

Institute for Catastrophic Loss Reduction Workshop

Flood and drought: What's next for watershed management?

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October 16 2015



Today we'll cover

- Brief background on Alberta WaterSMART
- Water in Alberta – flood and drought
- The 2013 Flood
- Six high level recommendations for flood mitigation
- The value of collaboration
- Room for the River case study
- Looking ahead



OUR MISSION

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 sharing our solutions with Canada and the World.

ACHIEVED THROUGH

Project development and execution

Identifying opportunities and innovative solutions to work toward a vision of improved water management

Collaboration and communication

Valuing collaboration and engagement by bringing diverse individuals and organizations together, to work toward common goals and accommodating multiple interests

Water strategy

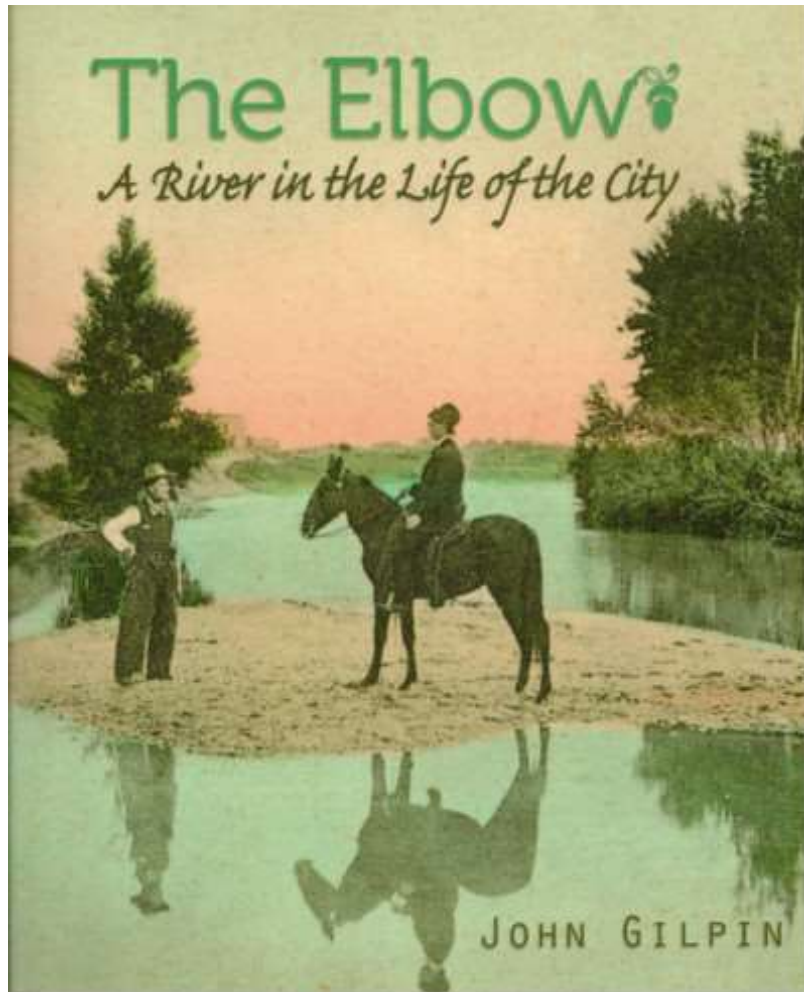
Conducting effective projects on water strategy for corporations, consortiums and other organizations

Supported by people knowledgeable in all aspects of water management at local, regional, and global levels

Water in Alberta

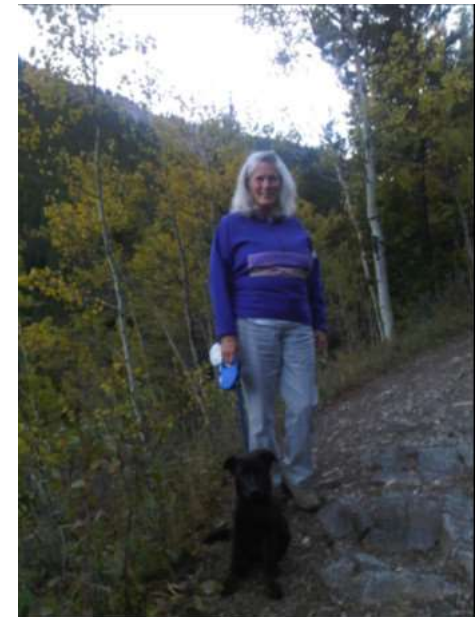


Everyone has their own water story

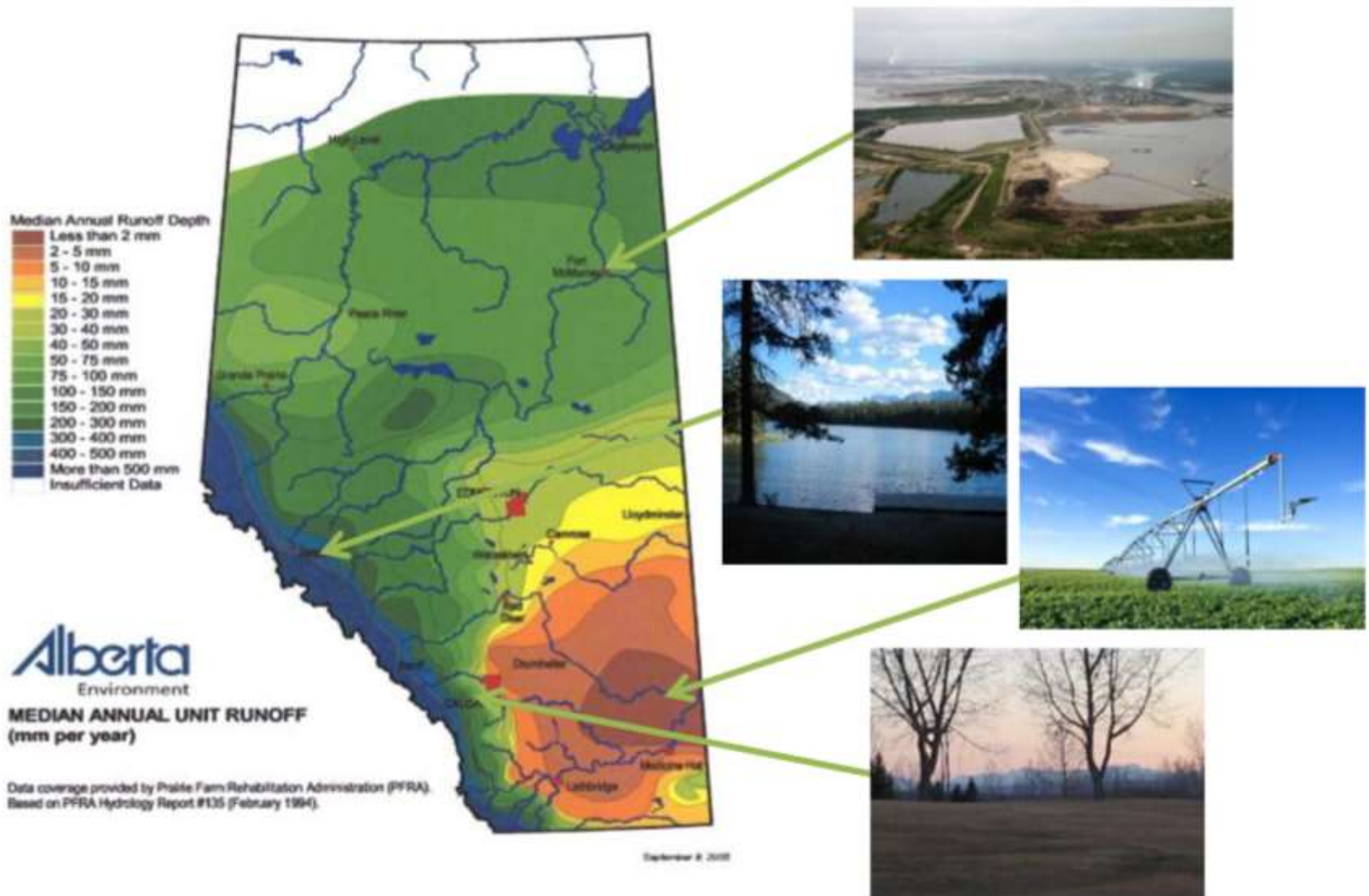


“economic and recreational benefits and periodic floods ... The Elbow River has thus evoked fear, respect, indifference, pleasure, frustrations, appreciation and distaste, while being drank, swam in, skated upon, avoided, polluted and crossed.”

