

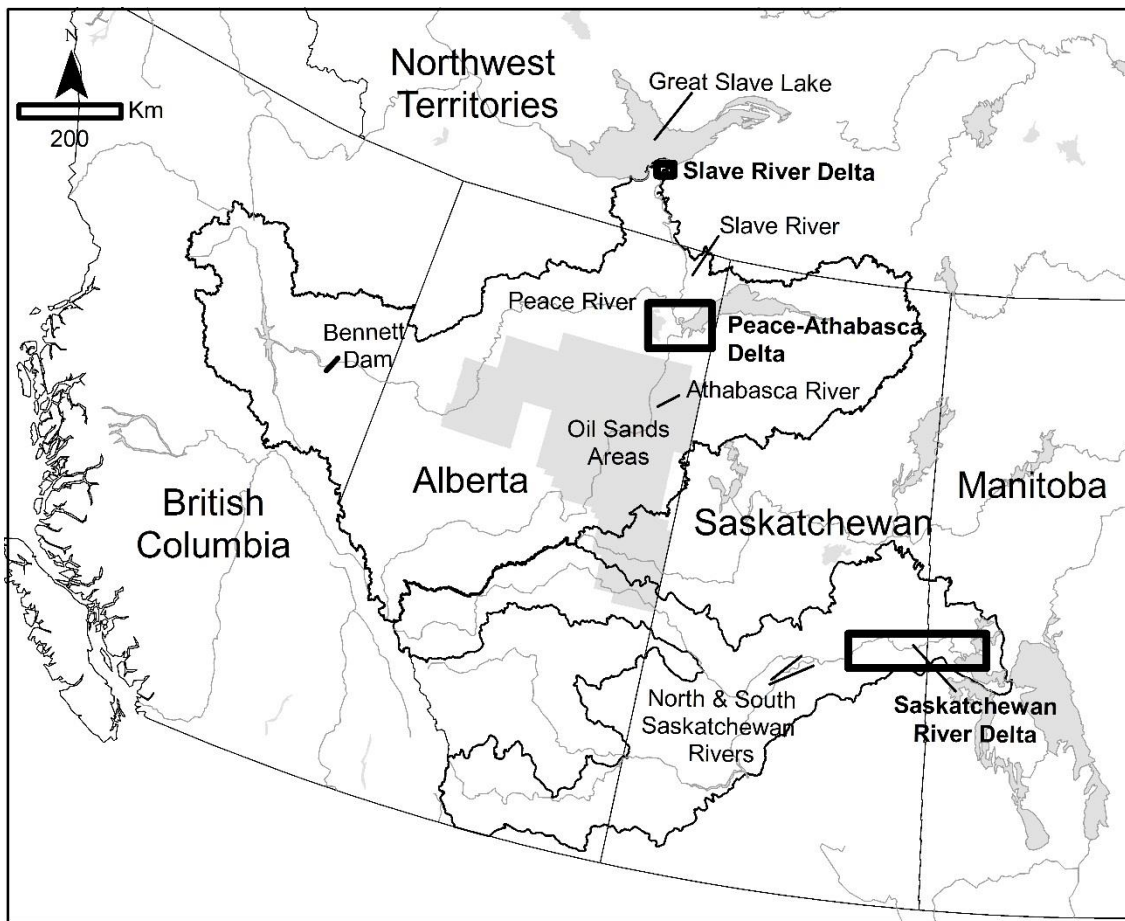
Environmental Flows and Hydro- Ecologic Metrics (B2): Flow needs for large river ecology

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Environmental Flows

Environmental flows describe the quantity, timing, and quality of freshwater flows and levels necessary to sustain aquatic ecosystems which, in turn, support human cultures, economies, sustainable livelihoods, and well-being.

The goal of environmental flow management is to protect and restore the socially valued benefits of healthy, resilient, biodiverse aquatic ecosystems and the vital ecological services, economies, sustainable livelihoods, and well-being they provide for people of all cultures.



