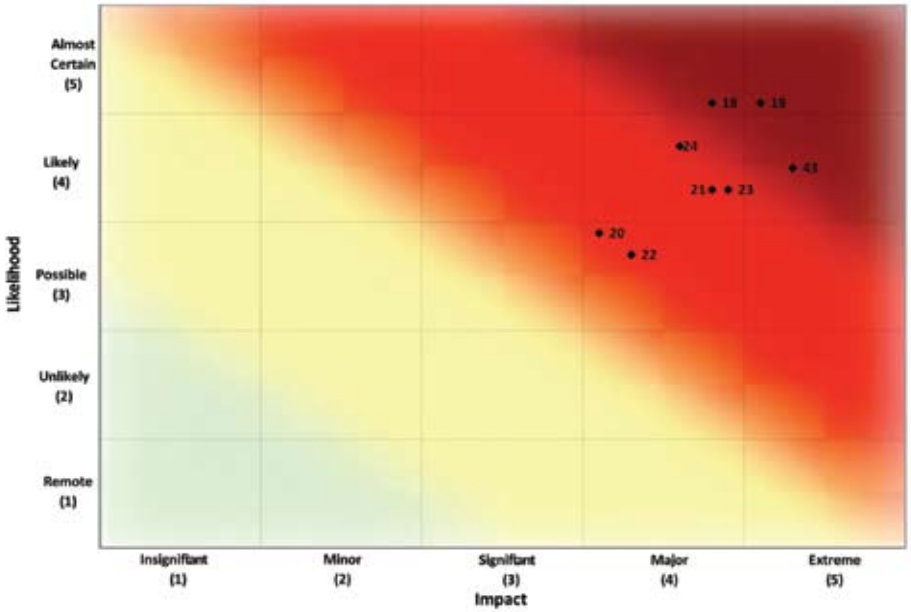


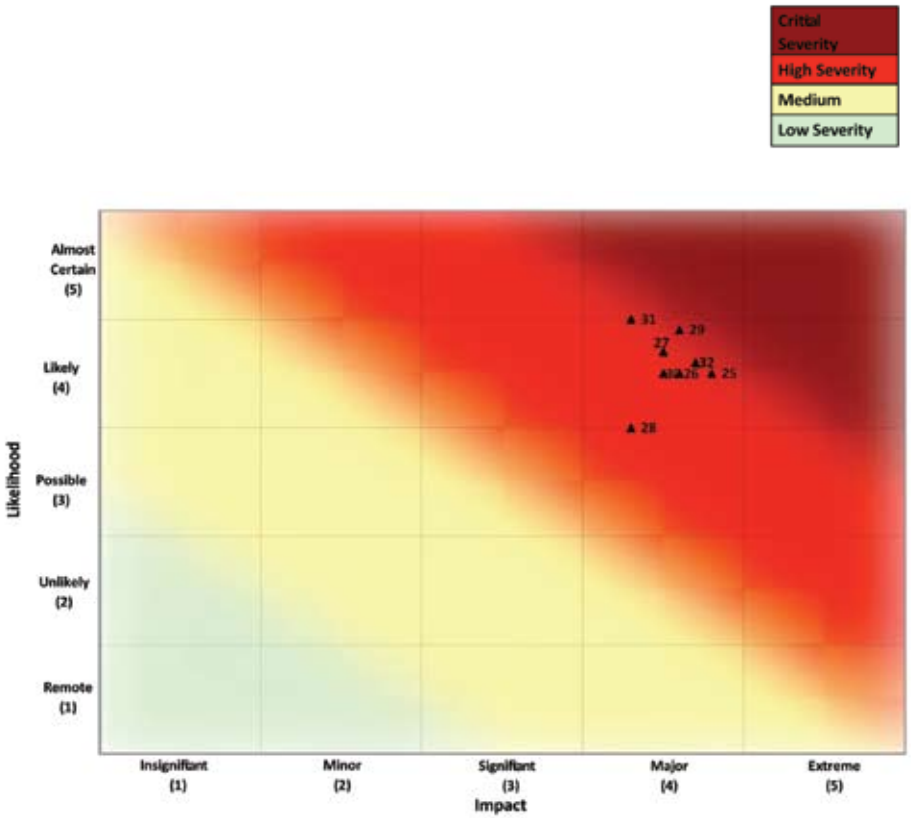
Environmentally aware, responsible and motivated watershed residents

1. What if people don't have a personal level of connection to the watershed?
2. There is a variance in social values and interest
3. Insufficient understanding/knowledge of watershed
4. Not having effective tools to support action (regulatory and non regulatory)
5. Lack of human and fiscal resources
6. Lack of effective communication

Abundant, healthy and biologically diverse aquatic and terrestrial ecosystems in particular riparian areas, native grasslands, headwaters, native fish, and forested areas

7. Competing interests
8. Resistance to change
9. Lack of understanding of implications of change
10. Lack of education/knowledge
11. (Protection for/of ecosystems) Lack of legislation and regulation
12. Lack of understanding of cumulative effects
13. Unclear definitions of abundant, healthy
14. Lack of baseline data – scientific data
15. Current state of the watershed is considered acceptable?
16. The presence of invasive and/or non-native species
17. Habitat loss



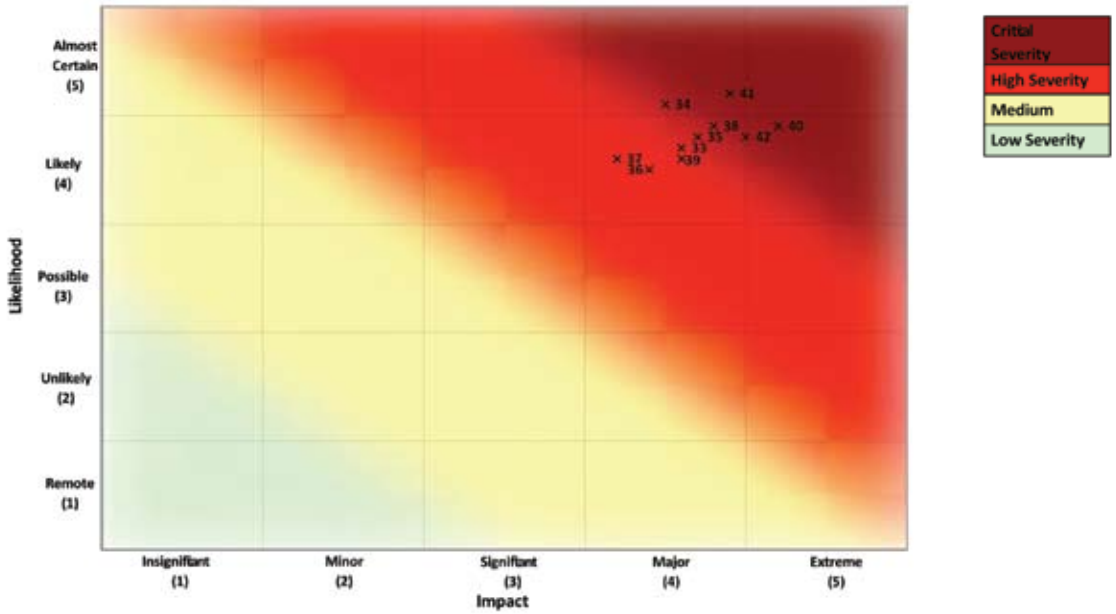


A safe and secure water supply

18. Emerging contaminants
19. (Human) Population growth
20. Political factors
21. Shortage of supply
22. Failure to respond due to cost and lack of resources
23. Impaired water quality
24. Extreme weather events (climate variability)
43. Headwater degradation

Balance allocations and wise management of water

25. Lack of knowledge around cumulative effects and consequences
26. Shortage of water lead to unwise management of decisions
27. Failing to define value of water (economic, social, environmental)
28. Quality of water being allocated won't meet the need of the user
29. Lack of knowledge of the relationship between groundwater and surface water
30. Ineffective legislation
31. Water supply variability over time
32. Lack of conservation/inefficient use of water



Land managed for multiple use with minimal impact on natural, cultural and historical assets

*Manage multiple use demands to maintain/restore health and function of terrestrial and riparian landscapes

