



Theme B2: Ecological flow needs

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Project team members

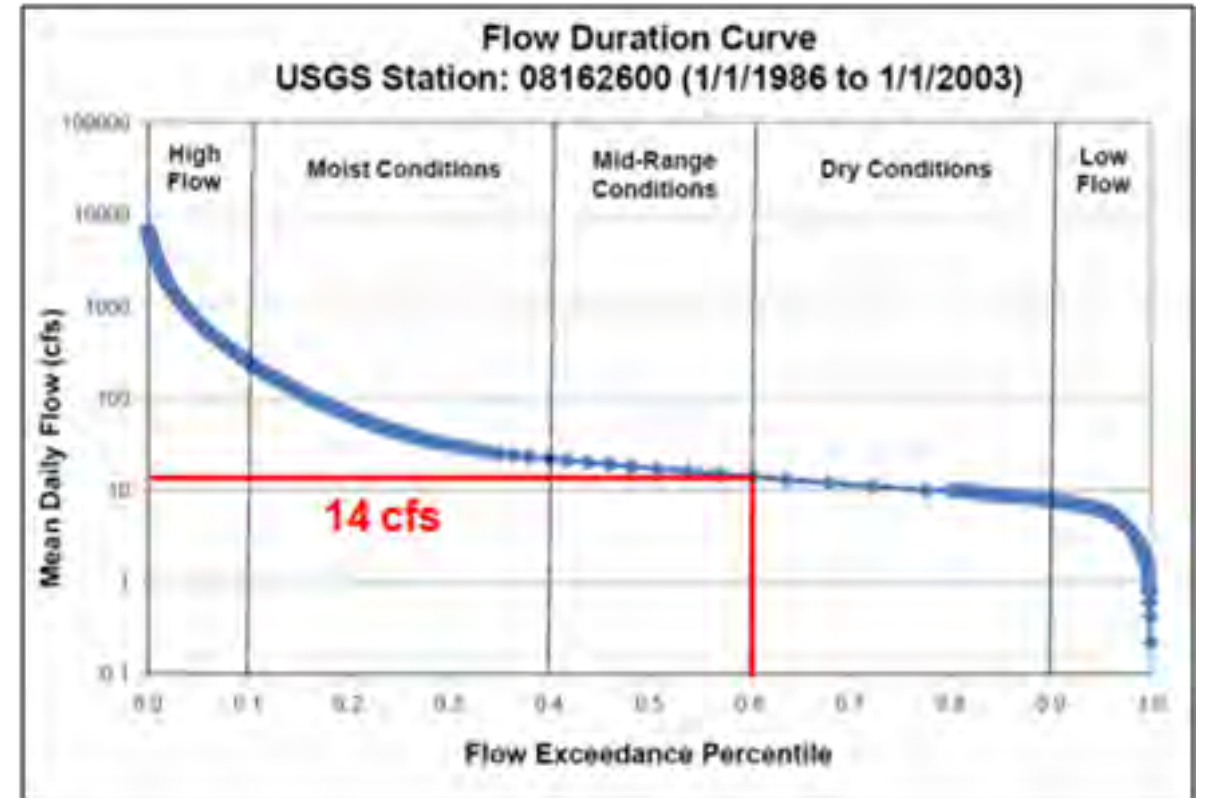
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Allen Curry (UNB), Helen Baulch (U of S)

The definition

- Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems

The old way of doing things

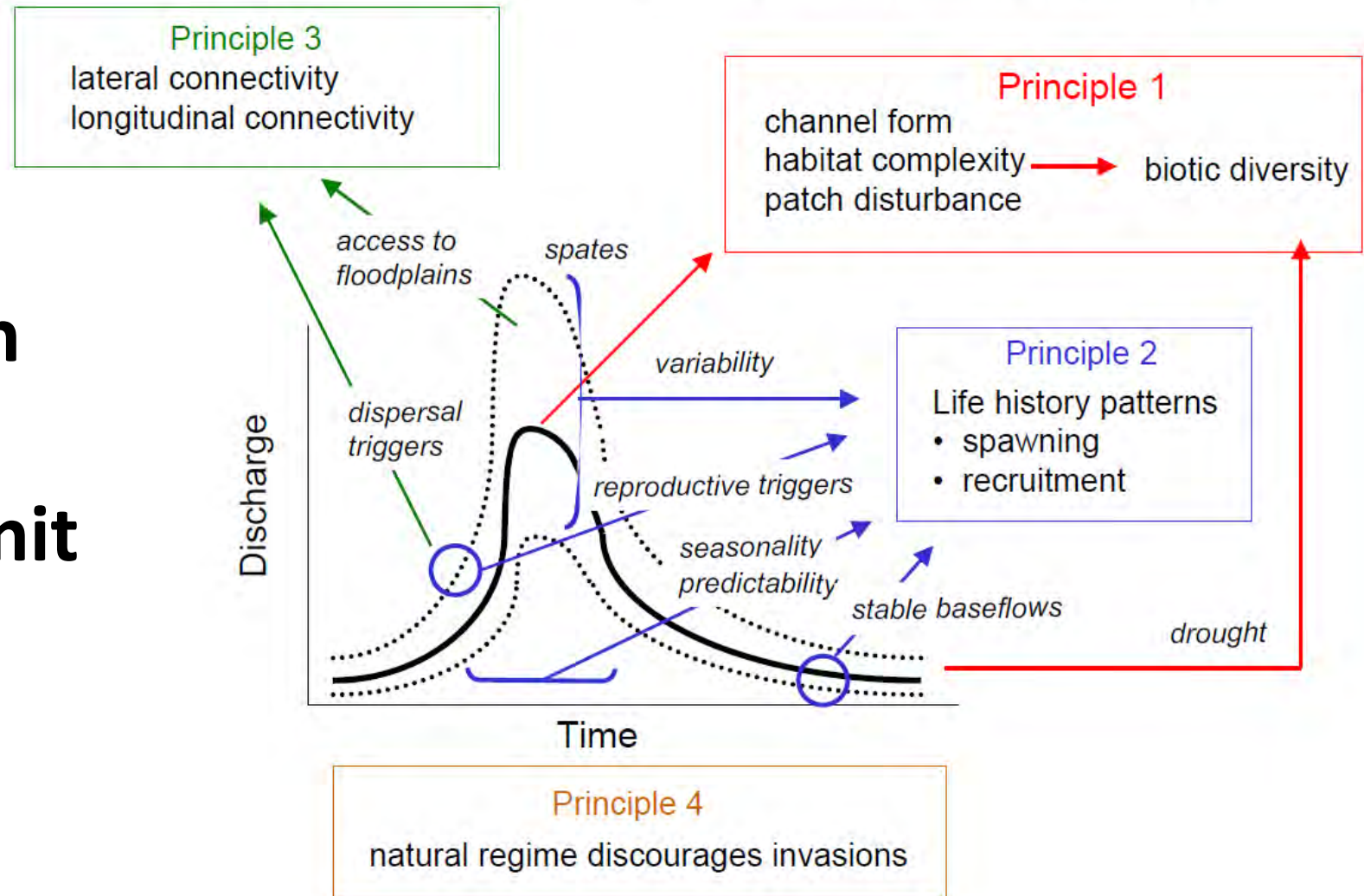
- Look-up tables (e.g. Tennant)
 - % of mean flow
 - 10% poor
 - 30% moderate
 - 60% excellent
- Focus on fish in channel