Lower flow

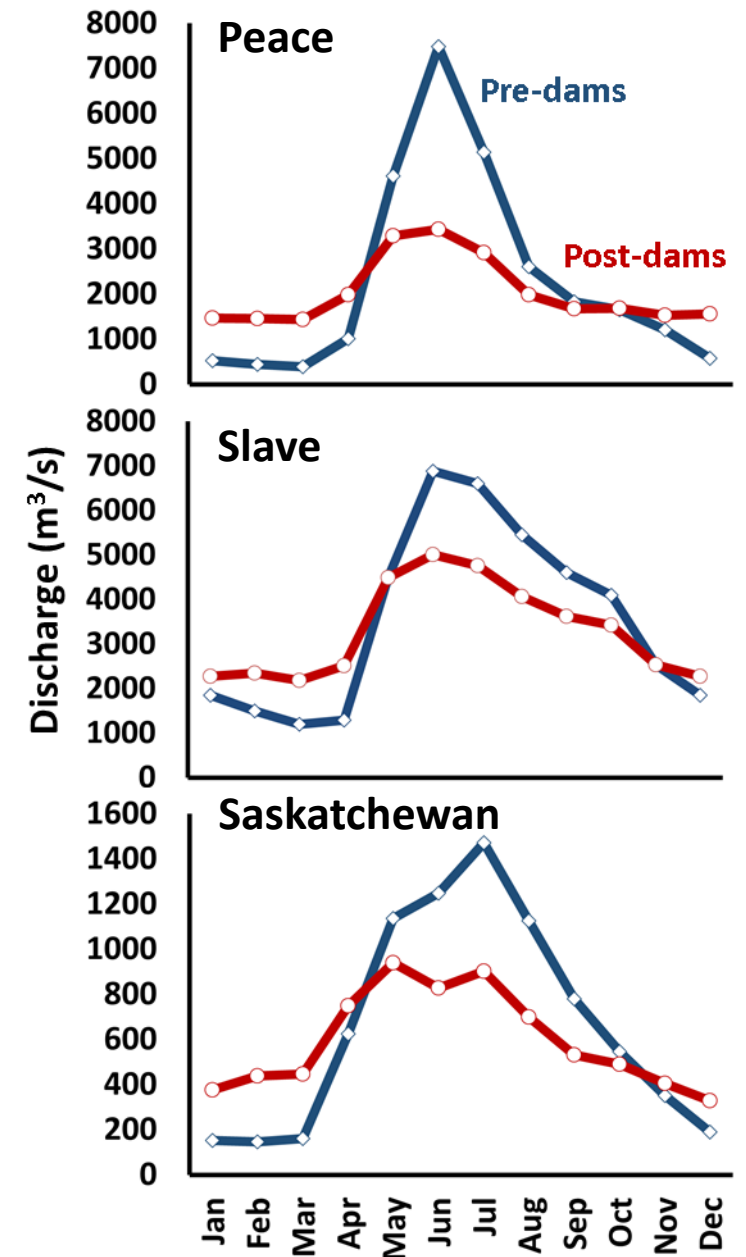
Change in seasonality

Less lateral connectivity

"The Peace Athabasca Delta is Mikisew's life source"
Melanie Dene, Fort Chipewyan, AB

