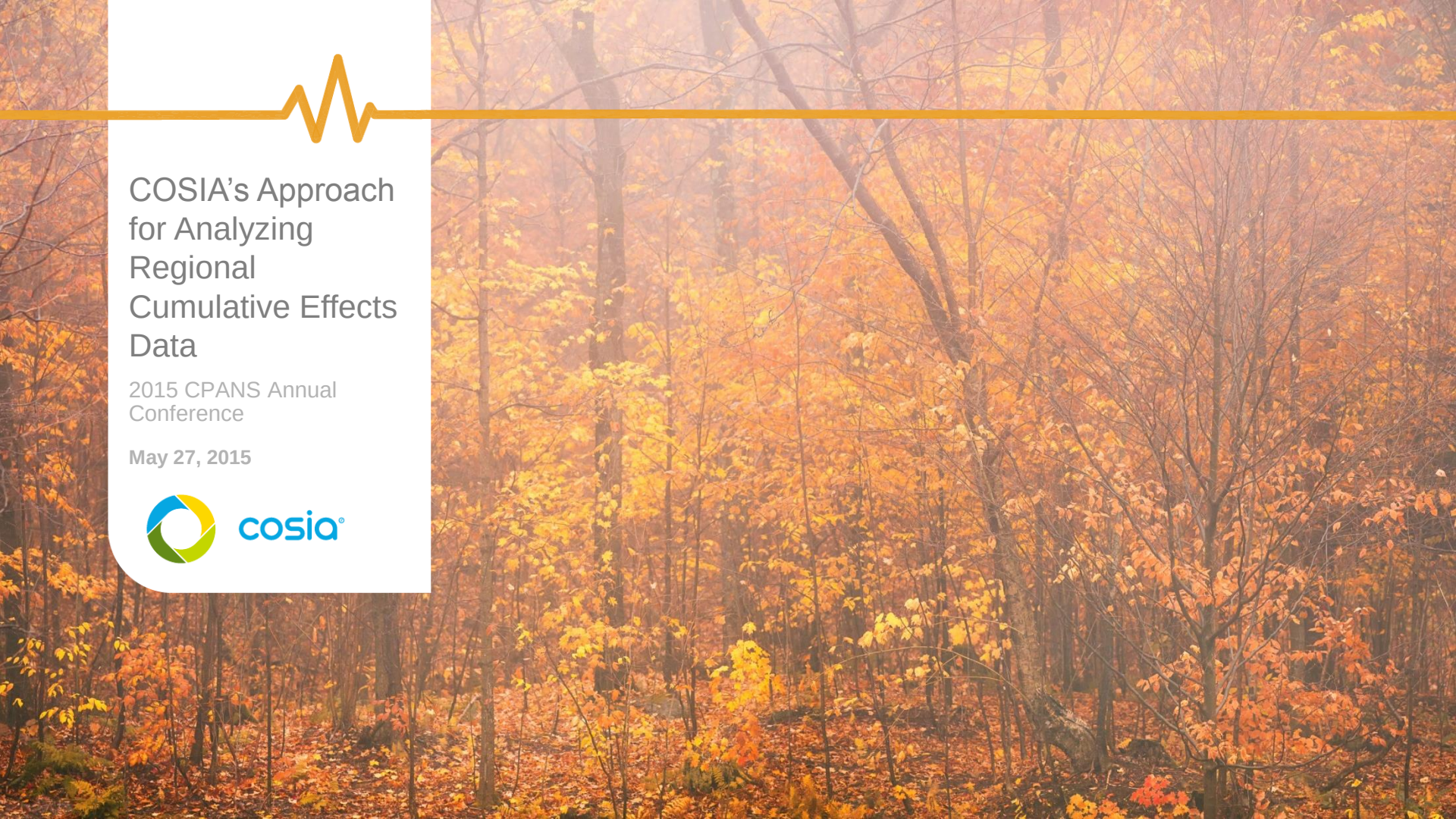


COSIA's Approach for Analyzing Regional Cumulative Effects Data

2015 CPANS Annual Conference

May 27, 2015

cosia

Role of the Director of Monitoring

Background

- Joint Oil Sands Monitoring program (JOSM) launched to address system reviews.
  - Transitioning now to the Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA) as an independent monitoring entity.
  - Industry funds OSM at up to $50 million per year.
- Industry restructured itself to allow for single point of contact on technical issues and aid transition to new system…

The COSIA Director of Monitoring provides a single, industry focal point for technical issues:

- Supported by an industry Monitoring Working Group, comprised of the senior technical monitoring leads from over 17 oil sands companies, to be formalized with a legal agreement.
- Focused on companies that provide more than 1% of OSM funding.

Monitoring is different from the COSIA Environmental Priority Areas (EPAs).

- Primary focus is on the funding that goes to the governments to do monitoring:
  - What, where, how are they monitoring?
  - What does the data say?
  - How should industry respond (in terms of monitoring)?
  - How to restructure other industry monitoring so it aligns with JOSM.