New methods use holistic approaches

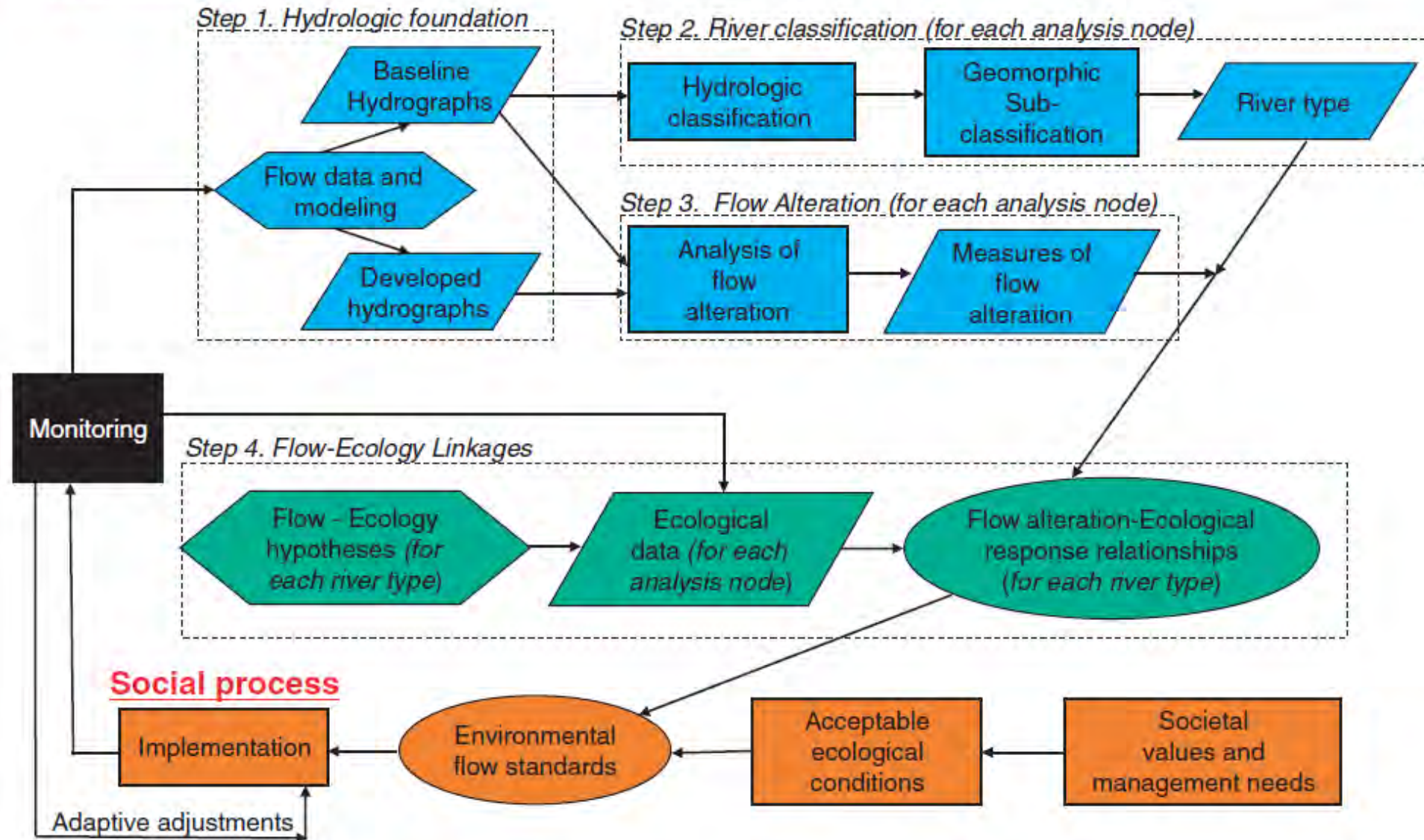
Aquatic biodiversity and natural flow regimes