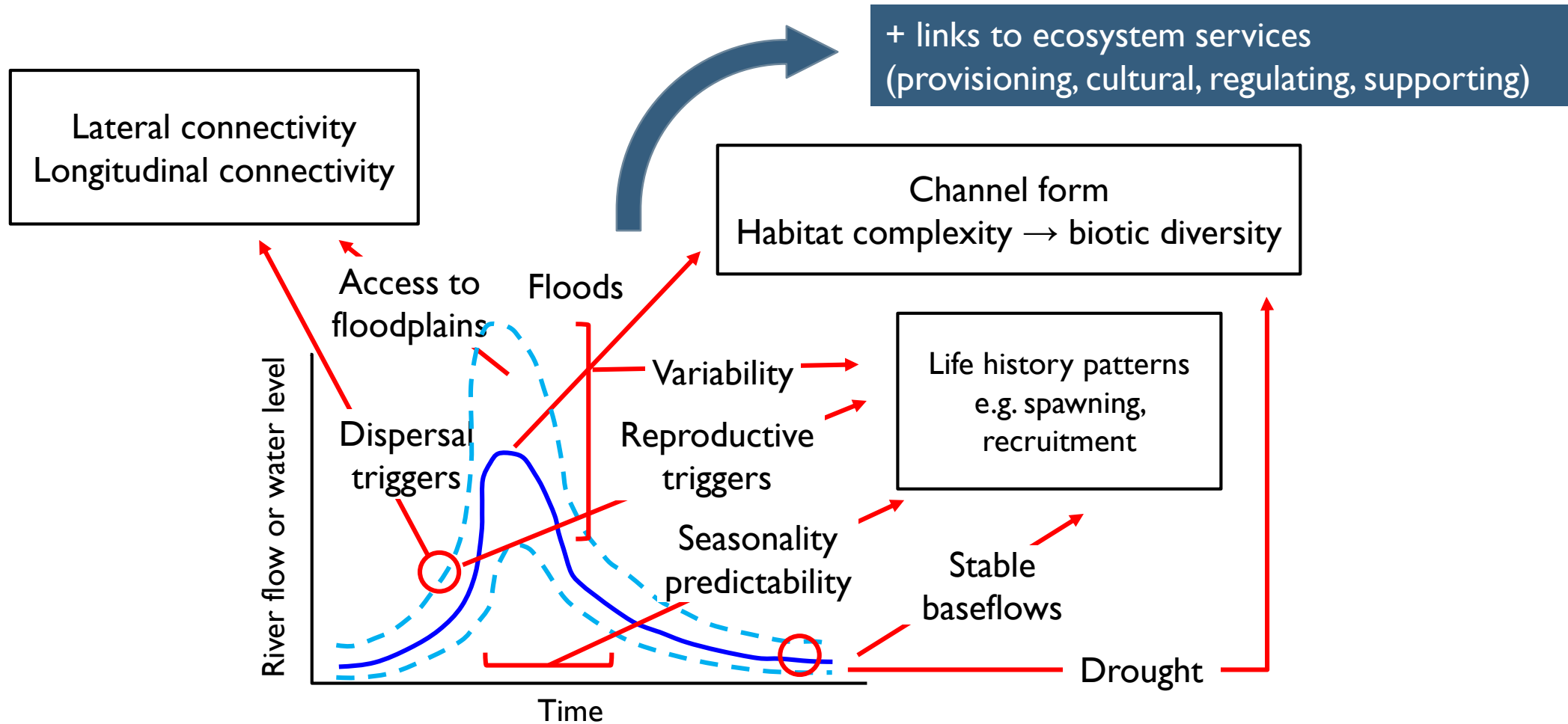
"The hunters and trappers now are probably 10% of the number that was there before"
Brad Laviolette, Fort Smith, NWT

"If the deltas are healthy, the people will be healthy"
Gary Carriere, Cumberland House, SK



The message from Delta people: *Bring back nature's flow to restore our deltas' rhythms*