**Lived beside
and hiked!**



Water issues vary widely across Alberta



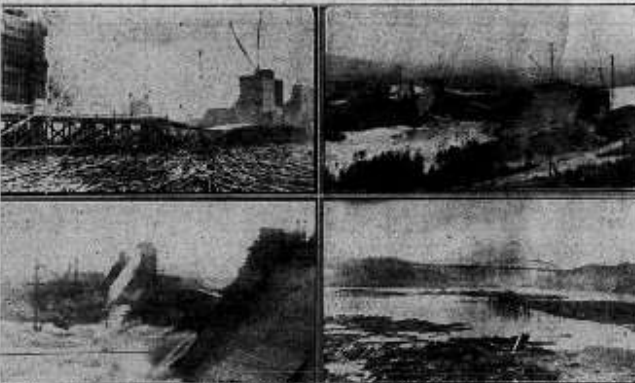
HUNDREDS OF CITY HOMES MENACED BY RIVERS

Baldwin Gov't Votes to Hand In Resignation

Cabinet Conference Monday Decides to Ask King for Official Release
MacDONALD TO AGAIN TRY MINORITY GOVT
For Second Time in Five Years British Labor Will Try to Carry On

BULLETIN
(By Canadian Press Cable)
LONDON, June 3.—The Baldwin government has voted to hand in its resignation to the king, after a cabinet conference Monday decided to ask King for an official release.
MacDonald, prime minister of England and head of the Conservative government, which has guided the nation since October, 1924, decided to tender the resignation of his ministry to the king.
His action, caused by the defeat of the Conservative party in the general election, is the first time in the history of the British monarchy that a prime minister has done so.
The cabinet conference Monday decided to ask King for an official release.
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Ghost River Dam Menaced by Floods



The upper left picture shows the tremendous log jam that stopped down the Bow and, cracking into the under-structure of the light railway bridge just in from the foundation. The center is shown being deposited by the river in its run. The lower right picture shows the forest burning through the substance at the dam and washing and eroding it to the river. Lower left is a view of the region undergoing a heavy rain down the dam, and some light shows the old bridge over the Ghost completely under water, while in the background the new bridge is seen very stark in the water.

Swollen Highwood Flowing Through High River Streets

Business Places Isolated by Water and Many Herded Out
Livestock Being Carried Down Stream
Townpeople Watching Big Emergency Dams With Deep Anxiety as Water Rises

The Day in Parliament

KING'S BIRTHDAY OBSERVED QUIETLY



King George VI, seen here in a military-style uniform, was the guest of honor at a luncheon given in his honor at the Hotel Vancouver Monday.

HEAVIEST RAIN IN YEARS STRIKES SOUTHERN ALBERTA

THUNDER STORM HITS SOUTH
ALBERTA, June 3.—Southern Alberta is shaking as a heavy rain and thunder storm hits the province. The rain, which began Sunday night and continued through Monday, has been the heaviest in years in many parts of the province. The rain has caused a great deal of damage to crops and livestock. The rain has also caused a great deal of damage to property and has caused a great deal of damage to the province.

Worst Floods Since '02 Ravage Calgary And South Districts

At Residential Areas Near Rivers Are Completely Covered Monday
Rivers Still Rising On Monday Afternoon
Bowness and St. George's Parks Wrecked—Animals At Zoo Drowned

Twenty-Fifth Avenue Bridge Is Washed Out
Twenty-five feet from the last to be washed away, the bridge was blown in by the river. The bridge was completely destroyed and the river was completely covered. The bridge was completely destroyed and the river was completely covered. The bridge was completely destroyed and the river was completely covered.

Two Streams Pouring Flood Waters Over Big Sections of the City
THE SITUATION AT A GLANCE
Bow river rose from 100 feet Saturday morning to 17 feet Monday afternoon and rising. Drains were 15 feet.
Elbow river rose from 240 feet Sunday morning to 270 feet Monday afternoon and rising. Drains were 15 feet.
One man, Ernie Walls, of Saskatchewan, drowned Sunday near Elbow. First of several drowned in Calgary, and one swept down stream. An unexploded car, in addition. Bill Colton, chief member of the party, escaped.
Thousands of dollars' damage done to houses and property in Elbow Park from Country 100 to junction of Elbow and Bow.
C.N.R. freight yard low washed out.
Bowness park completely inundated; houses wrecked; swimming pool destroyed and the river badly damaged.
St. George's park completely under water. Doghouse and swimming pool destroyed. Bare openings of tanks threatened and lost. Many animals drowned. Bears believed to be safe.
Bovine slaughter district. Poultry and cottages at Bowness, Bowness, Bowness and Westmount under water. Culture flooded in every part of the city near the river.
Bridges at Twelfth and Fifth avenue still in danger. Water logging over the Bowness.
Saskatoon 2000 people completely stranded.
Trunkline line from city northwest washed out.
Telephone communication with Bragg Creek cut off.
Roads cut off west of Bragg Creek.
Roads north to High River and Turin Valley impassable.
Interurban bridge at Elbow river washed out and debris dam to house started below the dam.
Turner Valley washed out and many drilling camps forced out on damage work reported.
High river completely under flood. Much damage to property and street, due through covering of lands.
One line in every part of the province in danger of being washed out.
Twenty-fifth avenue bridge was washed out, leaving with it a big debris dam.
Gas line to Okotoks 600 railway in Elbow washed out.
Much damage done by rain to high ground near the stream.
Approx 1000 power lines in southern grounds flooded.
Electricity downed in Calgary but not power were restored quickly Monday morning.
Telephone communication over and under established through the flood.
Flooded street and railway line. C.N.R. tracks completely flooded. Bowness light completely under water and lost of street car home washed out.

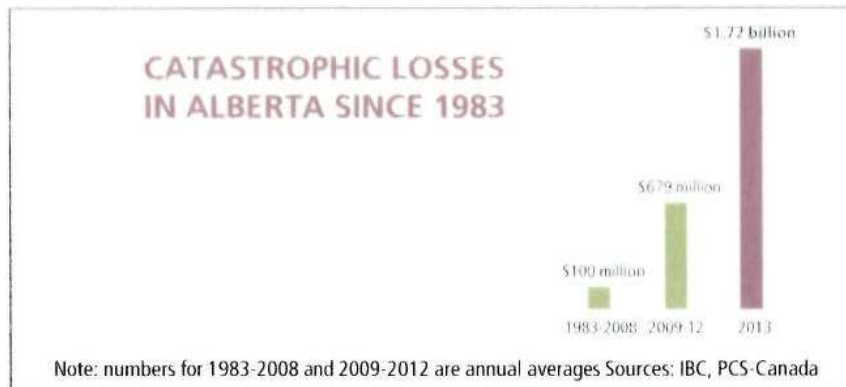
Bow and Elbow Rivers Continue to Rise Far Above Danger Levels

Derision: Water Power Officials Think Peak Has Been Reached
HEAVY RAIN REPORTED FROM JUMPING BANKS; CREEK TEARING POUNDS

An example close to home - excerpt from a letter from my insurer

Research for the Insurance Bureau of Canada shows that windstorms, hailstorms, flooding, drought and wildfires are expected to continue to impact Albertans in the years and decades to come.