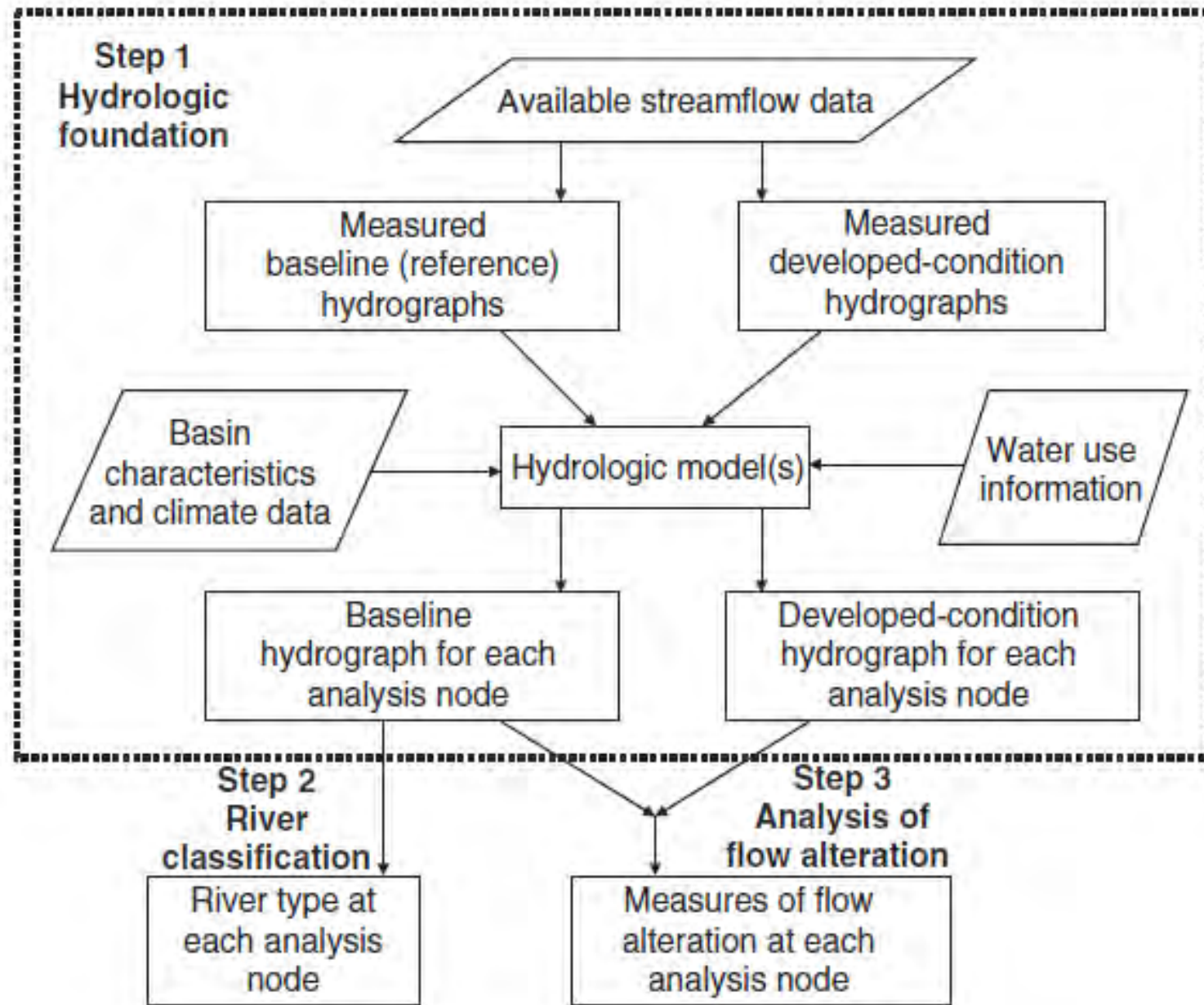
The hydrograph remains the fundamental unit of analysis



