AAFC
and
H_2O

Ian D Campbell

Director, Integrated Natural Resources

Agri-Environment Services Branch

Agriculture and Agri-Food Canada

AAFC and Water: Outline

- Role of AAFC in water
- Irrigation and drainage engineering
- Water quality protection
- Irrigation agronomy
- Climate change
- International engagement

Water Policy Pressures and Drivers

- *Consumer pressures*: demand for safe, sustainable food
- *Citizen pressures:* demand for environmental goods and services
- *Environmental pressures*: climate change is predicted to increase variability in water supply
- *Demand pressures*: water demand from other sectors is rising (e.g. municipal, industry)

Nutrient-induced algal blooms in L. Winnipeg put a $100 million tourism industry and a $20 million commercial fishery at risk.

Canadians value water more highly than all other national resources (including forests, oil & gas and agricultural land)

- Feb. 2010 RBC/Unilever Poll

Drought is Canada's "worst natural disaster" and cost $3.6 billion in losses for 2001-2002

“Water” is not one issue

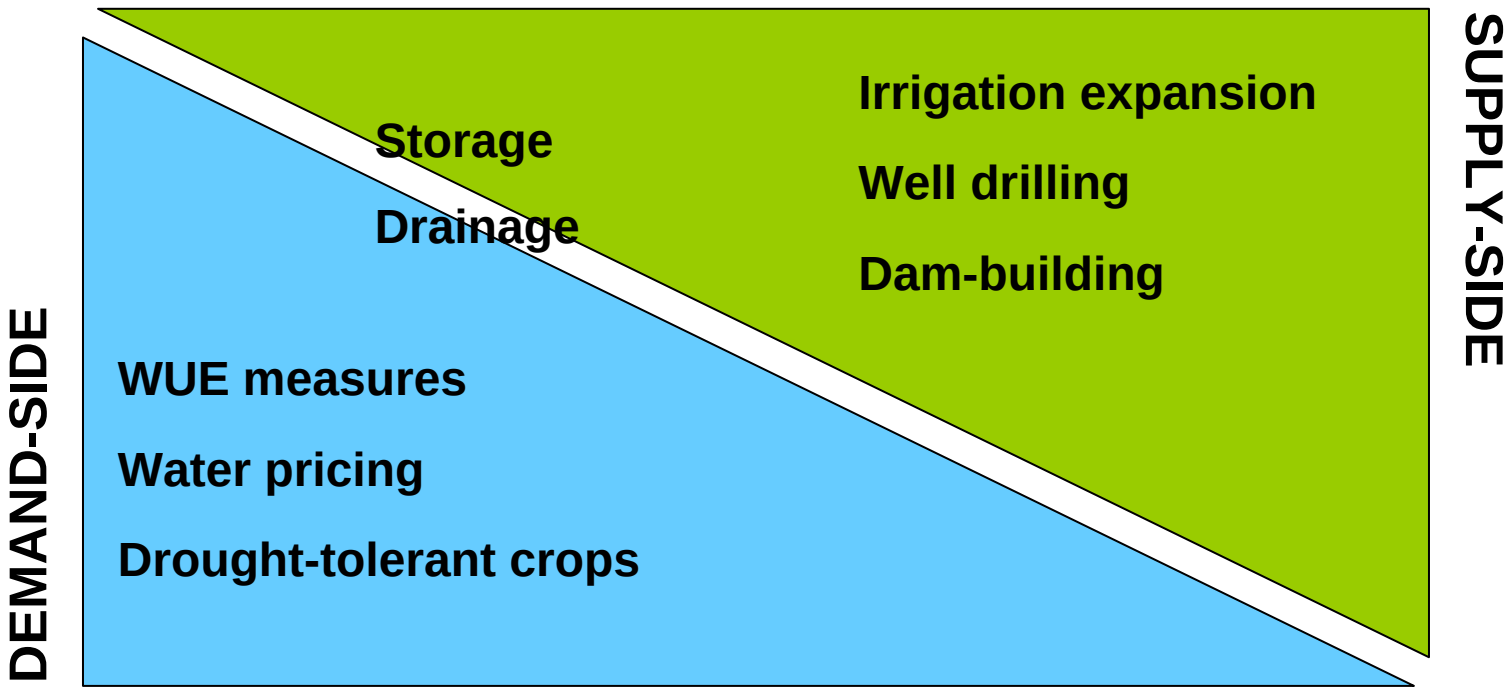
(a) On-farm water supply
(b) Integrated management of agricultural impacts on the watershed

Quantity	Quality
Maintaining safe and sufficient water supplies for production and the environment in the context of: - changing natural availability (e.g. climate change) - changing demands (e.g. rising municipal demand)	Reducing flow of excess nutrients and contaminants into the environment and back into production • Excess nutrients • Pathogens • Sediment • Pesticides • Emerging contaminants (PPCPs, GMOs, nanoparticles)

Activities on Water Policy

- Water identified as high priority under *Growing Forward*
  - Approach to water policy varies by province under flexible *GF* approach
- Past water supply activities
  - Rural Water Development and National Water Supply Expansion Programs
- Agri-environmental stewardship programs
  - EFPs and BMPs (nutrient management, riparian buffers, irrigation efficiency, etc.)
- Science and research
  - WEBs, Agri-Geomatics, NAHARP, FEMS, SAGES, EG&S

Supply vs. Demand-Side Options



We need to address all parts of this spectrum – but where should the balance be?