Jan 7 2013

Legacy of a half century of Athabasca oil sands development recorded by lake ecosystems

Joshua Kurek[a], Jane L. Kirk[b], Derek C. G. Muir[b], Xiaowa Wang[b], Marlene S. Evans[c], and John P. Smol[a,1]

[a]Paleoecological Environmental Assessment and Research Laboratory, Department of Biology, Queen's University, Kingston, ON, Canada K7L 3N6; [b]Aquatic Contaminants Research Division, Environment Canada, Burlington, ON, Canada L7R 4A6; and [c]Aquatic Contaminants Research Division, Environment Canada, Saskatoon, SK, Canada, S7N 3H5

Edited by John P. Giesy, University of Saskatchewan, Saskatoon, SK, Canada, and accepted by the Editorial Board November 19, 2012 (received for review October 11, 2012)

cosia
Canada's Oil Sands Innovation Alliance

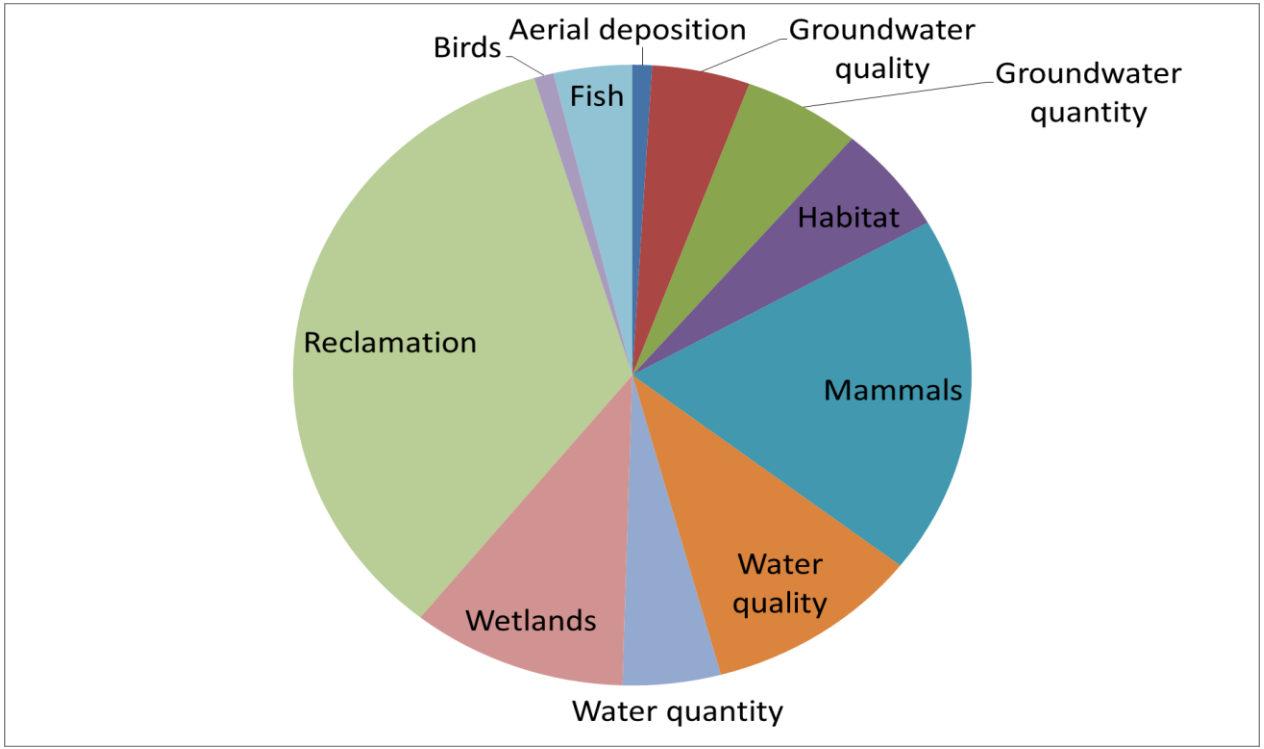
Information for Company-Specific Risk Assessment and Alignment

