Rethinking operations of river infrastructure from experience in Alberta: people, tools, and process

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PNWER 25th Annual Summit, Big Sky Montana

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Water Management Solutions

Alberta WaterSMART

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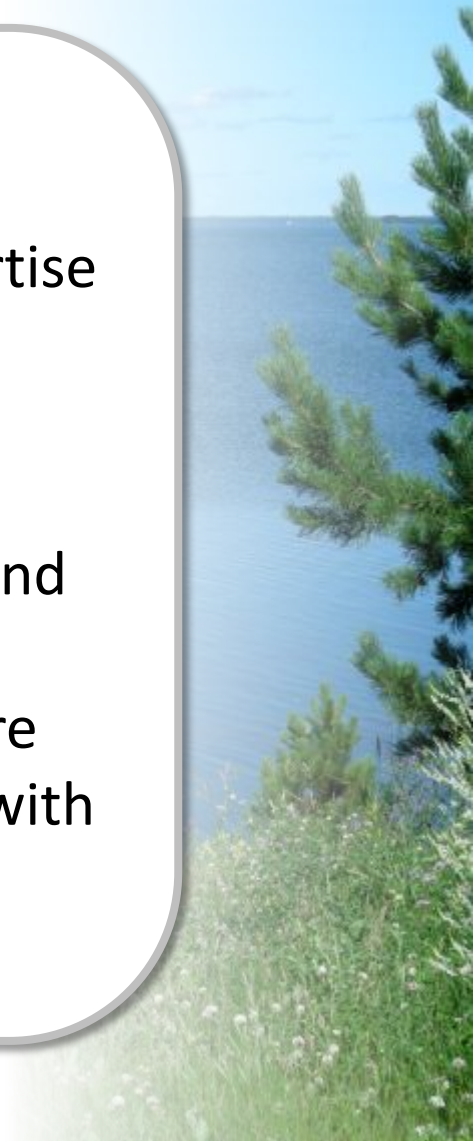
We are a niche strategic and engineering consulting company with deep domain expertise and understanding of water in Alberta.

We are committed to improving water management through better technologies and practices, for the social, economic and environmental benefit of current and future Albertans, and then sharing these solutions with Canada and the World.



Potential: Ongoing Adaptation Through Collaborative Water Management

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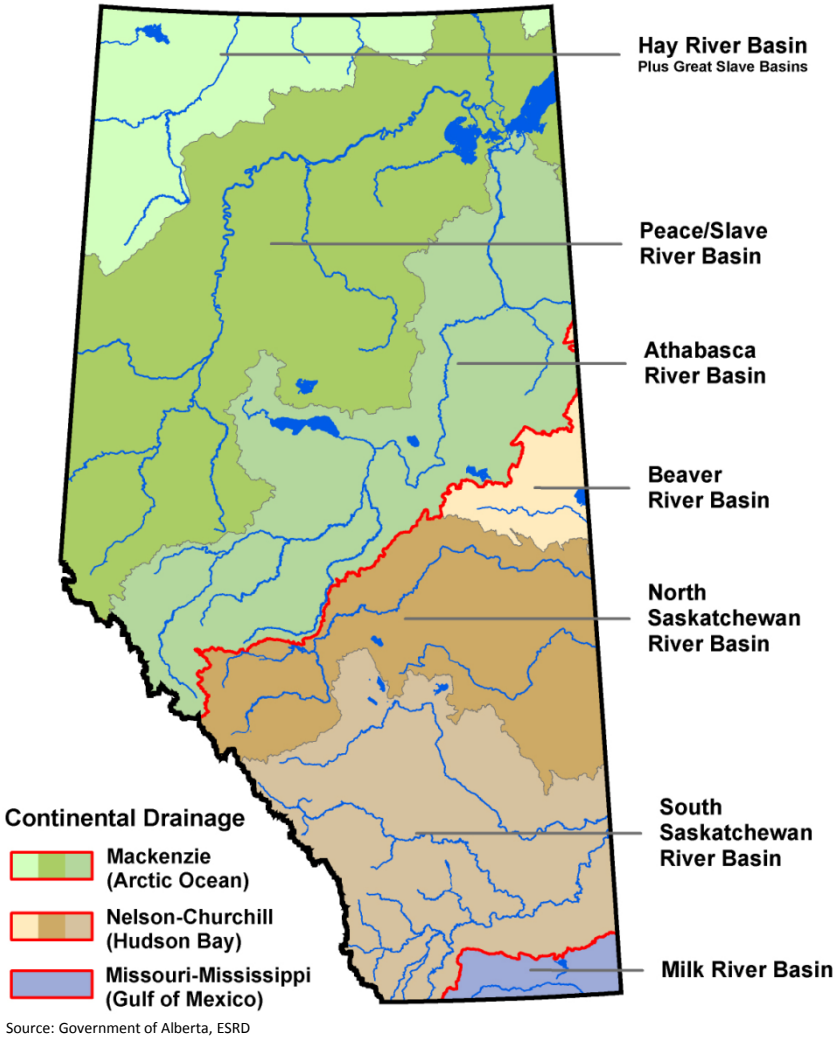

Source: Government of Alberta, ESRD

We need to adapt to the broad range of climate change related water challenges throughout Alberta, e.g.:

Sustaining ecosystems in the Peace and Athabasca

Addressing water shortages in the Peace tributaries

Balancing the cumulative impacts of development in the Athabasca

Ensuring water quality while supporting industry in the North Saskatchewan

Managing flash floods in the Red Deer headwaters

Supporting growth without environmental degradation in the Red Deer

Managing through multi-year droughts in the Bow and Oldman

Mitigating severe flood risk on the Bow and Elbow

Navigating cross-border relationships in the Oldman and Milk

… and more.