33. Existing commitments; -leases – quotas – extraction
34. Changing ownership structures. i.e. small mixed farms to large corporate ranches; ranches to subdivisions
35. Financial incentive structures do not match our environmental objectives i.e. draining a wet land to increase crop production – more value to the landowner and less to the environment
36. Lack of knowledge (about the resource of water and land), awareness, and engagement at all levels
37. Risk of not knowing value of resources in the future
38. Lack of jurisdictional co-operation
39. Failure to consider climate change in management decisions
40. Failure to recognizes impacts on the resource (cumulative effects)
41. Regulation and enforcement do not match intensity and complexity of use
42. Failure to recognize and manage intensity of use

APPENDIX J: TREATMENT OPTIONS FOR TOP 10 RISK STATEMENTS

Risk Statement	Raw Data
10. Lack of understanding and management of cumulative effects Priority 1	Immediate (now)-Pre Set overarching, clear, environmental outcomes » Consider linear and cumulative effects » That all sectors are bound by and trying to achieve ○ Ensure sector is working on the areas that they impact » Who sets the objectives? Use community engagement Environmental outcomes need to reflect social and economic considerations. » Include a factor in aboriginal, cultural, and spiritual outcomes Linked to existing planning process (*Land-use Framework*, *Water for Life*, Cumulative Effects Management) Rigorous management frameworks » Define strategies and roles » Define Cumulative Effects Analytical support for State of the Watershed (SOW) report, Trajectory, consequences » use existing info from Sustainable Resource Development, SOW and be prepared to supplement (How/who impacts what). Community Engagement » In processes above. » Education about the watershed. » Information to support informed "value" decisions. Ensure congruence between outcomes and regulatory framework » Direction, responsibilities, roles. Follow up (future) - Post » Monitoring (environmental thresholds, outcomes). » Review outcomes via adaptive management. » Refine plans and goals to achieve outcomes and actions. » Ensure direction, roles and responsibilities are defined (who) and review/refine to achieve outcomes (adaptive management). » Inform future research needs. ○ How do various sectors and actions relate to Cumulative Effects? » Ensure ongoing community engagement.

Risk Statement	Raw Data

15. Degradation and loss of aquatic and terrestrial habitat
 	
Priority 2
	Baseline data. Where are we at now?
	» From State of the Watershed (SOW) report approach gaps
	  ○ Address allocation. Out/inflow to the aquatic environment
	» Alberta Biodiversity Institute Monitoring left Southern Alberta out so far
	» Need to collect more information. Gain a spatial understanding along the watershed
	
	Priorities?
	» Start with aquatic. Come to understand the coupling to the land.
	
	Resources?
	» Need to be part of the strategy
	
	Treatments:
	» Aquatic-How and What
	  ○ Need to understand ecosystem relationships
	  ○ Put some science to this
	» Concurrently implement beneficial management practices (BMPs). Policies/Regulation
	» Engage/educate public to facilitate what needs to be done
	  ○ Show them with the science
	» Relate to the sub-basins (longitudinally)
	
	Riparian
	» Inextricably linked to aquatic
	
	Gaps (identified from SOW)
	» Hard to classify risk reduction
	» Data collection
	» Terrestrial-easier to collect data
	» Aquatic-very difficult and expensive
	» If we had data, we would be more successful
	» Move ahead with what we have
	
	Habitat Loss
	Terrestrial
	» Offstream watering
	» Land use issues
	  ○ Role of this report to influence *Land-use Framework*
	» Urban and rural issues

Risk Statement	Raw Data
22. Headwater degradation Priority 3	1. Better monitoring » What factors contribute to water quality & quantity 2. Each user/manager needs to measure up (to their own impacts) » Eg/ duty to restore post disturbance » Beneficial Management Practices (BMP) » Watershed protection 3. Apply zoning to headwaters identify high risk areas » Traditional knowledge – respect Blackfoot » Water society ethic 4. Determine balance between forest & grassland area 5. Define headwater – broader than green zone » +4000ft? 6. Land use indicators » edge density » range health » riparian health » land cover - percent disturbed/undisturbed 7. How to link users to land tenure vs. non tenure -ownership -regulated vs. non regulated
31. Financial incentive structures do not match our environmental objectives Priority 4	Note cumulative effects first » Cost of doing things to meet regulations ○ Discourage good practices unless enforced ○ Allow environment protection without cost to the protector ○ Incentives/disincentives for water conservation ○ Use State of the Watershed (SOW) report to instream objectives environmental object & therefore the areas to target with incentives » Then visit the indentified area to obtain cooperation in suggesting solution system ○ At least regional incentive costs ○ Ensure cross ministry awareness of these ○ Not limited to private land ○ Eg/protecting stream riparian area – costs of fencing & pumping but benefit goes downstream ○ Restore a wetland – benefits groundwater and wildlife not the landowner » Driving force will be equity or reward ○ 3 levels ▪ Regulated – penalize if foil ▪ Beneficial Management Practices – average (smoking) ▪ Excel – reward/recognition ○ Rephrase or recognition of benefits become practical & beneficial

Risk Statement	Raw Data
3. Insufficient understanding/knowledge of watershed Priority 5	» Region specifics into education & curriculums ○ Comparative analyses, fear, field trips » Traditional & historical knowledge & changes overtime » Maintain & improve linkages greater communication to watershed groups, stakeholders, etc ○ Identify gaps » Programs for tourism, immigrants, new residents » Champion teachers, communications committees » Incentives » DVD about watershed & OWC priorities » Online SOW reporting
20. Impaired water quality Priority 6	Beneficial Management Practices (BMPs) 1. Manage erosion risk on cropland 2. Buffers: Land use – cultivate – cover. Grass water courses 3. Over applied nutrients (Fertilizer, manure, intensive livestock operations, cow calf on streams) 4. Secure Water; the aquatic system is over allocated 5. Achieve riparian health 6. Source water protection Enforcement pre and post 7. Soften the edges to slow flow Retain water Filter For flood events 8. Water quality guidelines 9. Education (rewater – Singapore) Did not address groundwater - rewater Singapore

Risk Statement	Raw Data

28. Lack of conservation/inefficient use of water
 	
Priority 7
	» Where do we have more room to move/gain?
	» Efficiency is a form of conserving
	» Reason
	  ○ buffer for flow change
	  ○ Instream
	  ○ Economic tradeoffs
	» Municipal etc all have some room to improve
	» Irrigation still has some economic room to move
	» Savings available and need to be quantified for each group and then published to that group
	» Develop champions for each step improvement
	» Possible use increasing block rate
	» Variety of tools depending on the reason for efficient
	» Costs - money and social
	  ○ Energy
	  ○ Short availability
	» Benefits
	» Conservation is
	  ○ Leave in stream for aquatic now and as a reserve for future shortages
	  ○ Need because we have a current problem
	» Then what motivates the change
	  ○ Economics
	  ○ Social
	  ○ Science

Risk Statement	Raw Data
26. Lack of knowledge of the relationship between groundwater and surface water Priority 8	1. Know fair amount about surface water 2. Know much less about ground water 3. Even less about relationship Why? - we monitor surface What's the issue? (risks) » No new allocation of surface water (closed basin) so ground water is going to be a larger source/demand ○ As use approaches allocation of surface water, how will this impact ground water? » How are we impacting ground? » Quality Groundwater » Don't know volumes of uses. » Don't know unlicensed use » Don't know total availability » Challenge is resources to obtain data (some is being done – expensive) » Don't know if ground water feeds into surface » Pretty sure Oldman feeds into aquifers What do we need to do? » OWC can advocate that ground water mapping be done in the Oldman watershed » Coordinate data management ○ Data that's not accessible now could be used » Educate on reporting – so get a better database » Accurate testing and adequate » Metering wells » Achievability; expensive but doable » Identified as priority by government

Risk Statement	Raw Data

14. The presence of invasive and/or non-native species
 	
Priority 9
	Moderate Achievability
	» Education/awareness
	  ○ Benefits/problems
	  ○ Examples and demonstrations (photos)
	» Need to define which are of concern – levels of concern
	  ○ Where/what
	  ○ Riparian
	  ○ Need baseline data/monitoring
	  ▪ Noxious Weeds Act
	» Link to Environmental outcomes
	» What is realistic/achievable?
	» OWC assist with knowledge/sharing
	» Community/Weed Pulls
	» Proper grazing management
	» Consider climate change influences
	  ○ Adaptation
	» Minimize disturbance
	» Use horticulture societies and garden centres
	» Resources ($) for dealing with invasives
	» Advocacy role of OWC