14 May 2013

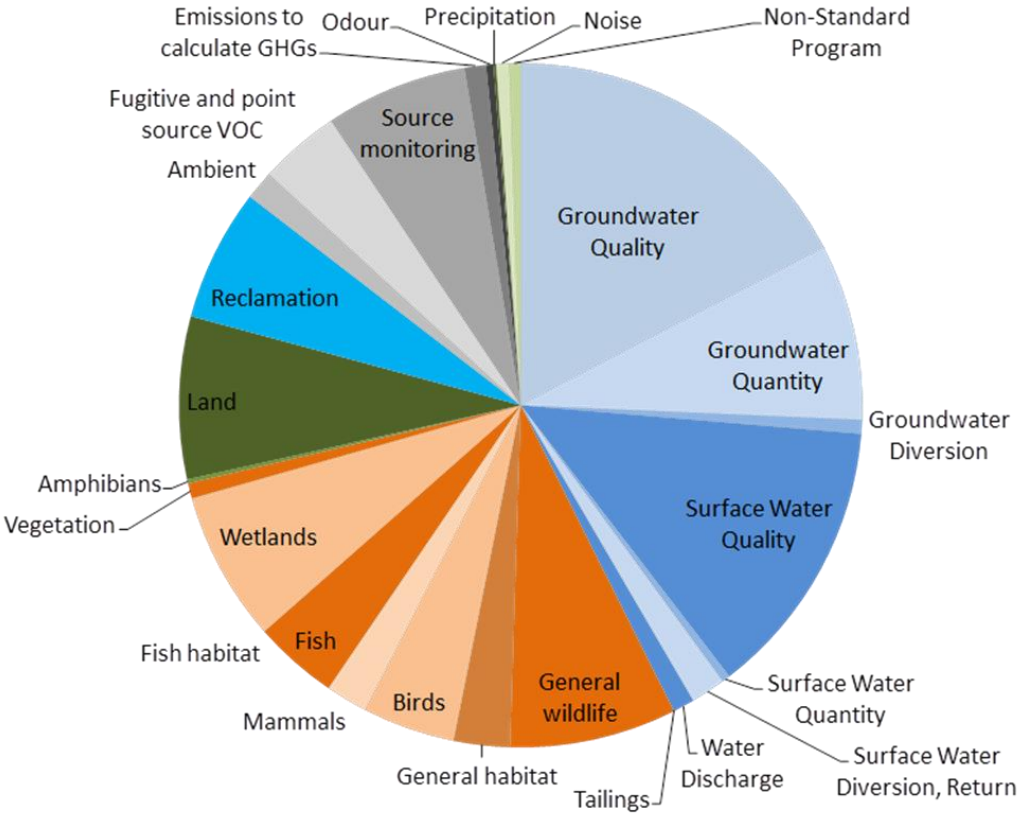
Screening Level for Potential Action

Company-specific Screening Risk Rating (Level of response warranted)						
	Mitigation should be considered					
	Change in monitoring strategy warranted					
	Need to consider focused JIP/EPA study	X_1 X_3		XXX$_5$	X_2	X_4
	Continue to monitor with JOSM	X_1		X X_1		
	Monitoring should be reduced; source uncertain					
		Not relevant for our facility	Marginal	Minor	Moderate	Major
	Environmental risk exposure					

COSIA studies and JIPs related to monitoring, n=107



Monitoring inventory (outside of JOSM)



Role of the Director of Monitoring cont.

Develop aligned industry positions on technical issues related to the JOSM technical design, implementation and ongoing refinement

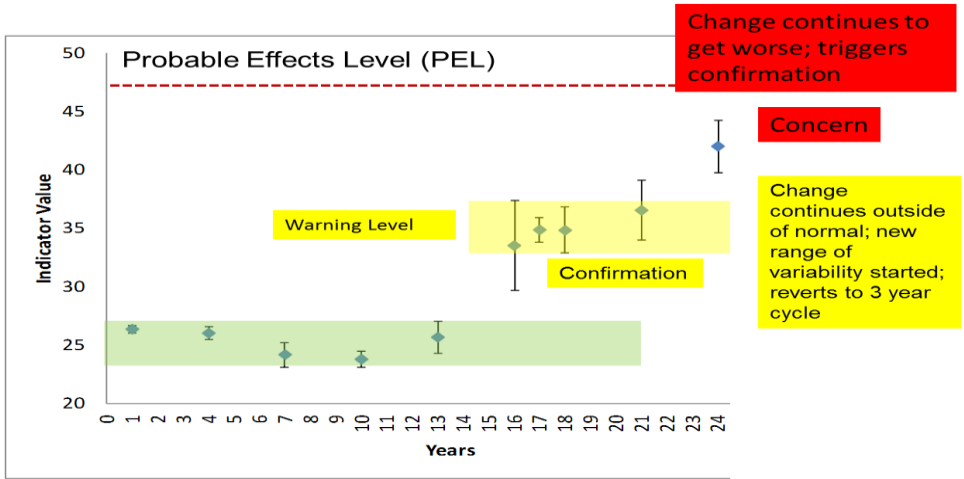
- Identify when a monitoring result has sufficient ecological significance that industry should pay attention.
- Develop triggers to align industry responses and non-JOSM monitoring decisions

Change will be present (and detecting it is easy)
(Industry wants to see impacts that are present)

- Try to define change and to separate
  - Change which is stable from change which is getting worse
    - Change which is Expected from Unexpected
  - Change which is stable is a question of acceptability
    - » do I have to fix it
    - Change which is getting worse is a question of sustainability
      - » At some level degradation will affect something important
  - When you see meaningful change
    - How big an area is changing
      - Is it getting worse
- If concern is high enough
  - What is causing it and do I have to fix it?
  - How do I fix it?