ELOHA: Ecological limits of hydrological alteration

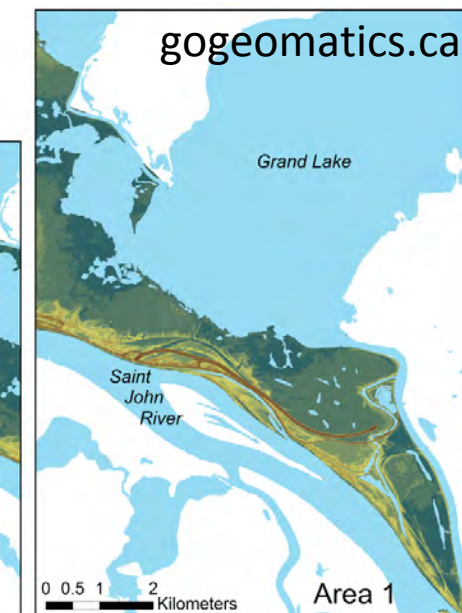
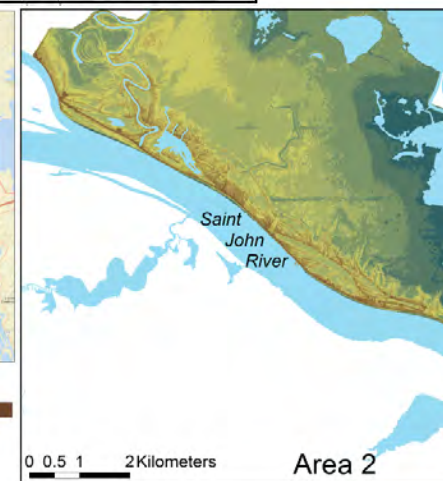
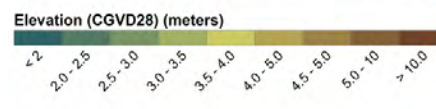
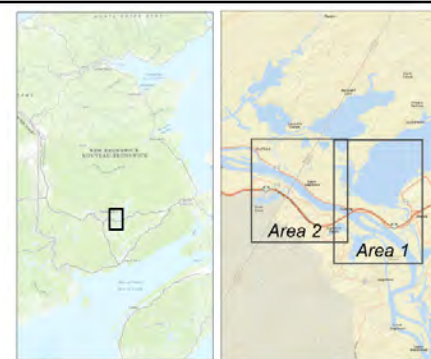
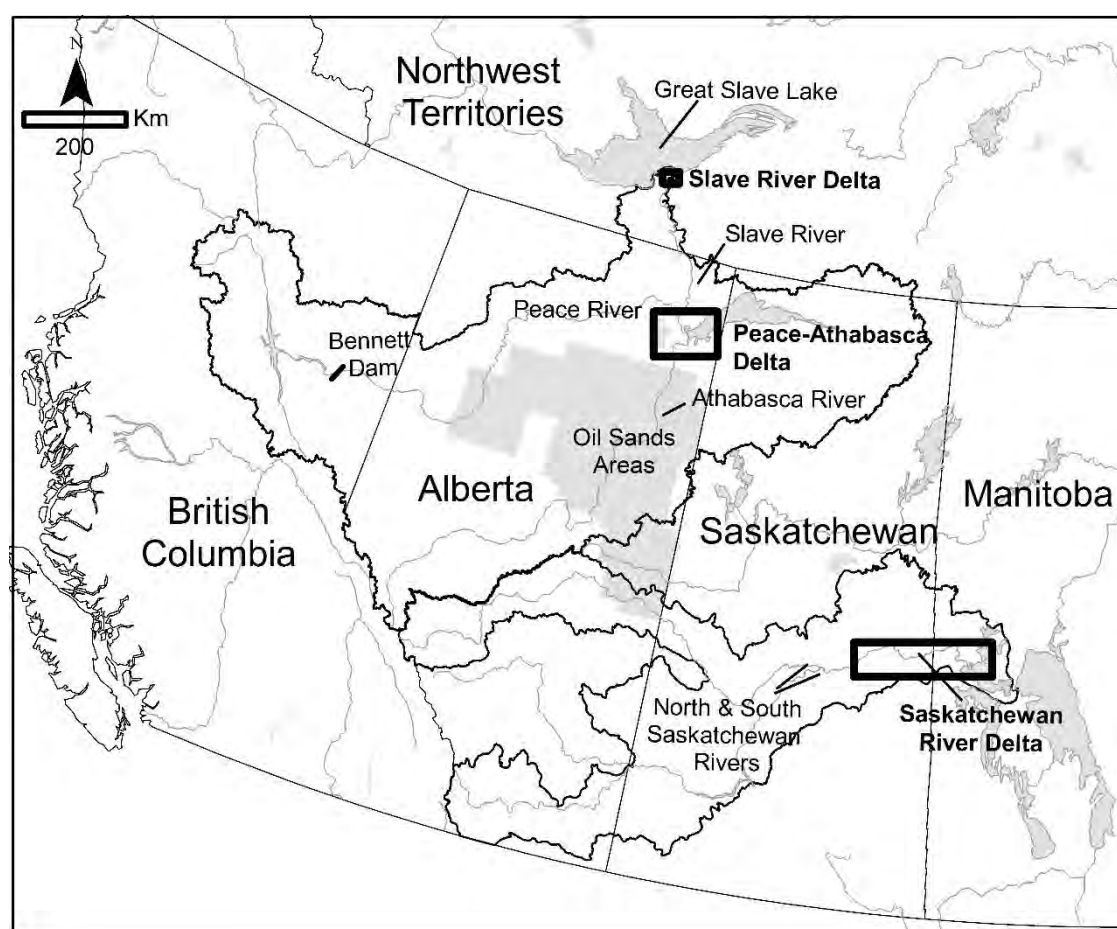
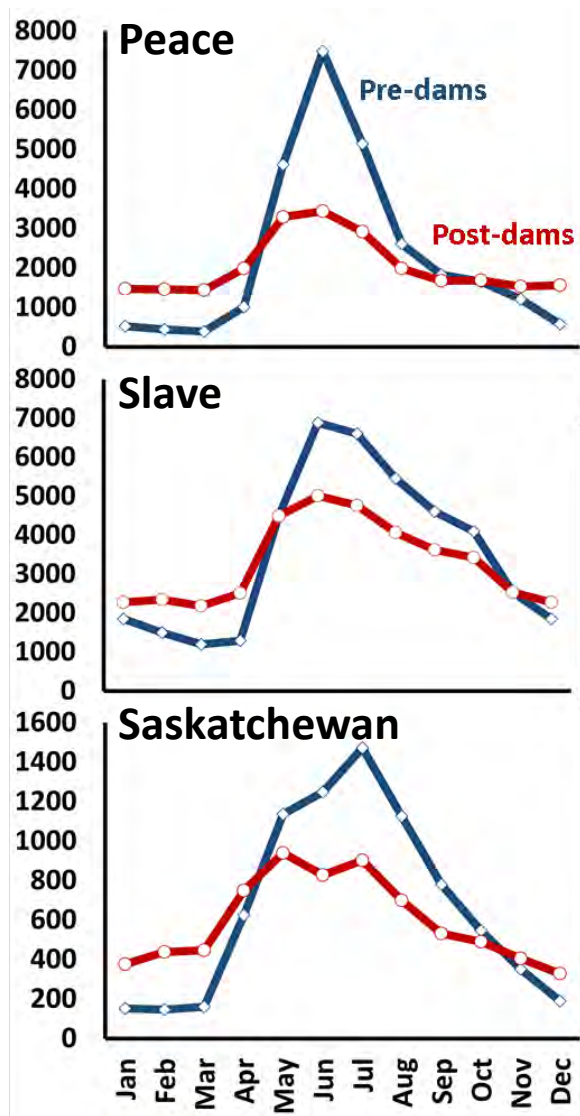
Scientific process





ELOHA steps 1-3

Discharge (m^3/s)



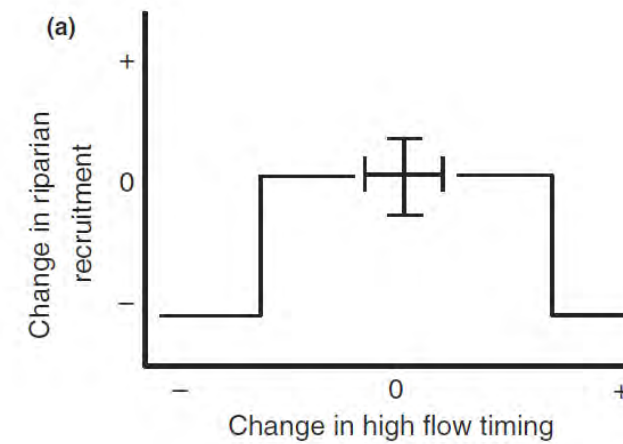
Proposed study reaches:
Inland deltas and floodplains