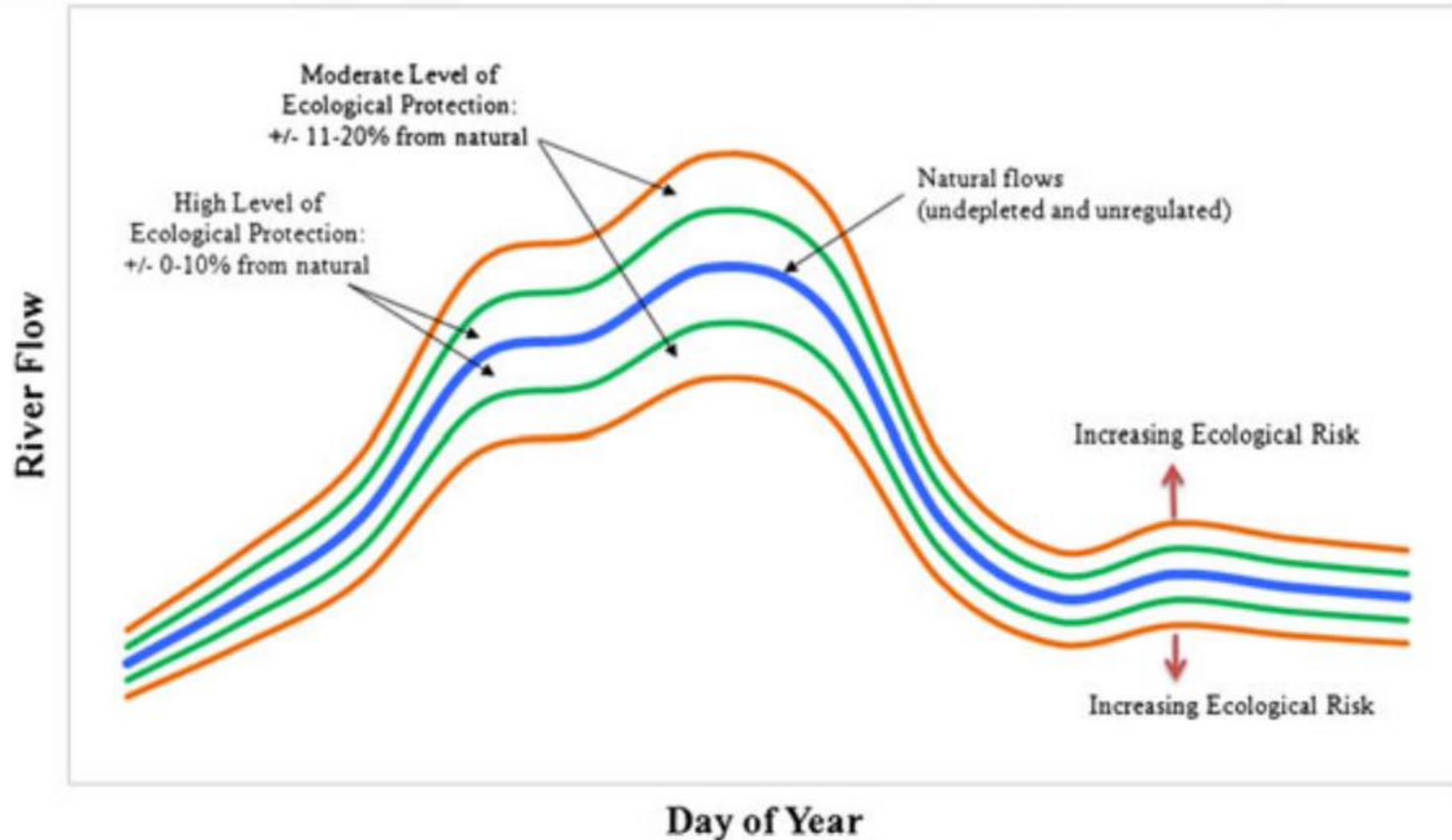
Linking changing flows and levels with our ecosystem



