

Climate Vulnerability and Sustainable Water Management in the SSRB Project: Red Deer River Modelling

A Message from the Project Team

February 2015

The South Saskatchewan River Basin (SSRB) Water Project brought together those who know the region's water systems best to look for opportunities to further enhance the resilience of the Red Deer River Basin. Unlike other sub-basins in the SSRB, the Red Deer River Basin is not closed to new water allocations, and as a result diverse economic development opportunities are potentially available. The landscape and broader environment in the region are valued for the cultural, aesthetic, and recreational benefits they provide, and there is a strong social desire to ensure these values are protected. The basin wide water quantity modelling conducted in this project suggests there is likely enough water on average to support growth, but this growth and associated demands should be managed carefully in order to avoid degrading environmental health.

Climate variability projections developed for this project suggest average annual streamflow in the basin will increase in the future. However, the basin will still be prone to droughts and floods, and needs to build resilience to both dry and wet conditions as the streamflow variability observed in the recent past is likely to continue. Land use plays an important role in watershed health and river management. Increases in water withdrawals and consumption due to projected growth may have a meaningful impact on future streamflow.

With this context in mind, the most promising strategies explored and identified to meet the goal of balancing economic growth with environmental health, included:

- Implementation of functional flows - A steady drawdown of Dickson Dam releases after a high flood flow would enable cottonwood saplings to proliferate and provide favourable conditions for other types of riparian life, and was clearly demonstrated in the modelling work as achievable.
- Dickson Dam operations to meet a Water Conservation Objective (WCO) (downstream focus) - Modified operations would ensure that the WCO could be met at all times.
- Dickson Dam operations to meet the WCO and new demands (downstream focus) - Operations would be further modified to ensure that the WCO and new downstream demands are met. Although the reservoir would have a larger drawdown to meet new demands, even with modified operations the reservoir should still refill at the end of every year – this is based on modelling of 81 years of historic data with current and some future demands.
- Additional storage - Additional storage would be a means of adapting to increased water demands due to growth in the basin. Additional storage is a promising strategy on its own; however, it was felt that additional storage would likely only be considered once growth outstripped the ability for current storage and infrastructure to meet demands and all feasible conservation efforts had been applied. Therefore, additional storage was only assessed in combination with operational changes and water conservation.
- Local flood protection - Several flood mitigation structures were modelled over the course of the project. Discussion indicated that there is limited flood mitigation potential from upstream dams and it would likely be more effective to focus on local mitigation and protection.
- Water conservation - Conservation would offer a decrease in water use in the system from what it would otherwise be; it can decrease some shortages in the system but would need to be coupled with other water management strategies to ensure long term water supply.
- Application of land use best management practices - The modelling work focused on the impacts of rates of development on flows into the river system and demands on the river system. Land use best management practices, while not explicitly modelled, were identified as being vital in minimizing local and, to a lesser extent, basin wide impacts of land use change on water resources.

- Effective implementation of Alberta's Wetland Policy - Effective implementation would incorporate various measures designed to protect existing wetlands in the face of new development, and facilitate wetland restoration in areas where they have been lost and their benefits can provide the most value. Wetlands help reduce flooding and soil erosion by storing runoff and slowing its downstream release, and are important areas ecologically.

There is no one simple solution for adapting the water management systems in the Red Deer Basin as the economic base grows, environmental considerations evolve, and the climate changes. Specific steps to advance the consideration and implementation of the most promising adaptation strategies include:

1. Incorporate further environmental flows into the day to day operations of Dickson Dam
 - a. Adjust Dickson Dam operations as required to ensure the WCO is met at all times, even with increased demands.
 - b. Work with University of Lethbridge researchers and ESRD to refine operational opportunities for functional flows and embed them as part of standard operating practice.
 - c. Work with local fisheries biologists to determine what additional opportunistic flow releases could be made to enhance downstream aquatic ecosystems.
2. Confirm the storage strategy ("roadmap") for the Red Deer River Basin
 - a. Determine what operational changes could be made to Dickson Dam in order to support additional growth in the basin while maintaining the WCO.
 - b. Confirm new storage planned for the Special Areas Water Supply Project (SAWSP), and incorporate any additional storage into the overall basin water management planning.
 - c. Determine what the trigger(s) will be for looking at additional storage in the basin (e.g., demand, catastrophic flooding, etc.), as the present infrastructure is adequate to meet current and some additional future demand as well as providing some level of flood protection.
3. Continue the systematic assessment and implementation of flood mitigation options
 - a. Continue local mitigation measures through programs such as the Alberta Community Resilience Program (ACRP) and the Watershed Resiliency and Restoration Program (WRRP).
 - b. Advance the Room for the River process to scan all options for enhancing river system function in relation to the built environment.
4. Advance related Government of Alberta programs that will help maintain a favourable water supply/demand balance
 - a. Support Conservation, Efficiency, and Productivity (CEP) plan implementation and promote water conservation through education and outreach.
 - b. Ensure Best Management Practices (BMPs) are part of the application process for new water licences.
 - c. Ensure land use BMPs are required through the land use planning and regulatory processes; including a process to vet and show benefits from the BMPs.
 - d. Effectively implement and enforce Alberta's Wetland Policy and related protection measures, such as no change in net discharge from new development, meaning that there is no increase to runoff from pre and post development.
5. Practice how the licence holders will manage through unprecedented times of shortage
 - a. Confirm the existing regulations, policies, and tools already in place for drought management.
 - b. Simulate drought operations and how water would be used by licensees during times of severe drought to test procedures, agreements, and tools needed in the event of a prolonged drought, e.g., operational details, forecast-based triggers for action, legal agreements and governance.
 - c. Create additional procedures and tools as needed based on the learnings from the drought simulation.

This work has reinforced the fundamental importance of maintaining and building the resiliency of our river systems and the ecosystems and communities that rely on them in the face of growing demands and changes to climate and land use. Expectations are high within the water community and the opportunities for improved decision making and outcomes are real. Alberta continues to benefit from the commitment and involvement of the water community. Now is the time to move from “talk” to “walk” and implement water resource management strategies and solutions that build on what is already being done.

Written by:

Mike Kelly
Mike Nemeth
Kim Sturgess
Claire Jackson

Ryan MacDonald
Megan Van Ham
Jon Sweetman

Project updates and reports can be accessed through the Alberta WaterPortal at: www.albertawater.com

If you have any specific questions regarding this work, please contact Alberta WaterSMART.