Interlocking strategy

(1) Maximize on-farm water use and storage efficiency

(2) Pursue integrated management at the watershed level

(3) Address critical research and technology development areas

Integrating water quantity/quality and surface/ground water

Irrigation and Drainage Engineering

Flow measurement

Services provided:

Project management

Hydrological interpretation/analysis

Development/testing of monitoring tools

Water sampling

Irrigation and Drainage Engineering

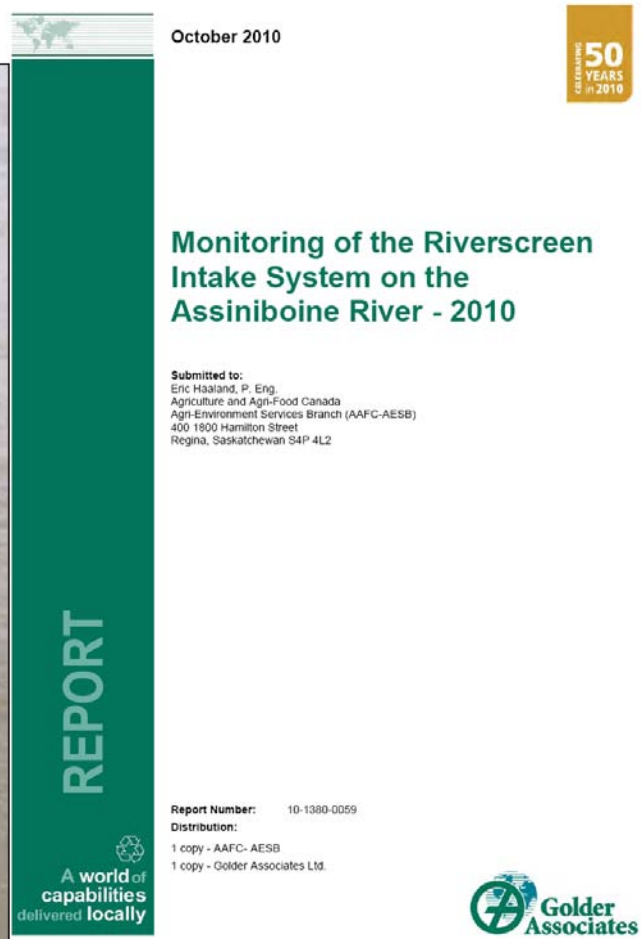
- Junction dam rebuilt 2009

- Area hit by torrential rains in 2010
- Flash floods wiped out part of Trans-Canada Highway

