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The Invitational Drought Tournament, Progress So Far, and Can it Be Useful to the NIDIS Community?

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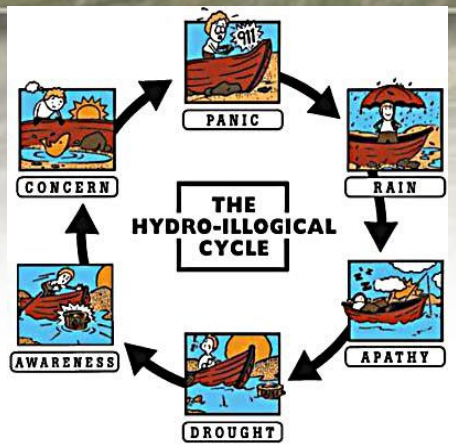
Canada

Using Scenarios to Prepare for Extreme Climate Events

The Goals of the Extreme ClimaTe Events PrepaRedness and Adaptation (EXTRA) are to:

- Identify strengths/gaps in preparedness and response.
- Build upon assets and address vulnerabilities.
- Engage stakeholders in discussions and planning for extreme climate events preparedness and response in the agricultural sector.
- Support institutional preparedness and response to extreme climate events by providing frameworks within which to conduct their assessments.
- Governance needs to be worked out.

The Genesis of the Invitational Drought Tournament

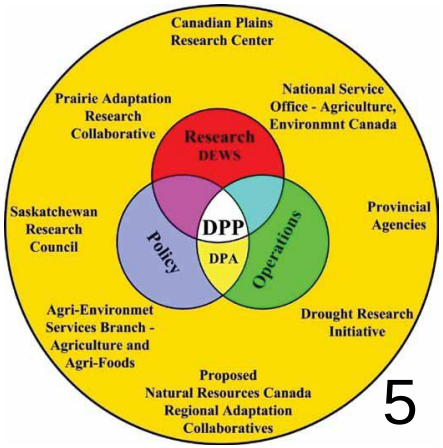


Panic 1

Competition 2

Discover/"War Game" 3

2 year/Game 4



Partnerships/Deliver 5

Multi-year Drought/Discover 6

How Do you Get People Excited About Working on Drought Planning and Preparation?

- **What is something everyone seems to have some affinity for regardless of race, creed, intelligence quotient, education, or economic standing?**

As far as I can tell it's SPORTS!

1. Colorado Fiction County, Shallow Creek Drought and , water supply and planning for local government and regions.
2. Potomac River agreement simulation water management – River Management.
3. Drought Ready Communities - Communities

Invitational Drought Tournament (IDT)

- Discussion-support tool under EXTRA umbrella
  - Helps institutions tackle drought preparedness.
  - Tries to identify gaps and vulnerabilities in drought preparedness
  - Forum for multi-disciplinary stakeholders to discuss climate preparedness and adaptation

How the Game Was Envisioned

- Multi-disciplinary teams of 4-6 players, with representatives from:
  - Policy
  - Water
  - Agriculture
  - Environment
  - Industry
- Goal of game - To reduce your drought risk over the short- and long-term by:
  - maximizing economic potential
  - minimizing social stress
  - improving environmental conditions

Sustainable Development Pillars

Participants

- Prairie Provinces Water Board
- Regional District of North Okanagan
- Government of Alberta
- Manitoba Water Stewardship
- Canada West Foundation
- Meewasin Valley Authority
- Alberta Department of Agriculture
- Alberta Innovates
- BC Ministry of Natural Resource Operations
- University of Calgary
- Nature Conservancy Canada
- Saskatoon Environmental Association
- Natural Resources Canada
- Agriculture and Agri-Food Canada
- Red River College
- Canadian Association of Petroleum Producers
- Canadian Cattlemen's Association
- Bow River Irrigation District
- Saskatchewan Irrigation Projects Association
- Cenovus - Canadian Association of Petroleum Producers
- AECOM
- Red River Basin Commission
- Soil Conservation Council of Canada
- Canadian Water Resources Association
- Drought Research Initiative
- Environment Canada
- City of Calgary
- University of Regina
- National Drought Mitigation Centre, USA
- R Halliday and Associates
- Hursh Consulting and Communications