Water in Alberta: Focus on Adaptation

"The strong link between climate change and water has contributed to the view that if mitigation is about carbon, then adaptation is about water." *- Alberta Climate Dialogue 2014*

Mitigation

is about **greenhouse gas**

is **global**

is a **trigger**

takes time

Adaptation

is about **water**

must be **local**

is about **action**

is **needed now**

Climate change will have a direct, significant impact on water resources

Alberta can and needs to focus on adaptation

History Demonstrates Extreme Climate Variability, Beyond Recent Record

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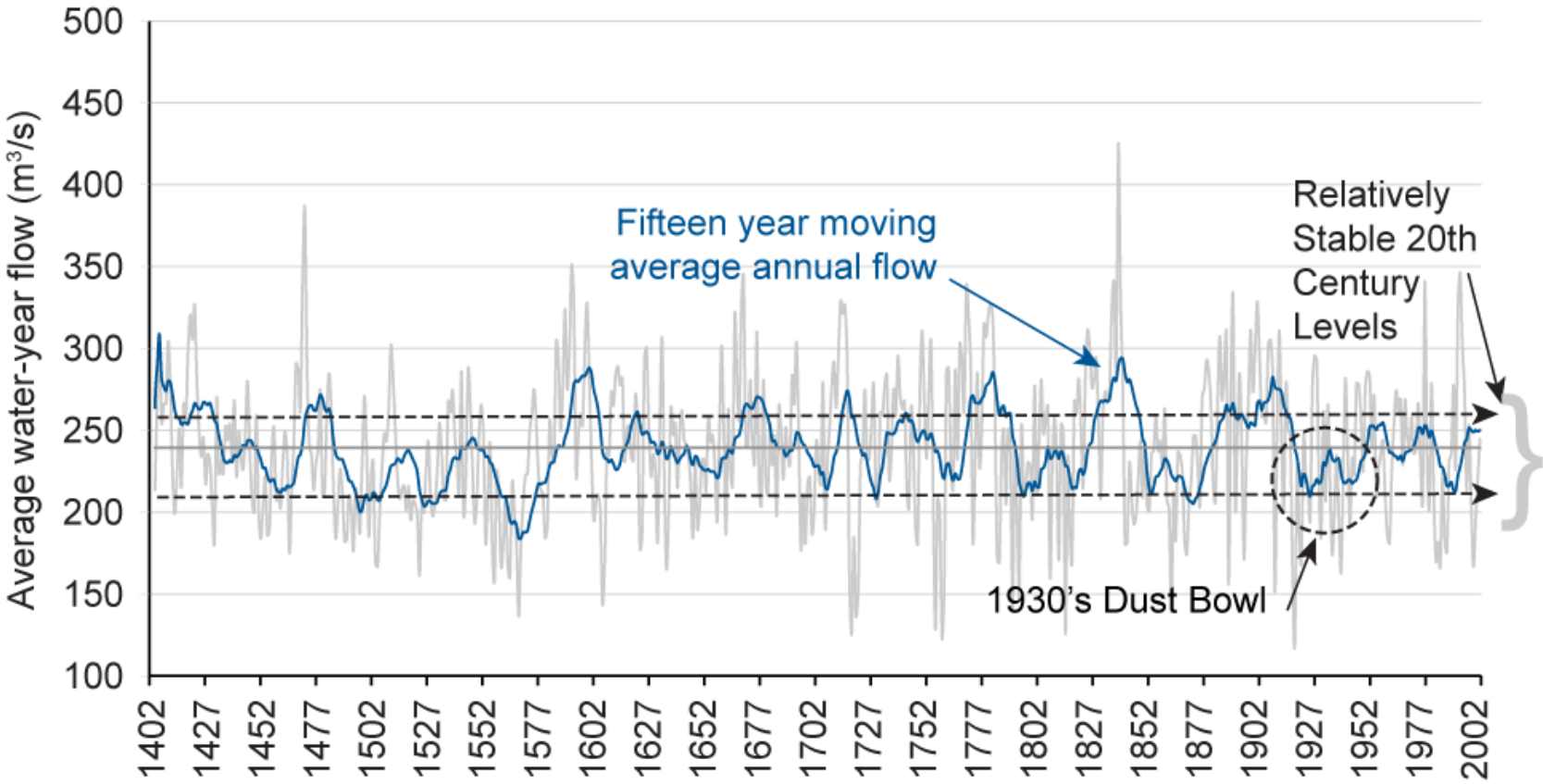
South Saskatchewan River Basin Flows (Bow + Oldman)



Reinforcing the importance of adapting and building resilience now, before more extreme events