- Dam survived

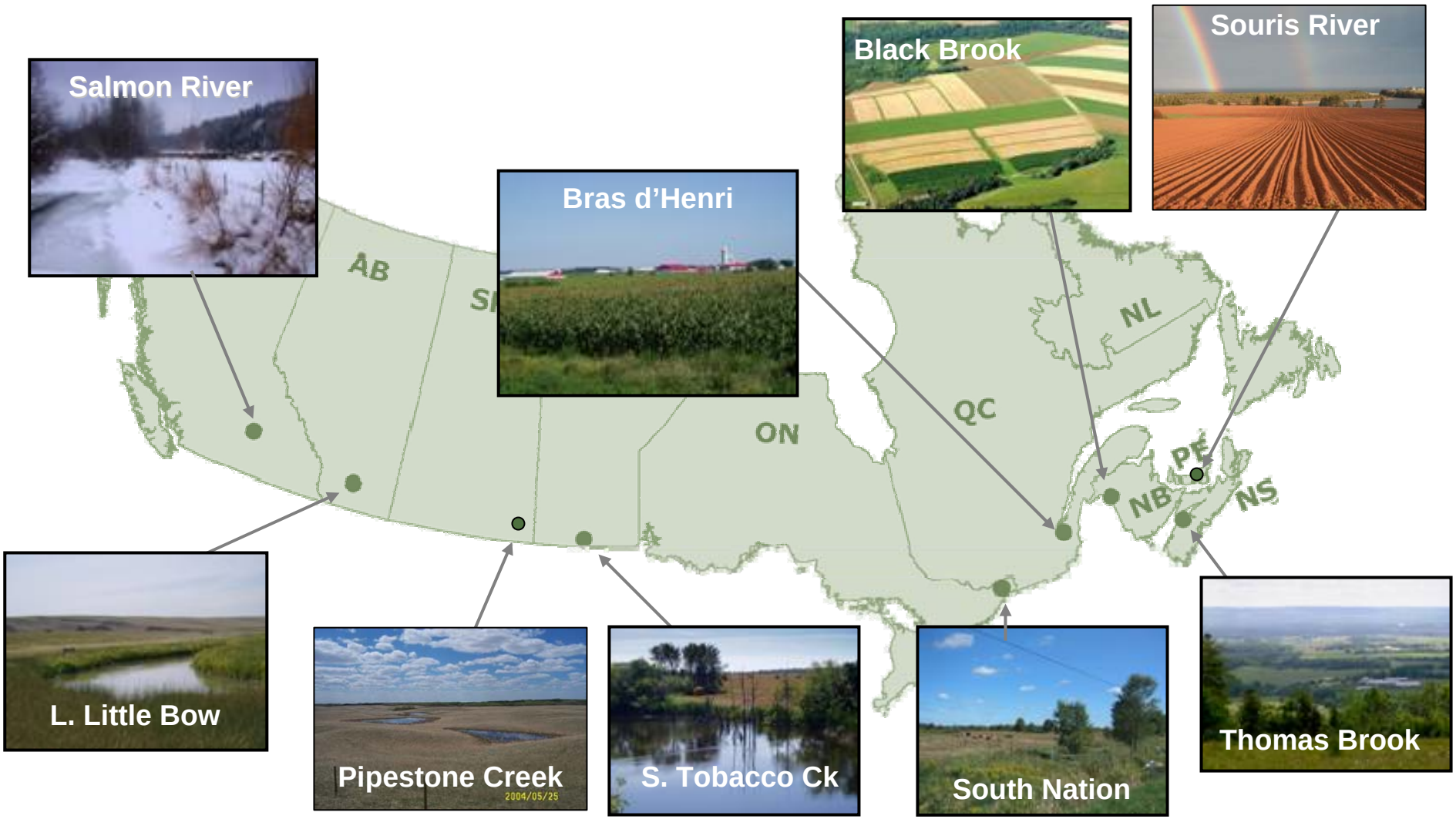
Irrigation and Drainage Engineering

Investigation of Innovative and Environmentally Sustainable Surface Water Intake Screen Designs



Watershed Evaluation of BMPs:

9 Cross-Canada 'Living Laboratories'



WEBs BMPs by Watershed

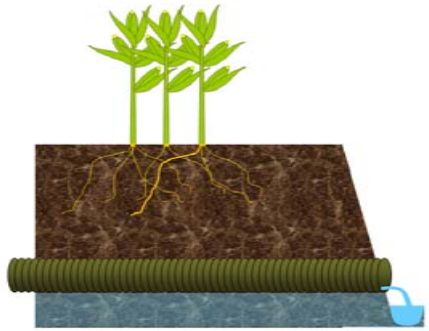
	WEBs BMPs	BC	AB	SK	MB	ON	QC	NB	NS	PEI
	Cattle exclusion fencing (off-stream water)	✓	✓			✓			✓	
	Off-stream watering without fencing		✓							
	Riparian vegetation management				✓					✓
	Nutrient input / mgt (chem; manure)		✓	✓			✓		✓	
	Tillage / residue mgt				✓		✓			✓
	Crop rotations						✓			
	Perennial cover			✓	✓					
	Reduced herbicide toxicity						✓			
	Winter bale-grazing			✓	✓					
	Irrigation efficiency	✓								
	Diversion terraces, grassed waterways							✓		
	Surface runoff / tile drainage control					✓	✓			
	Buffer strips		✓					✓		
	Farmyard runoff management								✓	
	Runoff retention pond				✓				✓	
	Wetland restoration			✓						

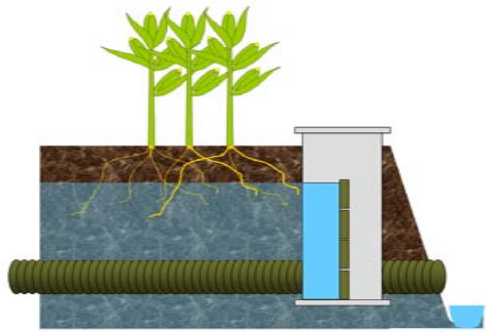
Key Elements of WEBs

- WEBs tests BMP watershed-scale impacts
- Started 2004, widely acknowledged as a highly successful venture
- Not all results are as predicted from smaller-scale studies!
- Represents an era of close inter-agency and key interdisciplinary cooperation
- WEBs ‘living laboratories’ represent a cross section of agricultural landscapes

Win-win Example

- Controlled Tile Drainage in the South Nation Watershed, ON
- Significantly reduced N & P loading in local surface waters and at the watershed outlet
- Economical: Yield increases pay for installation within 4-5 years (corn and soybeans).
- May require very little incentive, tech transfer, publicity, limited funding
- Now on S. Nation and Ontario provincial BMP lists

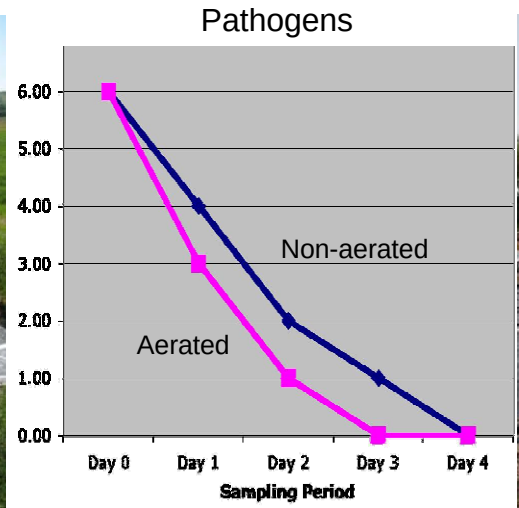




Water Quality and Food Safety

Research on reducing pathogens in irrigation storage reservoirs by aerating the reservoir and through various other treatments.