How the Game Worked in the First Iteration

- For the fictitious Oxbow Basin
  - Teams guided through a multi-year drought scenario of unknown duration and intensity
  - Teams have to make tactical and strategic decisions regarding adaptation to and mitigation of drought impacts
  - Teams have a pre-determined budget
  - Teams have the option to implement adaptation options before the unknown drought occurs

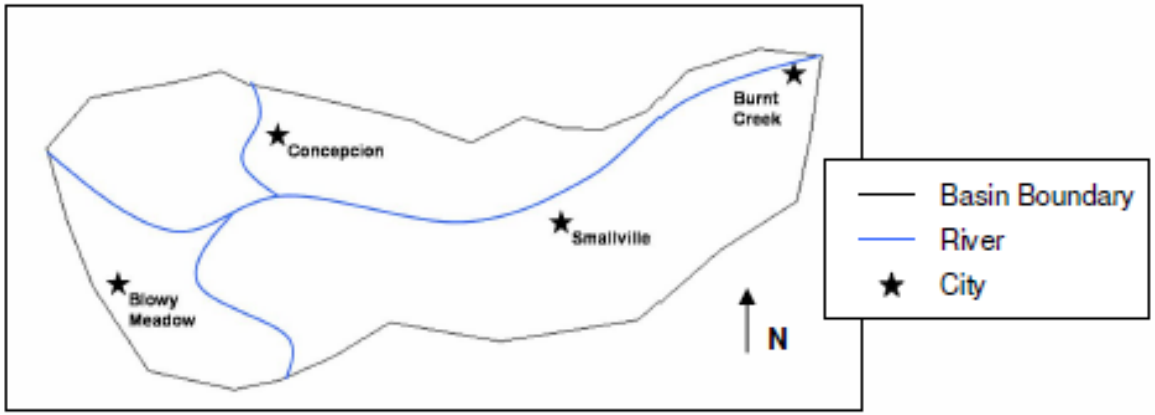
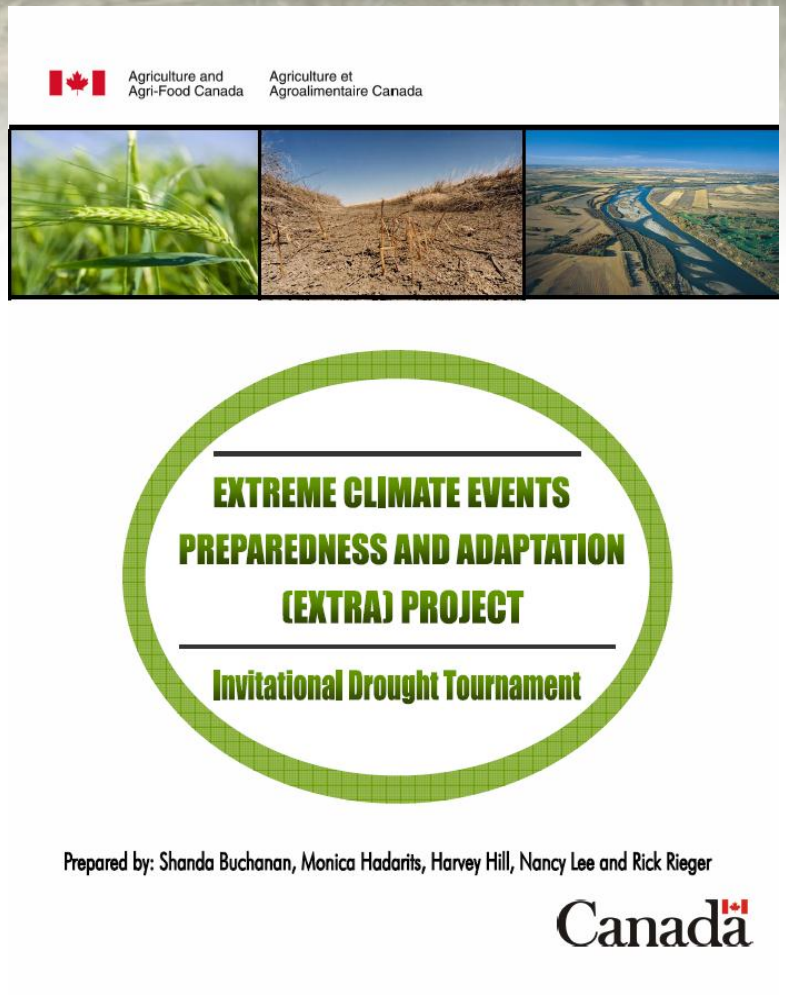