The Sub Basins are Already Managed Systems

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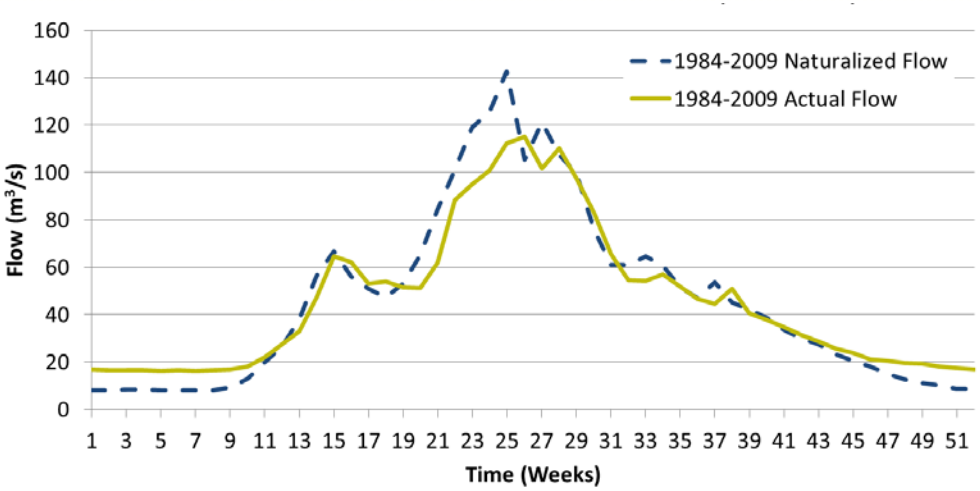
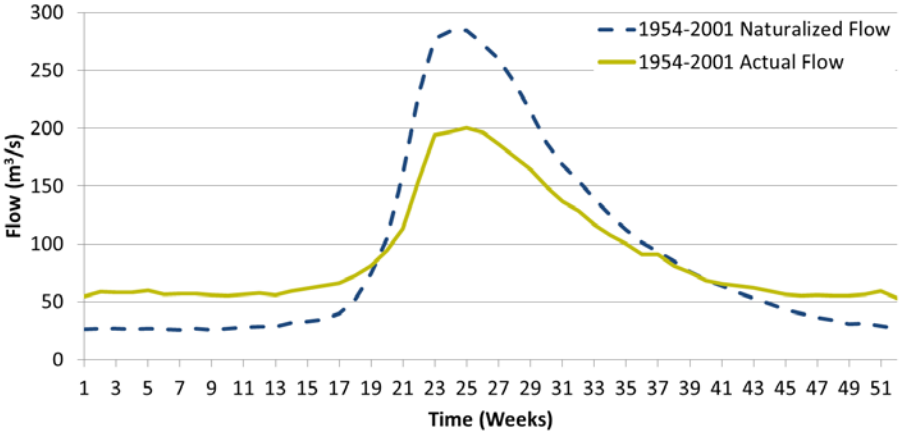
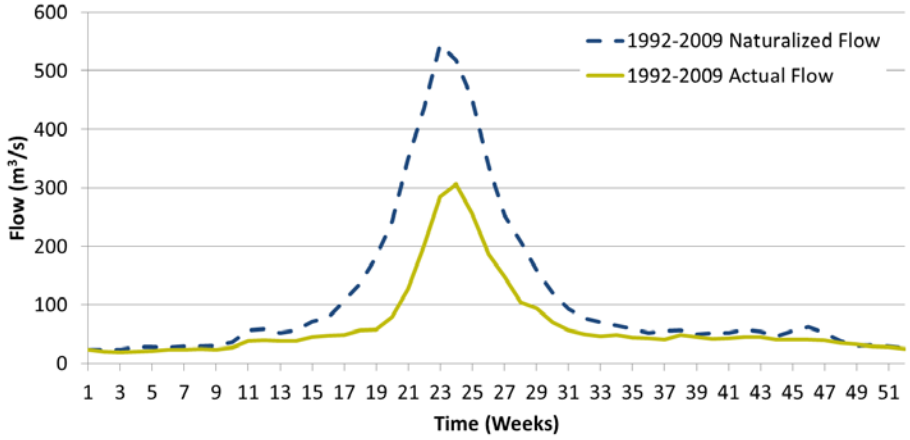
Red Deer River at Red Deer



Bow River at Calgary



Oldman River near Lethbridge



Operation changes can help:

- Adapt to future changes in flow
- Support shifts in basin priorities
- Provide water supply protection and increased certainty

So how do you go about re-thinking dam operations across multiple parties within watersheds?