Objectives

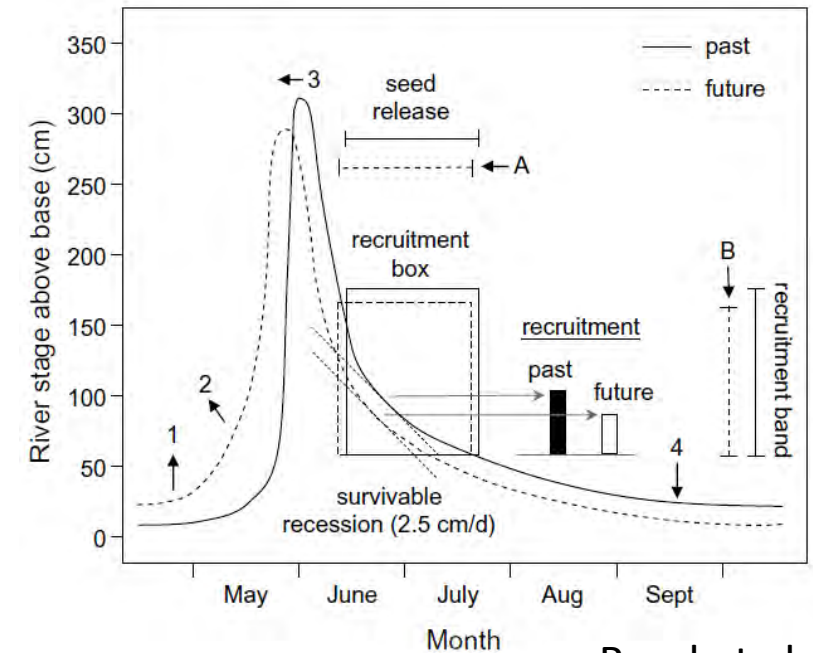
- Develop flow-ecology relationships
 - Species of special concern



- Mechanistic or process-based
 - Expert knowledge
-
- Develop rule curves for those relationships
-
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- Take outputs from water resource management models (Theme B1) to assess ecological implications
 - Current performance with existing management



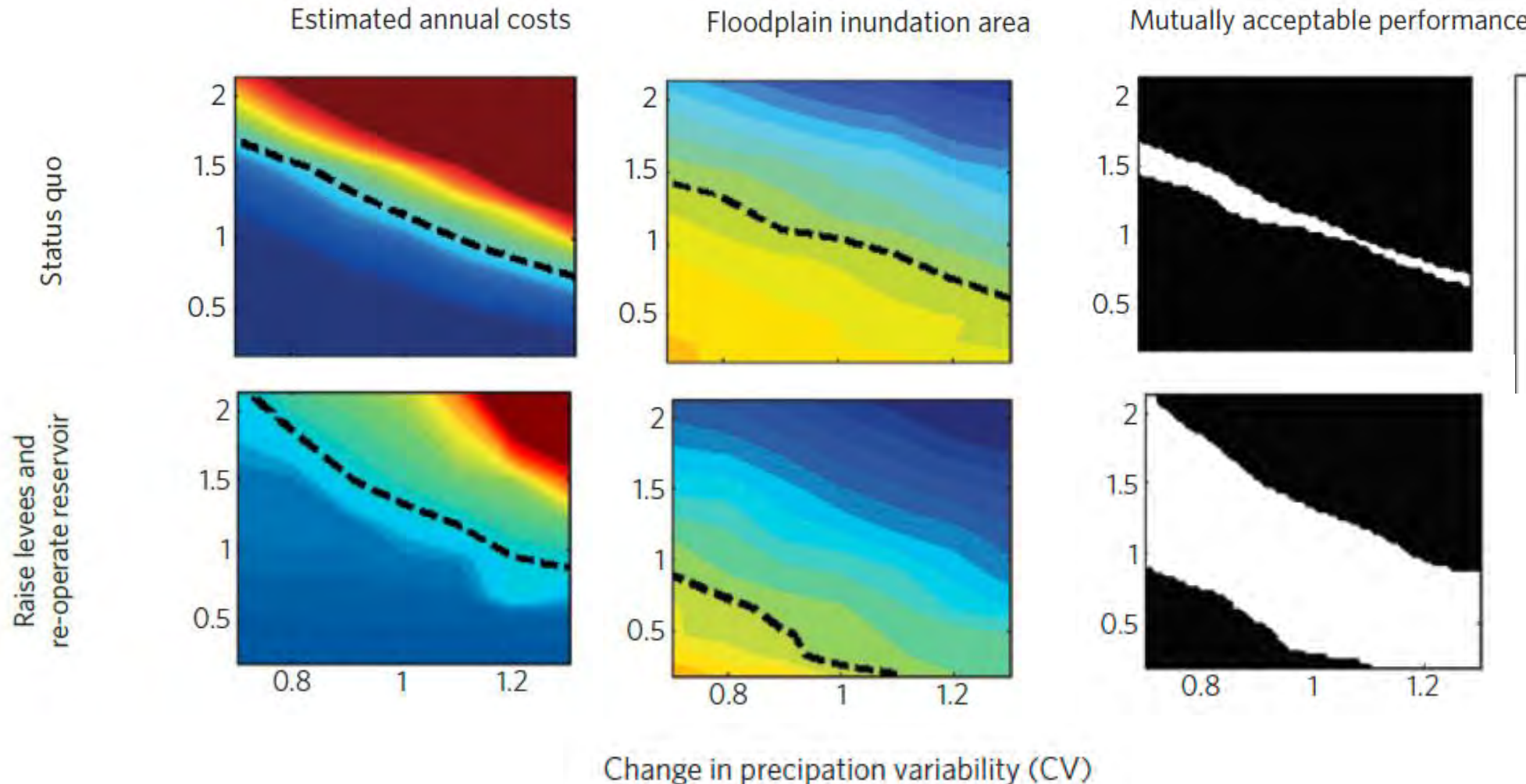
Poff et al. 2010



Rood et al. 2008

Objectives

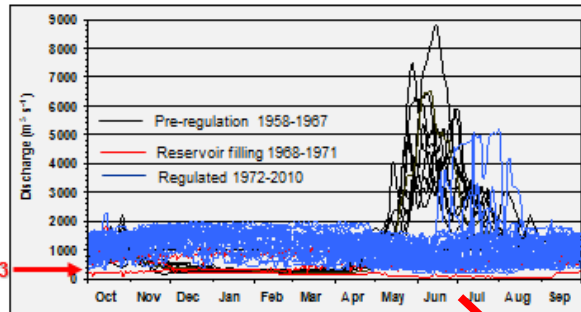
- Assess tradeoffs (future scenarios)
 - Future “acceptable” performance
 - Relative to economic and social objectives (Theme B3)



Environmental flows” – The quantity, quality and timing of water flows required to sustain freshwater & estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems.