Figure 1: Oxbow basin, Canada

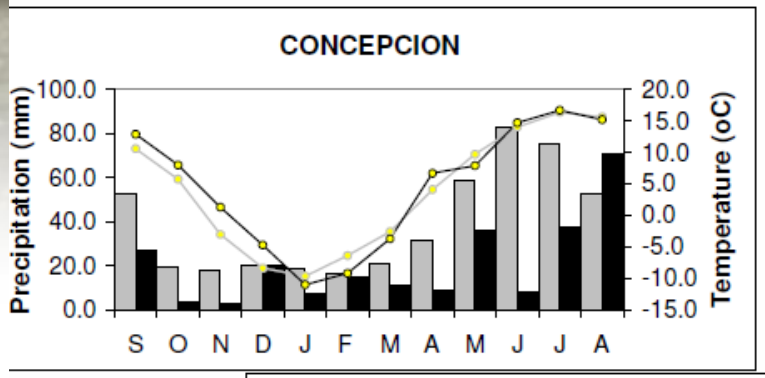
IDT Workbook and Scenario Guides

- The participants are given a workbook that outlined the purpose and rules of the game

- They also have a workbook for each year (round), with a different scenario outlined



Agricultural Drought



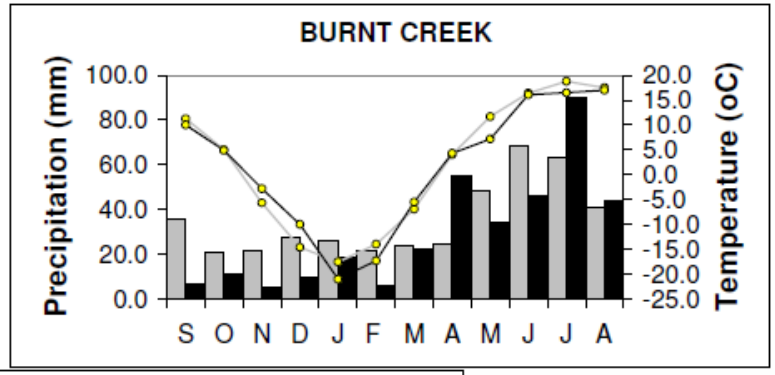
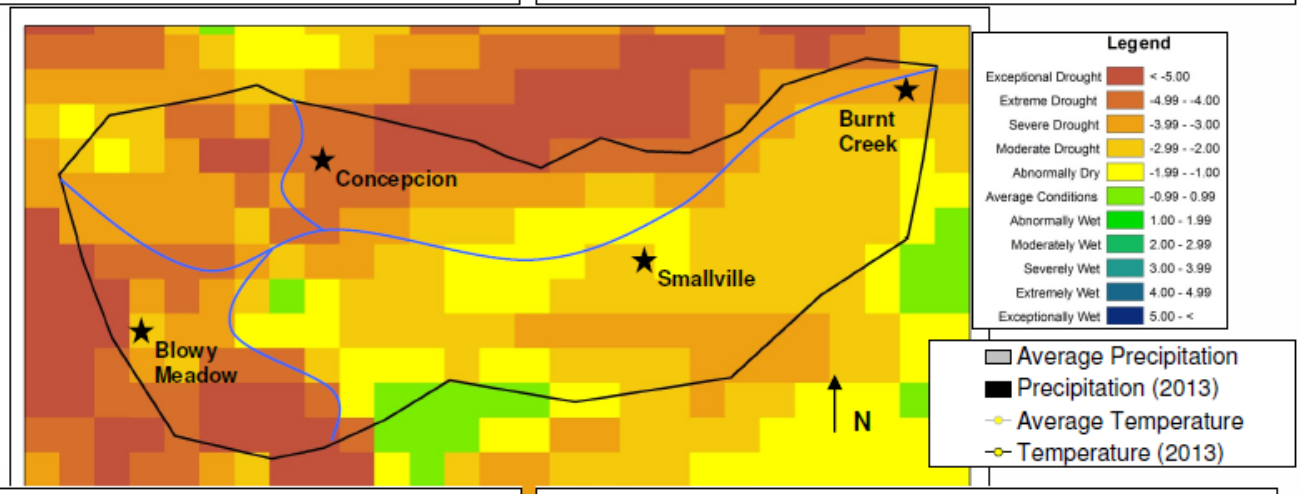
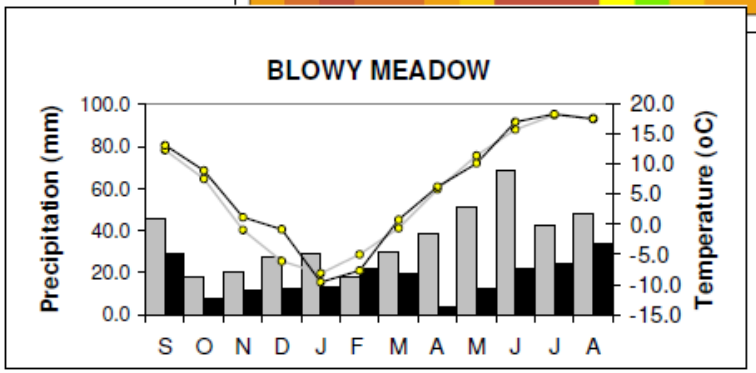
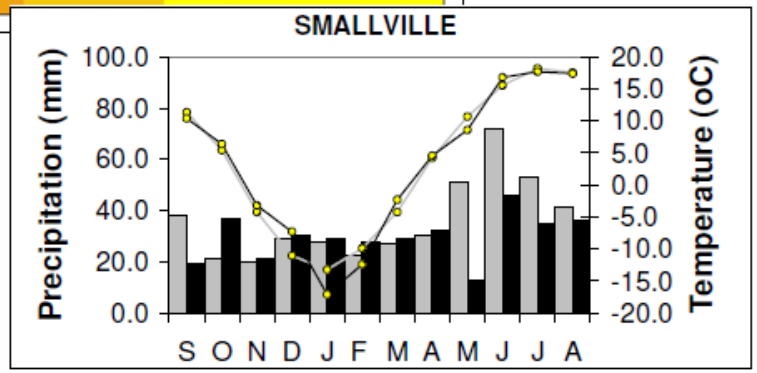


Figure 1: 2013 Palmer Drought Severity Index for July and 2012-2013 climate graphs (agricultural year) for Blowy Meadow, Concepcion, Smallville and Burnt Creek