Risk Statement	Raw Data
24. Failing to define value of water (economic, social, environmental) Priority 10	.07 cents per liter for potable water 0.14 cents per liter for distribution Bottled water Example of the value $ of water Right no water allocation economic consideration » More consideration to social/environmental » Also long term » Set thresholds of quality and quantity with economic, social, and environmental » Account as part of a true market value, water going back to the system » Use/consumption Water must be a public resource allocated on behalf of the people of Alberta Consumptive View - not being used (i.e. taken from the river) it has no value » Education to change mind set » Stewardship ethic (value and importance of water) » Start right - young Value of water in a process (potato chip ex) » Look at the whole system. How much water used for hamburger or oil » Plants that are suitable for a certain area biggest bang for your buck » Value of water if there is something that goes wrong i.e. Walkerton Intrinsic Value - on its own merit; conserve because it should be there Water Value » Crisis - becomes 'valuable' to people » Quality of water – Milk River example » Water variability (storage issues) ○ Natural process not always followed ○ More planning for water management many create impacts on the value of water (consequences) - drought Post: » Adaptive Management » Engage stakeholders about the value of water – "where do you want the water to go" – set values/priority

APPENDIX K: SOW REPORT, IWMP PHASE 1 AND RISK STATEMENTS COMPARISON

The numbers (e.g. 2.1 – chapter 2, section 1) represent how each item, in either the Sow Report or Phase 1 "What We Heard" Summary document, relates to the specific Risk Statement.

Risk Statement	SOW Report Gaps Chapter 8	SOW Report Trends Chapter 9	SOW Report Recommendations Chapter 10	Vision Outcome Statement - Phase 1	Phase 1 Questions 2a Barriers	Phase 1 Question 2b Opportunities
1. What if people don't have a personal level of connection to the watershed?				Aware, responsible and motivated	2.1; 3.1.5; 3.1.11; 3.2.2; 3.3.1	3.1.2; 3.3.1; 3.3.2; 3.3.3; 3.3.4; 6.2
2. There is a variance in social values and interest				Aware, responsible and motivated	3.1.1; 3.1.6; 3.1.11; 3.1.12; 3.1.13; 8.17; 9.1.4	3.1.1; 3.1.4; 3.2.2; 4.4; 8.1.2; 10.6.10
3. Insufficient understanding/knowledge of watershed			10.10; 10.15; 10.19; 10.24	Aware, responsible and motivated	4.1; 4.2; 4.3; 5.2.1; 10.5.8; 10.5.7	5.2.1; 5.2.4; 6.1; 6.3; 6.6; 8.12.3; 10.6.1; 10.8.6
4. Lack of effective legislation				Aware, responsible and motivated	8.3; 8.5; 8.6; 8.12; 8.13; 9.3.3	8.6; 8.8.1; 8.12; 8.12.2; 8.13; 10.4.3; 10.8.1; 10.8.2
5. Lack of human and fiscal resources				Aware, responsible and motivated	3.3.2; 3.5; 5.3; 7.3.2; 7.3.3; 8.8.1; 8.11	5.1.5; 7.1.8; 8.8; 8.8.4; 8.8.4
6. Lack of effective communication				Aware, responsible and motivated	3.4; 4.6; 8.16	3.2.3; 6.7; 6.9; 8.1.3; 8.1.4; 8.4
7. Competing interests			10.26	Abundant, healthy & biologically	8.18	8.1.2
8. Resistance to change				Abundant, healthy & biologically	3.1.3; 3.1.4; 3.2.1	8.5
9. Lack of understanding of implications of change				Abundant, healthy & biologically	3.1.7; 8.15	9.5.1

Risk Statement	SOW Report Gaps Chapter 8	SOW Report Trends Chapter 9	SOW Report Recommendations Chapter 10	Vision Outcome Statement - Phase 1	Phase 1 Questions 2a Barriers	Phase 1 Question 2b Opportunities
10. Lack of understanding and management of cumulative effects	8.1.5		10.5; 10.24	Abundant, healthy & biologically	1.6; 2.2; 3.1.9; 6.2; 6.5; 6.6; 7.10; 8.8.2; 9.3.1; 10.1.1; 10.1.2; 10.1.4; 10.6	2.1; 7.1.11; 7.1.16; 9.4.3; 10.2; 10.1
11. Unclear definitions of abundant healthy				Abundant, healthy & biologically	3.1.8	
12. Lack of baseline data - scientific data	8.1.1; 8.1.2; 8.1.3; 8.2.1; 8.3.1; 8.3.2	9.1; 9.2	10.2; 10.6; 10.16; 10.19-10.29	Abundant, healthy & biologically	7.9; 8.8.5; 9.5	5.1.4; 5.2.1; 5.2.2; 5.2.3; 9.6; 10.5.3
13. Current state of the watershed is considered acceptable?				Abundant, healthy & biologically		1.4
14. The presence of invasive and/or non-native species			10.27	Abundant, healthy & biologically	4.5; 9.7	6.5; 9.8; 9.9
15. Degradation and loss of aquatic and terrestrial habitat	8.1.4		10.4; 10.13; 10.14; 10.17; 10.18; 10.20; 10.25	Abundant, healthy & biologically	5.2.4; 7.5; 8.8.3; 9.2; 9.4.4; 9.4.5; 9.4.6; 9.6; 10.2.4; 10.11	7.1.5; 8.8.2; 9.5.6; 9.7; 9.10; 10.5.15; 10.6.8; 10.8.8
16. Emerging contaminants		9.2	10.2	Safe & secure	8.8.4; 9.3.2; 10.3.1; 10.4.2; 10.4.6; 10.12; 10.10	5.2.7; 10.5.1; 10.5.6; 10.6.7; 10.6.9
17. Political factors				Safe & secure	7.7; 7.11; 7.12; 8.2; 8.4; 8.7; 8.9; 8.14; 8.19; 10.5.5	7.1.6; 7.1.7; 7.1.9; 7.4; 8.15

Risk Statement	SOW Report Gaps Chapter 8	SOW Report Trends Chapter 9	SOW Report Recommendations Chapter 10	Vision Outcome Statement - Phase 1	Phase 1 Questions 2a Barriers	Phase 1 Question 2b Opportunities
18. Shortage of supply	8.2.5?		10.1; 10.7; 10.19; 10.21	Safe & secure	9.1.2; 9.1.6; 9.4.1; 9.4.2; 9.4.3; 10.4.5	9.2.6; 9.2.8; 9.3.4; 9.5.2; 9.5.3; 10.4.9; 10.5.9; 10.6.6
19. Failure to respond due to cost and lack of resources	8.2.2; 8.3.3		10.11	Safe & secure	5.1; 5.3	7.1.8; 7.2; 8.8
20. Impaired water quality		9.2	10.12; 10.20	Safe & secure	10.9	1.3; 9.4.1; 9.4.4; 10.4.8; 10.6.5
21. Extreme weather events (climate variability)				Safe & secure	1.1; 1.2; 1.5	1.1
22. Headwater degradation			10.17; 10.24; 10.25	Safe & secure	9.3.3; 10.1.3; 10.2.1; 10.2.2; 10.2.3; 10.2.5; 10.5.1; 10.5.2; 10.5.3; 10.5.4	9.4.2; 10.3; 9.5.5; 10.8.7
23. Shortage of water lead to unwise management decisions			10.8; 10.19	Balanced allocation	9.1.5	9.2.1; 9.1.12
24. Failing to define value of water (economic, social, environmental)			10.23	Balanced allocation	2.3; 3.1.2; 3.1.10; 6.8	3.1.3; 4.6; 9.2.11
25. Quality of water being allocated won't meet the need of the user			10.2	Balanced allocation		
26. Lack of knowledge of the relationship between groundwater and surface water	8.2.3; 8.2.4	9.1	10.9	Balanced allocation	5.2.2; 9.1.7	5.2.5; 9.2.9; 9.2.10
27. Water supply variability over time			10.21	Balanced allocation	1.3	1.2; 9.3.3
28. Lack of conservation/ inefficient use of water				Balanced allocation	8.8.6; 10.8	3.3.5; 4.3; 5.1.5; 5.1.3; 6.4; 6.8; 10.4.1; 10.5.12; 10.6.3; 10.6.4
29. Existing commitments; -leases – quotas – extraction			10.3; 10.24	Multiple use	9.1.1; 9.1.3	9.2.3; 9.2.4; 9.2.5; 9.2.7