Environmental Effects Monitoring (EEM) operates through cycles

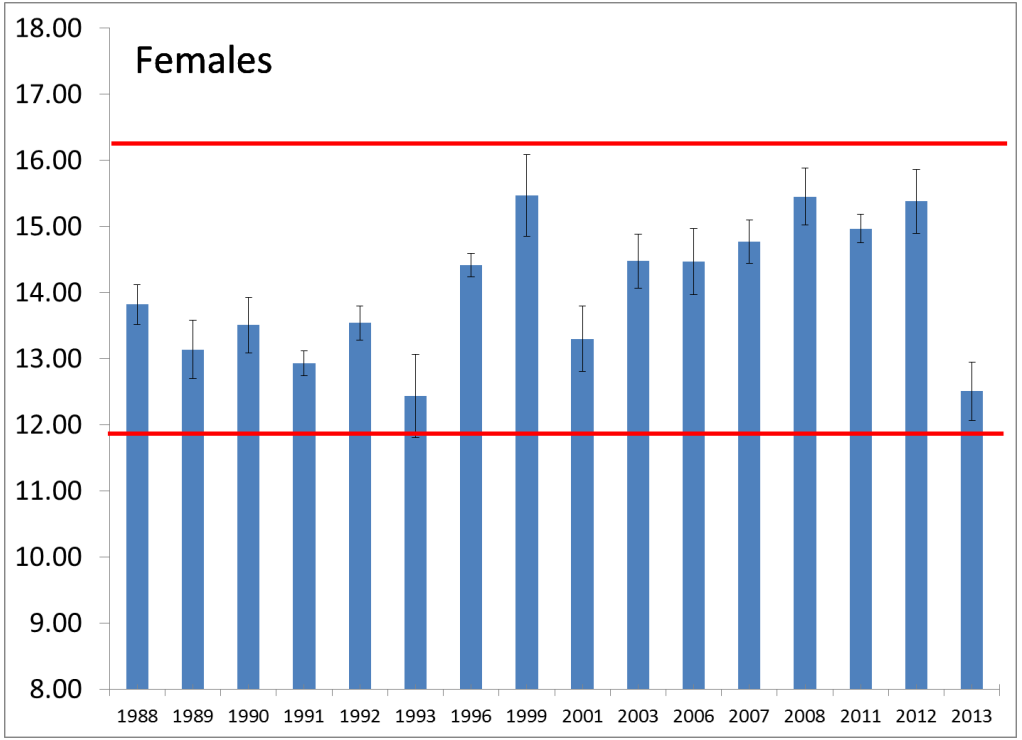
- Similar monitoring in each cycle (except IOC)
  - Surveillance
  - Confirmation
    - Minimal*
  - Extent and magnitude (focused monitoring)
  - Investigation of cause (IOC) – usually research-based



Triggers to adjust monitoring intensity and focus (from JOSM framework)

Tier	Example Trigger	Question	Frequency
Basic		Are there changes?	Regular
Confirmation	Difference beyond a critical effect size threshold (natural variability).	Can we confirm them?	More often
Extent	Confirmation of changes (reference site adequacy).	What is the extent and magnitude of the change?	More stations and indicators
Cause	Change across a sufficient area, or of a sufficient magnitude, or is getting worse (temporal consistency).	What is the cause?	Research-oriented
Concern	Change exceeds “ecological relevance”.	What is the solution and do I have to mitigate or compensate?	Hopefully never

What are these science-based triggers and how will we use them?

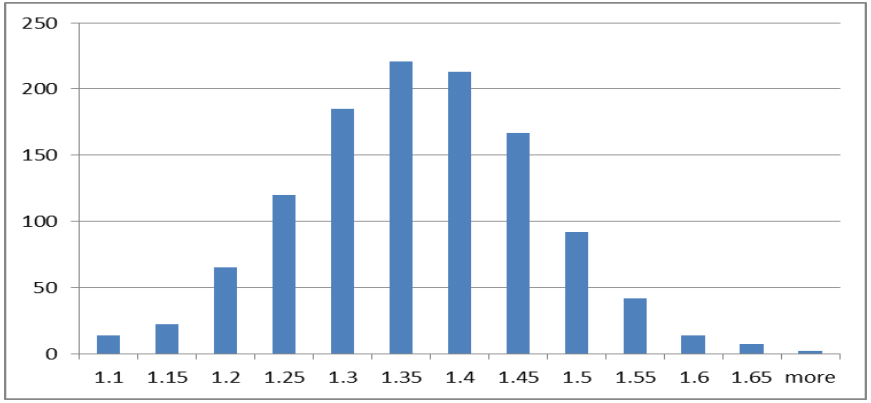


- How big a change in monitoring represents a significant enough change that we should pay closer attention?

