Cumulative Conundrums: Surface water & the complexity of CEM

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Water Tech

ENVIRONMENTAL LAW CENTRE

Outline

- About the Environmental Law Centre
- The cumulative context
- The current policy/legal framework
- Where are we going and can we get there?

About the ELC

- Mission: To ensure that laws, policies and legal processes protect the environment

Public Programs

- Information and referral
- Community outreach
- Law reform

Alberta LAW FOUNDATION

The Cumulative Context

Alberta Environment, River Water Quality Sub Index (2008-2009) http://environment.gov.ab.ca/info/library/7683.pdf

Northern Rivers: 2008-2009

River Location	Sub-Index Values (0-100)				Overall Index (Average)
	Metals	Nutrients	Bacteria	Pesticides	
Peace R. at Fort Vermillion	88	79	100	100	92
Peace R. upstream Smoky R. near Shaftesbury Crossing	86	79	100	100	91
Smoky R. at Watino	91	78	100	100	92
Wapiti R. at Hwy 40	97	90	100	100	97
Wapiti R. above confluence of Smoky R.	95	80	50	100	81
Athabasca R. upstream of Hinton	100	100	100	100	100
Athabasca R. at Athabasca	97	79	100	100	94
Athabasca River upstream of Ft. McMurray	97	79	95	100	93
Athabasca R. at Old Fort	89	70	100	100	90
North Saskatchewan R. at Devon	100	79	95	100	93
North Saskatchewan R. at Pakan	100	80	89	90	90
North Saskatchewan R. upstream Rocky Mountain House	100	80	100	100	95
Battle River at Hwy 53	90	31	72	93	72
Battle River at Driedmeat Lake	91	29	100	78	75