Adapted from
Bunn and Arthington, 2002



Current performance - Presumptive Standards

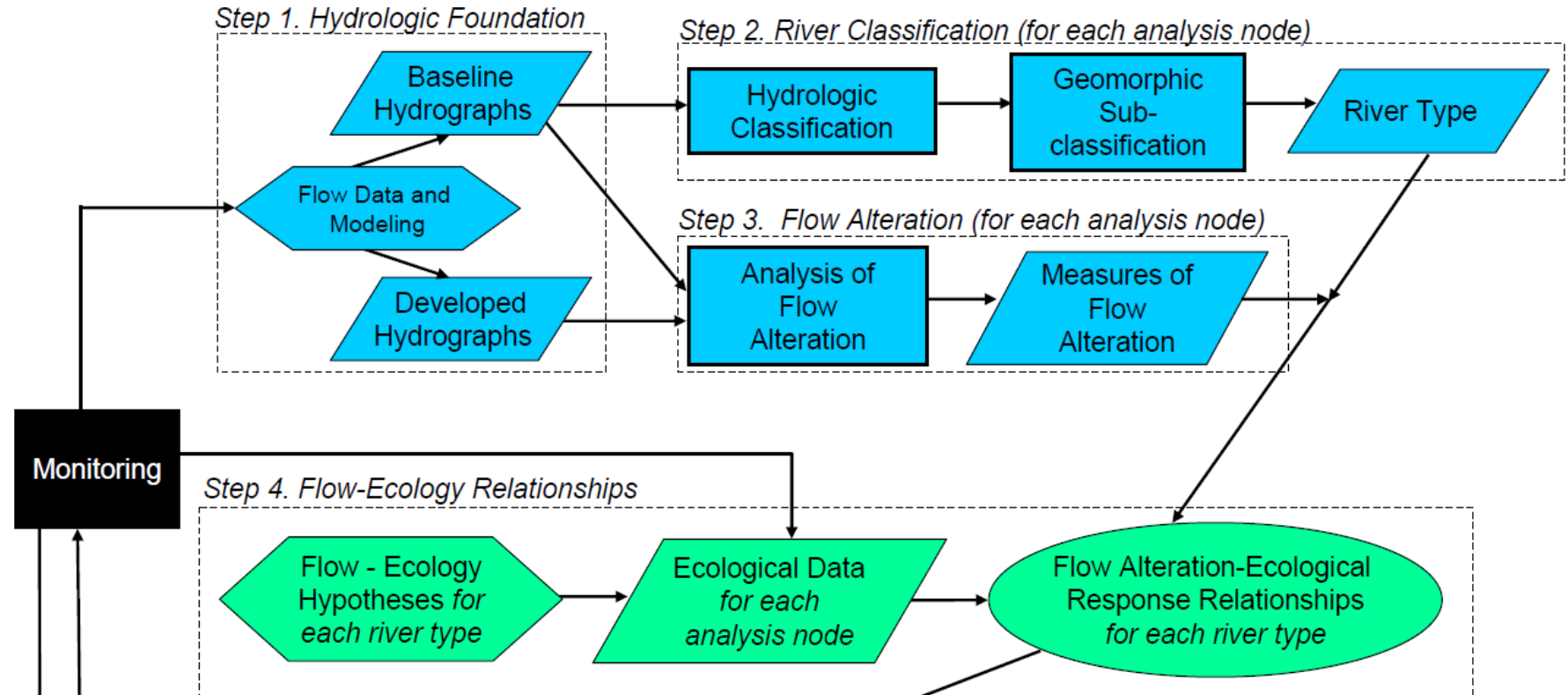


Standards can be defined for acceptable flow

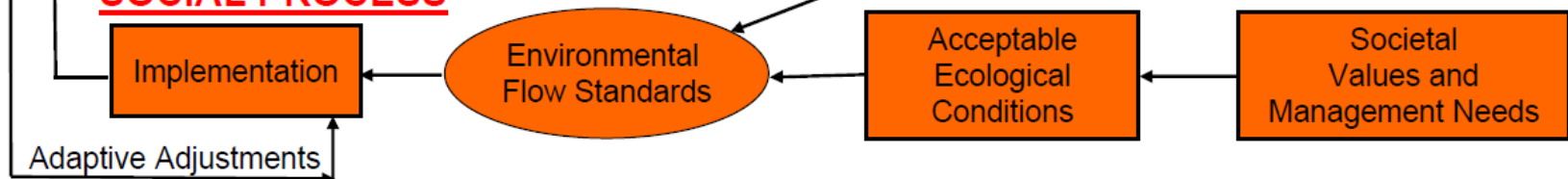
The greater the deviation, the greater the ecological risk

ELOHA (Ecological Limits of Hydrological Alteration)