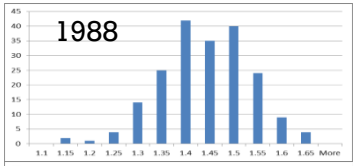
Mean±2SD

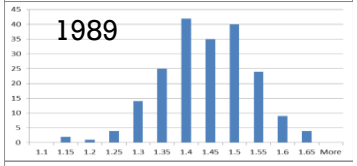
Normal Distribution

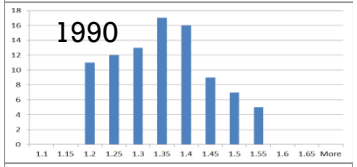
Fish Condition

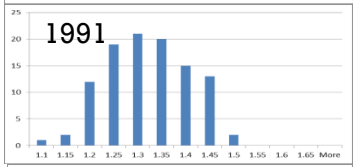


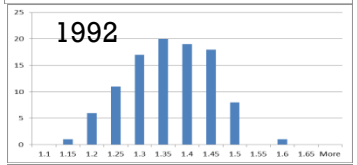
1988-2012 Mtn Bay Combined data

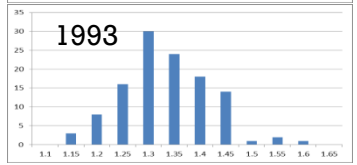


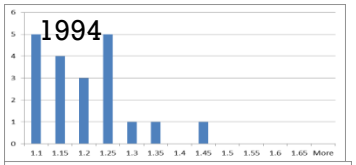


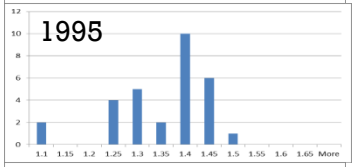


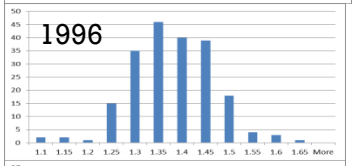


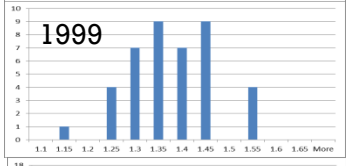


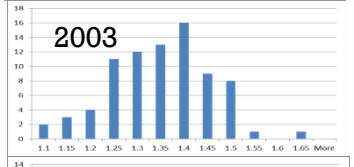


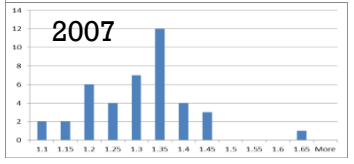






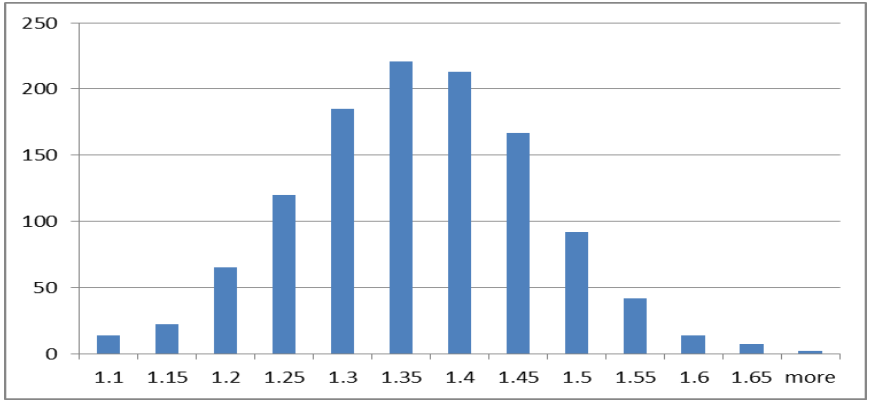




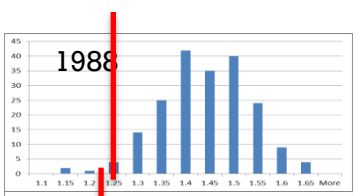