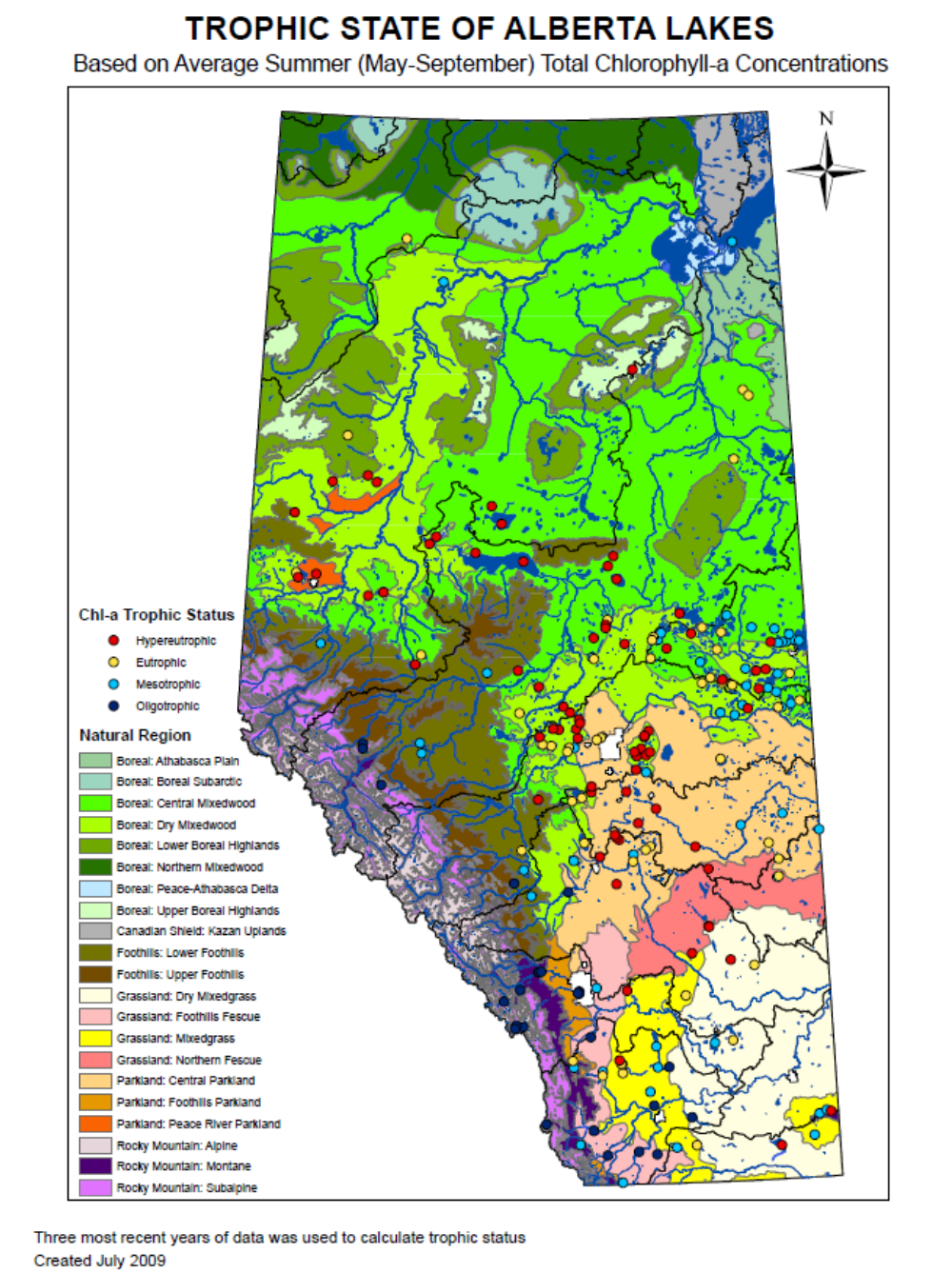
Southern Rivers: 2008-2009

River Location	Sub-Index Values (0-100)				Overall Index (Average)
	Metals	Nutrients	Bacteria	Pesticides	
Red Deer R. upstream of Red Deer (Hwy 2)	100	80	97	96	93
Red Deer R. at Nevis Bridge	100	79	89	91	90
Red Deer R. at Morrin Bridge	100	79	89	80	87
Red Deer R. at Jenner	92	62	49	84	72
Bow R. at Cochrane	100	90	100	100	98
Elbow R. at 9th Ave. Bridge	97	75	55	97	81
Bow R. at Carseland Weir	97	78	92	93	90
Bow R. at Cluny	97	79	100	93	92
Bow R. at Ronalane	100	78	84	75	84
S. Saskatchewan R. upstream of Medicine Hat	97	79	97	90	91
Oldman R. near Brocket	100	100	100	100	100
Oldman R. upstream of Lethbridge (Hwy 3)	97	90	92	89	92
Oldman R. downstream of Lethbridge (Hwy 36)	97	90	96	96	95
Milk River at Hwy 880	100	79	95	96	93

Index Ratings

Excellent	Good	Fair	Marginal	Poor
96-100	81-95	66-80	46-65	0-45

Trophic State of Alberta Lakes
http://environment.gov.ab.ca/info/library/8089.pdf



Cumulative context

- Cumulative inputs of cholestorol, phytosterols and fecal sterols
- Study reflects distribution over hundreds of km in SSRB and not limited to major point-sources.
- Endemic longnose dace populations affected.
  - Jeffries et al. **Presence of natural and anthropogenic organic contaminants and potential fish health impacts along two river gradients in Alberta, Canada**. *Environmental Toxicology and Chemistry*, 2010; DOI: 10.1002/etc.265

Battle River study

- Cumulative effect of human developments negatively linked to the relative abundance of lithophils and positively linked to the relative abundance of omnivores.
- Agriculture and cattle density impacts on aquatic species abundance and variety
  - Stevens, C.E. et al "Influences of Human Stressors on Fish-Based Metrics for Assessing River Condition in Central Alberta" *Water Qual. Res. J. Can*. 2010 Volume 45, No 1, 35-46.