Risk Statement	SOW Report Gaps Chapter 8	SOW Report Trends Chapter 9	SOW Report Recommendations Chapter 10	Vision Outcome Statement - Phase 1	Phase 1 Questions 2a Barriers	Phase 1 Question 2b Opportunities
30. Changing ownership structures.				Multiple use	6.4; 10.4.3; 10.4.4	10.5.2; 10.5.13; 10.6.2
31. Financial incentive structures do not match our environmental objectives			10.11	Multiple use	6.1; 6.3; 6.7; 6.9; 8.6	4.1; 4.2; 4.5; 4.7; 4.8; 8.14; 10.5.4; 10.5.5; 10.5.10; 10.5.14
32. Risk of not knowing value of resources in the future				Multiple use	7.2	
33. Lack of jurisdictional co-operation				Multiple use	7.1; 7.3.1; 7.6; 7.8; 8.1; 8.10	7.1.13; 7.1.15; 7.1.14; 7.2; 8.1.1; 8.2; 8.3; 8.7
34. Failure to consider climate change in management decisions			10.28	Multiple use		1.1
OTHER			10.22; 10.27		1.4 4.4; 5.2.3; 7.3.4; 7.4; 9.4.7; 9.8; 10.1.5; 10.3.2; 10.4.1; 10.4.7; 10.4.8; 10.5.6; 10.7	2.2; 2.3; 3.1.5; 3.2.1; 5.2.3; 5.2.6; 5.2.8; 7.1.7; 7.1.3; 7.1.4; 7.1.10; 7.1.12; 8.9; 8.10; 8.11; 9.1; 9.3.1; 9.3.2; 9.5.4; 9.5.7; 9.11-9.11.2; 10.4-10.4.2; 10.4.4-10.4.7; 10.4.10; 10.5.7; 10.5.8; 10.5.11; 10.7; 10.8.3-10.8.5; 10.8.9; 10.8.10

APPENDIX L: CATEGORIES FOR THE PLANNING FRAMEWORK

Working Team Proposed Risk Statement Categories

Approach to Watershed Management

Cumulative effects management is an approach to environmental management based on an adaptive management cycle of identifying outcomes, setting targets and limits, identifying actions for implementation and assessing performance through monitoring, evaluation and reporting. Basically, it is developing and delivering outcomes to meet environmental, social, and economic needs of the watershed.

- Lack of understanding and management of cumulative effects – Priority 1
- Competing interests – Priority 29

Scientific

These risk statements have a higher scientific data need requirement and can be defended through setting specific targets and limits. The primary focus of these statements is environmental, however, social and economic implications need to be considered when identifying treatment options and implementing.

- Degradation and loss of aquatic and terrestrial habitat – Priority 2
- Headwater degradation – Priority 3
- Quality of water being allocated won't meet the need of the user – Priority 33
- Emerging contaminants – Priority 16
- Lack of knowledge of the relationship between groundwater and surface water – Priority 8
- The presence of invasive and/or non-native species – Priority 9
- Lack of baseline data/scientific data – Priority 12
- Impaired water quality – Priority 6
- Current state of the watershed is considered acceptable? – Priority 31

OWC Strategic and Operational

These risk statements correlate with the broad operational activities of the OWC; they become the 'to-do' list to better inform, educate, engage and empower watershed residents.

In addition, certain statements will be taken to the next level: political influence or involvement through potential policy changes and legislation. A team could be formed within the OWC to assess and analyze existing and pending legislation.

There may be opportunity to quantify some of this information, but it is primarily the social and/or behaviour change activities that will affect the watershed.

- Unclear definitions of abundant healthy – Priority 30
- Lack of human and fiscal resources – Priority 17
- Lack of effective communication – Priority 18
- There is a variance in social values and interest – Priority 23
- Lack of understanding of implications of change – Priority 24
- Political factors – Priority 25
- Insufficient understanding/knowledge of watershed – Priority 5
- Failing to define value of water (economic, social, environmental) – Priority 10
- Risk of not knowing value of resources in the future – Priority 11
- Lack of effective legislation – Priority 15
- Lack of jurisdictional co-operation – Priority 20
- What if people don't have a personal level of connection to the watershed – Priority 22
- Failure to respond due to cost and lack of resources – Priority 26
- Failure to consider climate change in management decisions – Priority 21
- Lack of conservation/inefficient use of water – Priority 7
- Financial incentive structures do not match our environmental objectives – Priority 4
- Shortage of water leads to unwise management decisions – Priority 14
- Resistance to change – Priority 34

Out of the Council's Control

The following risks statements may be considered out of the Council's control or scope. However, there may be opportunity for further education or risk management planning to alleviate the potential impact on residents and the watershed.

- Extreme weather events (climate variability) – Priority 32 (We don't have control over the extreme weather events but we can potentially be prepared for them and mitigate the consequences.)
- Water supply variability over time – Priority 27 (We don't have control over water supplied directly by the environment but we have opportunities to 'manage' supply through infrastructure. Infrastructure could reduce uncertainty and variability of supply over a short period of time.)
- Changing ownership structures i.e. small mixed farms to large corporate ranches; ranches to subdivisions – Priority 28 (We don't have control over zoning or land sales but we can work with those agencies/organizations to understand cumulative effects and long-term planning needs.)
- Existing commitments; leases/quotas/extraction – Priority 19 (Water allocation; no control except to become more familiar with the system, identify gaps and make connections to the environmental and economic relationship.)
- Shortage of supply – Priority 13 (Opportunity to educate residents about why/how to conserve. Correlating supply with the environment and economics IF supply continues to diminish through climate/weather events. How does demand affect this? Infrastructure (dams) may provide relief in the short term.)

APPENDIX M: TREATMENT OPTIONS FOR PROPOSED SCIENTIFIC CATEGORY RISK STATEMENTS

Risk Statement	Raw Data
Degradation and loss of aquatic and terrestrial habitat Priority 2	**Initiatives** • OWC Integrated Watershed Management Plan • State of the Watershed report • Municipal (Use Recreation) • Crowsnest Pass Recreation Use • South Saskatchewan Regional Plan • 5 Year Irrigation Water Quality study • Prairie Conservation Action Plan • Crown Manager's Partnership • Species Recovery Plans (Sturgeon, West Castle, Aquatic/Terrestrial) **Legislation** • Wetlands Policy • Forestry Act, Fisheries Act, Species at Risk Act, Water Act, Public Lands Act, Agricultural Operations Practice Act, Alberta Land Stewardship Act, Alberta Environmental Protection Act • South Saskatchewan River Basin Water Management Plan • Need: Riparian Policy? **Measurements/Metrics** • Cows and Fish riparian assessment • Foothills laboratory and assessment • Alberta Biodiversity Monitoring Initiative • Regional Heath • Environmental Impact Assessment • Alberta Riparian Condition Assessment • C5 Forest Management Plan • Inventories: native prairie vegetation, grassland vegetation, aquatic vegetation • ALCES and other models • Ecological services – valued landscapes • Ducks Unlimited wetlands • MultiSAR • Environmentally Significant Areas • Alberta Water Council – Aquatic Significant Areas **Implementation/Needs and Strategies (Need to accomplish)** • Develop a strategy for implementation **IWMP – Recommendation for Aquatic/Terrestrial in the Oldman Basin** • Confirm legislation and policy • Test • Alignment • What we've got and what we want – scenario building **Implications** • Resources need to be aligned • Detailed implementation plan – who does what by when • Tools: legislation, incentive, BMP **Agencies/organizations** • All levels of government, NGO/ENGOs, Industry, Public – landowners, Interest of jurisdiction • Who is affected or impacted by the outcome **Additional Treatment Options** • Public education • Adjustment to jurisdiction • WPAC's **Information needed** • Social/economic analysis scenarios • Plan, spatial, everyone access