Brisbane Declaration 2007 – global call to action

Peace River

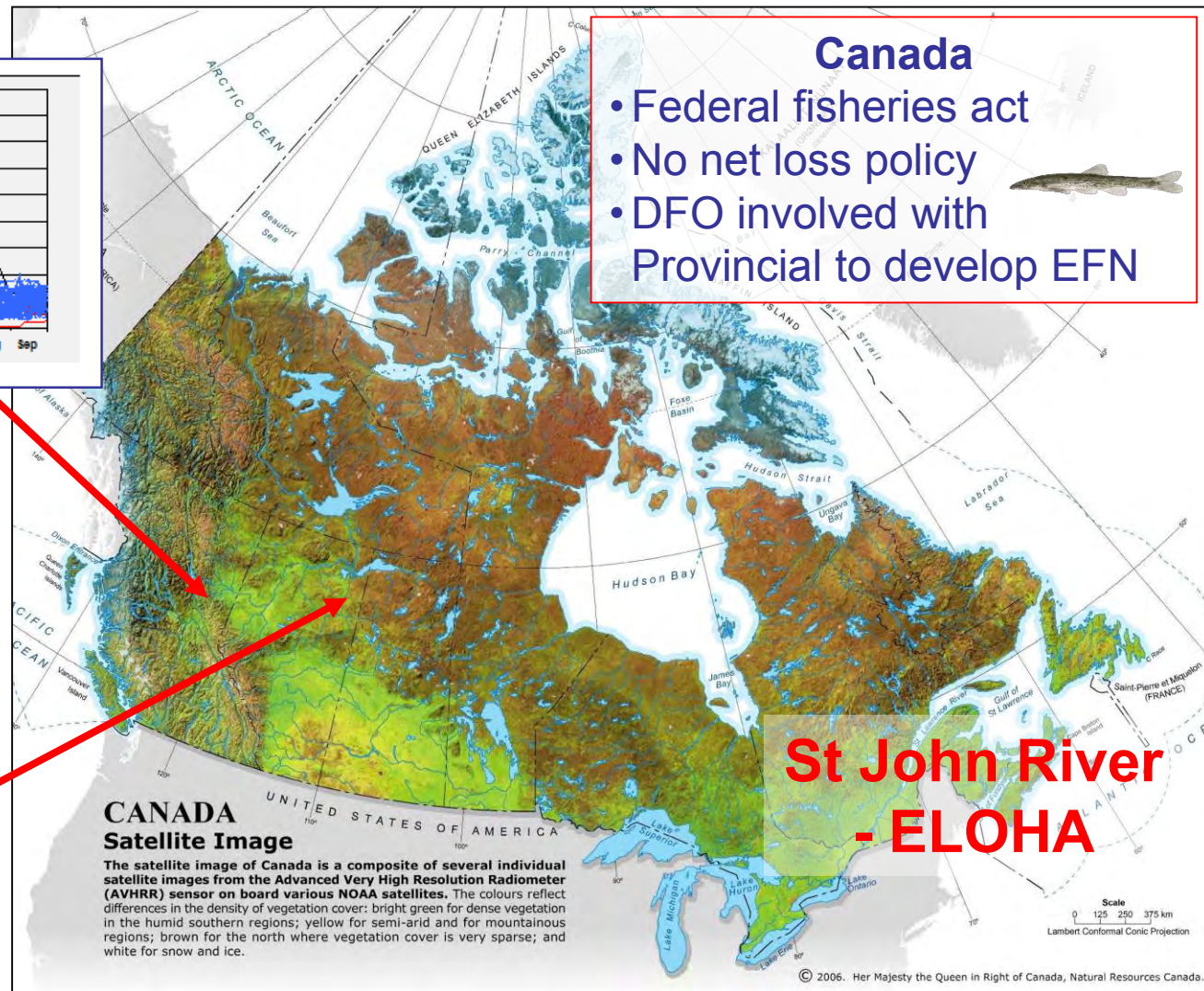
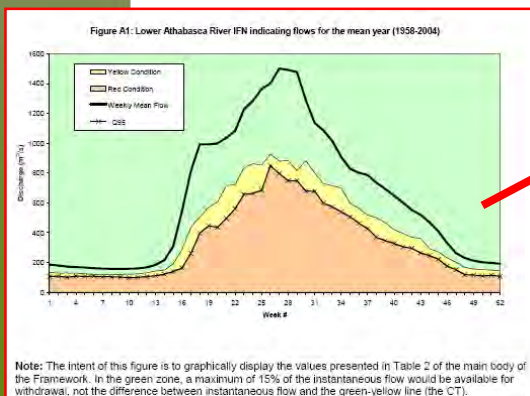


