

# **Water Policy and Extreme Climate Events**



**UNIVERSITY OF  
CALGARY**

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Canada 

- Project Description
- Partnerships and Project History
- Droughts and Drought Policy
- Water Allocation in Prolonged Droughts
- Policy Lessons from the 2013 Calgary Flood

- To identify and assess water policy reforms that will help Canadians prepare for and respond to droughts, flooding and greater hydrologic variation.
- To identify selective public and private investments to prevent, to prepare for, to mitigate or to respond to extreme climate events, such as investments in system capacity, reliability, resilience and infrastructure.

# Partnerships / Project History

- Project was motivated by strong interest, as partners, from two separate offices of Agriculture and Agri-Food Canada
- Both units were disbanded since the inception of the project, and all AAFC partner funding commitments were rescinded.
- An interactive workshop was organized by AAFC with industry groups in 2013.

- In the absence of any assured funding partner, no WEPGN funds were spent in fiscal 2012-13, shrinking the project timeline by one year.
- Alberta Innovates (Energy and Environment Solutions) joined as a funding partner in the Fall 2013, allowing project research activities to begin then.

## Drought Policy and Action Plans

- Drought mitigation
- Monitoring, reporting, communication
- Drought preparedness (Adaptation)
  - 🔥 **Water Allocation in Prolonged Droughts**
- Drought response and emergency management



## Alberta's Agriculture Drought Risk Management Plan May 2010

The ADMP is a pro-active, effective, and risk management approach to mitigating the effects of drought on Alberta's agricultural areas.

Policy, Strategy and  
Intergovernmental Affairs Division

Government  
of Alberta



## Severity, geographic scope, duration

### Duration:

- Shorter: 2001-2002, 1983-1987
- Longer: 1929-1937, 1887-1896,  
1792-1804, 1710-1720,  
1688-1692, 1560-1570

- California experience with 1987-1991 and with current drought, 2011-ongoing
- Australia experience, 1995-2009
- Colorado experience, 2001-2002
- Alberta experience, 2001-2002

*... but what a difference a year  
can make!*



**August - 2001**



**September - 2002**



**Declaration re  
Sharing Water for Human Needs and Livestock Sustenance  
During Water Shortages  
December 6, 2010**

The Alberta Irrigation Projects Association is composed of all 11 irrigation districts in Alberta, duly constituted under the Irrigation Districts Act, R.S.A. 2000, c. S-11. These member districts of the Alberta Irrigation Projects Association declare the following:

WHEREAS the member districts of the Alberta Irrigation Projects Association have been granted water licences, by the Government of Alberta, of considerable quantity for irrigation under the principle of prior allocation; and

WHEREAS the member districts of the Alberta Irrigation Projects Association have prior right to some licensed water relative to the right of some municipal, domestic, and other domestic water users in the area of the Province of Alberta within and surrounding the irrigation districts; and

WHEREAS the members of the Alberta Irrigation Projects Association recognize that water is vital to sustain human health and well-being, and that of livestock; and

WHEREAS drought conditions are recurrent in southern Alberta as a result of variability of the weather;

THEREFORE the member districts of the Alberta Irrigation Projects Association agree to the following:

**In the case of water shortage due to drought conditions that can occur in southern Alberta, the member districts of the Alberta Irrigation Projects Association agree, within their right to control, the following:**

- 1) the member districts will participate in water sharing by temporary assignments with other licence holders with lower priority, in accordance with section 33 of the Water Act, R.S.A. 2000, c. W-1, in good faith, so that sufficient water can be distributed for human needs and livestock sustenance; and**
- 2) no fee will be charged for these temporary assignments of water for meeting human needs and livestock sustenance;**

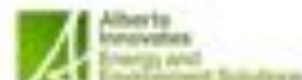
**Temporary assignments may specify a profile for water conservation measures that is reasonable and appropriate given conditions of the drought and water needs at the time.**

# South Saskatchewan River Basin Adaptation to Climate Variability Project

Adaptation Strategies for Current and Future Climates  
in the Bow Basin

Final Report

June 2013





**Figure 6: Water bank storage under normal conditions (2028-2032)**  
 Scenario: 3yr Min (CGCM 3T47 3B1), 30-year record



**Figure 7: Water bank storage under multi-year drought conditions (2043-2046)**  
 Scenario: 3yr Min (CGCM 3T47 3B1), 30-year record

Source: Alberta Watersmart, 2013, p. 17

# Remaining Policy Challenges

- Invest in capacity to measure, monitor and enforce withdrawals of groundwater and surface water
- Clarify uncertainty about water allocation rules and ‘property rights’ during a prolonged drought
- Explore and create tools for re-allocating scarce water, if and where appropriate