Risk Statement	Raw Data		
Headwater degradation Priority 3	• Need to include better legislation & enforcement that specifically protects the headwaters from further degradation. Current lack of enforcement is stemming from lack of political will to enforce motorized recreation & random camping. Better communication needs to be combined with legislation & regulation. • Better signage to show where designated trails are. • Better monitoring of tributaries that flow into the mainstream • Specific legislation initiatives – Public Land Use Act, Provincial Parks Act. Need to look at both acts & decide which ones will provide the best protection for the headwaters. • Zoning could be under various pieces of legislation depending on management intents. • Balance between forests & grasslands are important: where the balance is defined by scientific & traditional (First Nations) knowledge and various management options to increase acres of grassland (eg/ prescribed burning, selective logging, etc). • Define area of headwaters; might not be broad enough.		• Land cover is important, the cover of grasslands vs. the cover of tress has to be a balance • Create partnership with Counties, Municipal Districts and Parks Canada to address some of the issues around fire planning and weeds. • Highway 3 south to Waterton Park is the part of greater interest in the watershed. • Needs more technical expertise.
Lack of knowledge of the relationship between groundwater and surface water Priority 8	**Other Initiatives** • Alberta Environment – Claude Eckert, Calgary; Jeff Gutsell, Lethbridge • 10-15 year process underway; Calgary – Edmonton Corridor almost finished & air mapping for highway 2. • Bjorlund is interviewing Willow Creek residents on potential land use/water issues. • Natural Resource Conservation Board and Alberta Agriculture are looking at 2 sites for risk to groundwater near Battersea Drain. There may be contamination data available. • Alberta Environment has a groundwater management framework in the planning process but it needs some data prior to this completion. • University of Lethbridge is researching the location of natural springs (Rood). • Might be more useful to focus on sensitivity/vulnerability of specific recharge. • Groundwater vulnerability mapping on Battersea Drain has been done.	• Oil & Gas – when drilled logs done there may be a potential data source • Fracking consideration • Freedom of Information and Privacy needs to be consider with some information • First Nations: once a year do bacterial for health; special project with chemical data for limited number of wells; good drinking water for each house annually. • Blairmore has groundwater supply – Are they metering for volume? • There are a few long term groundwater monitoring status wells (5 or 6). Quality of data questionable because not capturing what influence there are. • Some groundwater sites associated with river sites hydrological monitoring. • Timing for the Alberta Government to put strategic steps in place. • Question: where in the basin is groundwater used or most important? • Differences between Piikani & Kainai **Who has to be there** • PFRA, Kainai, Piikani – public works	& health, Municipalities, Alberta Environment, Geological survey, NRCB, Alberta Agriculture, Alberta Health, Oil & Gas & large water user industries, University of Lethbridge **Broad Implementation Needs & Strategies** • What data is there and what gaps exist? • Need to prioritize sub watershed **Treatment Options** • Introduce a testing regime to be followed by well users & regulating agency (Working Well program - maintenance/education). • Metering • Suggestion for home ownership/acreage – have a requirement to take care of water source if they are living off of groundwater. • Work from gaps identified by data collection. **What areas need attention** • Currently used more in western portion than eastern therefore concentrate on west first.

Risk Statement	Raw Data		
The presence of invasive and/ or non-invasive species Priority 9	• High Priority 1 – Identify species of concern, why a concern & where • Separate landscape types to set goals – native grasslands vs urban vs cropland • Determine where to focus efforts; decide which landscapes and species are more important (link priority to watershed health) **Treatment** • Educate/awareness • Establish & continue monitoring • Minimize disturbance in native ecosystem with appropriate grazing management • Resource extraction guidelines to minimize/avoid native & weed preventative measures • Prevent introduction, spread and dispersal • Restore ecosystem to increase resilience • Encourage more weed/invasive pulls • Horticultural/garden centres – develop list of invasive species and provide alternative plants species or management choices	• Reclamation guidelines & standards need to adhere to • Increase the sense of importance – link to economic impact • How to identify species and address issues • Ensure adequate & coordinated legislation **Organizations/Agencies** • Municipal including rural and urban, federal & provincial departments of all resources/land use departments, ENGOs, Alberta Irrigation Projects Association (AIPA), Alberta Native Plant Council, AG Fieldmen Association, Watershed Stewardship Groups, species at risk planning (Canadian Wildlife Service (CWS), Department of Fisheries & Ocean (DFO), Sustainable Resource Development (SRD)), • Construction (in any sector), reclamation, environmental consulting companies & related companies • Horticultural/gardening sector including business • College & university – teaching	horticultural & native species ecology • Landowners of all types, Canada Parks & Wildlife Society (CPAWS), Foothills Restoration Forum, Prairie Conservation Forum, Cows & Fish **Areas of Concern or Need** • East slopes – fish – West slope – cutthroat trout: east slopes – in (plants) are less invaded • Work West to East & upstream to downstream • Rough fescue grasslands are threatened ecosystems & susceptible to invasive • Riparian areas very easily establish • Parks and protected area should be priority • Keep areas uninvaded or control when small invasion **Information needs** • Pull together all existing needs • Prioritize/discuss management options in terms of how they impact watershed health & quality (eg/ burn vs. spray vs. other)
Impaired water quality Priority 6	• Should include surface and groundwater **Other Initiatives (gaps)** • Should include groundwater • Enhanced monitoring to define priority areas for action • Focus on being proactive or reactive e.g. headwater protection vs. mitigation • Emerging contaminants vs. known contaminants • Need to fully understand the issues before we recommend beneficial management practices	**Measurable (metrics)** • Need to monitor & measure the water resource • Measure community engagement • Manage common databases of water quality (AENV, AARD, Cities, First Nations, etc). Is this a role for the OWC? **Broad Implementation Needs & Strategies** • Understand data gaps and compile available data • Figure out a way to collect required data (consistent & sound)	• Prioritize areas to focus beneficial management practices

Risk Statement	Raw Data		
Current state of the watershed is considered acceptable? Priority 31	• Publicize pertinent information from SOW report. • We have sufficient information in the SOW report to begin this process. We also need to fill gaps identified in the SOW report. • No clear pre & post here, this is a constant issue • Identify specific issues/impacts in specific locations/reaches so that people see the reality of the situation. • At the same time we need to demonstrate that different locations and activities are integrated in the overall health/function of the Oldman watershed. • Use a combined approach.	**Stakeholders** • OWC is the clear lead on this; might be considered the OWC's first priority. • Partners: authorities (jurisdictional), irrigation, municipal, federal, provincial, First Nations • Holders of Rights: industry, municipalities, property holders • Knowledge holders: academic institutions, government institutions, traditional knowledge, producer working groups • Target Audience: schools, recreational users, industry, producers & managers, irrigation, livestock, dryland, rangeland	**What do we need** • Better linkages between activities and issues/impacts • Better linkages between management practices and results/improvements • Source of info on these through government agencies, producer working groups, and academia
Emerging contaminants Priority 16	**Existing Treatment (controls)** • Health Canada – research in support of guidelines • Industry – Water Environment Research Foundation & Water Research Foundation **Purpose** • Pre – more research dollars on impacts; increased collaboration with agencies from other countries • Post – require more monitoring of chemicals approved for use **Agencies to include** • Health Canada, Alberta Environment		

APPENDIX N: SUMMARY OF CORE TEAM INPUT FOR SCIENTIFIC CATEGORY AND TOP 10 PRIORITIES

Note: Summary Table for all Risk Statements can be found on the CD available from the OWC.