SCIENTIFIC PROCESS



SOCIAL PROCESS



IMPC environmental flows - objectives

- Develop flow-ecology relationships

- Species of special concern

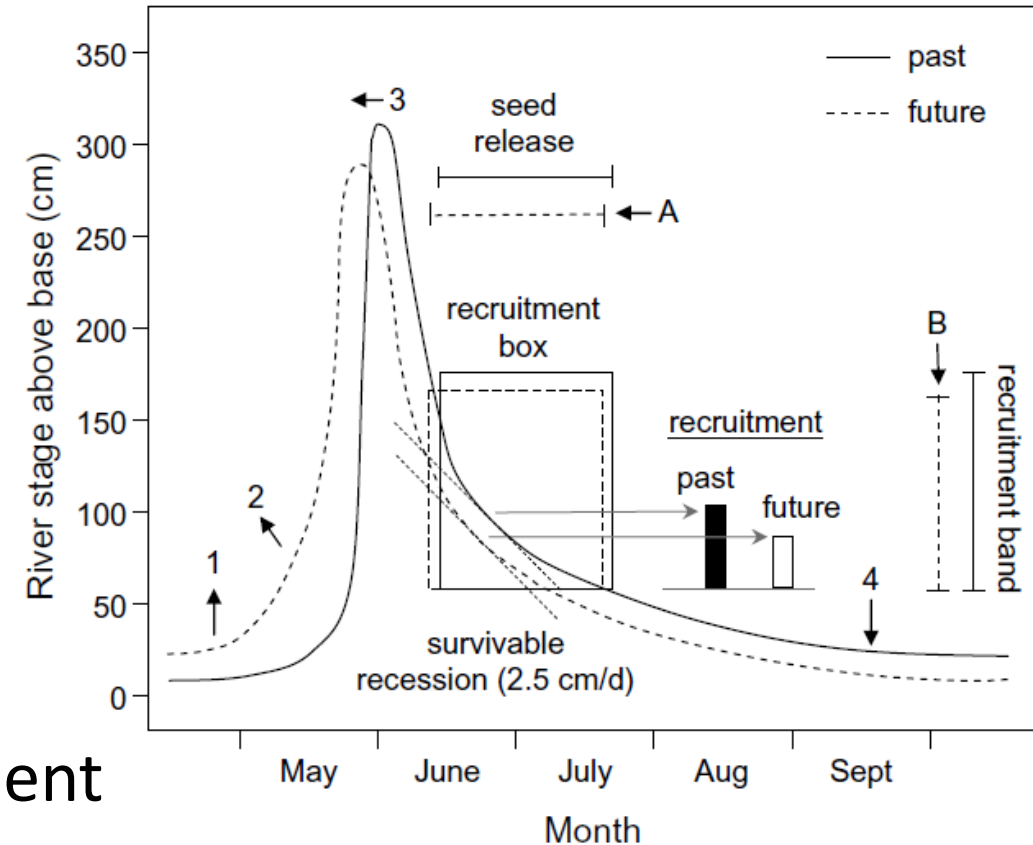


- Mechanistic or process-based
 - Expert knowledge

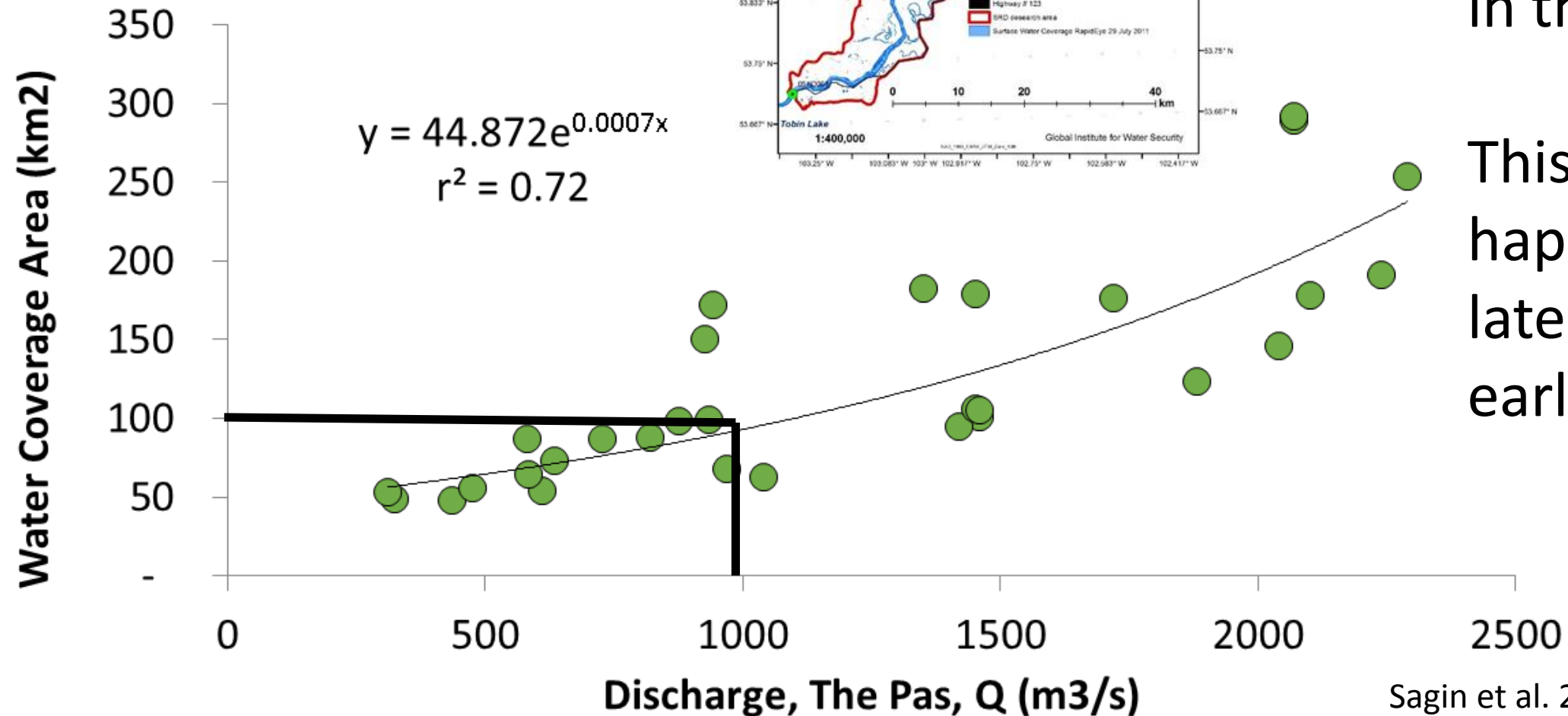
- Develop rule curves for those relationships