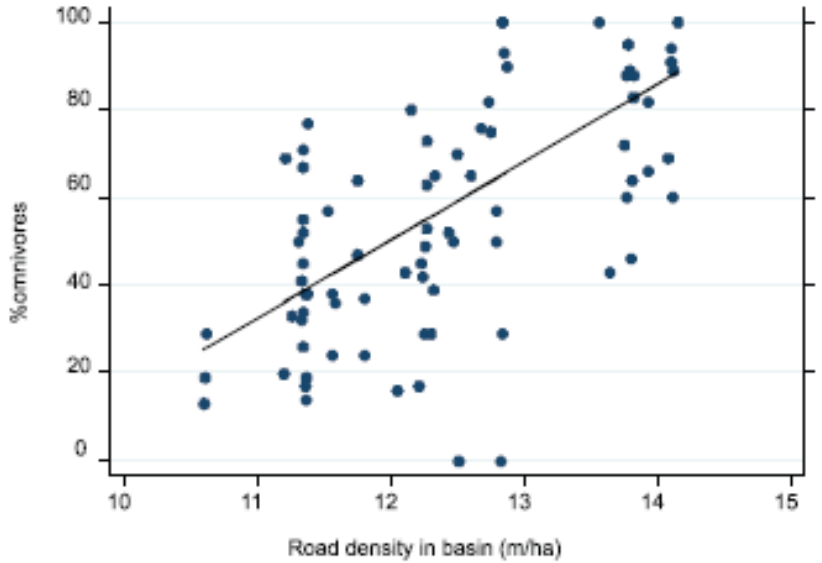
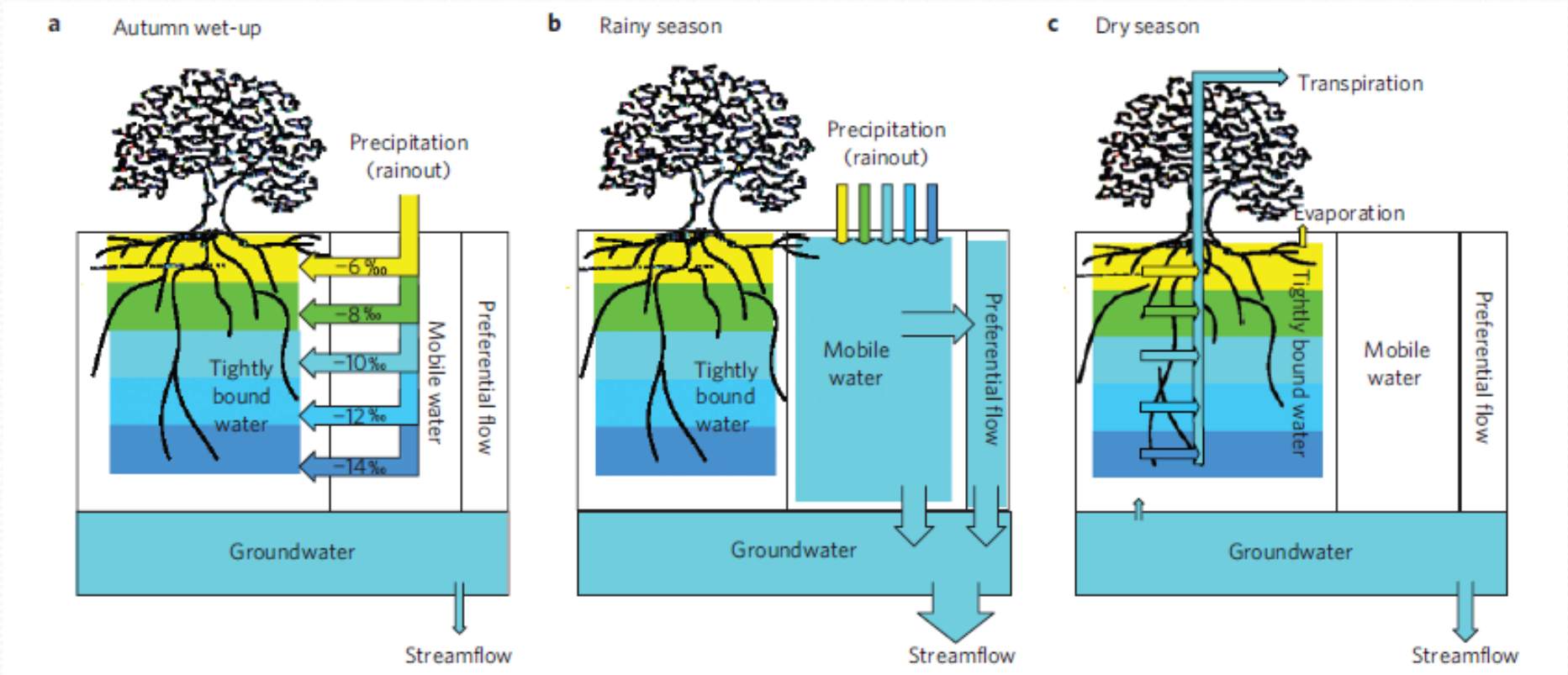


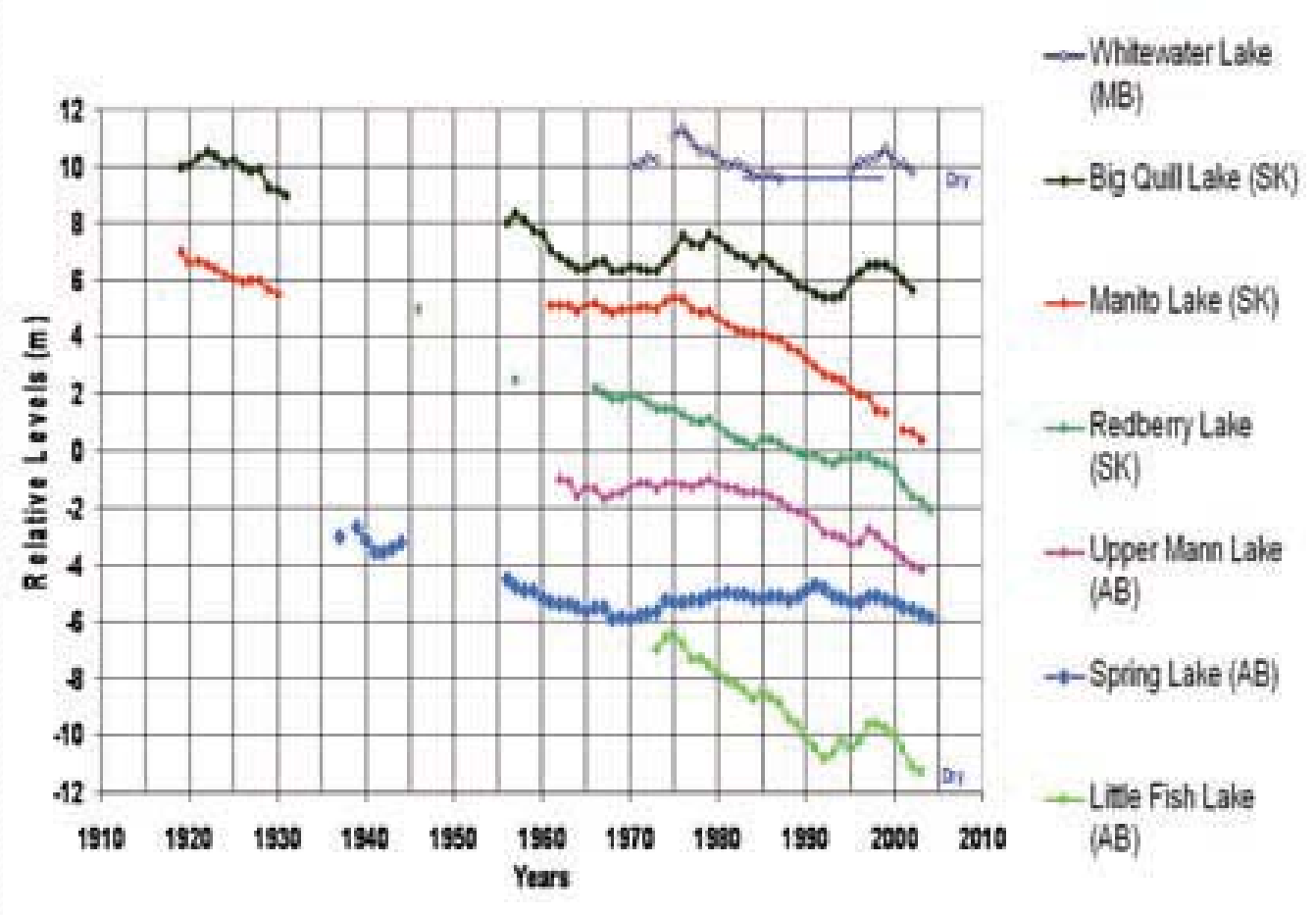
Fig. 2. A stressor-metric relationship, specifically a model-averaged regression line predicting %omnivore metric values with road densities in the basin (m/ha) overlaid with a scatter plot for the 80 sites sampled in the Battle River, Alta. (also see Table 4).