The graph below illustrates the increase in catastrophic losses in Alberta over the last 20 years. Insurers have had to adjust coverage limits and products to ensure that coverage continues to be available and in order to meet the increasing demands of catastrophic claims.



Local community
survey on insurance

\$15,000 basement
insurance

There is nothing of
value in my
basement

Drought is no stranger to Alberta

19th Century Drought

1790s 1791-1873 1857

- Drought impacted the ability of fur traders to move goods on the North Saskatchewan River

- Decimation of bison population, partly due to drought

- Palliser Expedition
- Alberta declared "unsuitable for agriculture"

20th Century Drought

1910 - 1920s 1930 1980s

- Drought and settlement continued

- Dirty Thirties

- 1984 driest year since 1916

21st Century Drought

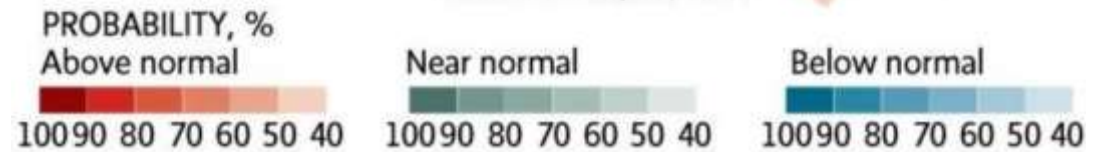
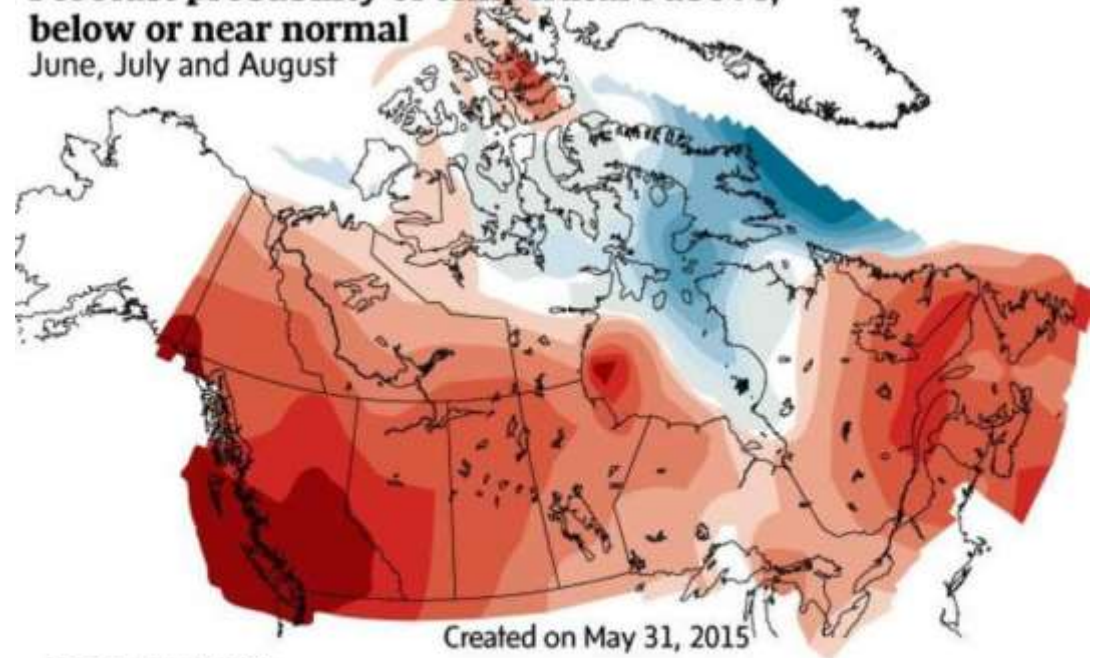
2002 - 2004 2009 - 2010

- Drought cost the Canadian economy \$5.8 billion

- Drought caused communities in central and northern Alberta to declare states of emergency

- It is unknown when the next drought will occur

Forecast probability of temperature above, below or near normal June, July and August



CARRIE COCKBURN/THE GLOBE AND MAIL | SOURCE: ENVIRONMENT CANADA

Impacts of drought on agriculture

21 August 2015

Alberta declares a province-wide agricultural disaster

Insurance payouts to drought-hit farmers will likely near \$1 billion

JODIE SINNEMA, EDMONTON JOURNAL | 08.05.2015 |

A screenshot of a news article from Global News. The article is titled "Alberta declares disaster after losses from drought" and is by Erika Tucker, an Online Reporter for Global News. The article is dated August 21, 2015, at 8:59 pm. The article includes social media sharing options for Facebook (294), Twitter (21), Email, and Print. Below the article is a photograph of a field of dry, yellowed grass. The caption below the photo reads: "Farmers east of Okotoks, Alberta are concerned about the dry season's effect on crops. July 2015." The photo credit is "Ma. Szlak / Global News". The Global News logo is in the top left corner, and the location is set to "Edmonton". There are also links for "Change Location" and "TV News Programs".

Disaster response and rising costs

The Insurance Bureau of Canada reported the 2011 Slave Lake wildfire was the second costliest natural disaster in Canadian history at more than \$700 million, with \$400 million in uninsurable losses.

Environment Canada

In 2012, 62% of all insurance losses from natural catastrophes were in Alberta

Insurance Bureau of Canada

From 2009 to 2014 insured losses from catastrophic events were close to or above \$1 billion each year – most of this was due to water damage

Insurance Bureau of Canada

July and August 2015 saw flash flooding in the cities of Chestermere, the province informed residents its Disaster Recovery Program funds do not cover flooding from sewer or pump issues



The June 2013 flood



The 2013 flood is estimated to cost \$6 billion

- The most damaging flood in our province's history.
- The combination of melted snowpack and days of torrential rain resulted in extremely high and swollen rivers in the Southern region of Alberta.
- Approximately one-hundred thousand people were evacuated, four people killed, and homes and businesses impacted.
- In the aftermath of the spring 2013 flooding, Albertans across the province were questioning flood mitigation methods, what they were, how they worked, and how our province could move forward to address future flooding...



Heroes: City of Calgary Water Services



City of Calgary
Glenmore Reservoir Water
Treatment Plant



City of Calgary
Bears paw Water Treatment
Plant during 2013 Flood

**“This disaster impacted 100,000 residents.
If the water treatment plants had gone down, this disaster
would have impacted a million residents.”**

Dan Limacher, City of Calgary Water Services

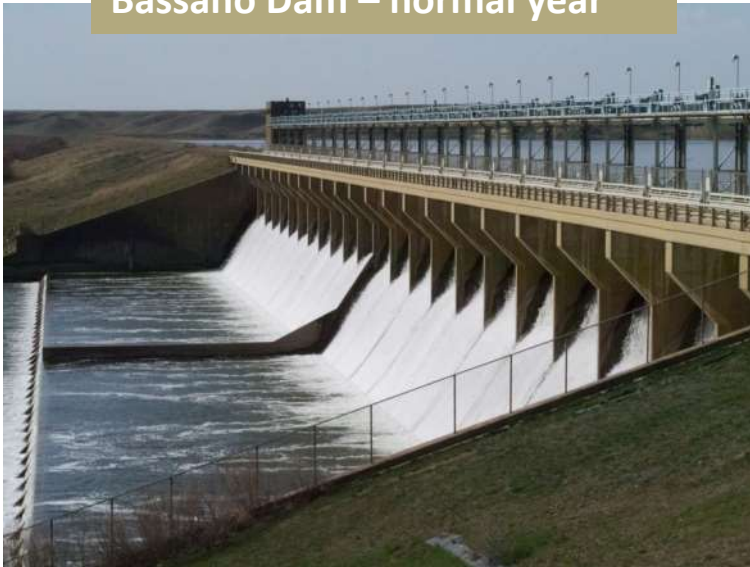
Heroes: Earl Wilson



"Hundreds of millions of dollars were at risk ...
I flipped a coin a million times trying to decide
whether to pull the plug."