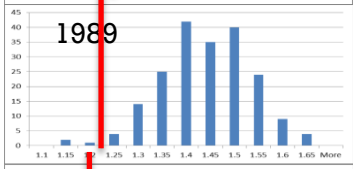
5th percentile changes between years

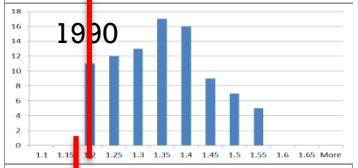
Fish Condition

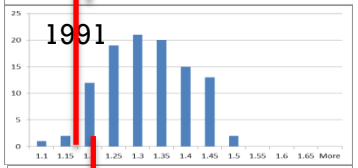


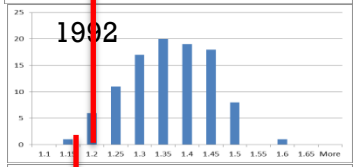
1988-2012 Mtn Bay Combined data

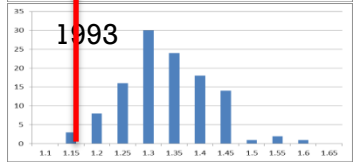


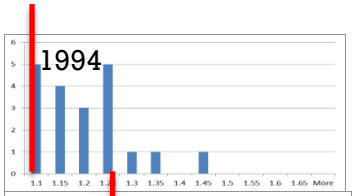


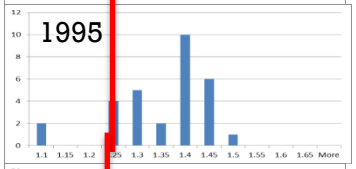


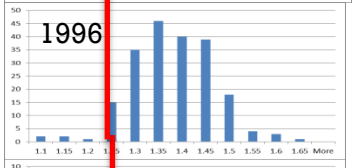


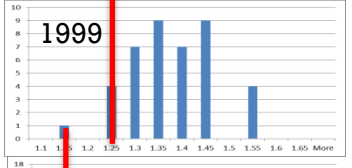


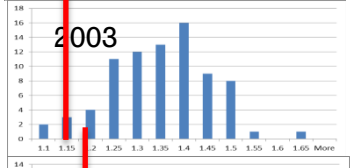


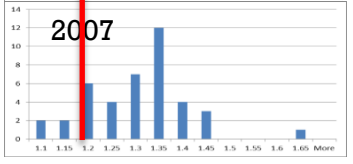




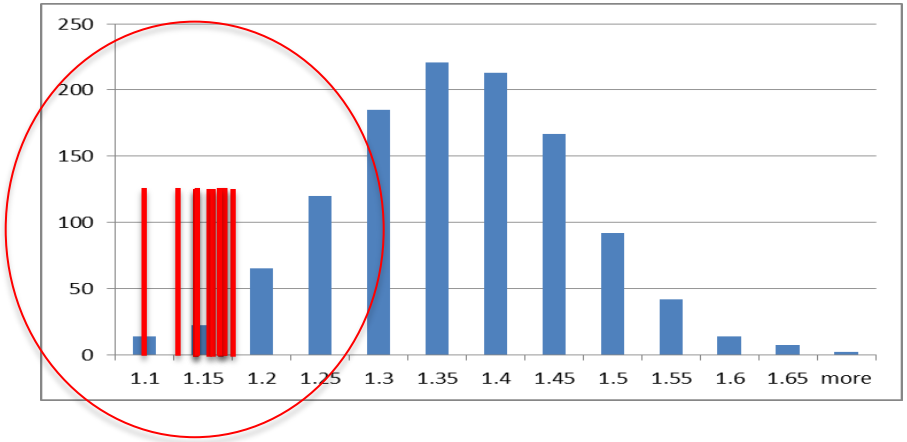




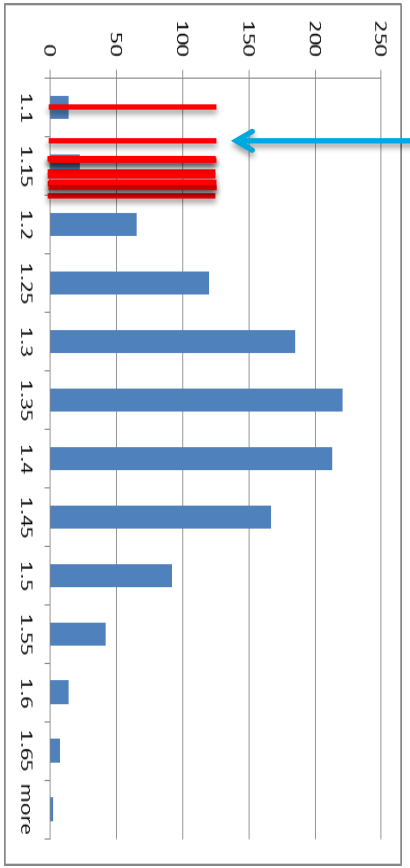




Fish Condition