Do we even know enough?

- *Nature Geoscience* "Ecohydrolgic separation of water between trees and streams in a Mediterranean climate" (J. Renée Brooks *et al*. 2009) and Prof. Jeff Mcdonnell (University of Oregon) (presentation at University of Alberta, 2011)



Uncertainty, climate and supplies



Historical water levels for closed-basin prairie lakes (from van der Kamp and Keir, 2005; van der Kamp et al., 2006) cited in Climate Change Impacts on Canada's Prairie Provinces: A Summary of our State of Knowledge http://www.parc.ca/pdf/research_publications/summary_docs/SD2008-01.pdf

The impact of climate change on the glaciers of the Canadian Rocky Mountain eastern slopes and implications for water resource-related adaptation in the Canadian prairies
"Phase I" - Headwaters of the North Saskatchewan River Basin
Climate Change Action Fund - Prairie Adaptation Research Collaborative
PARC Project P55
M.N. Demuth[1] and A. Pietroniro[2]

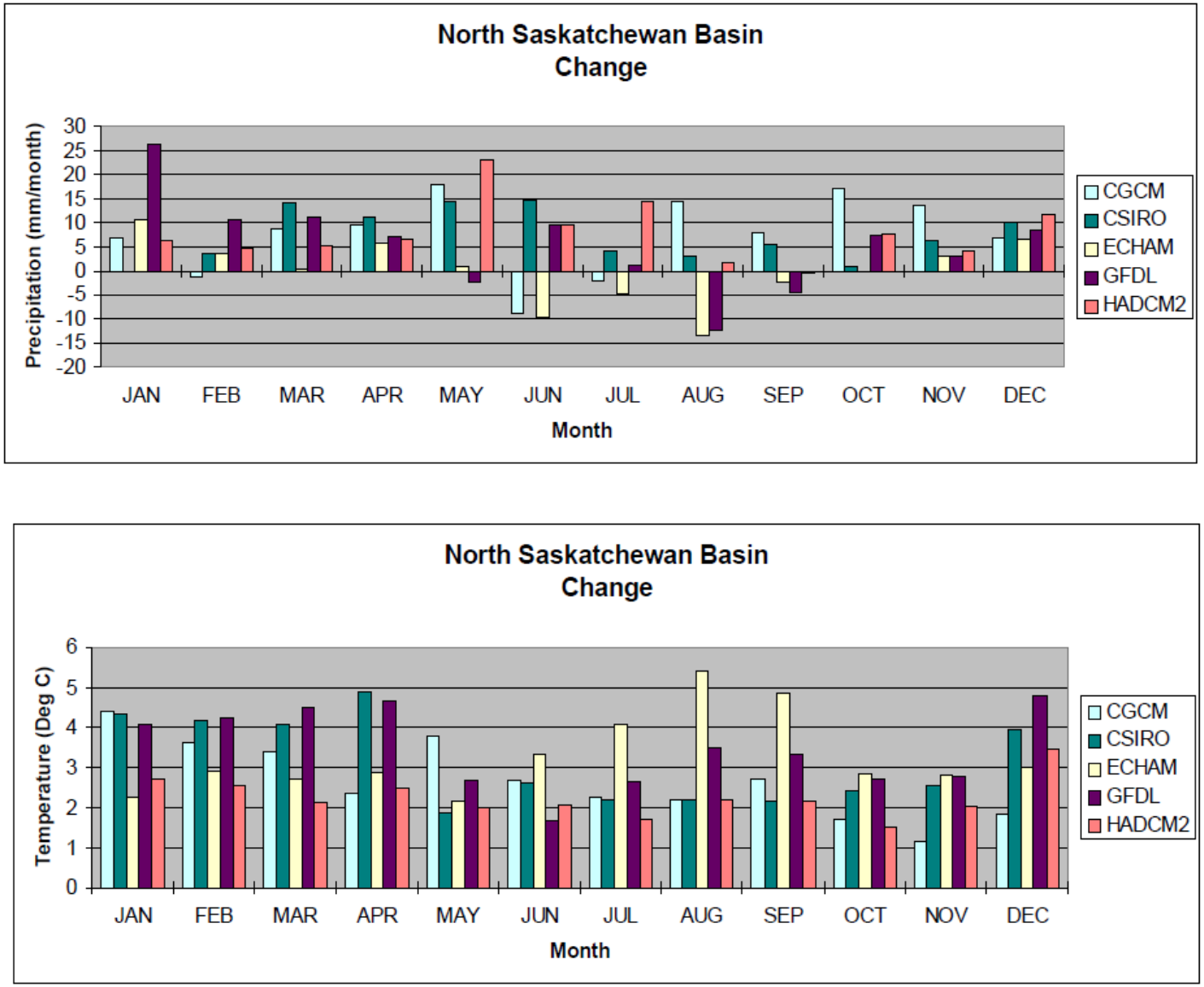
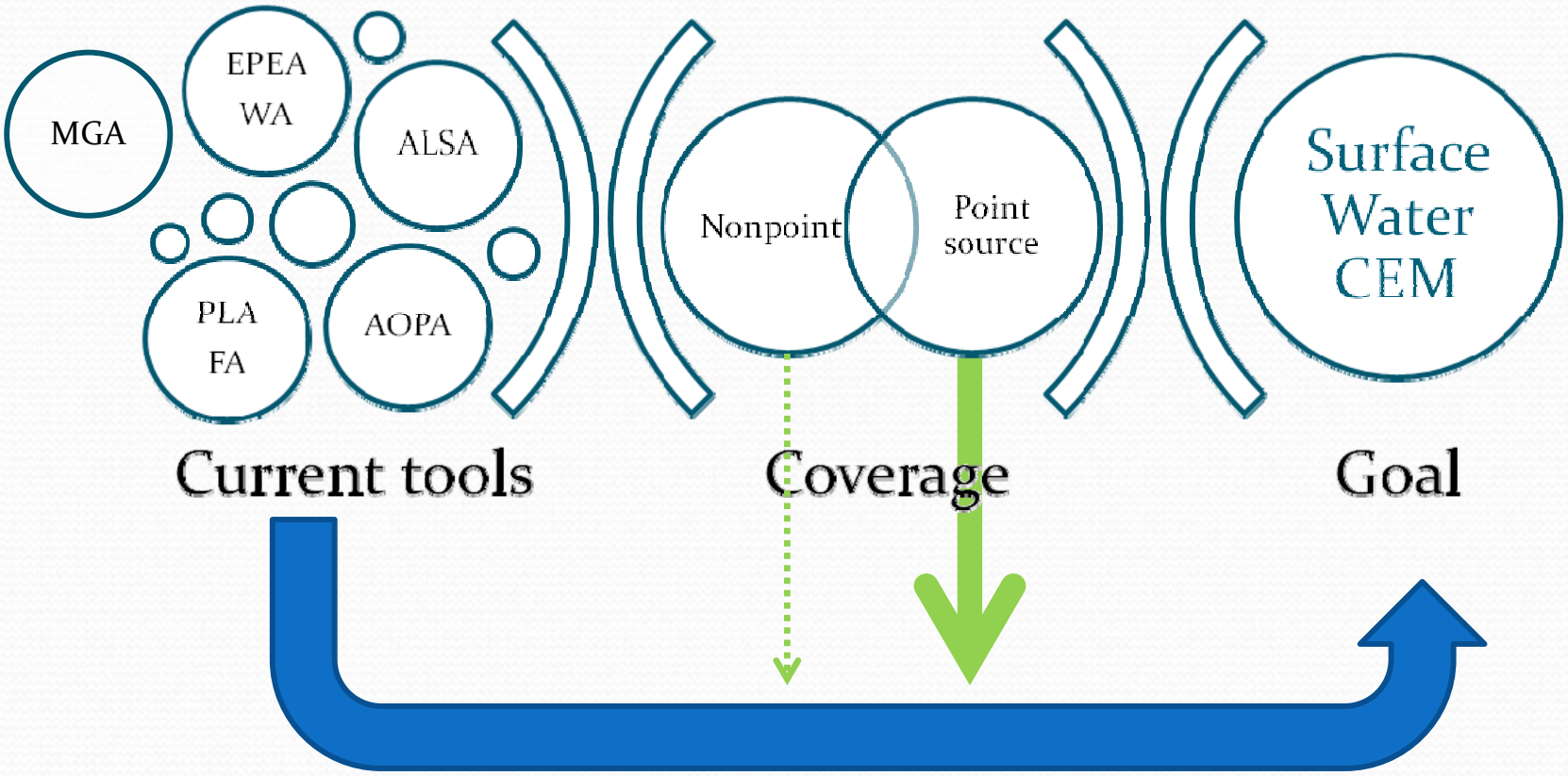


Figure C 7 - Preciptation and temperature change between 1961-1990 and 2040-2069 for the North Saskatchewan River Basin.