1. Bring Together the People that Know the Water Management Systems the Best

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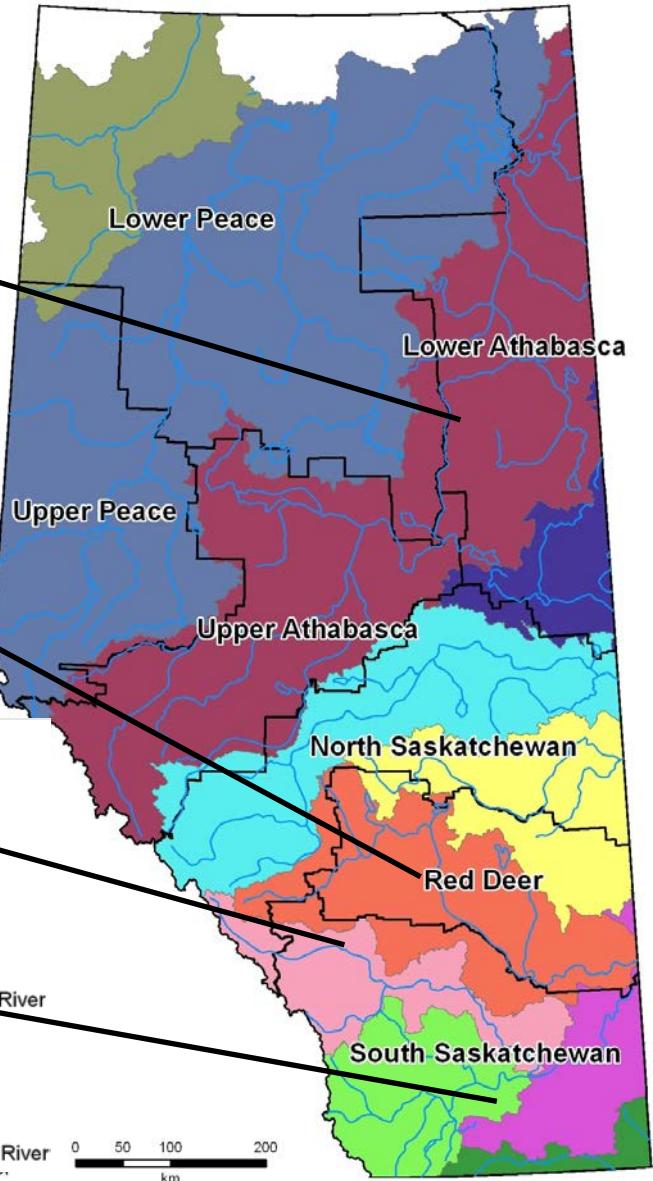
These are Steering Committee members as the Athabasca is in the forming stage

Participation from: Alberta Environment and Sustainable Resource Development, Alberta Agriculture and Rural Development, and Alberta Tourism, Parks, and Recreation



2. Provide a Strong Base of Data and Tools

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Input data from best available sources…

Alberta Environment and Sustainable Resource Development
- *Naturalized flow data*
- *WRMM licence data*
- *Reservoir operations*

Working Group Participants
- *Demand data*
- *Operations*

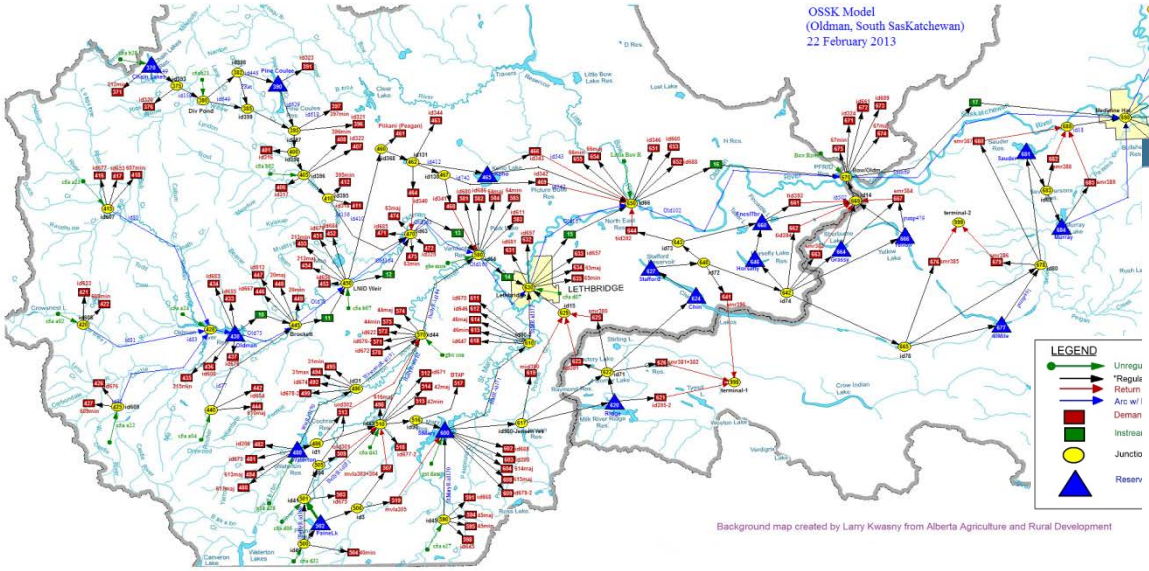
Alberta Agriculture and Rural Development
- *IDM demand data*

PARC Prairie Adaptation Research Collaborative
- *Climate variability data*

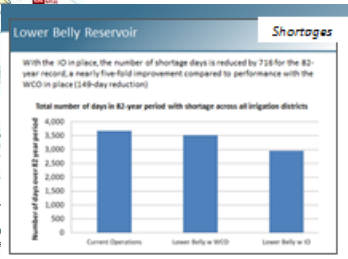
ALCES Sustainable Landscapes, Sustainable Futures
- *Land use simulations*

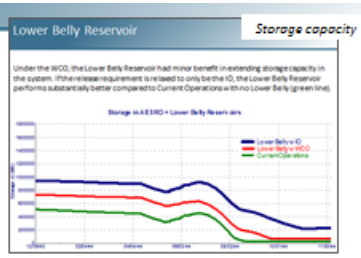
…interactive model of surface water quantity for each sub basin…

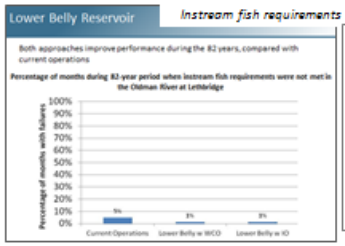
~80 years of historic data + 30 years with climate variability

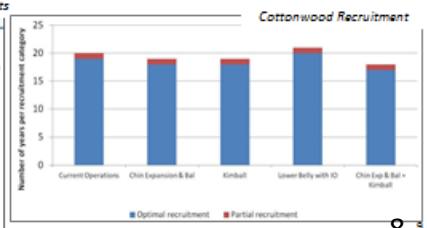


…with performance measures reflecting basin interests.