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
1	*Lack of understanding and management of cumulative effects* Our plan needs to incorporate cumulative effects management approach as it unfolds.	• Communicating information • Setting thresholds (density of activity/development) • Approvals and planning with cumulative effects in mind, with multi-sectoral and jurisdictional approach • Control/oversight of high level discretionary powers; including litigation • Planning for population growth • Regional plans (South Saskatchewan Regional Plan) • Research, monitoring, assessment • Current state and trajectories • Integrated decision making • Communication amongst all levels – scientists, public, policy makers • Research cumulative effects; resources, economy, social side • Monitor use/access • Establish control mechanisms • Review/improve legislation; identify loopholes	• Consider moratoriums/limits to further use of some areas or resources • Apply reclamation or restoration guidelines • Appropriate comprehensive research on cumulative effects; requires funding and resources • Support for implementation: incentives, reward, compensate, assistance • Fund and develop cumulative effects research for better decision making • Zoning, water conservation targets • Regulation; must have enforcement • Municipal planning • Crisis management: tougher choices • Better understanding of ramifications of decisions through research and education • Set thresholds or caps on use (or users) (e.g. max numbers using forest reserve area)	• Research needs: contaminants we don't know about yet • Defining the current state • Need to define cumulative effects • Adaptation is key • All processes need to be linked – economic, social, environmental • There will be tradeoffs of a social and economic nature • Any work that OWC does will contribute to the *Land-use Framework* (LUF) process; outcomes will be driven by SOW, LUF, etc. • The real issues will be in the tributaries, the OWC will play a major role with this • Continued community involvement • Need to incorporate social, economic and environmental change to whatever outcomes are set • Need to have a clear direction on how to get there

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
2	*Degradation and loss of aquatic and terrestrial habitat* The degradation and loss of aquatic and terrestrial habitat are a known threat. (Scientific Category)	• Manage land use activities to maintain habitat with appropriate activities, locations, and intensity • Implement cumulative effects based management	None identified	• Understanding and defining what are the concerns. There are different levels of management, are there different levels of concern? • What agencies are responsible for what (Implementation) • Different land management practices: proper grazing management and minimizing disturbances • What has been lost? What hasn't been lost has not been quantified. Need to set a baseline or what standard do we want to compare to? • Priority: aquatic aspects in data collection. We least understand the aquatics and recognize there are huge data gaps on water itself • Start with aquatics and move out from there • Need to be measuring what's happening with biodiversity • Over-allocation and degradation; addressing over-allocation in the southern tributaries as identified in the SOW report **Initiatives to consider** • OWC Integrated Watershed Management Plan • State of the Watershed report • Municipal (Use Recreation) • Regional Plan (SSRP) • 5 Year Irrigation Water Quality study • Prairie Conservation Action Plan • Crown Manager's Partnership • Species Recovery Plans (Sturgeon, West Castle, F/P Aqua/Terrestrial) **Legislation** • Wetlands Policy • Forestry Act • Species at Risk Act • Water Act • Public Lands Act • Alberta Environmental Protection Act • Alberta Land Stewardship Act • Fisheries Act • South Saskatchewan River Basin Water Management Plan • Need: Riparian Policy **Measurements/Metrics** • Cows and Fish Riparian Assessment • Alberta Biodiversity Monitoring Initiative • Regional Health • Environmental Impact Assessments • Alberta Riparian Condition Assessment • C5 Forest Management Plan • Inventories (Native Prairie Vegetation, Grassland Vegetation, Aquatic vegetation) • ALCES and other models • Ecological Services • Ducks Unlimited wetlands research • MultiSAR • Environmentally Significant Areas **Implementation Needs and Strategies** • IWMP – Recommendation Aquatic/ Terrestrial • Confirm legislation and policy • Test • Alignment • What we have and what we want – scenarios • Implications • Aligning resources • Determine implementation plan – who does what • Tools: legislation, incentive, beneficial management practices **Agencies/Organizations** • All levels of government • NGO/ENGOs • Industry • Public – landowners • Interest of jurisdiction • Affect/effect – outcome • Impacted – outcome • Additional Treatment Options • Public education • Adjustment jurisdiction • WPACs • Information needed • Social/economic analysis, scenarios • Plan, spatial, everyone access

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs	
3	*Headwater degradation* With current headwater management and protection in the Oldman watershed there is a risk of further headwater degradation. (Scientific Category)	None identified	None identified	• Better monitoring of factors contributing to water quality/quantity • Each user/manager needs to recognize their impact and obligations • Apply zoning to headwaters and identify high risk areas • Determine balance between forest and grassland areas • Define headwaters – broader than green zone • Need to quantify land use indicators: edge density, range health, riparian health, land cover, disturbed vs. undisturbed lands • How to link users to land tenure/ ownership vs. non-tenure • Need to identify user and their impacts • Need to include better legislation and enforcement that specifically protects the headwaters from further degradation • Better signage to show where designated trails are	• Better communication needs to be combined with legislation & regulation • Better monitoring of tributaries that flow into the mainstream • Specific legislation initiatives – Public Land Use Act, Provincial Parks Act • Where the balance is defined by scientific & traditional (First Nations) knowledge • Various management options to increase acres of grassland (e.g. prescribed burning, selective logging, etc) • Define area of headwaters • Create partnership with Counties, Municipal Districts and Parks Canada to address some of the issue on fire planning and weeds • Highway 3 south to Waterton Park is the part of greater interest in the watershed • More technical expertise

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
4	*Financial incentive structures do not match our environmental objectives e.g., draining a wetland to increase crop production; more value to the landowner and decrease in value to the environment* Incentives structures (financial and non-financial) may not support environmental behaviours but instead promotes economic gain. Careful thought must be given to these programs to avoid negative consequences and consider cumulative effects.	• Recognition of Ecological Goods & Services (EGS) values in policies • Compensation for EGS values	• Revision/implementation of policy that considers EGS values	• Monetary incentives for water conservation; driving force is equity or rewards • Need to identify the people who live in the regional area to identify the appropriate solution • Regional level cost-sharing for incentives • Needs analysis of benefits • Allow environmental protection without cost to the individual who benefits society by their actions • Need to use the SOW report to recognize the environmental objectives already identified • Provide examples of costs and benefits in protecting streams/riparian areas • Improved efficiency contributes to conservation • Rewarding innovation • Recognition of benefits, not regulation • Has to be a level of equity or reward, same rules apply to everyone • Land stewardship should not be limited to private lands
5	*Insufficient understanding/ knowledge of watershed* There is a general lack of understanding and awareness of the Oldman watershed on a regional level.	• Get specifics of Oldman watershed in school curriculum • Use education and communication programs to get people inspired and connected • Blend watershed stewardship activities with other activities people are already doing • Promote Cows and Fish model • Communication and education • Funding: adequate research and long term approach for communication • Involve people: hands on experiences with resources (include this in research, too)	• Constant communication • Carrots and sticks: commitment to compliance • Using gentle peer pressure to influence values/actions (watershed groups) • Evaluation of efforts of communication and research and adapt • Use research to direct ways to increase knowledge	• Research traditional and historic knowledge of the watershed (understand what is there and what we're trying to achieve over time) • Maintain and improve linkages between OWC groups and the public • Increase understanding of what the OWC is doing • Positive/proactive incentives: financial; social; environmental; educational • Negative: regulations; peer/fear pressure • Increase public awareness; understand public perspective • Create programs for new residents, educate groups

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
6	*Impaired water quality* There is a concern about current and future water quality in the Oldman watershed, in particular non-point and unregulated sources of contamination. (Scientific Category)	• Conservation and efficient use • Source water protection • Riparian protection • Waste water treatment • Land use management • Beneficial management practices • Education	• Research – keep up with issues • Monitor and report	• Need water quality guidelines • Education is a precursor to reduce/mitigate risk • Continue to manage erosion risk on cropland • Need to secure water in the aquatic system • Need to achieve riparian area health • Source water protection • Need for enforcement (pre and post event) • Promote further research and analysis (e.g., technical and cost issues: impacts of over-application of nutrients, cattle in streams, etc.) • Should include surface and groundwater • Enhanced monitoring to define priority areas for action • Focus on being proactive or reactive e.g. headwater protection vs. mitigation; emerging contaminants vs. known contaminants • Need to fully understand the issues before we recommend beneficial management practice **Measurable (metrics) to assess success of BMPs** • Need to monitor & measure the water resource • Measure community engagement • Manage common databases of water quality (AENV, ARD, Cities, First Nations, etc) **Broad implementation needs & strategies** • Understand data gaps • Compile available data • Figure out a way to collect required data (consistent & sound) • Prioritize areas to focus