- Take outputs from water resource management models to assess ecological implications

- Current performance with existing management



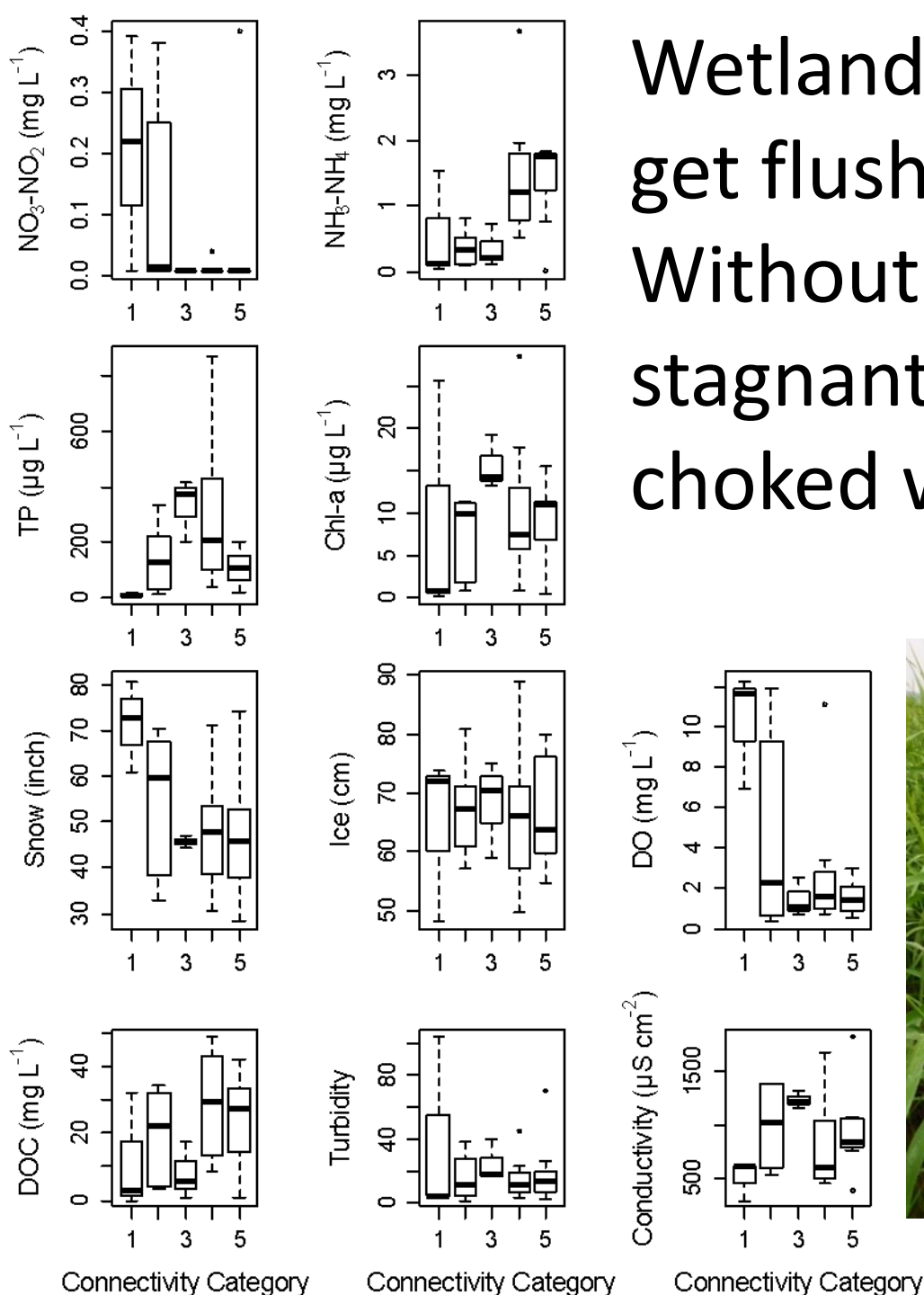
Example: Lake Sturgeon



Above ~1000 m³/s, extensive flooding occurs in the delta