Also research on treatment of agricultural wastewater, particularly from cattle containment areas, to avoid source-water contamination.



Water Quality and Food Safety

Reviewing Canadian guidelines for pathogens.

Most Agricultural water quality guidelines relate to productivity, however pathogen guideline relates directly to food safety (crops to be eaten raw)

Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses

SUMMARY TABLE

Update October 2005

Summary of Canadian water quality guidelines for the protection of agricultural water uses.

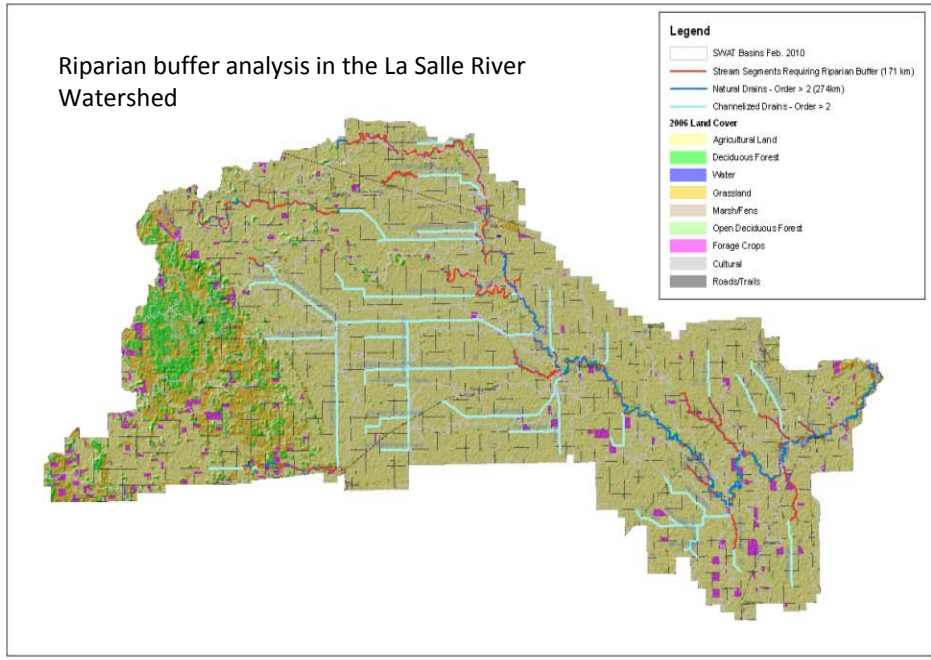
	Irrigation water		Livestock water	
Parameter[a]	Concentration ($\mu g \cdot L^{-1}$)	Date[b]	Concentration ($\mu g \cdot L^{-1}$)	Date[b]
Aldicarb	54.9[c]	1993	11[c]	1993
Algae, blue-green [See Blue-green algae]				
Aluminum[d]	5000	1987	5000	1987
Aniline[d]	Insufficient data	1993	Insufficient data	1993
Arsenic[e]	100[f]	1997	25[f]	1997
Atrazine	10[f]	1989	5[f, g]	1989
Beryllium[d]	100	1987	100[f]	1987
2,2-Bis(*p*-chlorophenyl)-1,1,1-trichloroethane [See DDT (total)]				
Blue-green algae (Cyanobacteria)[d]			Avoid heavy growths	1987
Boron[d]	500–6000[h]	1987	5000	1987
Bromacil	0.2[f]	1997	1100[f]	1997
Bromoform [See Halogenated methanes, Tribromomethane]				
Bromoxynil	0.33[i]	1993	11[f]	1993
Cadmium	5.1[i, j]	1996	80	1996
Calcium[d]			1 000 000	1987
Captan	Insufficient data	1991	13[f, i]	1991
Carbaryl	Insufficient data	1997	1100	1997
Carbofuran	Insufficient data	1989	45	1989
Carbon tetrachloride [See Halogenated				

Red-Assiniboine Project

Objectives

Evaluate the potential to utilize watershed modeling to simulate the water quality impacts of a changing landscape with respect to:

- Land use
- BMP adoption levels
- Municipal wastewater treatment



Ultimately, to guide integrated watershed resource management and agri-environmental programming and policy

Soil & Water Assessment Tool SWAT

ALCES

CANWET™ (v 3.6)