Earl Wilson, General Manager, Eastern Irrigation District
Calgary Herald, May 1, 2014

Bassano Dam – normal year



Bassano Dam – June 2013



Heroes: my WaterSMART team



Event was reported and responses managed primarily via social media.



@WaterPortal



FB.com/WaterPortal

How could we help?



June 20, 2013: Colpitts Ranch est. circa 1890



June 21, 2013: Stampede Park



The Canadian Water Summit was held in Calgary on June 27, 2013. We had the best water minds in the Basin, Canada and the World focused on flood mitigation solutions

The 2013 Great Alberta Flood: Actions to Mitigate, Manage and Control Future Floods



Our six high level recommendations

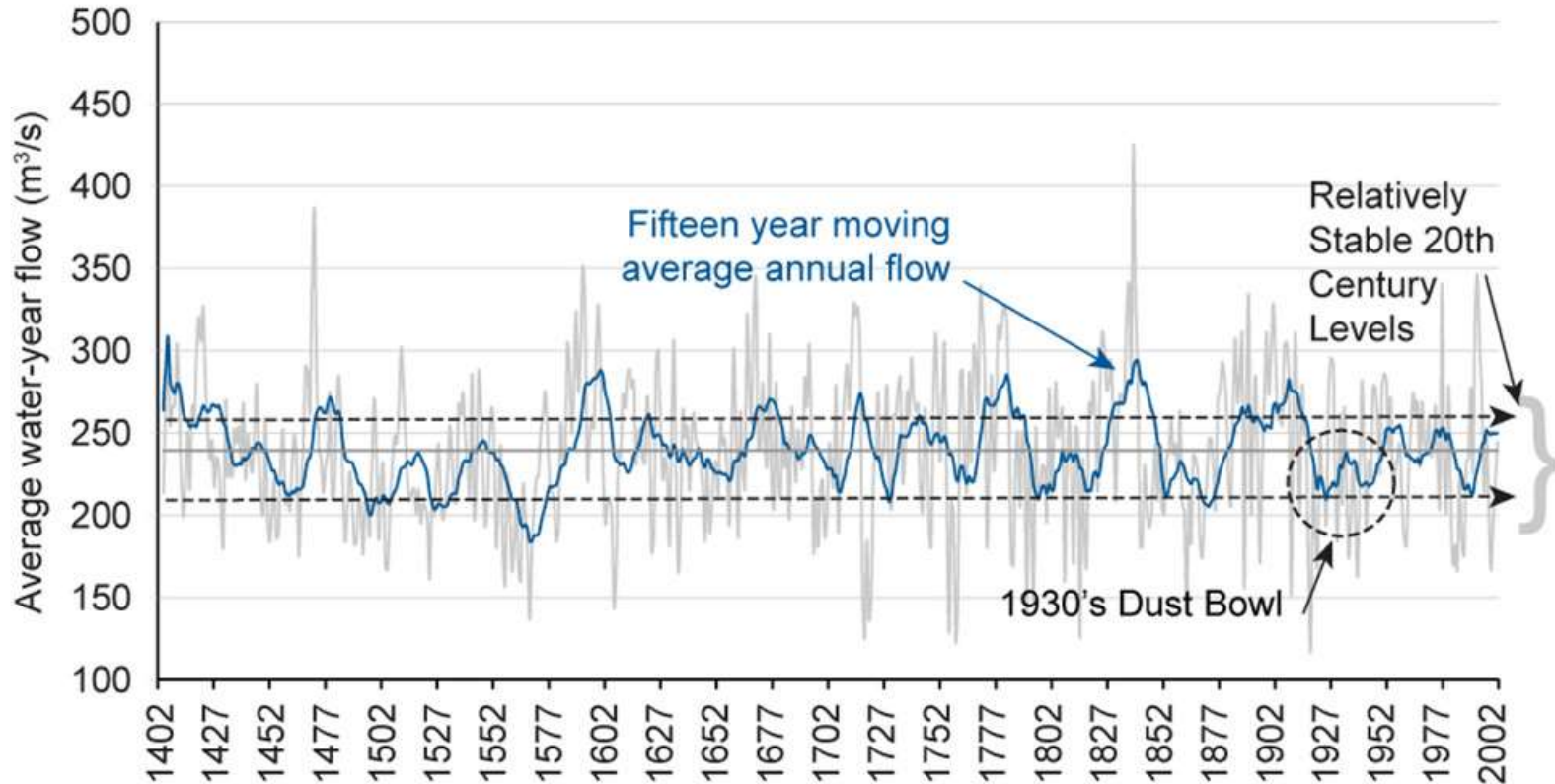
1. Anticipate and plan for more extreme weather events, including both flood and drought
2. Improve our operational capacity to deal with potential extreme weather scenarios through better modeling and data management
3. Investigate the cost/benefit balance of investing in physical infrastructure such as on and off-stream storage, diversions, and natural infrastructure such as wetlands
4. Consider flood risks in municipal planning and strengthen building codes for new developments in flood plains
5. Evaluate options for overland flood insurance
6. Manage our water resources collaboratively, and ensure WPACs across the province have proper authority and funding.

Recommendation 1.

Anticipate and plan for more extreme events

History demonstrates extreme climate variability

South Saskatchewan River Basin Flows (Bow + Oldman)