Canada

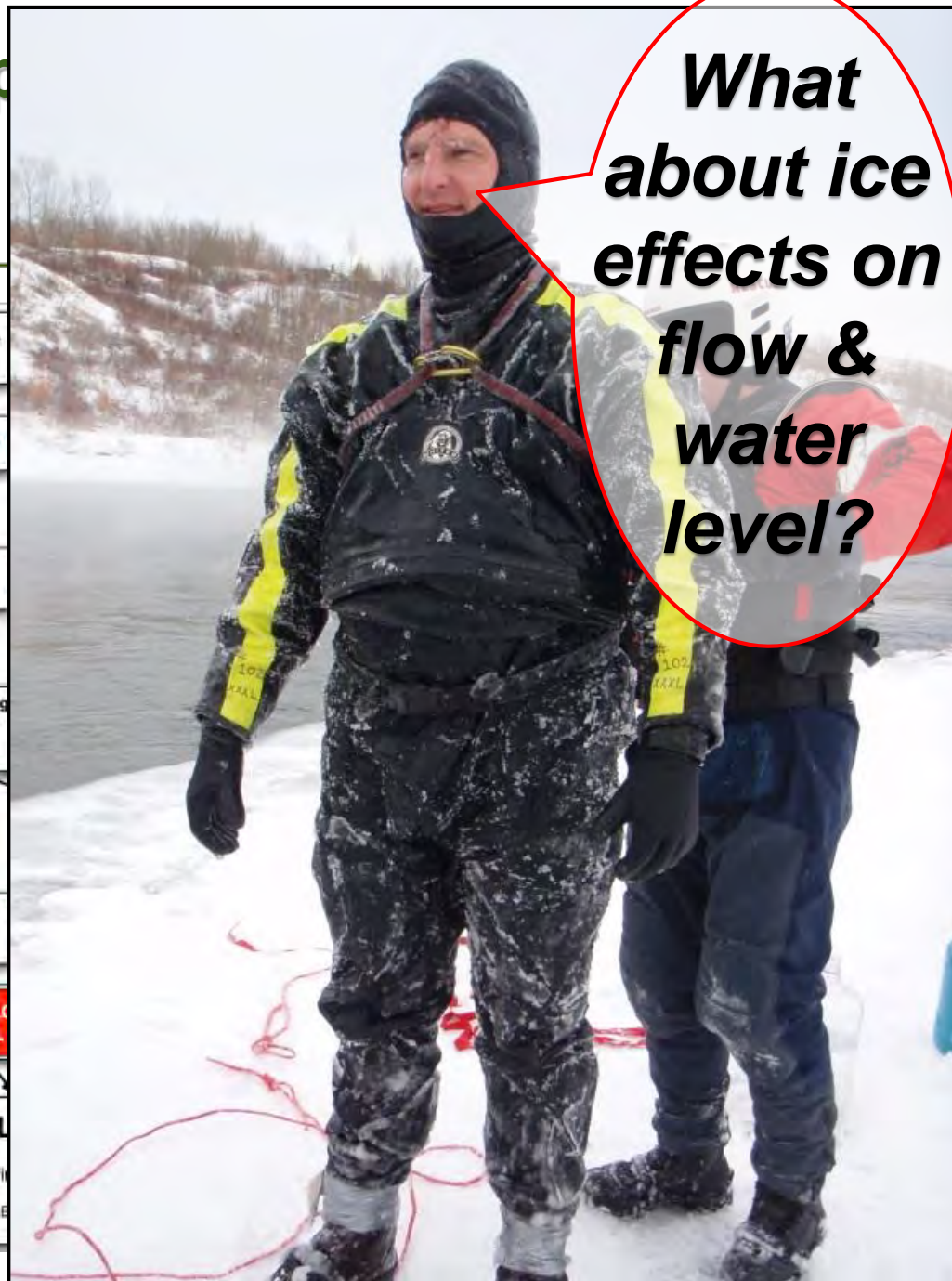
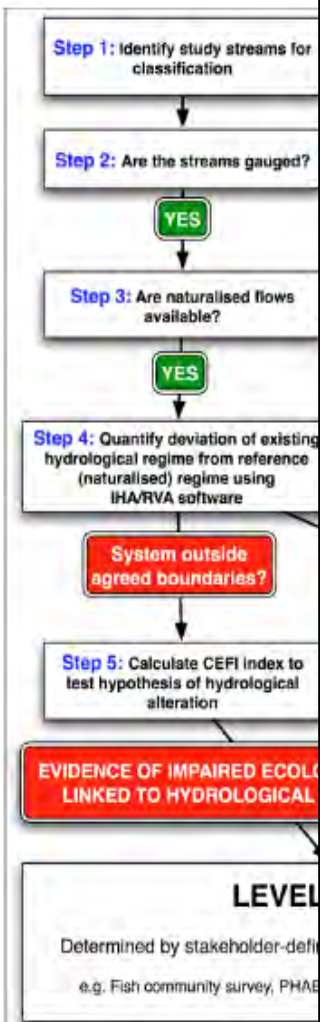
- Federal fisheries act
- No net loss policy
- DFO involved with Provincial to develop EFN



Athabasca River



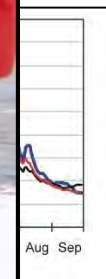
Prop



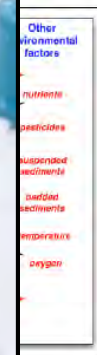
What about ice effects on flow & water level?

g and

an accepted alteration 80 to 120%

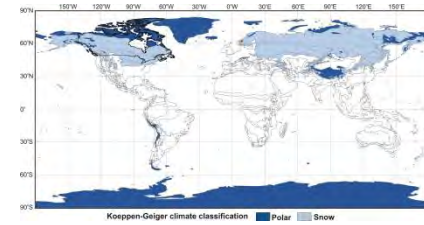


ple within O:E values reference CEFI complete.

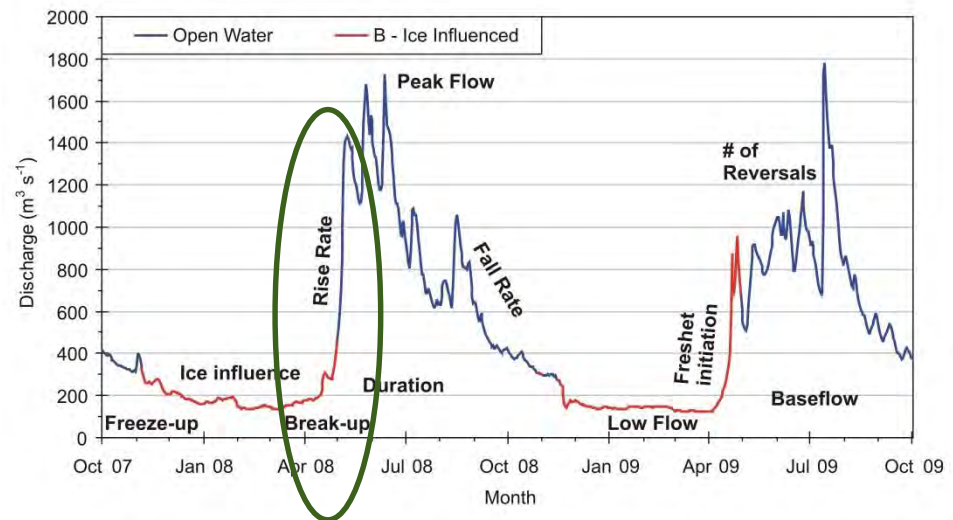
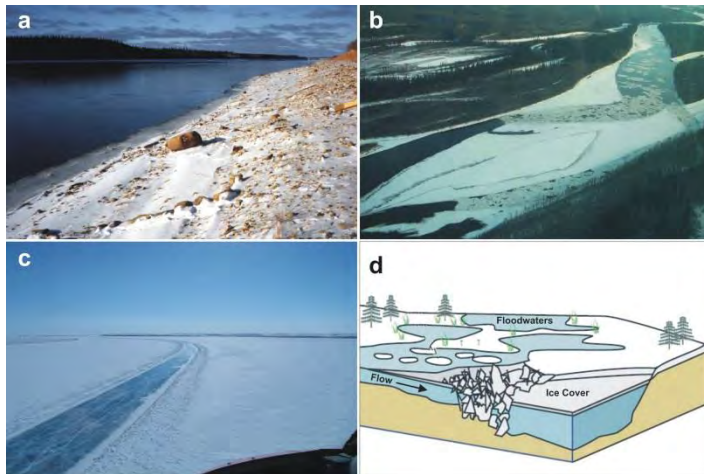