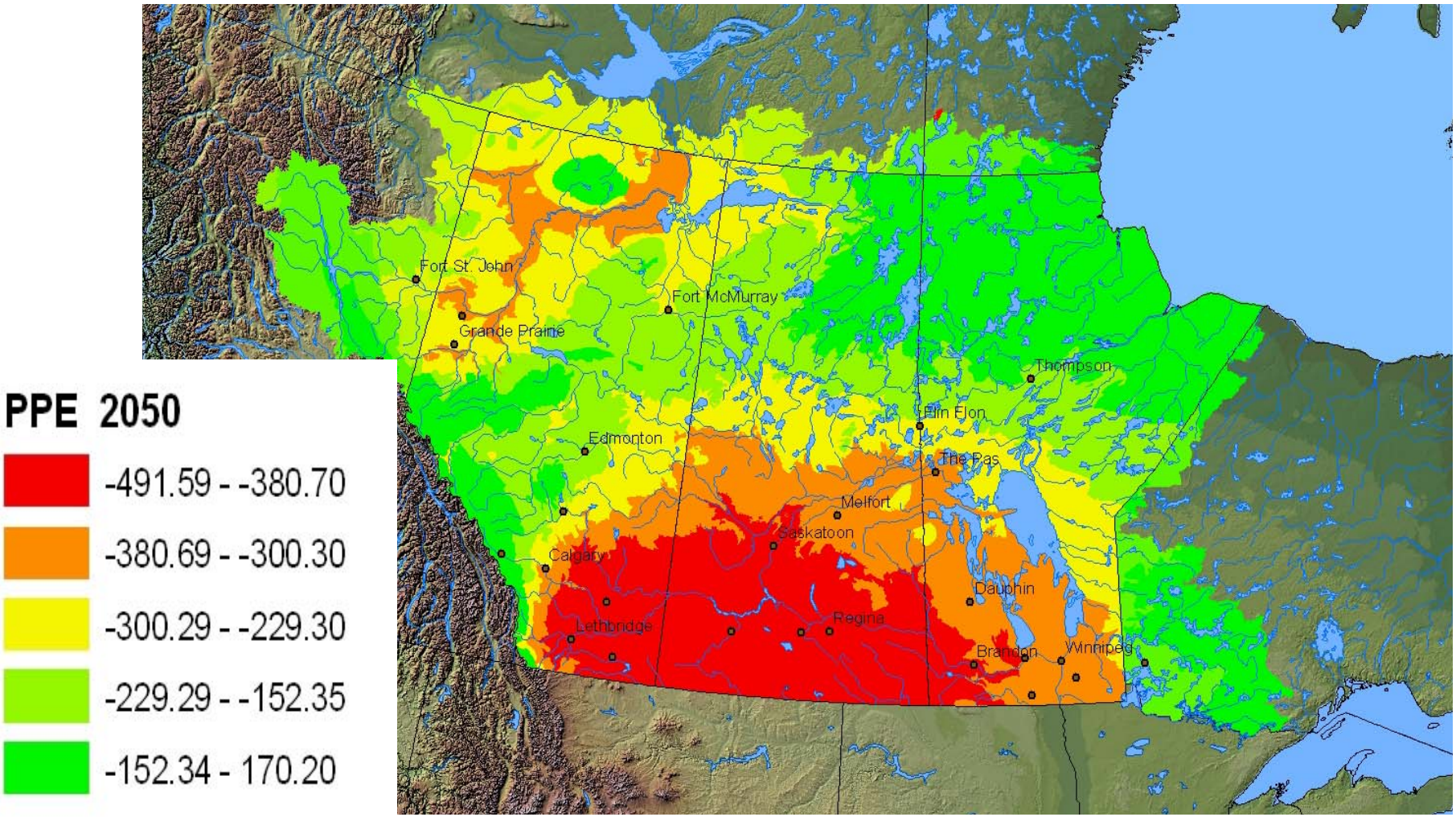
Watershed Modeling

Decision Support System

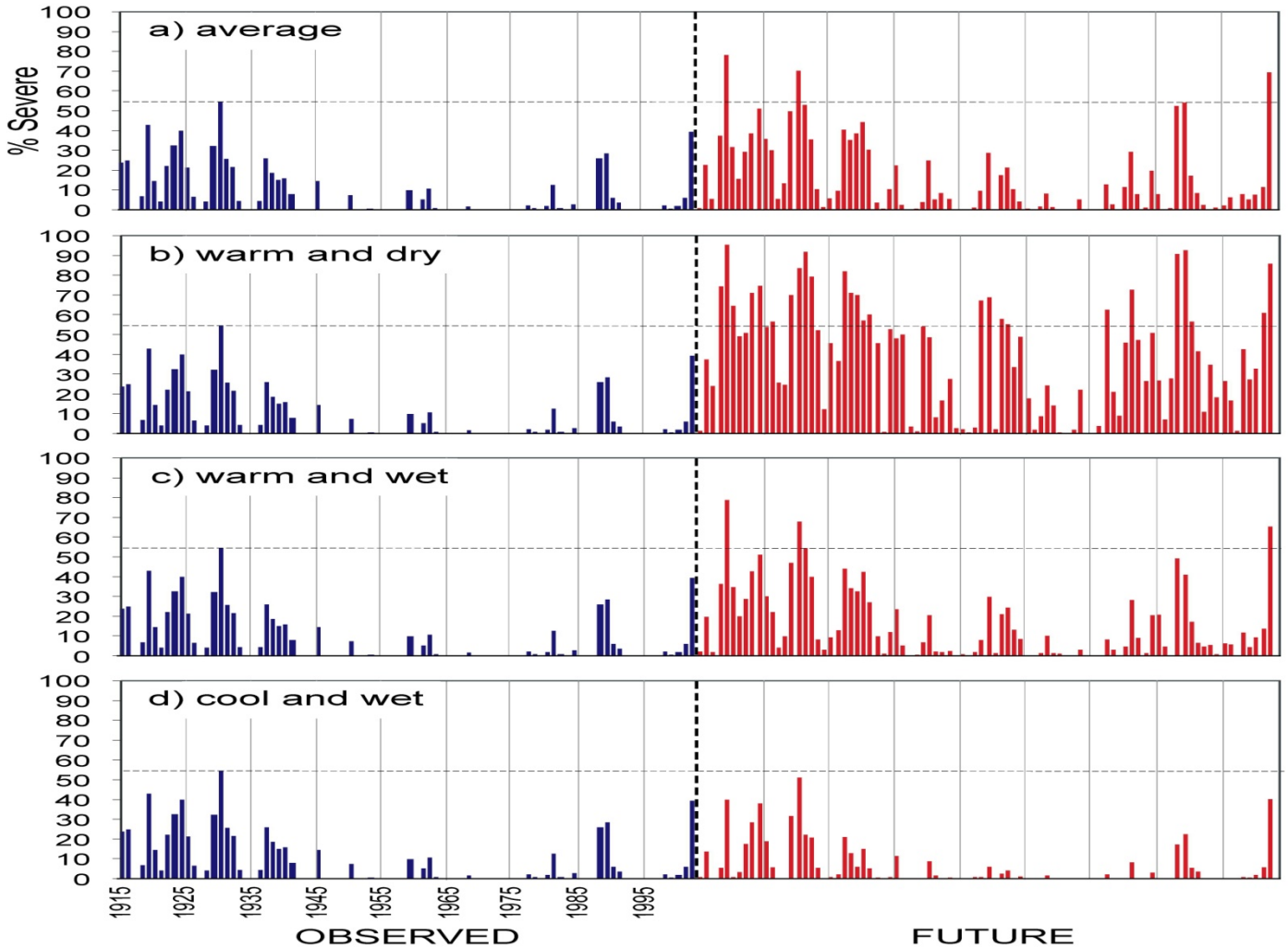
"On the ground" Action

Irrigation agronomy

Climate Change: Projected Moisture Deficit 2050 (CGCM1)



Projected Drought Scenarios



(Bonsal, 2006)