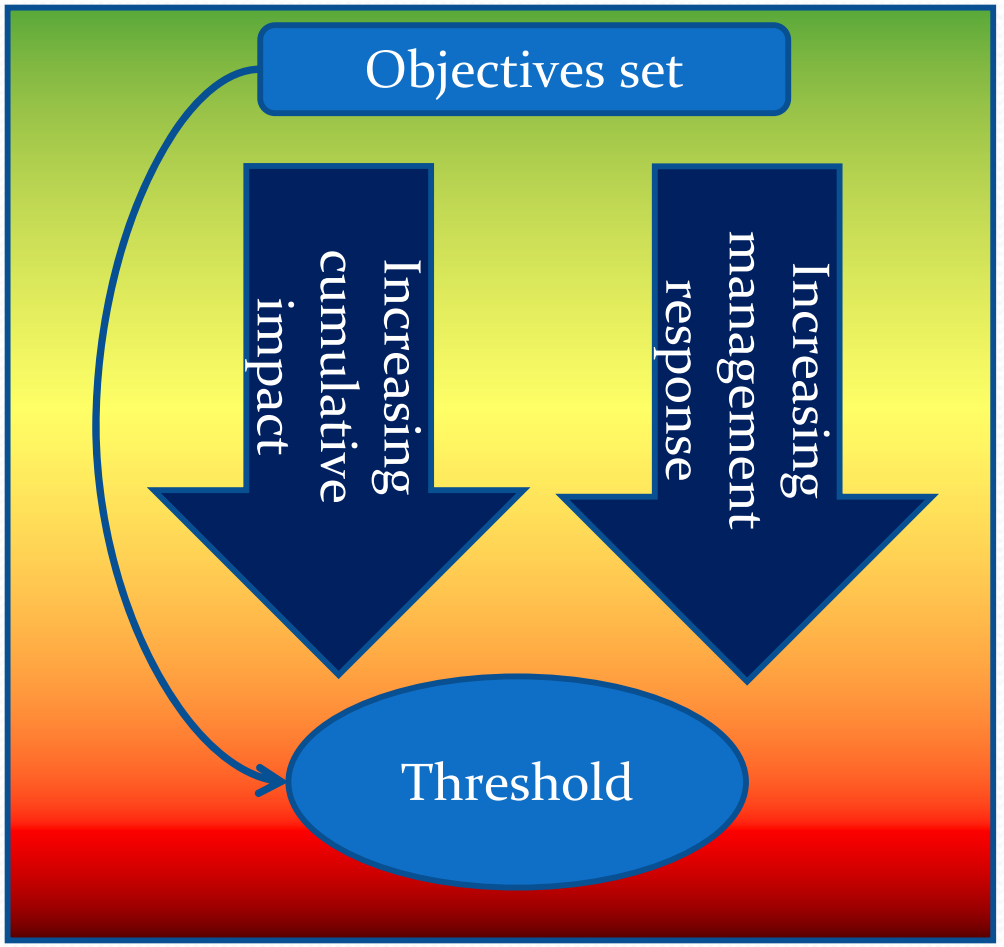
Legislative context



EIAs, BMPs, Mitigation, Policies, Programs

Positive CEM intentions

- Led by Alberta Environment
- Outcome/results based regulation
- Increased flexibility and efficiency
- Adaptive
- Linked to regional planning process
- Framework approach