Cold-regions Hydrological Indicators of Change in Ecological Flow Assessments

Peters et al. 2014 Hydrological Sciences



- Cold-regions aquatic environments influenced by the timing and magnitude of the annual spring freshet and summer high flow resulting from snowmelt and rainfall, which generally follows an extended low-flow period over the winter months influenced by an ice cover

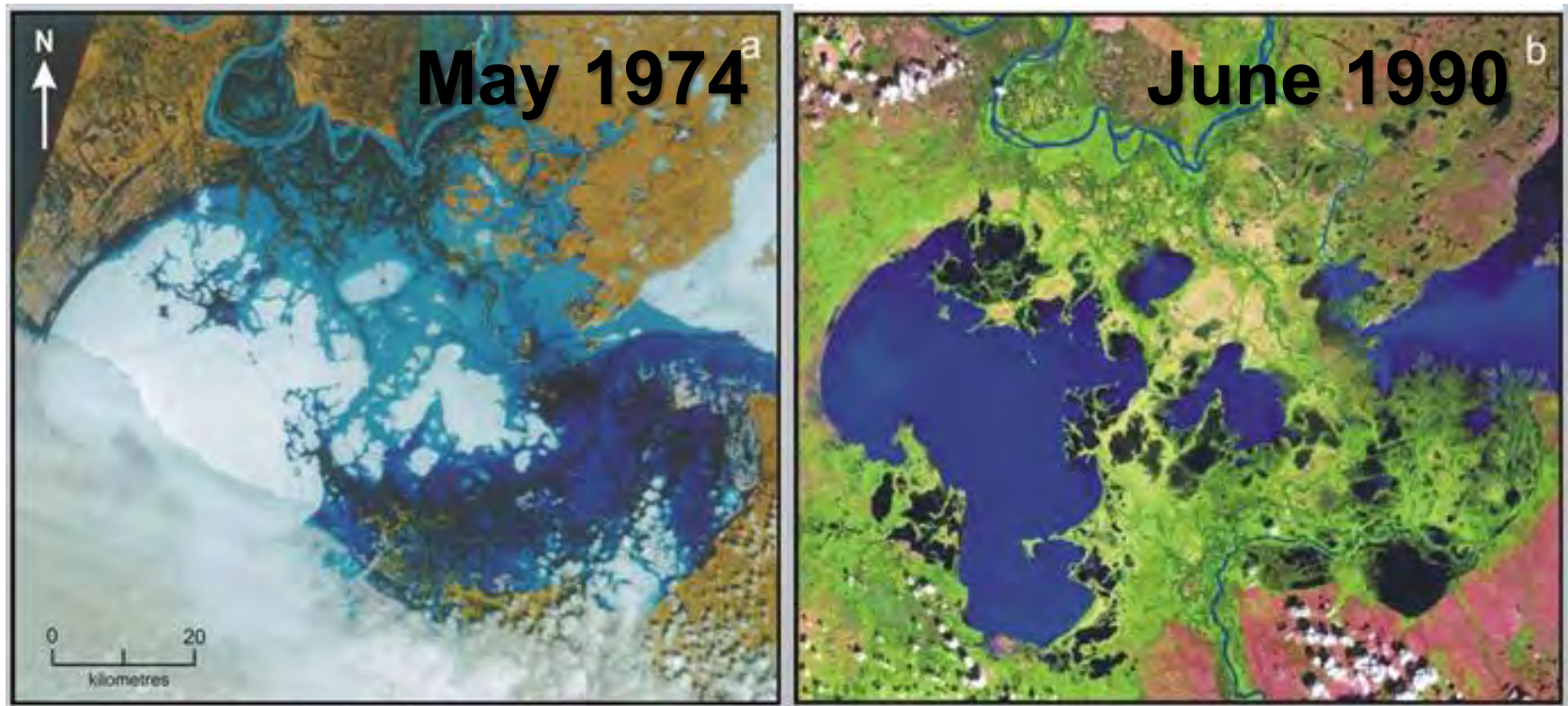


- ECCC developed suite of hydrological indicators specific for cold regions

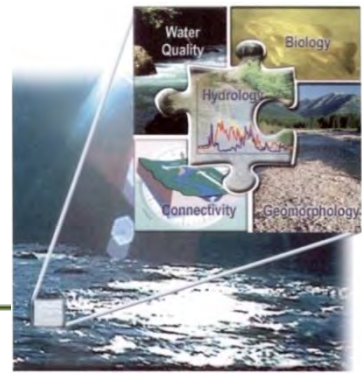
Connectivity to Floodplain

- EFN development and implications for downstream floodplain deltaic ecosystems – connectivity to wetlands

Example of Extreme Conditions: Peace-Athabasca Delta



Take Away Messages



- EFN approaches should consider the effects of ice on riverine and floodplain/deltaic environments
 - Existing CHIC tools easily incorporated into hydrological models
- EFN guidelines consider the impacts of climate variability/change on the timing and magnitude of flows/water levels.
- Assess feasibility of water management approaches to occasionally enhance/restore flow/level conditions to maintain ecosystems
- Caution should be exercised when using hydrological models for development of EFN guidelines
 - need to assess model ability to replicate important hydrological indicators (timing and magnitude)
 - eg. Shrestha et al. 2014 Hydrol. Proc. VIC Model Fraser River Basin