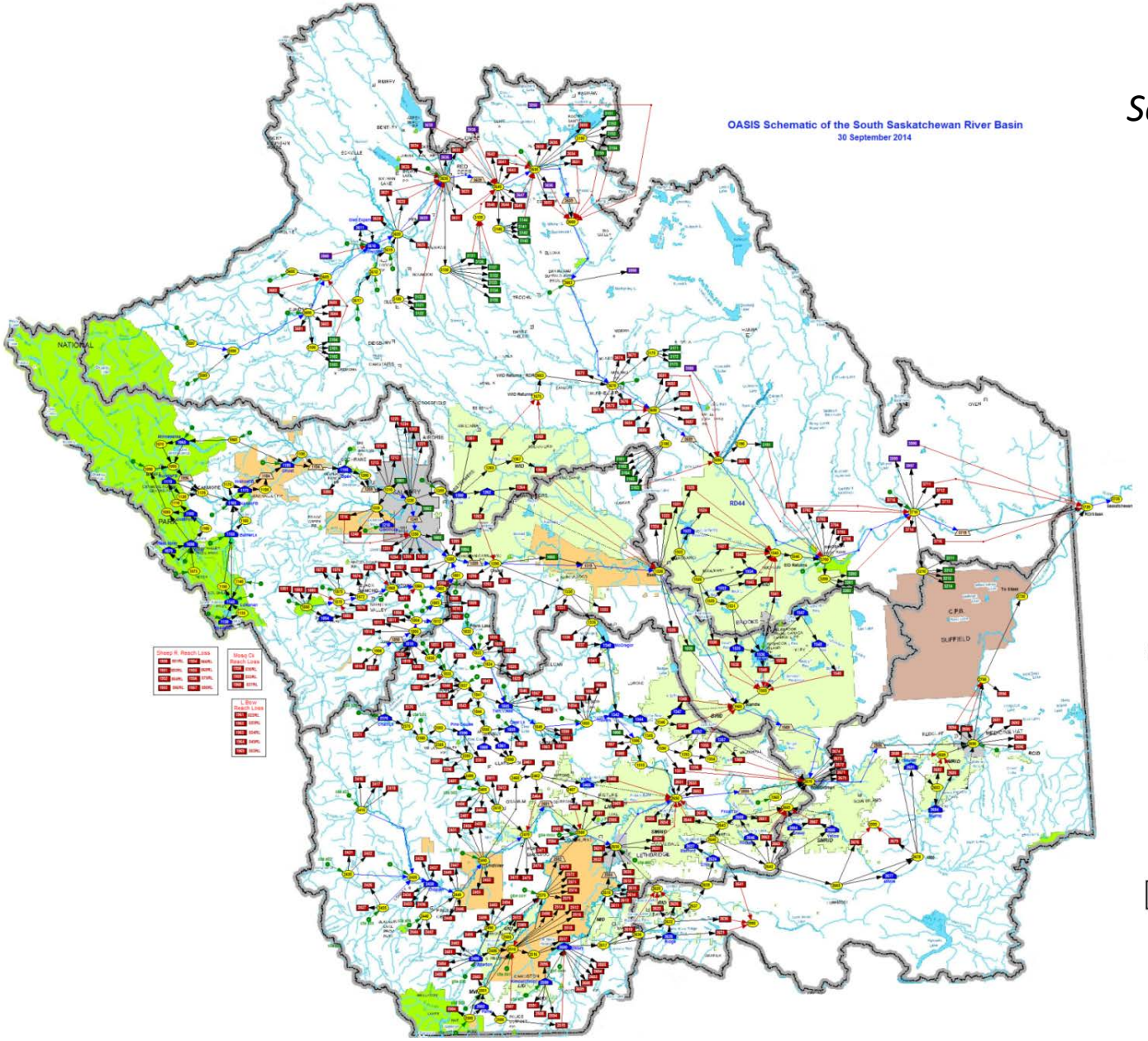








Integrated SSRB Operational Simulation Model



South Saskatchewan River Operational Model (SSROM)

South Saskatchewan River Basin Reference Map

Legend

- SSRB Sub-basins
- Irrigation District Boundary
- Park National/Provincial
- First Nation Reserve
- Military Base

Alberta
Agriculture and Rural Development
Irrigation and Farm Water Division
Basin Water Management Branch

OASIS Modelling has been used Extensively Many Years

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HYDROLOGICS

These projects consistently lead to implemented solutions

Basins Modeled with OASIS

Collaborative Process

3. Work Collaboratively To Identify Impacts and Opportunities

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- Participants use the model to explore the system and explore opportunities
- Participants review the plausible range of impacts from changes in demand, infrastructure, climate, or land use
- Participants explore (define, model, test etc.) potential adaptation strategies and management opportunities in response