APPENDIX N continued

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
7	*Lack of conservation/ inefficient use of water* There is a need to be efficient with the use of water. Users need to focus on conservation in their behaviours and operations.	• Velvet glove • Science and technology – all sectors of use • Social marketing of conservation • Integrated water use planning • Pricing/valuing of water	• Iron fist • Regulations incentives/ fines	• We all have room to improve: motivation to conserve • In-stream flow needs • Drought mitigation • Charge for water needs to be enough to encourage conservation • Need to understand the water requirements for development • Develop champions for each step of improvement • What motivates the change – how much will it cost (weigh economic, social or environmental costs) • Municipal has some room to improve • Irrigation sector has some economic room to move • Savings available and needs to be quantified for each group/sector and then presented to that group/sector for action • There are a variety of tools available depending on the reason to use or choose (efficiency) • Change due to costs or because there is not enough to go around • Conservation means leaving it in the stream for aquatic benefits now and a reserve for future and new economic development (1/3, 1/3, 1/3) • Water re-allocation is available today, but can't use this as a hedge for the future/ unable to hoard water supply

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
8	*Lack of knowledge of the relationship between groundwater and surface water* Since surface water can have an impact on aquifers and groundwater, there is a need to understand these relationships better to protect ground water from further contamination and over use. (Scientific Category)	• Develop the knowledge base; share information • Identify priority areas • Collaboration and coordination among parties • Raise awareness • Precautionary principles considered in decisions until more is known	None identified	• Know fair amount about surface water; know far less about groundwater; know even less about the relationship between the two • Groundwater information gaps: volumes of uses; unlicensed use; does groundwater feed into surface water and aquifers; what is the total availability • Advocate that groundwater mapping be done in the Oldman watershed • Coordinate data management: existing and new accessed data • Educate on reporting: to create a better database • Promote adequate testing and metering (i.e., wells) • Identified as a priority by government: expensive but doable **Other Initiatives** • Alberta Environment – Claude Eckert, Calgary; Jeff Gutsell, Lethbridge • 10-15 yr process underway; Calgary – Edmonton Corridor almost finished & air mapping for Hwy 2 • Bjorlund is interviewing Willow Creek residents on potential land use/water connection • Natural Resource Conservation Board and Alberta Agriculture looking at 2 sites for risk to groundwater near the Battersea Drain • Contamination data • Alberta Environment has a groundwater management framework in planning process but need some data prior to this • University of Lethbridge is looking at mapping location of springs (Rood) • Potential data source: groundwater vulnerability mapping on Battersea Drain has been done • Driller requirement only when drilled • Oil & Gas: potential data source • Fracking consideration • Freedom of Information and Privacy Act • First Nations: once a year do bacterial for health and special project did chemical data for limited number of wells • Blairmore has groundwater supply • Few long term groundwater monitoring status wells (5 or 6) • Some groundwater sites associated with river sites hydrological monitoring possible (some modeling needs have been discussed) • Time to put strategic steps in place Alberta Government • Question: where in basin is groundwater used or most important – poor aquifer – eastern area • Differences between Piikani & Kainai **Who has to be there** • PFRA • Kainai, Piikani – public works & health • Municipalities • Alberta Environment • Geological survey • Natural Resources Conservation Board • Alberta Agriculture • Alberta Health • Oil & Gas & large water user industries • U of L (spring data base) **Broad Implementation Needs & Strategies** • What data is there and what gaps exist (watershed science group forwarded project to begin to address this) • Need to prioritize sub watershed **Treatment Options** • Introduce a testing regime to be followed by well users & regulation agency (Working Well program; maintenance/ education) • Metering • Suggestion for home owner/acreage to have a requirement to take care of water source if they have a well • Work from gaps identified by data collection • Particular areas of concern • Currently used more in western portion than eastern therefore concentrate on west first

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
9	*The presence of invasive and/or non-native species* The presence of invasive non-native species is an indicator of the health of the watershed. (Scientific Category)	• Education/ awareness • Screening/ inspection/wash equipment • Minimize disturbance/ access • Multi-jurisdictional cooperation/ action	• Controlled programs • Enforcement • Restoration	• Consideration around vegetation, animals, climate change, etc. could influence invasive and non-invasive species; need to distinguish between non-invasive and invasive species • Education and awareness • Spatial component is missing: need to define where, what and levels of concern • Need baseline data and monitoring • Proper grazing management • Consider climate change influences and adaptation to those changes • Minimize disturbance • Resources (monetary and manpower) to deal with invasive species • Advocacy role of OWC: knowledge/ sharing; examples and demonstrations; community engagement, weed pulls; asking government to put money into prevention/control of invasive in their recreation sites • High Priority 1 – Identify species of concern, why are they a concern & where they are located; separate landscape types to set goals – native grasslands vs. urban vs. cropland; determine where to focus efforts - decided which landscapes and species are more important (link priority to watershed health) **Treatment Options** • Educate/awareness • Establish & continue monitoring • Minimize disturbance in native ecosystem (appropriate grazing management, resource extraction guidelines to minimize/avoid native & weed preventative measures) • Prevent introduction, spread or dispersal • Restore ecosystem to increase resilience • Weed/invasive pull/removal • Horticultural/garden centres – develop list • Reclamation guidelines & standards • Increase the sense of importance – link to economic impact • Provide alternative plants species & management choices • How to identify species • How to address issues • Ensure adequate & co-ordinated legislation **Organizations/Agencies** • Municipal include urban and rural • Federal & provincial departments of all resources/land use departments • ENGOs, Alberta Irrigation Projects Association (AIPA), ANPC, AADMC, AAG, Fieldman Association, Watershed Stewardship Groups • Species at risk planning (CWS, Department of Fisheries & Ocean (DFO), Sustainable Resource Development (SRD)) • Construction (in any sector), reclamation, environmental consulting companies & related companies • Horticultural/gardening sector including business • College & university – teaching horticultural & native species ecology • Landowners of all types • Canada Parks & Wildlife Society (CPAWS) • Foothills Restoration Forum • Prairie Conservation Forum • Cows & Fish **Areas of Concern** • East slopes – fish – West slope – cutthroat trout • Work West to East & upstream to downstream • Rough fescue grasslands are threatened ecosystems & susceptible to invasive • East slopes – in (plants) are less invaded • Riparian areas very easy to establish • Parks and protected area should be priority • Keep areas uninvaded or control when small invasion **Information Needs** • Prioritize/discuss management options in terms of how they impact watershed health & quality (e.g. burn vs. spray vs. other)

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs	
10	*Failing to define value of water (economic, social, environmental)* There is a failure to value, recognize and integrate the economic, social and environmental implications of watershed management, decisions and use. This includes First Nations and spirituality.	• Functioning water market subject to environmental and social controls • Incent people to attach greater value to water • Irrigation Districts are pre planning for water allocation during drought	• Balance allocation by demand • Public pressure to change policy and regulations • Adaptive management	• Need to address perception of value of water • Consumptive view: if not being used, it has no value • Instill intrinsic value: conserve because it should be there • Only understand the value of water when there is a problem • Water is a public resource and needs to be allocated on behalf of the public • Water costs currently based on economics; more consideration to social and environmental values over long term • Set thresholds of quality and quantity based on economics, social, and environmental values • As part of a true market value – need to include water going back into system • Education/engagement to change views; start early; educate the younger generation	• Instill a stewardship ethic: value and importance of water • Engage stakeholders about the value of water: set values and priorities • More planning for water management may create impacts/have consequences on the value of water e.g., during drought periods • Aboriginal ethics and the intrinsic value of water to the people • Best management practices: manage erosion risk on croplands; over-applied nutrients; secure water – aquatic system is over-allocated • Soften the edges to slow flow: water retention, improve filtration, reduce impact of flood events • Source water protection • Need to address groundwater: quantity and value • Water storage and variability: need to start mimicking a natural process/ system