North American Drought Monitor

September 30, 2006

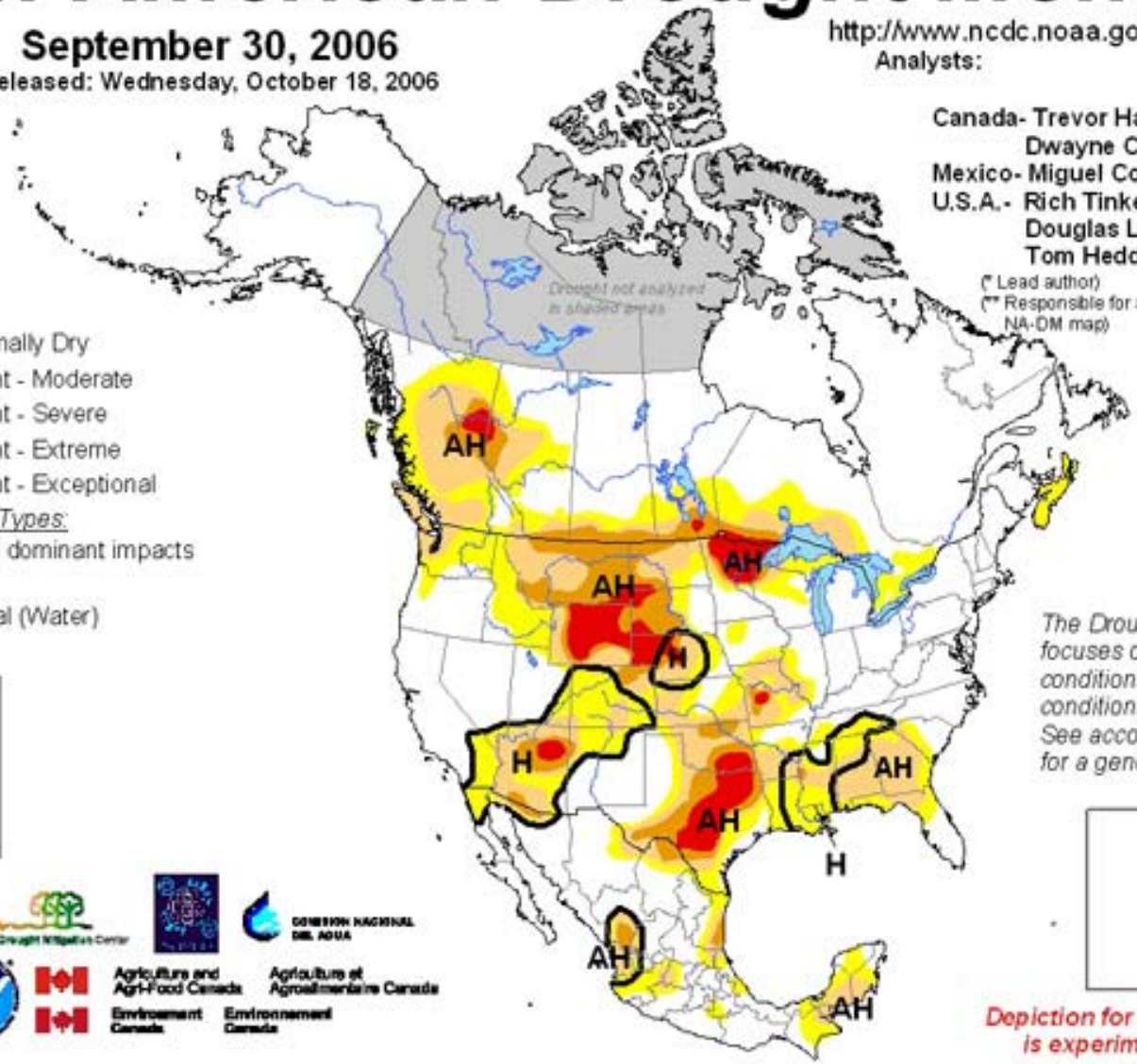
Released: Wednesday, October 18, 2006

http://www.ncdc.noaa.gov/nadm.html

Analysts:

Canada- Trevor Hadwen
Dwayne Chobanik
Mexico- Miguel Cortez
U.S.A.- Rich Tinker*
Douglas Le Comte**
Tom Heddinghaus

(* Lead author)
(** Responsible for assembling the NA-DM map)



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

~ Delineates dominant impacts

A = Agriculture

H = Hydrological (Water)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text for a general summary.