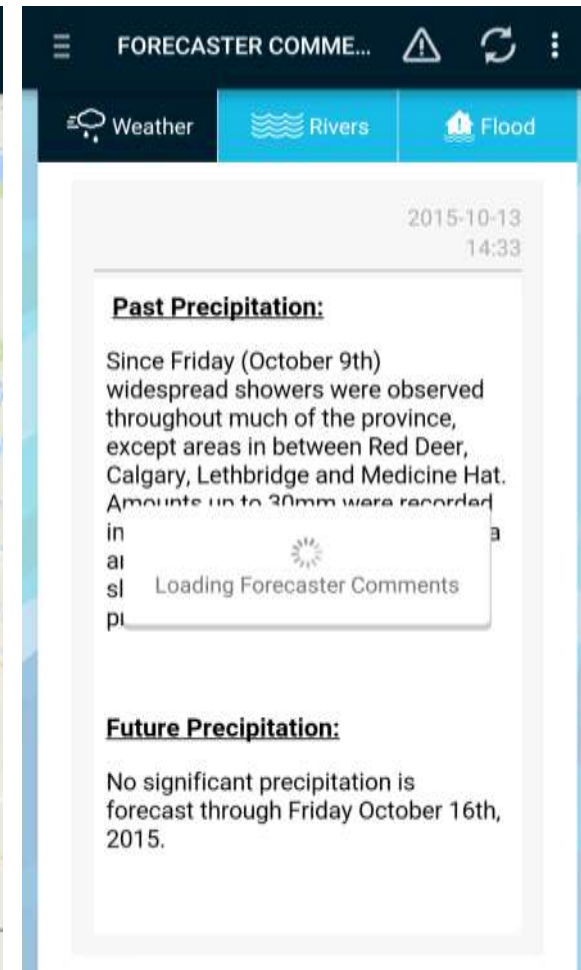
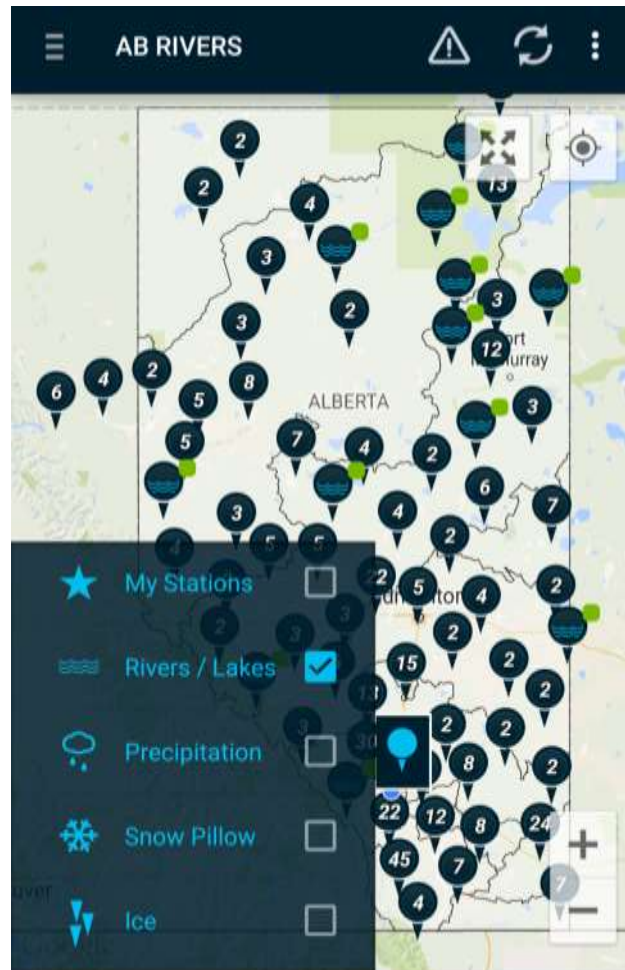
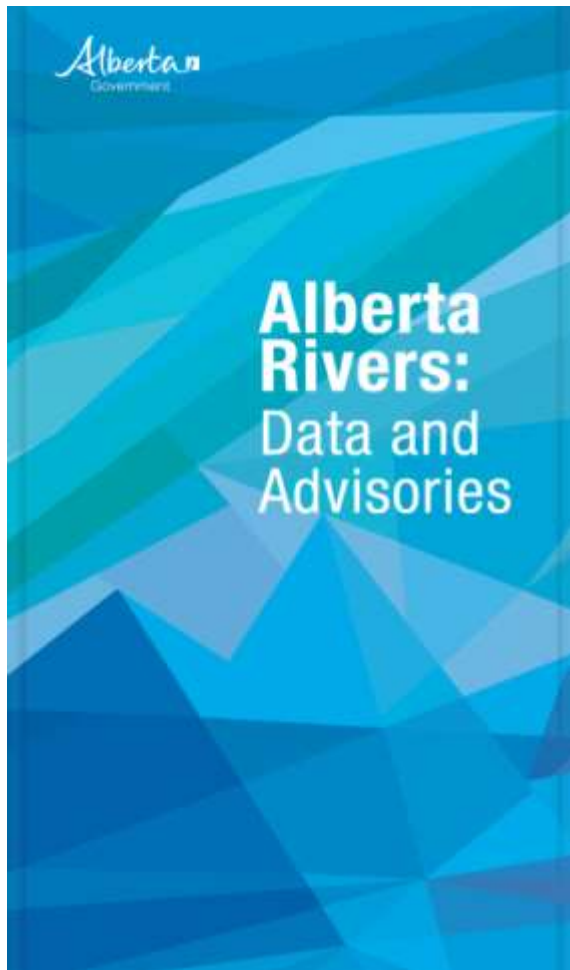


Source: David Sauchyn, University of Regina

Historic and tree ring data indicate future flood/drought events
could be far more severe than recent record

Recommendation 2.

Improve operational capacity and response



Recommendation 3. Investigate cost/benefits balance of physical infrastructure and natural infrastructure

Bow Basin Flood Mitigation and Watershed Management Project

March 31, 2014



Room for the River Pilot in the Bow River Basin

Advice to the Government of Alberta

December 19, 2014



Submitted by:

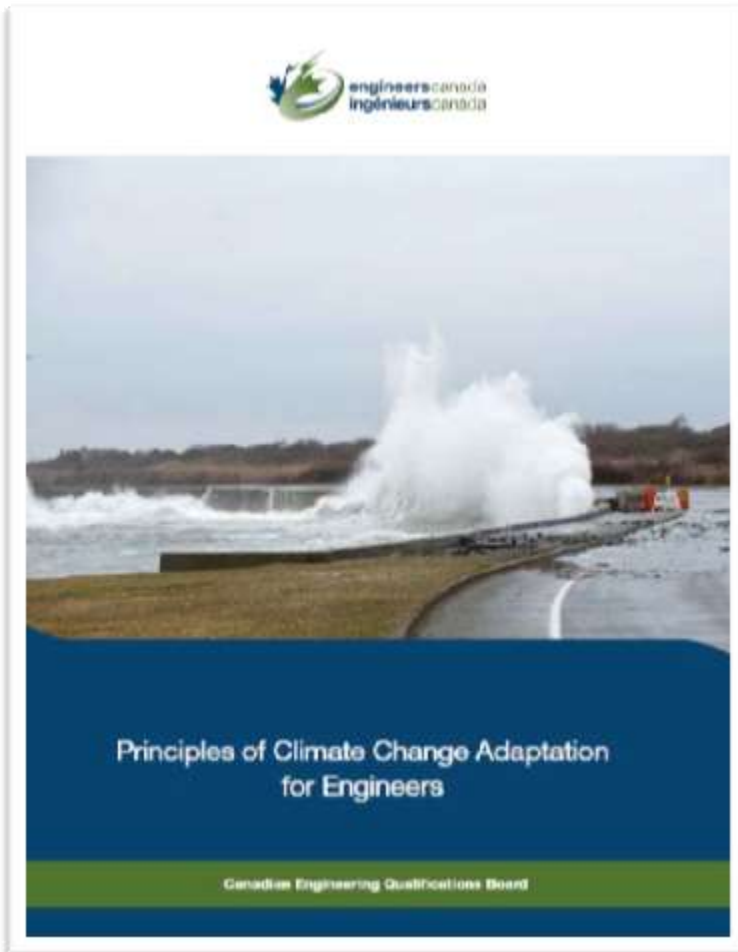
P. Kim Sturgess, P.Eng., FCAE
CEO
WaterSMART Solutions Ltd.
#200, 3512 - 33 Street NW
Calgary, Alberta T2L 2A6

Submitted to:

Cathy Maniego and Andrew Wilson
Resilience and Mitigation Branch
Environment and Sustainable Resource Development
205 JG O'Donoghue Building
7000 - 113 Street
Edmonton, Alberta T6H 5T6

These reports and more available free on www.albertawater.com

Recommendation 4. Consider flood risks in municipal planning and strengthen building codes



Professional Judgment

Guideline Element # 1: Integrate Adaptation into Practice

Guideline Element # 2: Review Adequacy of Current Standards

Guideline Element # 3: Exercise Professional Judgement

Integrating Climate Information

Guideline Element # 4: Interpret Climate Information

Guideline Element # 5: Work with Specialists and Stakeholders

Guideline Element # 6: Use Effective Language

Practice Guidance

Guideline Element # 7: Plan for Service Life

Guideline Element # 8: Use Risk Assessment for Uncertainty

Guideline Element # 9: Monitor Legal Liabilities

Recommendation 5.

Evaluate options for overland flood insurance

Albertans who live in floodplains can now get overland flood insurance



MATT MCCLURE, CALGARY HERALD

[More from Matt McClure, Calgary Herald](#)

Published on: June 2, 2015 | Last Updated: June 2, 2015 7:13 PM MDT

Homeowners in Alberta who live in floodplains can now insure their losses from overland waters with one of the province's largest property insurers ... Using new software that maps the risk of inundation down to the individual property level, the Co-operators said this week it is now able to price a comprehensive water damage product...