These rules of allocation might not be binding and enforceable:

- Inter-provincial apportionment obligations to downstream provinces
- The irrigation industry declaration on water sharing for human needs
- Qualifications and conditions on existing licences to divert water
- The First-in-Time, First-in-Right system of rationing based on prior allocation



## Alternative mechanisms to re-allocate

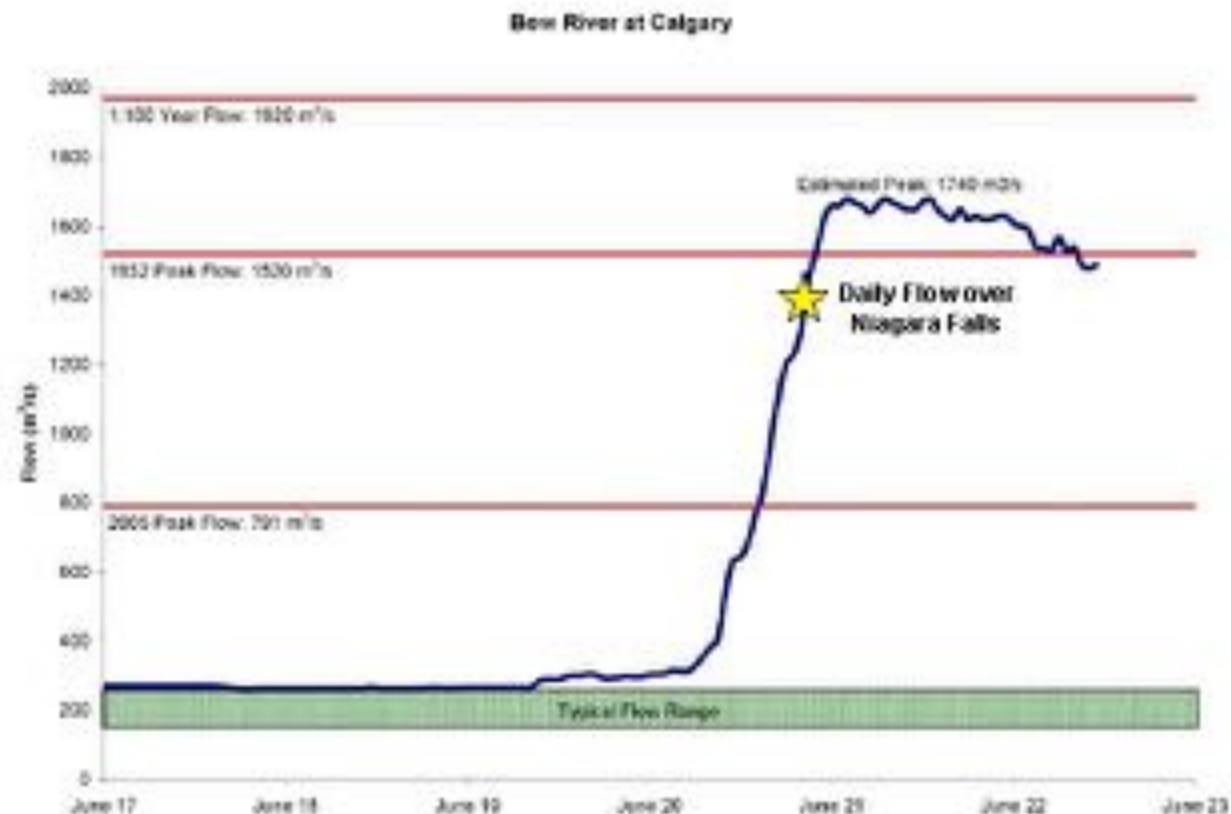
### water in times of extreme shortage:

- Priority hierarchies by use category
- Active spot and futures markets for water trading (short-term 'rentals')
- Water banking
- Water pricing for some or all uses or sectors

- The Calgary Flood of 2013

# Scope of Flooding - Calgary

- Bow River flow rate ten times normal
- Evacuations – Over 100,000 persons
- Flood damage to downtown core
- Utilities compromised
- 5,986 homes impacted
  - 1,946 suffered major damage
  - 36 not safe to reoccupy pending further assessment



The years 2005 and 2013 are the only times Calgary has ever declared a State of Emergency.