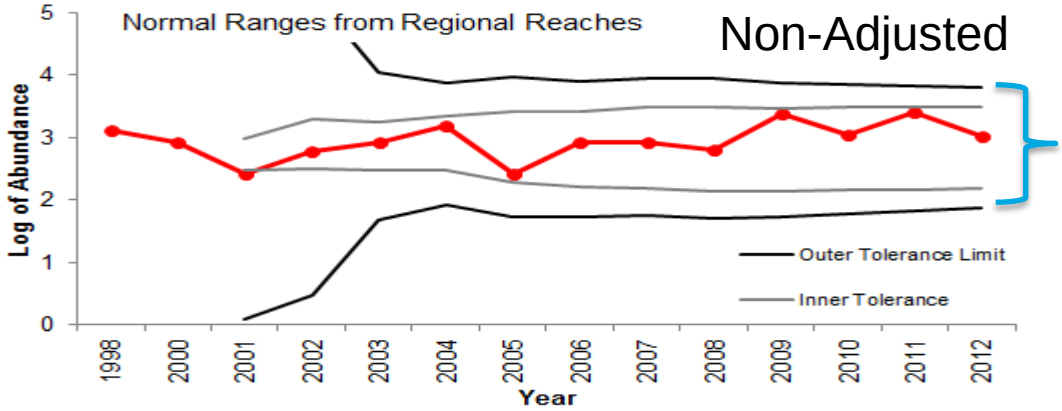
1988-2012 Mtn Bay Combined data



Can get “confidence limits” on the confidence limits

= inner and outer “tolerance” limits

Lower Muskeg River

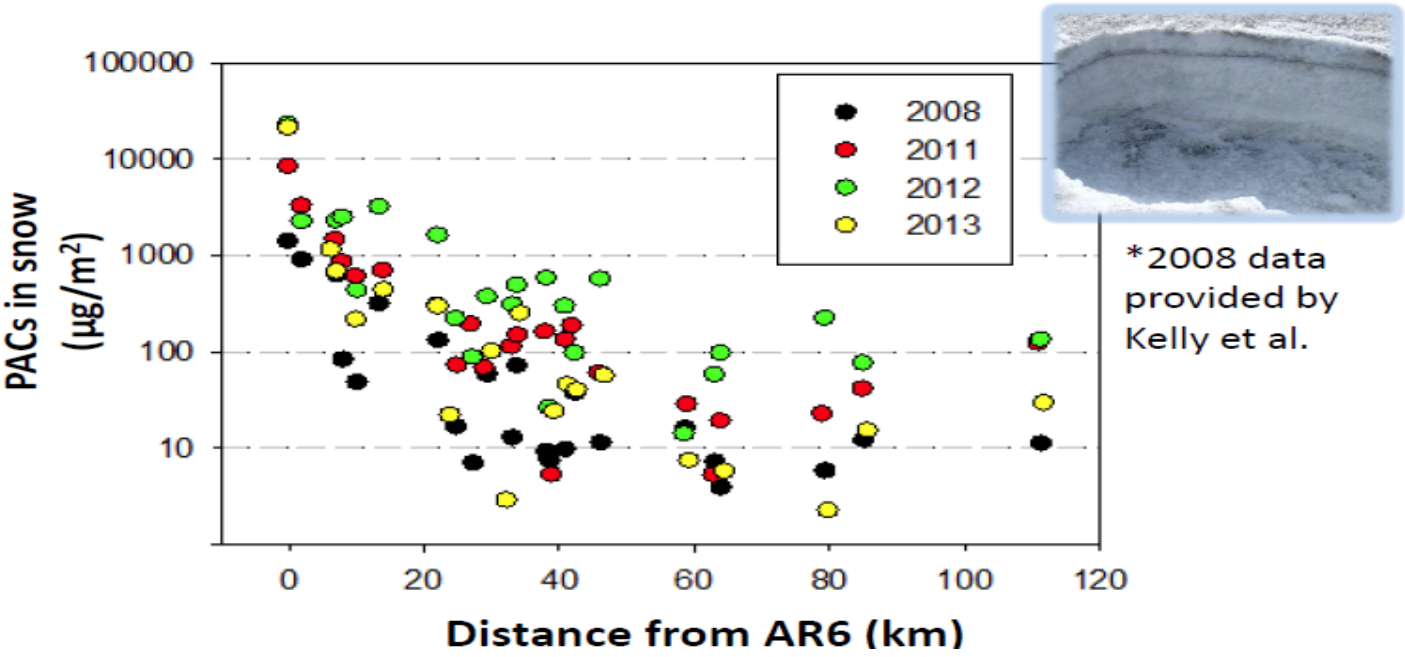


Non-Adjusted

Limits on normal range, change with addition of new data

Adjusted

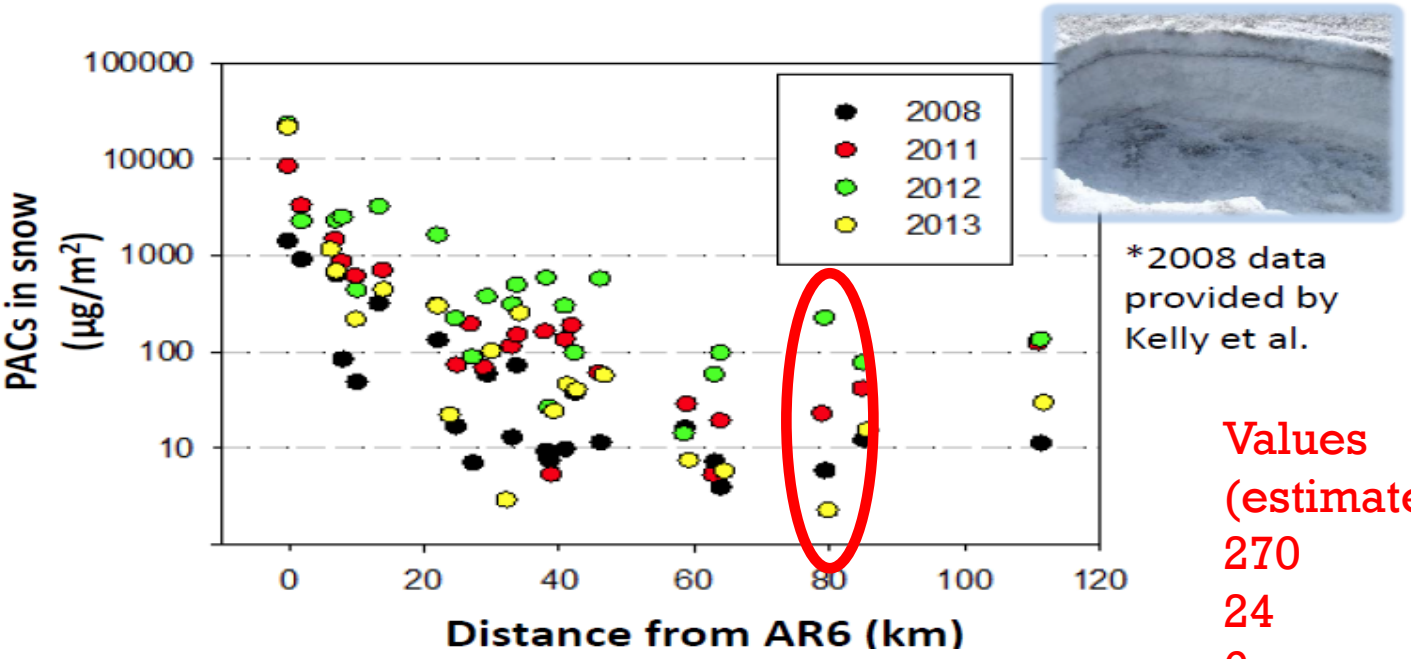
Comparison of snowpack PACs loads from 2008 to JOSM 2011-2013 at the same sites



*2008 data provided by Kelly et al.

Brook, Kirk et al. 2015 JOSM Science Symposium

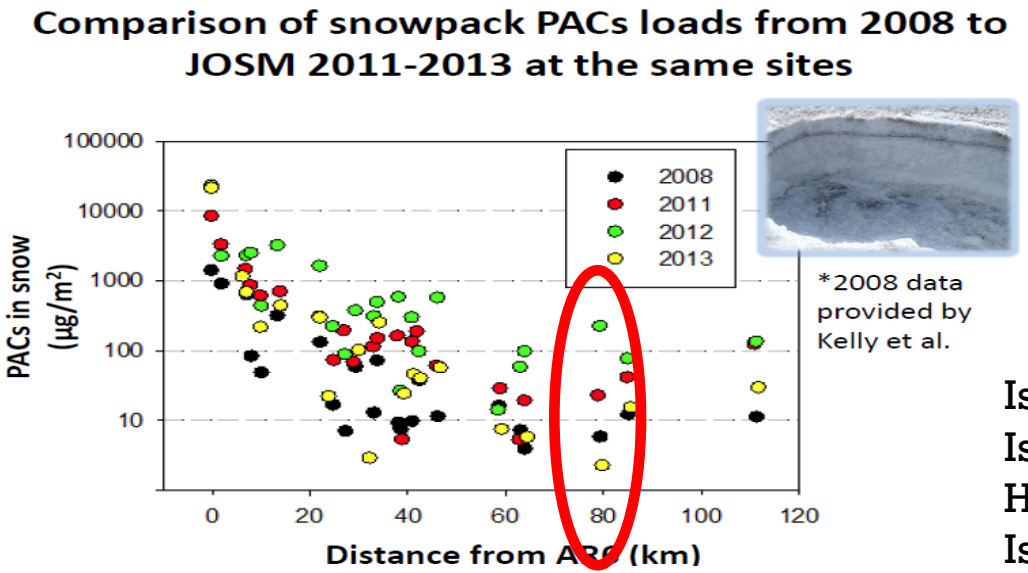
Comparison of snowpack PACs loads from 2008 to JOSM 2011-2013 at the same sites



*2008 data provided by Kelly et al.