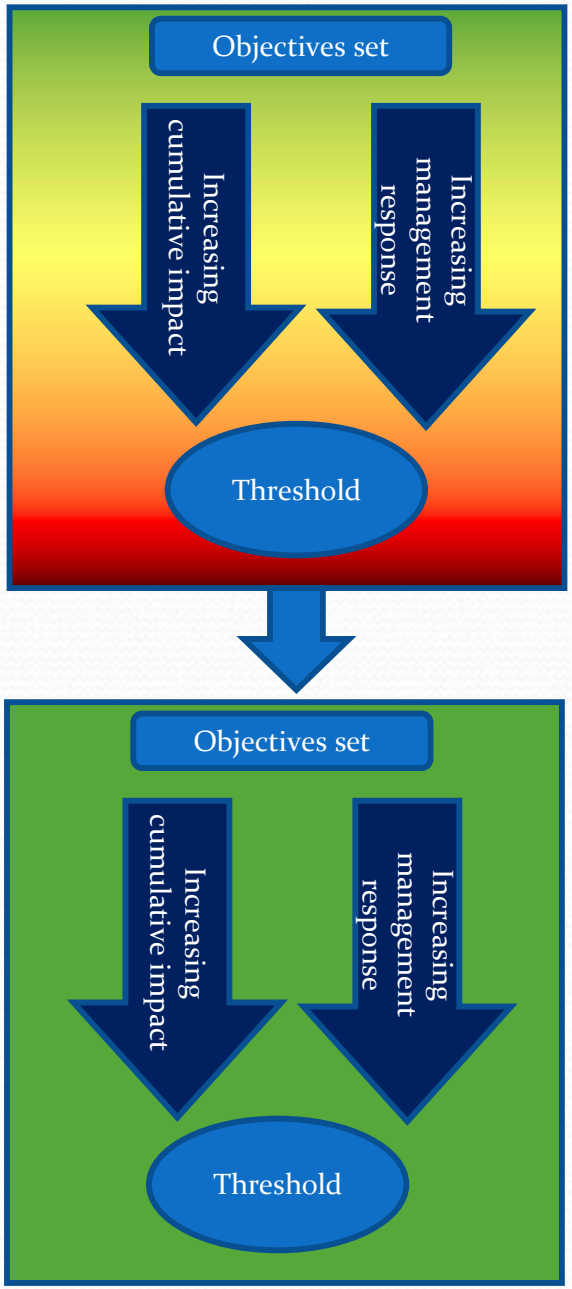
Positive CEM intentions

- Watershed planning
  - State of the basin
  - Implementation?

- ALSA
  - Mechanism for implementation
  - LARP/SSRP
    - Source water protection

Threats

- Poor objective setting
- Threshold creep
- Grandfathering
- Lobbying and litigation over regulator responses



Gaps and Barriers

Monitoring Capacity

- Data gaps
  - Nutrient – particularly Phosphorus
    - Air and Soil loading
  - Lake monitoring
  - Pesticides
  - Hormones/endocrine disruptors
  - Synergistic effects
  - Air borne contaminants – e.g. NE

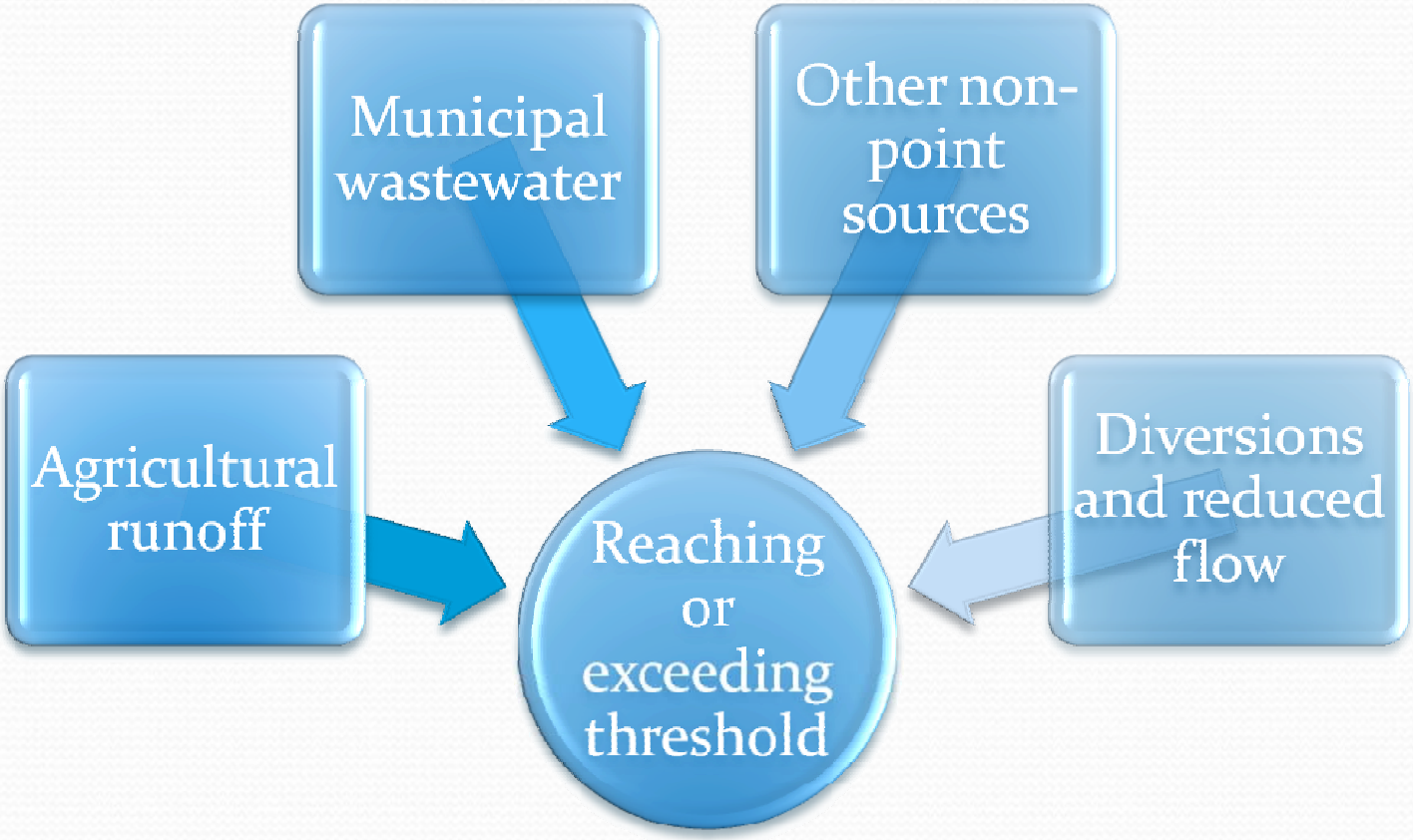
Assessment Capacity

- Cumulative assessment of loading from point and non-point source
- Baselines?
- Assessment of flows on assimilative capacity
- WPAC technical and financial capacity

Implementation issues

- Accountability for outcomes
  - Regional outcomes, results based regulation and the nexus of causation
    - Justifying regulatory action
- Crown liability
- Outcome based regulation will often be required – i.e. setbacks/buffers

Accountability?