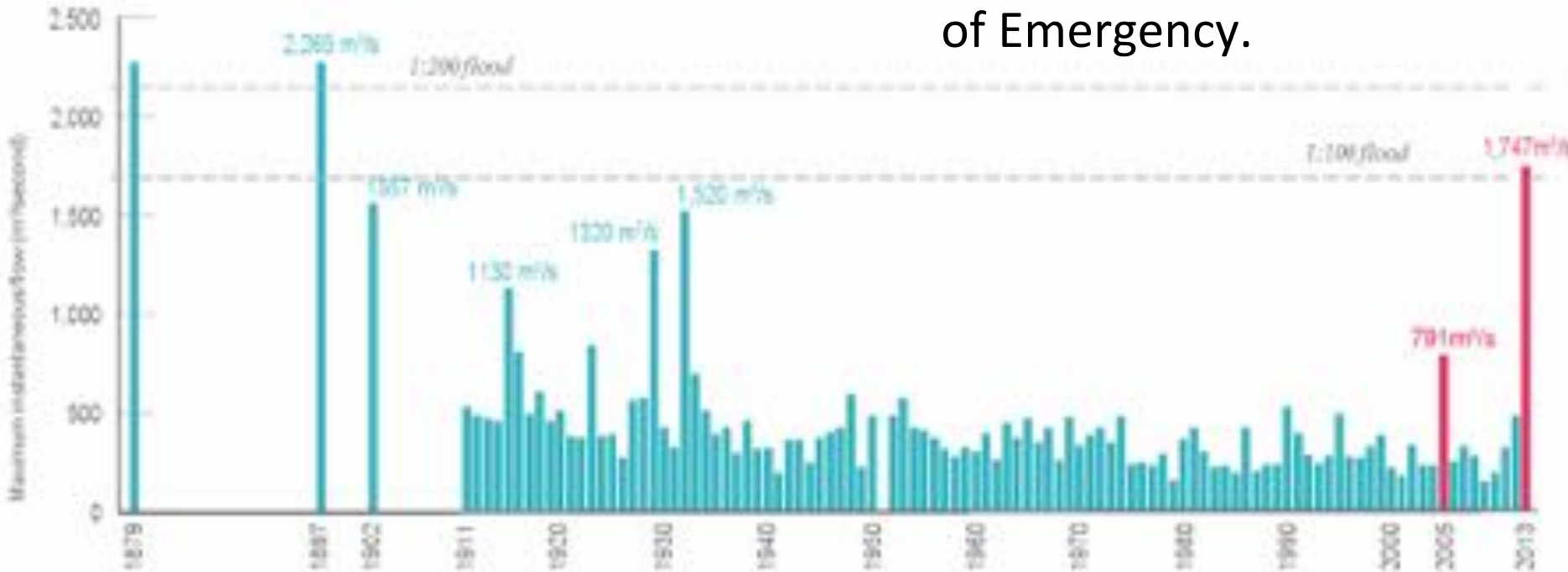


Figure 1. Maximum flow in the Bow River at Calgary between 1879-2013.

Source: City of Calgary Flood Report 2014





# Contributing Factors

- No national flood prediction program
- Regional flood mapping was out of date
- Insufficient flow gauges and data
- Lack of coupled meteorological and hydrological flood modeling in real time
- Encroachment of urban development into floodways since (at least) 1983

## Major Proposals:

- Diversion tunnel to move peak Elbow River flows away from residential and business districts (CAD \$550 million)
- On-stream storage dam on Elbow River (CAD \$388 million)
- Off-stream flood storage (dry dam) (Elbow River) (CAD \$310 million)



## Proposals:

- “Room for the River” (Netherlands), “Floodplain by Design” (Washington State) and other zoning approaches
- “Red-circling” flood zone properties by marking on the land title that no future compensation will be paid.
- Voluntary and mandatory public buy-out programs for vulnerable properties

- Canada has not offered (voluntary) private insurance against overland flooding.
- Private insurers still faced claims of about CAD \$2 billion (2013 Calgary flood).
- Some Canadian insurers may be entering this market. Uptake is uncertain.
- Mandatory public programs such as the National Flood Insurance Program (USA) do not exist. Should they?

- Canada's federal disaster assistance programs have provided "free" partial insurance coverage in cases like this.
- After the flood, CAD \$70 million was handed out to 40,000 people in the form of pre-loaded debit cards ( = \$1,750 on average).
- Current policies do not provide sufficient incentive not to develop in flood zones, and do not place the cost of bearing those risks on property owners.

## Key Issues Going Forward:

- Need for better estimates of the social expected cost of future flood damage, in order to assess spending proposals
- Greater attention to multi-use dimensions of infrastructure, since future drought may be a greater risk than floods.
- Insurance reform may hold promise.

**THANK YOU**