Aviva Canada also began offering an overland water endorsement this month that covers losses from the accumulation or runoff of surface waters to customers in Alberta and Ontario who already have sewer backup coverage.

Recommendation 6.

Manage our water sources collaboratively

Collaboration between federal, provincial and municipal governments, WPACs, irrigation districts, hydropower companies, NGOs is required, and can be improved by:

- Supporting WPACs to work with their membership to assess flood and drought risk, consequences, and mitigation strategies, and to provide advice to GoA
- Considering the creation of a Provincial Water Authority for coordinated watershed management across the WPACs
- Supporting and providing increased capacity to smaller communities to respond to natural disasters.



The value of collaboration



A collaborative process of involvement is essential for

Common knowledge base

Defined objectives

Society-wide issues

Adaptation, not prevention

Shared costs

Public support

Credibility

Project participants typically include

WPACs

Municipal governments

NGOs with water interests

Irrigation districts

Alberta Government

Academia

Technical experts

Industry

The interested public

Collaborative modelling process builds knowledge and enables exploration

Computer aided negotiation,
computer aided dispute resolution,
computer modelling for decision support...
...many names, similar approaches

Six steps

1. Determine participants, interested parties, and project team
2. Prepare and agree on Project Terms of Reference
3. Develop Performance Measures
4. Build the model
5. Test the model and explore alternatives “what if...”
6. Reach consensus and assess practical implementation

Collaboration case study

Room for the River



Dutch Room for the River Program

Dutch National Water Authority responsible for administering *Room for the River* program.

Program objectives for the Rhine branches are:

- Safely cope with a 1:1250 years discharge of 16,000 cms without flooding
- Enhance the overall spatial quality of the river landscape

Their process has been

1. Joint problem definition
2. Inventory of project proposals
3. Hydraulic modelling and assessment of cost-effectiveness of all proposals (Planning Kit)
4. Joint (participatory) selection of a set of projects that together 'do the job'
5. Local implementation (transparency and extensive engagement throughout) under national supervision



Source: <http://www.ruimtevoordewaal.nl/en/room-for-the-river-waal/>

Recognize the differences between Southern Alberta and Netherlands river systems



River Ijssel in the Netherlands

Wide, flat and slow

Channelized

Ends in the Atlantic Ocean

At least a week's notice of flood



Bow River in Alberta

Narrow, steep and fast

Development only in City and towns

Ends in agricultural region

Maybe eight hours notice of flood

Objective

Learn from the Dutch Room for the River experience to identify and consider potential flood mitigation options in the Red Deer River Basin and Bow River Basin to reduce vulnerability of people and infrastructure along with improving the overall environmental quality of the river.

Approach

- WaterSMART was engaged by Alberta Environment to facilitate this pilot
- Built on work already identified, studied and implemented in the basin
- Worked with water managers, watershed managers, regulators and experts that know the river
- Applied a systematic, informed framework and process that could be replicated in other basins

Room for the River Pilot contributors

Alberta Agriculture and Rural Development



Alberta Wilderness Association



Elbow River



Watershed Partnership



THE CITY OF
CALGARY



Western Sky
Land Trust

Conserving Our Sense of Place



KANANASKIS
IMPROVEMENT
DISTRICT



ROCKY VIEW COUNTY
Cultivating Communities



Ducks Unlimited Canada
Conserving Canada's Wetlands

Alberta
Environment and Sustainable
Resource Development



Spray Lake Sawmills



Trout Unlimited
Canada



Cows and Fish

Alberta Riparian Habitat Management Society

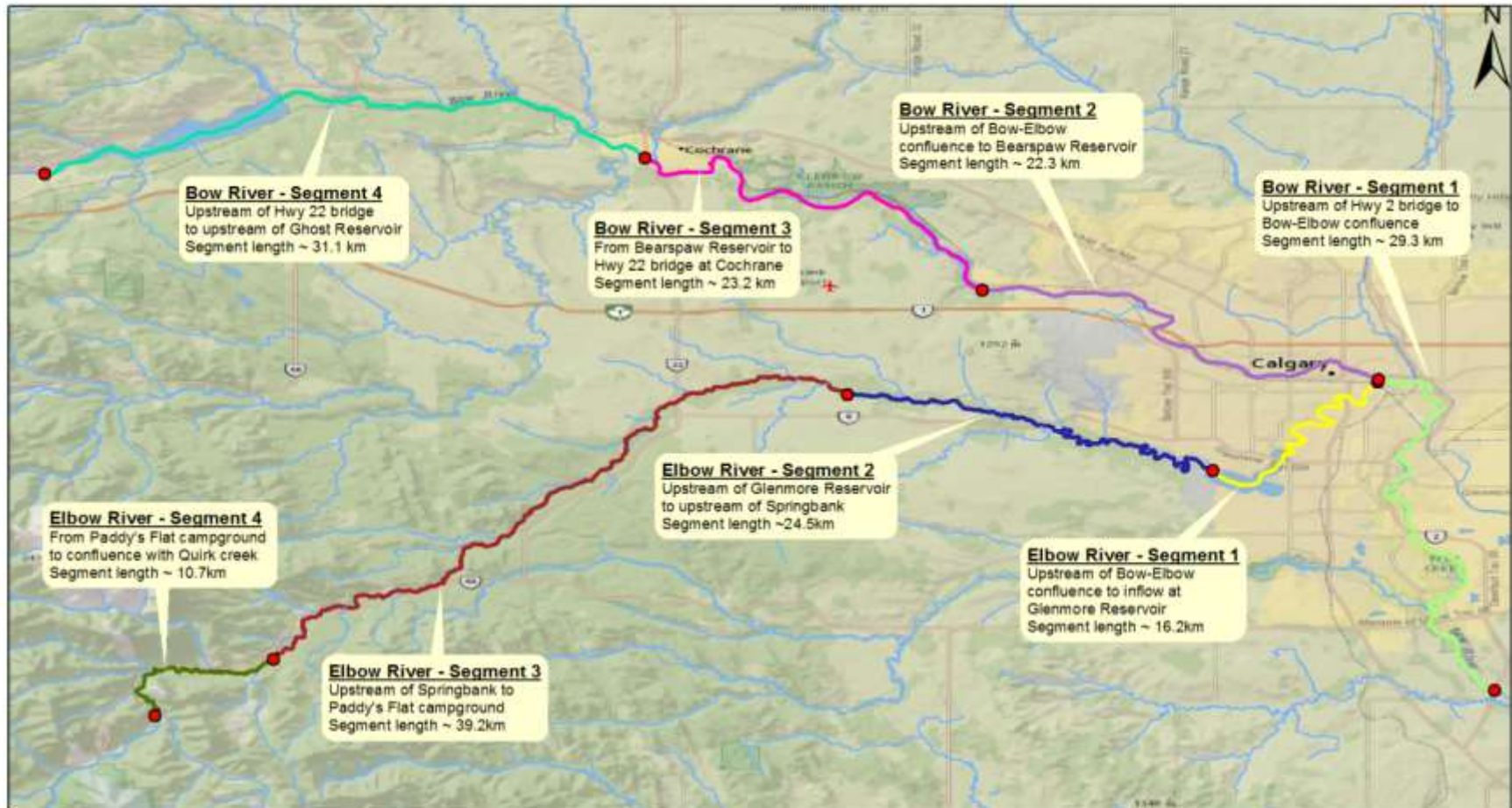


Fisheries and
Canada

TransAlta



Apply framework to the Bow Basin



Bow and Elbow River Segments



Tables organized by river segment to generate all possible mitigation ideas



All ideas captured, organized
and reported.
Nothing was deleted or removed.
No politics!