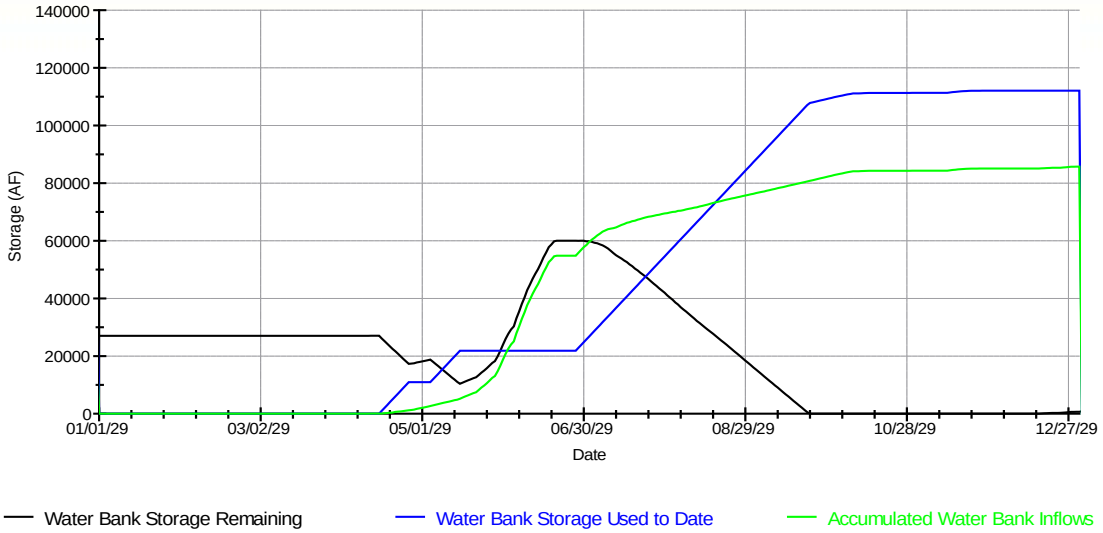
The four sub basins in the SSRB have been analyzed for threats from increasing water demands, droughts, floods, and climate variability, and for potential environmental improvement opportunities while meeting these demands.

Bow Adaptation Strategy: Upstream Water Bank

Improving benefits in the Bow is all about timing

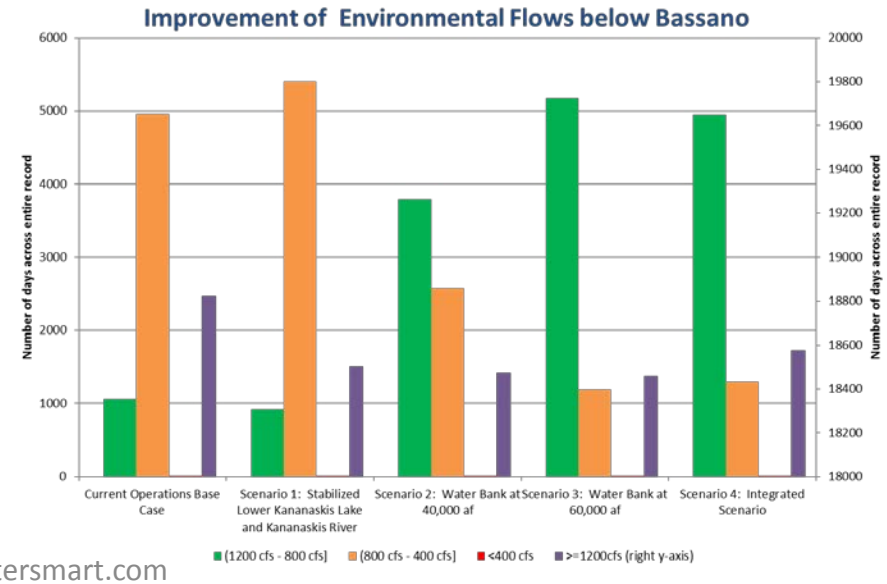
The water bank is a volume of water used to make releases as needed to meet basin needs

- % storage spread across existing TransAlta reservoirs
- % of inflows



Agreed to operating rules are vital in producing the expected benefits

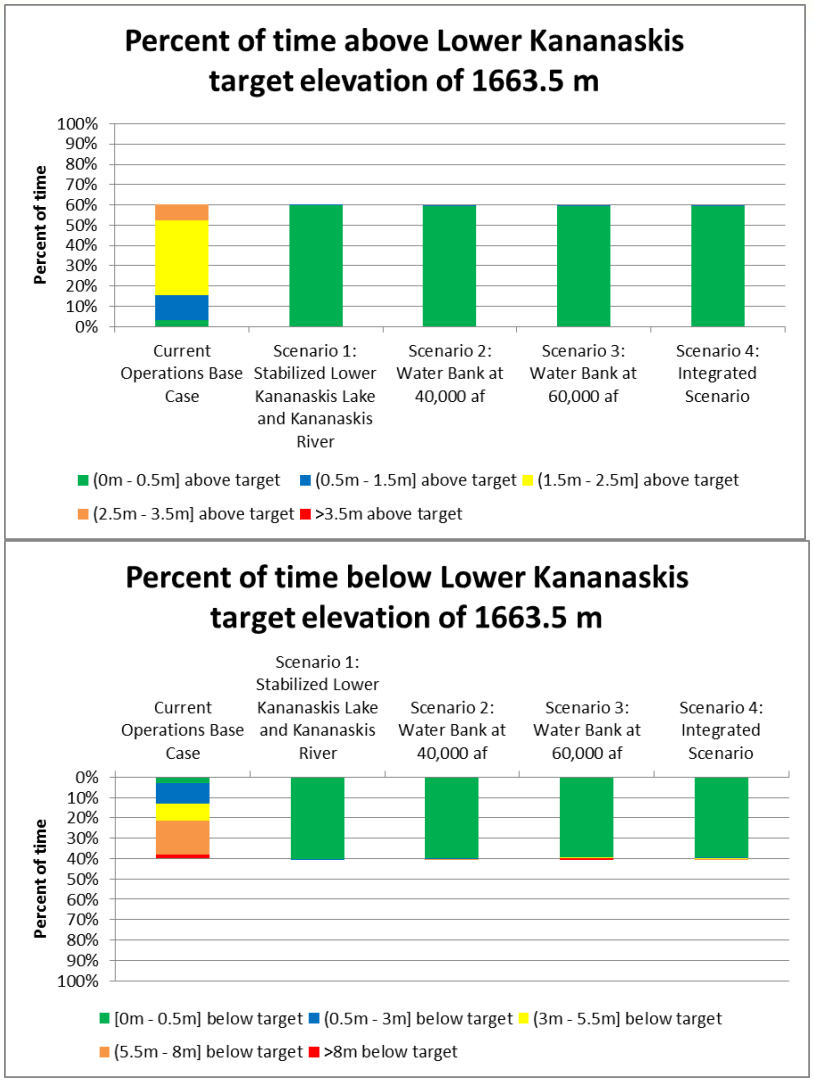
e.g. Release to maintain flow of 800 cfs at Bassano