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
12	*Lack of baseline data - scientific data* There is need for more scientific research (i.e., baseline data, inventories) to confirm priorities and the costs and benefits of actions. (Scientific Category)	• Identify and address data gaps • Ensure politician understanding and support • Royalty or fees from industry to support data collection/research/ and reporting • Monitoring the environmental effects of projects as part of approval • Establish science forum - i.e. a collective of the scientific capability that meets regularly to set priorities and review results and reset priorities • Better communication of the baseline data we do have, e.g. instream flow needs and the quality of the data	• Identify risks of the data gap and any of the associated decisions and actions that are data deficient • Develop a contingency plan – in case 'wreck' happens	None identified
16	*Emerging contaminants* There are an increased number of contaminants entering the watershed that may not currently be monitored. These contaminants have the potential to impact human and animal health and ecosystems. (Scientific Category)	• Research and monitoring (properly funded) and data compilation • Better understanding of unintended and cumulative effects of otherwise approved chemicals • Pharmaceuticals (i.e. environmental impact including recognition of synergistic or additive consequences) • Ability to change or add to monitoring • Reduction of release of chemicals/ contaminants e.g. via water quality treatment • Reliance/consideration of precautionary principle	• Epidemiological, long- term, animal and human and plant health studies look at long term impacts • Improve water quality treatment (and other controls (air quality))	**Existing Treatment (controls)** • Health Canada – research in support of guidelines • Industry – Water Environment Research Foundation & Water Research Foundation **Purpose** • Pre – more research dollars on impacts; Increased collaboration with agencies from other countries • Post – require more monitoring of chemicals approved for use **Agencies to include** • Health Canada • Alberta Environment

Priority	Prioritized Risk Statement and Definition	Pre-Event	Post-Event	Management Actions and Information Needs
31	*Current state of the watershed is considered acceptable?* There is need to validate the current state of the watershed to make sound management recommendations. Individuals consider the current state of the watershed ok, while in reality certain areas need improvement. (Scientific Category)	• Numerical and historical credibility available and communicated • Easy to implement programs or tools that visually demonstrate and measure level of impact • Empower personal responsibility	• Monitoring and demonstration of progress to show what improvement looks like and compare to before • Compliance/ enforcement measures	• Publicize pertinent information from SOW report • We have sufficient information in the SOW report to begin this process. We also need to fill gaps identified in the SOW report • No clear pre & post here, this is a constant issue • Identify specific issues/impacts in specific locations or reaches so that people see the reality of the situation • At the same time we need to demonstrate that different locations and activities are integrated in the overall health and function of the Oldman watershed **Stakeholders** • OWC is the clear lead on this; might be considered the OWC's first priority **Partners** • Authorities (jurisdictional): irrigation, municipal, federal, provincial, First Nations • Holders of rights: industry, municipalities, property holders • Knowledge holders: academic institutions, government institutions, traditional knowledge, producer working groups • Target audience: schools, recreational users, industry, producers & managers; irrigation, livestock, dryland, rangeland • Government agencies, producer working groups, academia **What do we need** • Better linkages between activities and issues/impacts • Better linkages between management plans & results/improvements • Source of info on these
33	*Quality of water being allocated won't meet the need of the user* There is a concern about current and future water quality in the Oldman watershed, in particular non-point and unregulated sources of contamination. (Scientific Category)	• Value ecosystem services • Effective regulations • Maintain source water quality; headwaters • Risk assess and prioritize mitigation strategies • Regional planning	• Upgrade treatment facilities • Prioritize uses of varying water quality	None identified

APPENDIX O: SOW RECOMMENDATIONS AND BEST MANAGEMENT PRACTICES

(EXCERPT FROM THE STATE OF THE WATERSHED SUMMARY REPORT PAGES 14 &15.)

Recommendations for the Oldman watershed have been organized into the following categories:

Planning – This includes the ongoing watershed management planning processes that the Oldman Watershed Council (OWC) has implemented for several years. It also includes the municipal planning process.

Stewardship – This too is ongoing, and incorporates community involvement, including education and awareness.

Reclamation and Restoration

Data gaps – Addressed in the main report.

Planning

Water management in the Oldman watershed must consider the impacts of both droughts and floods. Early awareness of significant stream flow and water quality trends is essential for preparing water management plans and adaptation measures to minimize impacts on users and environmental resources. Learning to survive on less water will be the challenge.

1. Develop adaptation plans to manage potential declining flows in Beaver Creek and Little Bow River sub-basins. Trends in other Sub-basins should be updated on a regular basis: continue to monitor diversion rates, timing of withdrawals, and return flow volumes within the watershed.

2. Undertake monitoring programs to support adaptive management for environmental protection and mitigation, such as the plan recommended by the Highwood Management Plan Public Advisory Committee to assess performance of the Highwood Diversion Plan and support adaptive adjustments.

3. Consider modifying allocations and other options to achieve sustainable water use levels in the future, especially within the Southern Tributaries Sub basins and Oldman River mainstem.

4. Consider development of "Riparian Policies" throughout the watershed to protect areas that are key to managing water quality parameters, such as total suspended solids (TSS) and fecal coliforms.

5. Establish targets under a municipal planning framework for municipalities with increasing populations and land use pressures. These targets can establish short, medium and long-term goals or thresholds that reflect their capacity to supply municipal drinking water, and water for industrial or recreational purposes.

6. Update the State of the Watershed report on a periodic basis – every five years.

The use of Instream Objectives (IOs) and Water Conservation Objectives (WCOs) to monitor stream flows and determine whether or not the instream needs of the aquatic ecosystem are being met has proven to be a good management tool. However, several of the current IOs and WCOs could be adjusted within the Oldman watershed to provide a more accurate picture of actual supply and demand.

7. Currently, unregulated streams (e.g., Castle River and Lee Creek) are unable to meet IOs or WCOs that are set higher than natural flow. On such streams, instream targets should be limited to a realistic target value or natural flow, whichever is less.

8. On regulated streams, the IO and WCO could be set higher than natural flow to provide instream benefits beyond that of natural conditions or to mitigate human impacts. Such instream conditions could become targets for regulation of stream flow.

The Oldman watershed is closed to new surface water allocations, and this will increase demand for groundwater. Data on groundwater resources, water use, or water quality are generally not known for the Oldman watershed.

9. Use of groundwater as an indicator is recommended for future State of the Watershed reports.

Stewardship

10. Support implementation of good stewardship practices.

Nitrogen and phosphorus associated with human activities, such as municipal wastewater effluent and agricultural operations, enter surface waters as a result of insufficient treatment. Improving quality of surface waters can be accomplished by ensuring municipal wastewater is treated and reducing the amount of runoff and leaching directly into surface waters from feedlots and pastures. Advances in wastewater treatment technology in recent years have resulted in significant reductions from this source.

11. Support rural beneficial management practices: off-stream watering systems, riparian zone protection, buffer strips, manure incorporation.

12. Support urban beneficial management practices: storm water management; water conservation.

As population density increases, soil erosion risk increases. Soil erosion is a result of weather patterns and land use practices within a watershed. Land uses that expose the soil, such as cultivation, subdivision stripping and grading, logging, mining and temporary road construction, allow the rain, snow and wind to move sediments into the surface waters.

13. Areas of moderate to high risk of soil erosion may require additional land management practices to ensure the continued health of riparian and aquatic life. Soil erosion potential should be modeled at a scale relevant to individual activities.

14. Consider implementing and monitoring source and erosion controls for all new developments and in areas with exposed earth; moving livestock watering, holding, and overwintering areas away from stream banks; and minimizing the width of stream crossings.

15. Expand public education and awareness of water and water use within the Oldman watershed.

Reclamation and Restoration

Riparian health assessments are sporadic throughout the watershed. As more are completed, they provide the mechanism for highlighting areas of concern and focusing restoration efforts and best management practices.

16. Support the Cows and Fish program, especially in the Oldman River mainstem.

17. Implement drainage erosion control measures including revegetation and reforestation as soon as possible following surface disturbance.

18. Continue with beneficial management practices, including field shelter belts, avoidance of overgrazing, summer fallowing, and reduced tillage.

This State of the Watershed report provides the foundation for making future watershed management decisions. As stated in the Preface: "Watershed level work seems overwhelming because of the scale. However, there are ways to make watershed scale work more manageable. The first step might be to recognize that we can manage cooperatively what we can't individually." This "community" approach is what will continue to connect us as we move toward our desired future for the Oldman watershed.

The OWC is a not-for-profit organization working in partnership with communities and residents to improve the Oldman River watershed through sustainable water management and land use practices.

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