Policy opportunities identified through collaboration and engagement

1. **Map inundation and/or hazard across the whole basin** to provide a base of knowledge for development, mitigation and recovery decisions, and enforcement
2. **Document damage to infrastructure** to retain institutional memory on flood impacts to inform future building and mitigation
3. Strengthen and enforce policy and regulation to **halt or minimize new development in floodplains**
4. **Ensure projects are rebuilding more robustly** than before; e.g., new Glenmore Dam gates higher than original stop logs
5. Revisit standards and incentives to promote **building roads and bridges to leave more room for the river**
6. Establish **more stringent guidelines for new pipeline and utility** construction in or across floodplains
7. Establish basin wide guidelines for **“as needed” flooding of light infrastructure areas**
8. **Stop the removal of log jams in the headwaters** (where it is not close to flood risk) to maintain natural retention
9. **Strengthen and enforce land use BMPs** to maintain the flow regulation and retention in the catchment
10. **Improve monitoring of precipitation and river flow** measurements as well as the methods and timelines of public communications related to possible flood warnings

Advice to Government of Alberta

1. Scan of specific, actionable opportunities to further implement *Room for the River* measures along the Bow and Elbow main stems above and including Calgary.
2. Recognition of what has already been done along the Bow and Elbow rivers to create room for the river.
3. Possible practical and implementable “no regrets” opportunities
4. Suggestions on potential broader program, process and engagement

An elevated understanding amongst the water community in the Bow Basin of the *Room for the River* program, measures and associated opportunities in Alberta.

A tested framework and process for applying *Room for the River* measures to all watersheds in Alberta.

Looking ahead



Announcements expected in the upcoming Budget

- Provincial support to continue one large infrastructure project for mitigation on the Elbow River
- Some discussion of utilizing existing dam infrastructure on the Bow River for flood and drought mitigation
- Continued funding for more local berming projects, as well natural infrastructure projects, such as wetlands.

What is needed and hopefully being discussed

- What level of risk protection is the Province willing to access for properties downstream of the Glenmore Reservoir?
- What are the economic trade-offs between major infrastructure projects and other options, such as relocation?

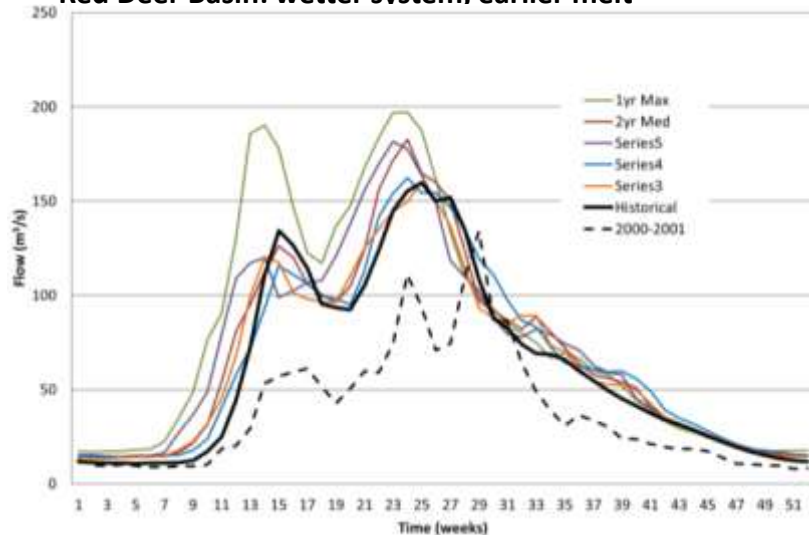
Why environment and climatic changes matters to everyone

- Water is already a barrier to population growth, economic development, and recreational demand
- Home to over one third of Alberta's population; southern Alberta's population expected to grow 60% by 2041
- Loss of glacier storage (lower reserve and natural summer flow on the Bow River)
- Climate and weather patterns can change rapidly
- Growing world demand for irrigated agriculture production
- Environmental concerns throughout the river systems
- Reach-dependent impacts on high value fisheries and other recreation
- Risk of periodic floods and drought without coordinated and systematic approach to manage or mitigate



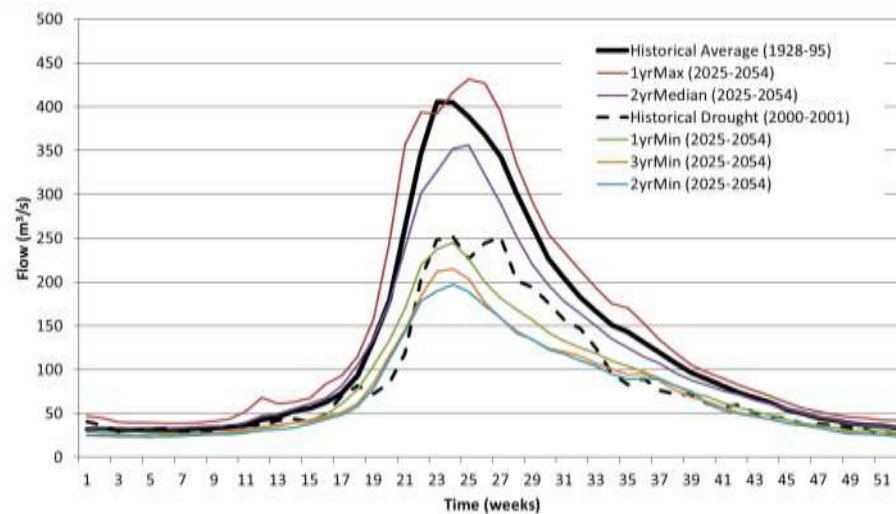
Learnings: climate variability will play out differently in each sub basin