Hydrologic Drought

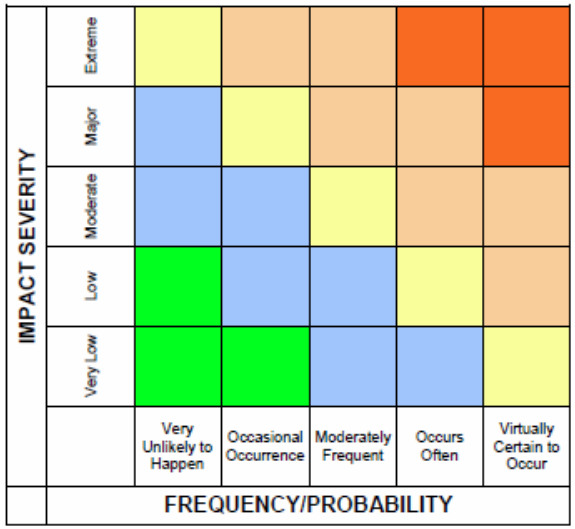
A) **Natural streamflow**			2986
	B) **Demands**	**Municipal** (e.g., drinking water, household use) (14%)	526
		Agriculture (e.g., irrigation, livestock watering) (75%)	2816
		Industry (e.g., energy, mining, tourism, recreation) (4%)	150
		Other (e.g., in-stream flow needs, habitat) (7%)	262
		Total	3754
Water balance (A-B)			-768
Storage			1314
Additional water made available through adaptation option:			
Additional water made available through adaptation option:			

Adaptation Option Examples

Adaptation option	Adaptation type	Details	Cost
Water Management			
Enhance irrigation water delivery system and application efficiency by 25%	Long-term strategy that takes 5 years to implement. This strategy will be completed prior to the scenario	300,000 acres have been converted to high efficiency irrigation and 1000 kms of canal have been lined with concrete to reduce seepage	$193,000,000
Financial Management			
Relief payout to producers	Short-term emergency response strategy aimed at reducing immediate economic and social stress in the agricultural sector	Provide an emergency payout of $35 per acre to producers affected by drought	$100,000,000
Land Management			
Promote green cover	Long-term operation management strategy aimed at changing land use in the basin	Provide producers with $85 per acre over 10 years to covert 150,000 acres of marginal annual cropped land at-risk of soil degradation to perennial cover	$12,750,000

Scoring

- Each adaptation option has a score
  - Economic
  - Social
  - Environmental
  - Meets short-term needs (1 year)
  - Meets long-term needs (15 years)
- Scoring is based on a modified risk assessment
  - Team with the lowest score, i.e. lowest residual risk, wins



Extreme risk: Immediate controls required

High risk: High priority control measures required

Moderate risk: Some controls required to reduce risks to lower levels

Low risk: Controls not likely required

Negligible risk: Scenarios do not require further consideration

Baseline Drought Risk Scores

CHARACTERIZATION OF ECOLOGICAL SEVERITY AND RISKS (step 2)		
Scoring category	**Severity score**	**Description and examples**
Severe	9	Ecosystem structure and function are fundamentally changed in a non-reversible manner: • Significant permanent habitat loss within a watershed
Serious	7 – 8	Ecosystem structure and function are damaged; species and populations decline and communities change; habitats and abiotic resources are lost; less robust food chain: • Decline in suitable habitat for species persistence (e.g. decreased carrying capacity)
Moderate	4 – 6	Ecosystem structure or functions affected; infrequent or intermittent effects; individuals may die but populations are not at risk; habitat is intact; impairment of primary processes; loss of resilience: • Changes in habitat during critical stages of some terrestrial life
Minor	1 – 3	Ecosystem structure and functions are exposed to stress but system integrity is intact, transitory effects on habits, species or individuals: • Small changes in habitat but does not unduly affect species persistence

Yr 1: 46
Yr 2: 168
Yr 3: 176
Yr 4: 204
Yr 5: 208
Yr 6: Innovation Round

Results from the Innovation Round

1. Create multi-stakeholder watershed groups and preparedness plans

2. Aquifer management strategy

3. Invest in value-added manufacturing for irrigated high value crops

4. Diversify economy away from water intensive agriculture

5. Develop parks for eco-tourism, recreation, and interpretation

6. Create wetlands for regional aquifer storage and banking program for drylands

Results from the Innovation Round

7. Enhance environmental resilience
   - Rural Land Stewardship Plan cost shared program
8. Infrastructure Program
   - short term: groundwater development, dugouts, water hauling (if necessary)
   - long term: rural water co-op infrastructure, groundwater storage pilot, etc.
9. Land Conversion Program
   - Convert crop to grass
   - source water protection – long term benefit
10. Financial Relief
    - Farm debt relief, etc.
11. Business Incentive Programs
    - Enterprise Grant to stimulate new and existing industry to enter or re-enter the basin market
    - encourage economic diversification by stimulating small business (perhaps farmers), particularly information technology