When a water bank release is made TransAlta releases that much more than they would have released without the withdrawal

- This requires a formula to determine “how much TransAlta would have released”
- The impacts on TransAlta generating revenues depend on when the water is released

Bow Adaptation Strategy: Stabilizing Lower Kananaskis Lake



Oldman Adaptation Strategy: Chin Reservoir Expanded and Balanced

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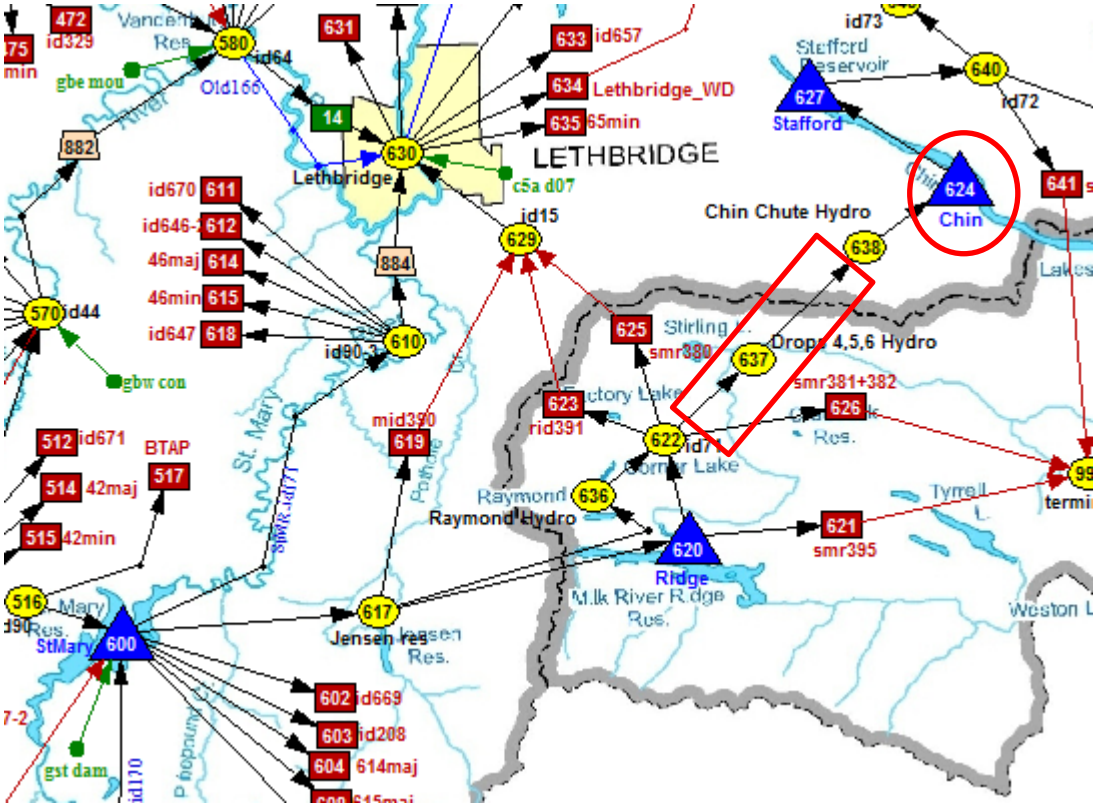
Chin Reservoir:

- Expand Chin Reservoir by 74,000 cdm (~60,000 AF)
- Fully balanced with ESRD Reservoirs (that is, the entire amount of existing and new storage was added to the balancing system- total storage of 235,000 AF)

- If a Chin-based storage option is pursued, the “balancing” aspect of this strategy must also be applied to ensure that benefits accrue to the rest of the system.

- Without balancing, water is preferentially stored in Chin Reservoir, ahead of ESRD reservoirs, where it has fewer potential applications.