Values (estimated)
270
24
6
2.4

Brook, Kirk et al. 2015 JOSM Science Symposium



Brook, Kirk et al. 2015 JOSM Science Symposium

Values (estimated)
270
24
6
2.4

Is there deposition – Yes
Is it confirmed - Yes
How big an area? – in progress
Is it getting worse? – no evidence

but we have
a) a baseline
b) An estimate for a trigger to tell us what "worse would look like

Mean + 2SD would be
>336

Science questions:
1. Where is it coming from?
2. What is the role of dust?
3. What is driving the natural variability? *

Ongoing monitoring

Change Assessment
(Baseline assessment)

Accumulated state monitoring

Status and Trends

Changes over time in water quality and quantity and indicators

Cumulative Effects Monitoring

Is my receiving environment changing because of accumulated stress?

Existing Developments "Compliance Monitoring"

Compliance Monitoring

Regulatory

Crisis/spill Management

Impacts, extent and magnitude

Mitigation Effectiveness

Response to corrective action

Environmental Effects Monitoring

Residual impacts when in compliance

Performance Monitoring

Triggers to ensure that development's predictions were accurate

Proposed Developments "Development Assessment"

Cumulative Effects Assessment

Scenario forecasting of potential developmental impacts and regional changes

Environmental Impact Assessment

Can development proceed?

Environmental Risk Assessment

Sensitivity and mitigation analysis

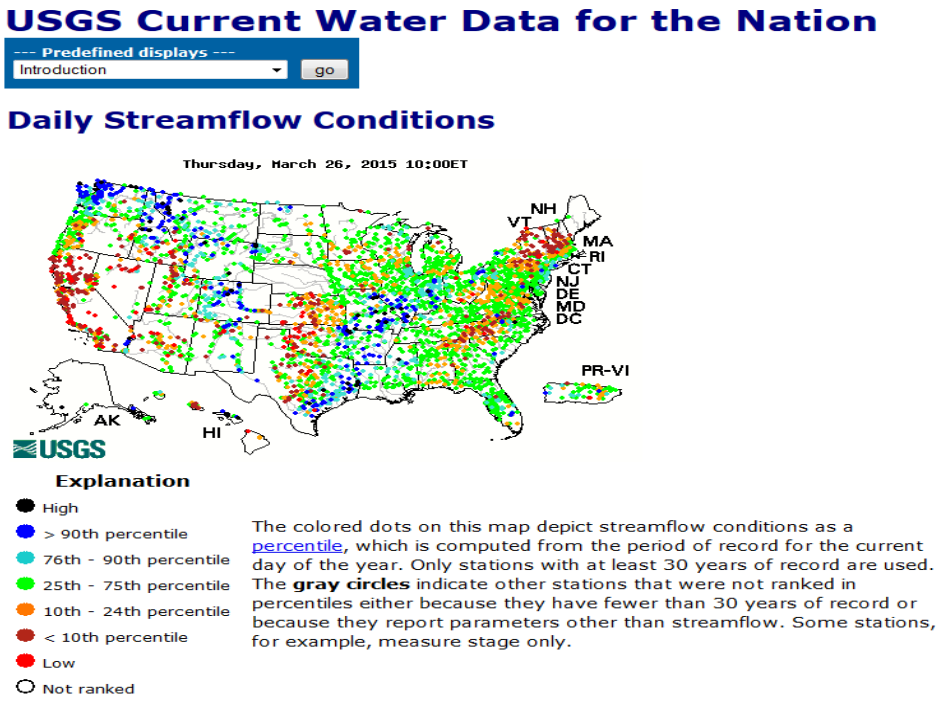
No common framework, philosophy, methodology, linkages and no common regulatory basis

- Need to understand
  - Inherent variability in measurement
  - Variability between sites
  - Variability between years

- How big a change you want to be able to detect
- Power and sample size requirements and limitations

What is a change?

- Has my site changed?
- Have sites near my site changed?
- Is it a regional change?



Issues

- Asking the right question
- Where does it fit
- Is it a real change and a true concern
- How do you give it appropriate context
- Where does identification of cause fit and how to approach it

Industry needs actionable results from an environmental monitoring system…

- Industry committed up to $50M a year to the new cumulative effects monitoring system
  - The new monitoring agency, AEMERA, responsible for the monitoring
  - Monitoring has visibility to the most senior levels of companies
    - Monitoring is needed to provide assurance that the resource is being developed sustainably
- Are there existing changes in the area relative to OS development, and if so,
    - what is changing,
    - where is it changing, and
    - how much is it changing?
      - Once you see changes you can track them
        - » Cumulative effects requires collaborative actions