Red Deer Basin: wetter system, earlier melt

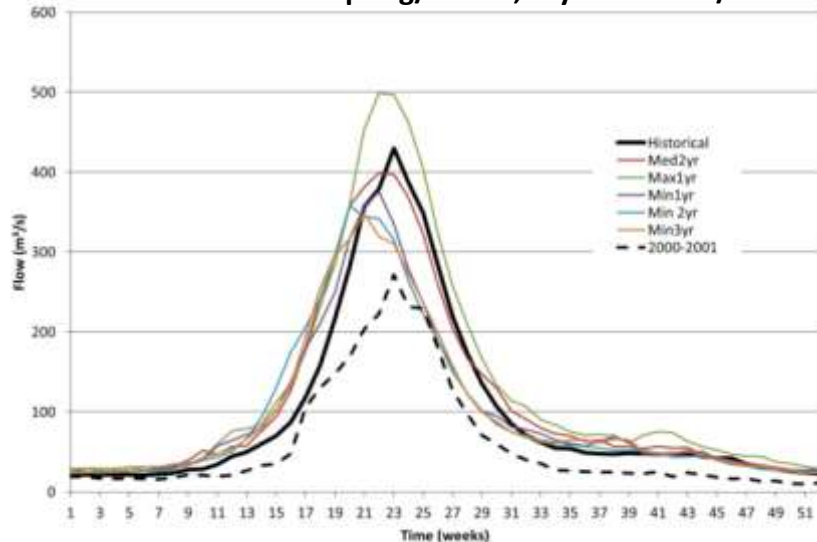


Climate Variability Scenarios Compared to 2000-2001 in each Basin

Bow Basin: dryer system overall

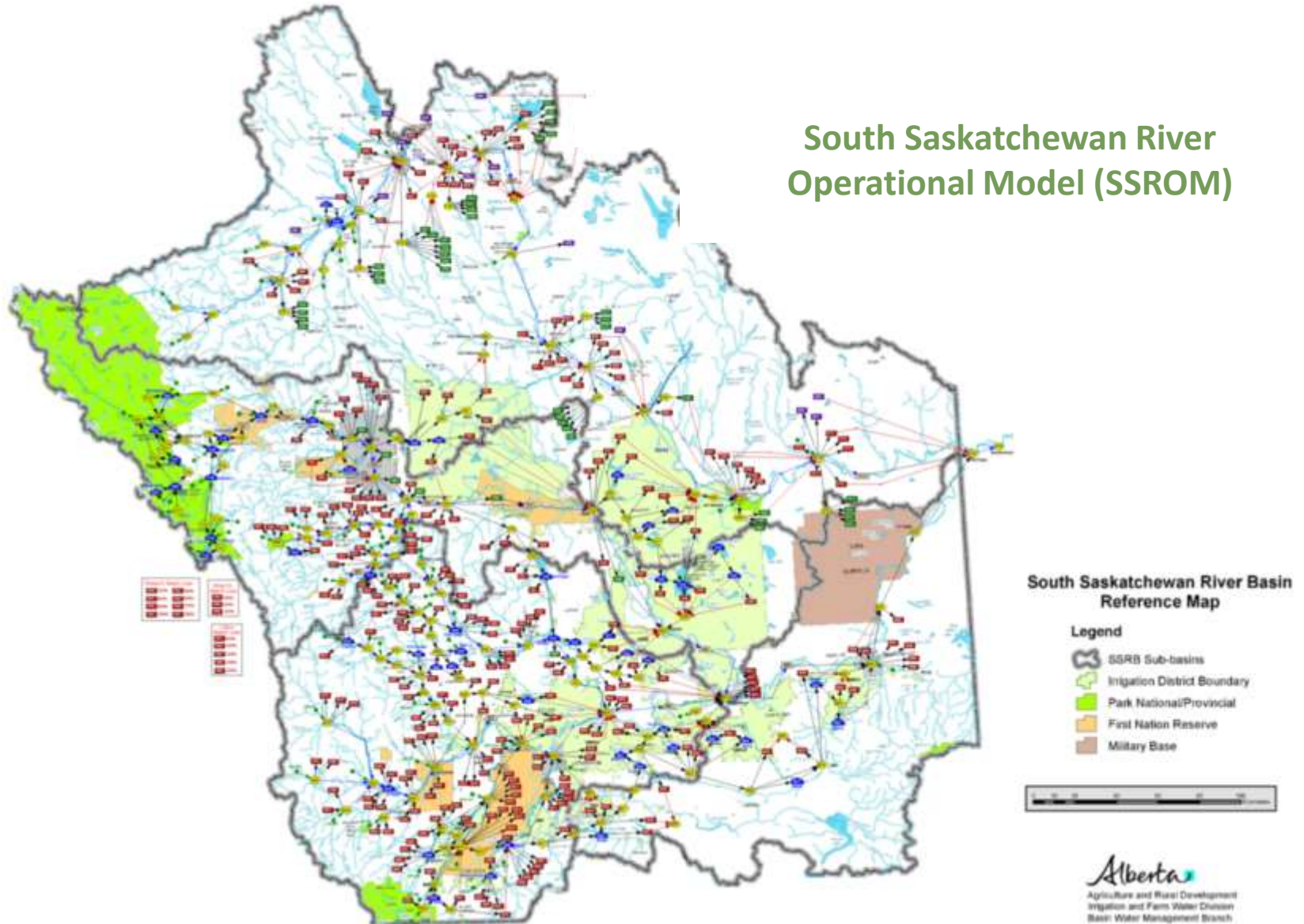


OSSK Basins: wetter spring/winter, dryer summer/fall



Building an integrated operating model to develop and test basin-wide resilience strategies

South Saskatchewan River Operational Model (SSROM)

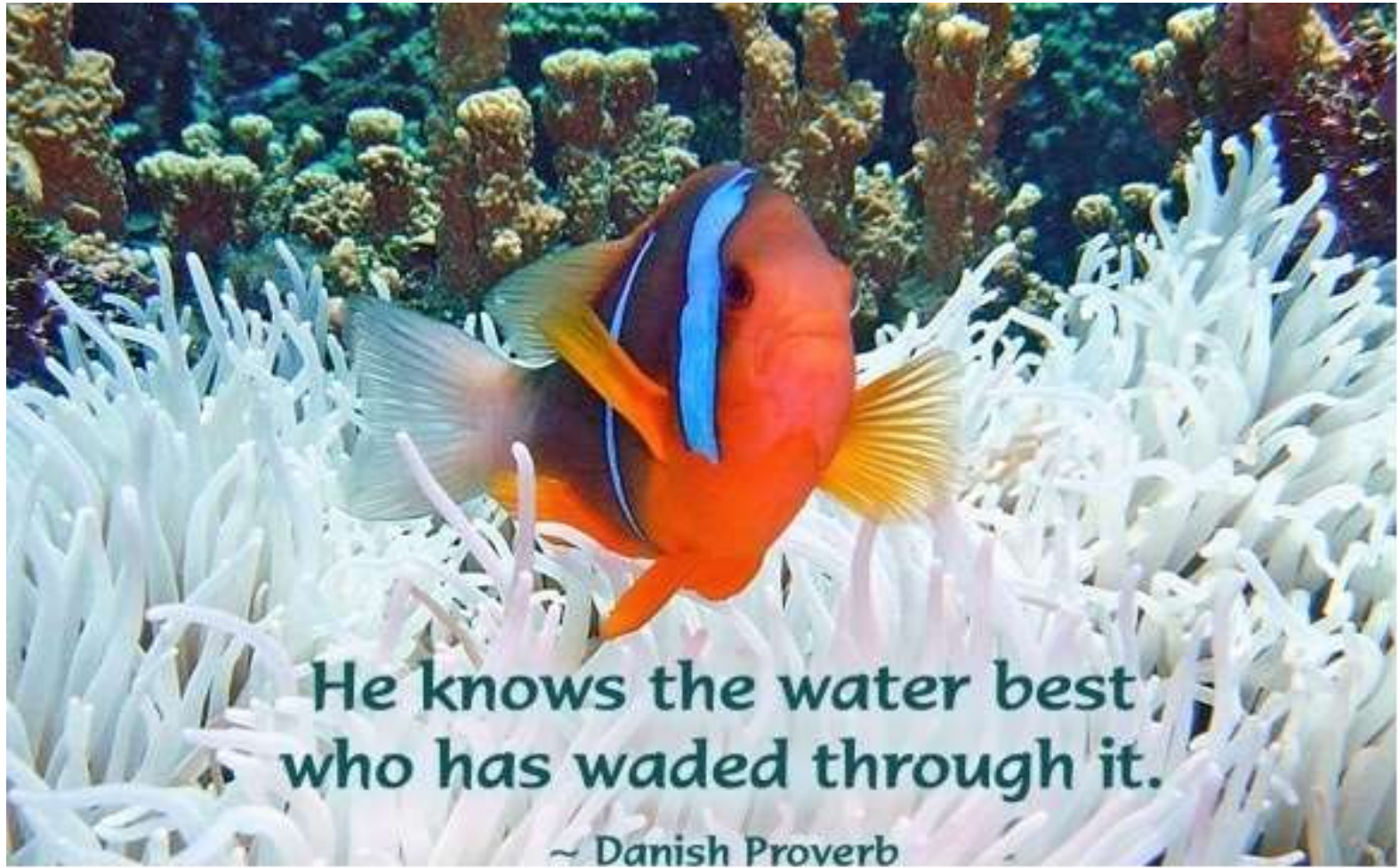


A collaborative approach and adaptive water management is critical

- Natural climate variability and climate change pose a huge challenge to Alberta, as headwater for major east and north flowing rivers
- Land use changes significantly impact river systems and flows
- Water supply, timing and nature of precipitation matched with growing water demands likely the most significant environmental and climatic impacts
- Adaptive water management is essential for Alberta's continued prosperity.

**No single entity or initiative can address
this challenge alone**

Manage our water resources collaboratively



Water: the key to our sustainable future



More information



www.albertawatersmart.com



www.albertawater.com