Water is now a high profile issue: Now is the time

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Big disaster= Big driver

700 head offices are located here

Stampede Grounds: Our identity is here

Calgary Flood June 21st 2013

Business leaders live here

Bow Adaptation Strategy: Operate Ghost &Barrier for Flood Control (Flood Extent Visualization)

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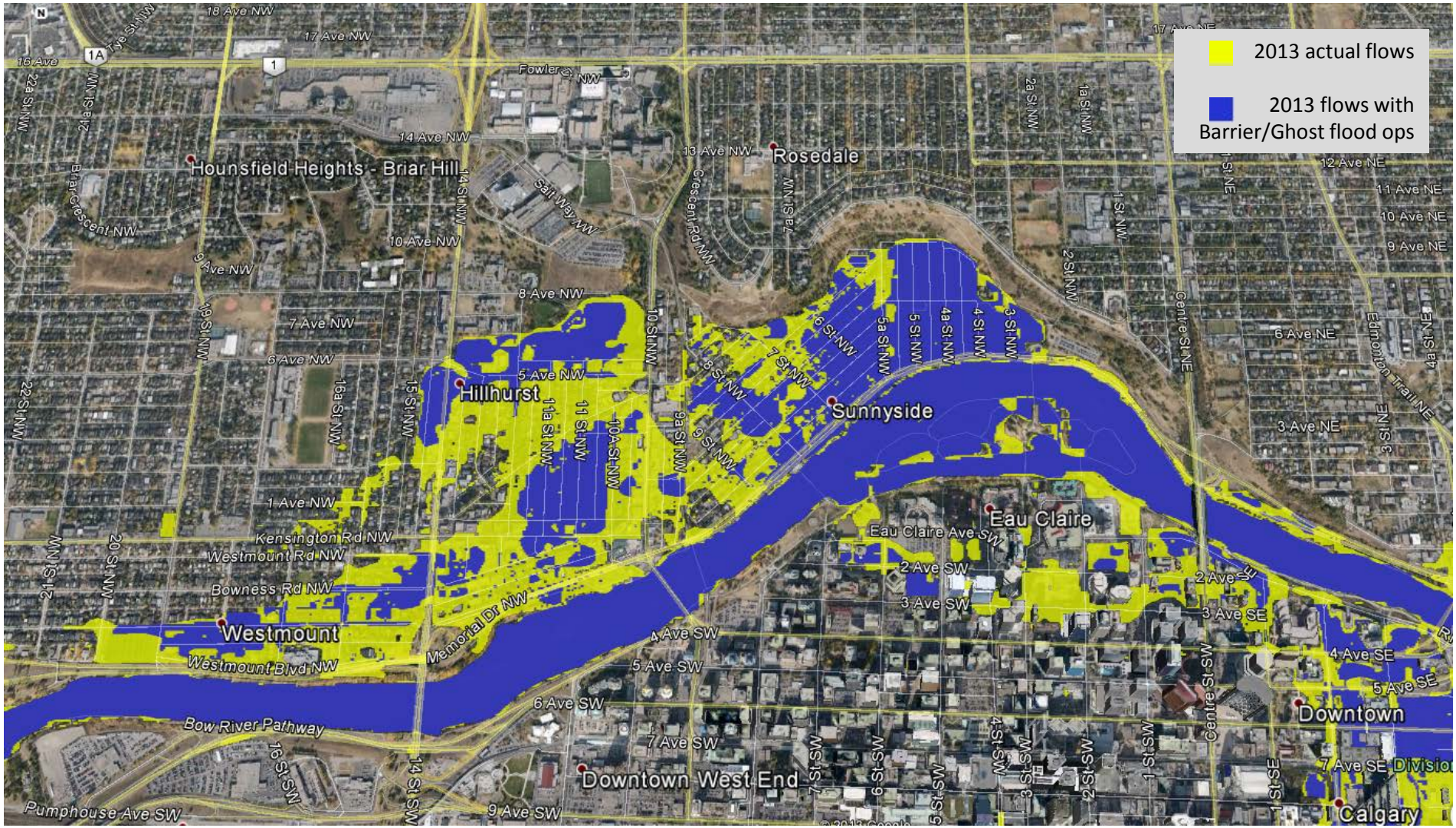
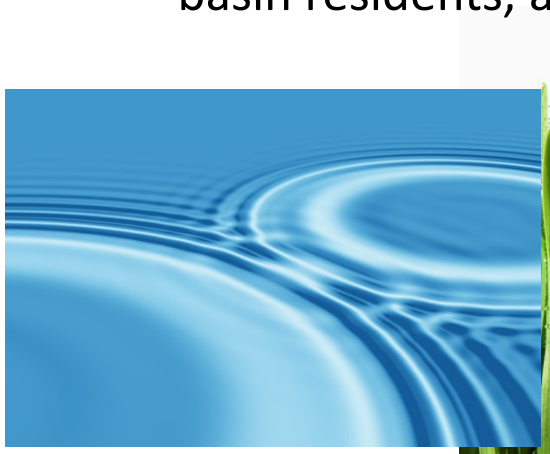


Opportunity: Ongoing Adaptation Through Collaborative Water Management

Collaborative water management:

- enables informed, appropriate, and timely water and watershed management decisions on opportunities for existing reservoirs to be repurposed for different interests (environmental, social, and economic) or new storage facilities
- contributes to environmental planning and cumulative effects management
- Multi-interest stakeholders working with government in the interest of all basin residents, and tax payers




Water: The Key to Our Sustainable Future

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