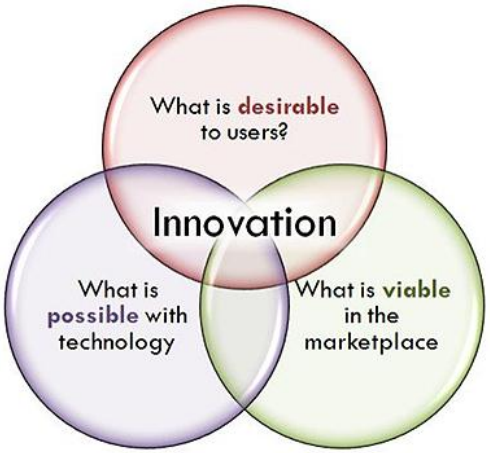


photo taken from ipprospective.com

Challenges and Recommendations

1. The water balance scenario was static, so there was no way to account for positive steps taken to conserve water the year before; this made scoring the adaptation options difficult.
2. In future exercises, the web or other simulation software may be useful in automating the adaptation scores and other aspects of the scenario. It may also help to provide more detail on the impacts of adaptation options on the basin.
3. The funding strategy needs to be flexible and proactive; using cost benefit analysis to establish and use budgets. The government funding cycle is not aligned with the climate cycle. A participant suggested having a budget range rather than a cap.

Lessons Learnt – Comments from Participants

- Opportunity for knowledge exchange and networking
- Encourages teams to develop a group vision for the basin

" What did you take away from the meeting ? "

- Participants tended to work as a team vs. competitively in their sector roles
- An automated process for running the game would allow for more adaptation choices
- Scoring process needs to be clear and transparent to promote learning
- Engage watershed groups to make the framework operational

Comments From Observers and Participants

- *"It takes adaptation-planning exercises to a new level, above and beyond an inventory of impacts and adaptation…"*
- *"…see the tournament mostly in terms of a process rather than an outcome."*
- *"…this approach could be applied to other adaptation strategies and climate scenarios."*
- *"…the tournament has strong potential for testing the application of science to adaptation decision making."*

Potential Implications for Canadian Agriculture

- Strengthens collaborative decision-making
  - Framework creates a forum for multi-sector discussion
- Encourages proactive business risk management
  - Scenario planning under uncertainty (climate, political, economic, etc.)
- Enhances innovation environment
  - Provides “safe environment” to debate politically-sensitive adaptation options, e.g. interbasin water transfers

Next Steps

- Add other climate scenarios
  - excessive moisture scenarios
  - sequences of wet and dry years or a “full” (ENSO) cycle
  - Incorporate the effects of climate change
- Add more adaptation strategies including some that are more socially oriented
- Add farm level adaptations (BMPs – which would require more participation by producers)
- Leverage computer modeling

Next Steps

- We would like to produce a “tool kit” for educational institutions and practitioners. This could be an online database that can be queried and would allow users to construct their own climate scenarios.

- Intended to be useful across multiple spatial and temporal scales and environments.

- Explore an “International Invitational Extremes Tournament”.

Possible Links to Presentations I Saw Yesterday

- Different groups require different information, some more quantitative others less so.
- Could it support Colorado Drought Planning at the Basin or County level? One dream that it supports the Prairie Provincial Water Board Decisions in an appropriate manner.
- Fish maintenance by coordinating water flow?
- Municipal Drought Planning Tool Box Workshop Series
- Droughts we haven't experienced but know have occurred in the paleo record.

- Mentoring of new staff?
- Synergy of planning for cascading effects
- Ithaca example
- Support planning training.

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Thank you!

Canada