Depiction for Canada is experimental

USDA

National Drought Mitigation Center

CONAGUA

Agriculture and Agri-Food Canada

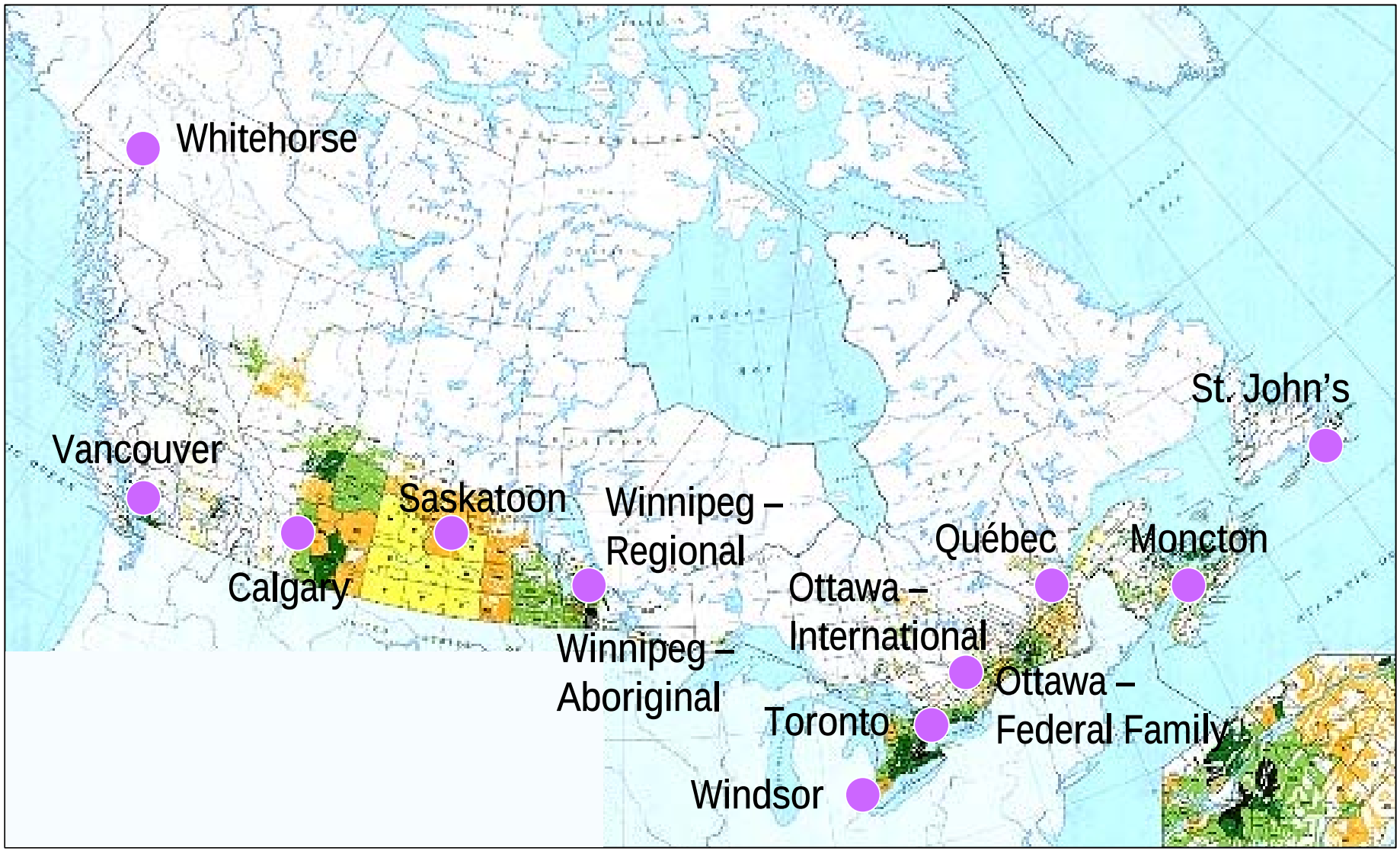
Agriculture et Agroalimentaire Canada

Environment Canada

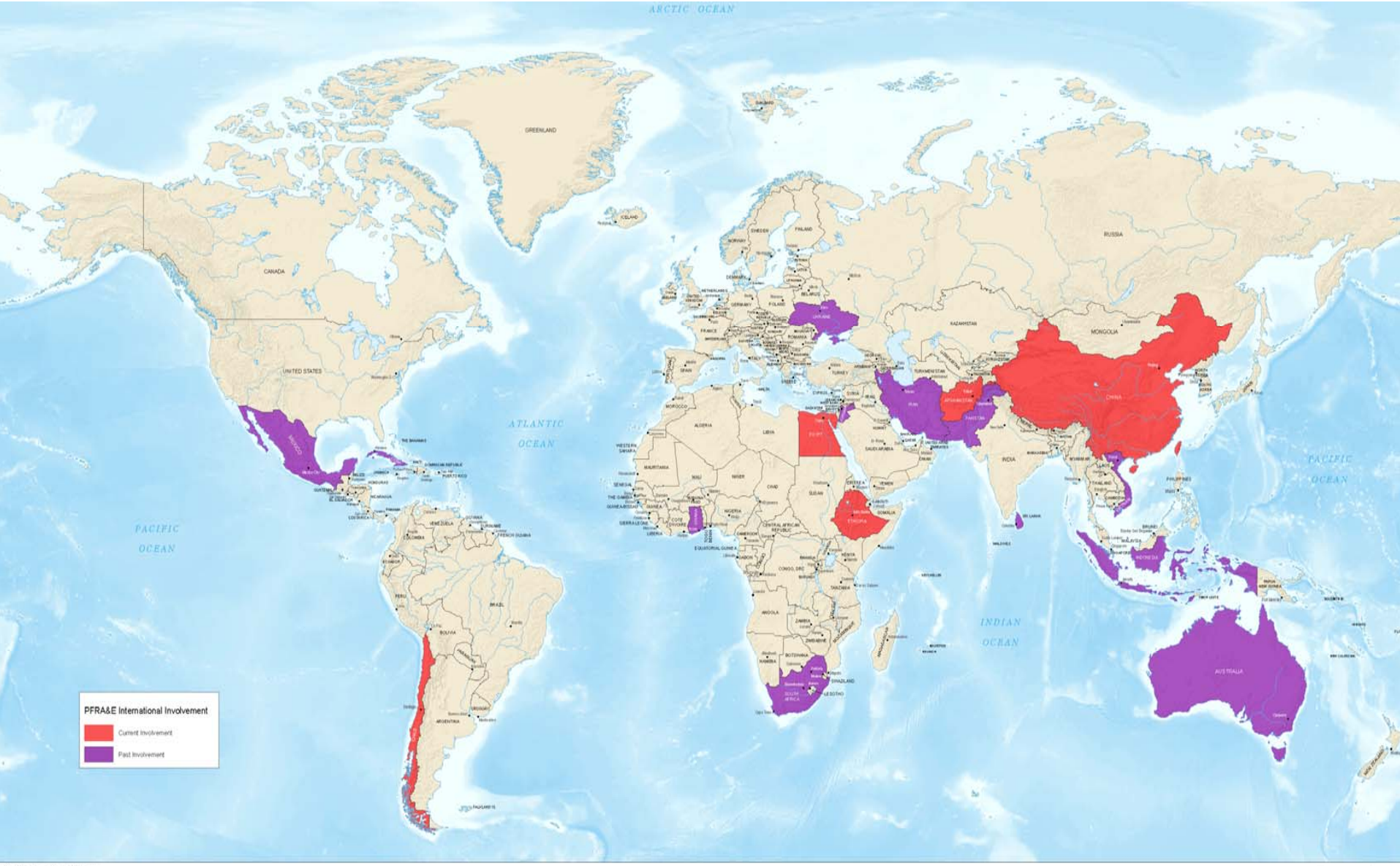
Environnement Canada

Climate Change Adaptation Roadmap

13 Adaptation Workshops



International Activities



Ethiopia

Medium to long term food security

- Sustainable irrigation development of land and water resources
- Surface water storage, diversion and conveyance works
- Groundwater storage
- Efficient water use

Global Research Alliance

GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

- New Zealand-led initiative stemming from Copenhagen meeting
- 31 countries participating
- Focus on greenhouse gas mitigation in agriculture
- Canadian component emphasizes livestock, agro-forestry and irrigation