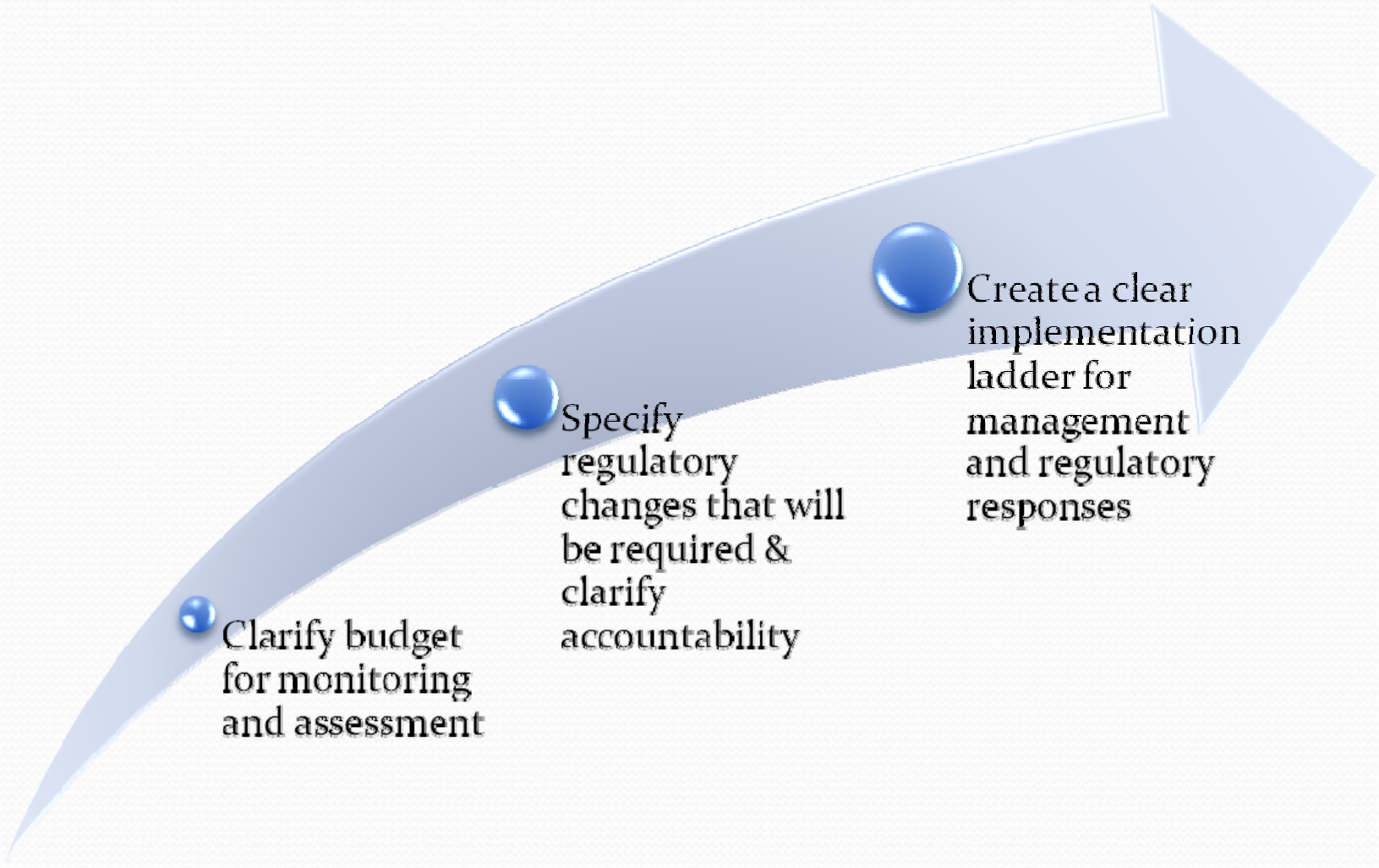


- Regulatory response required
  - Sector based reductions?
  - Pro-rata?
  - Grandfathered?
  - Proven contribution?
  - Anthropogenic vs. natural?

Key messages

- Knowledge and monitoring
- Policies and regulation must be comprehensive and landscape/watershed based
- Administration must be comprehensive, evaluative, and adaptive
  - Enforcement and compliance
  - Mitigation & BMP
- Costs of implementation must be forecast and met
  - e.g. Chesapeake Bay TMDL– estimated over $9.5 billion in urban stormwater costs
    - Chesapeake Bay TMDL and Virginia Watershed Implementation Plan (Hampton Roads Planning Commission) stormwater reductions ($679M annually) http://www.hrpdc.org/MTGS_%20AGDS/Agendas/2010/Oct2010/H13_Ches_Bay_TMDL.pdf

Recommendations moving forward



Discussion & Questions

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