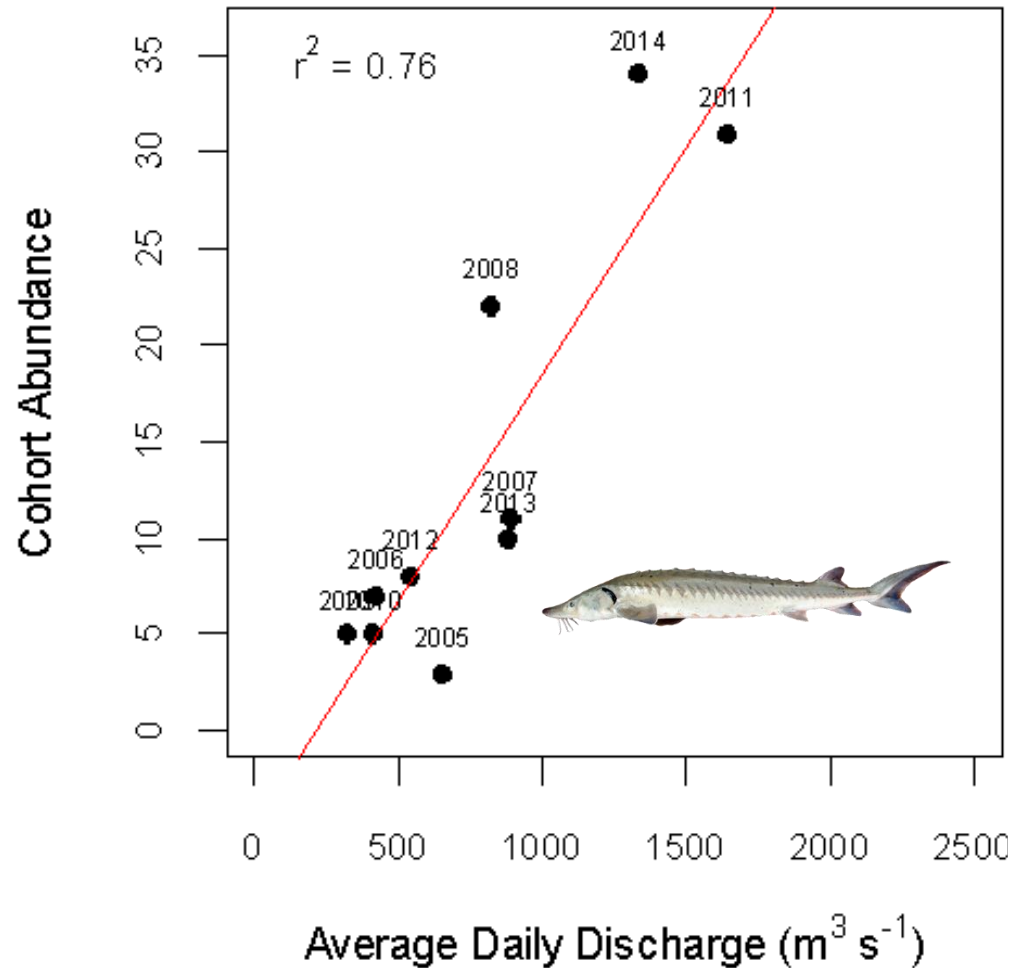
This normally happens in the late spring or early summer

Wetlands in categories 4 and 5 only get flushed when $Q > 1000 \text{ m}^3/\text{s}$. Without flushing, they become stagnant, dry up entirely, or get choked with invasive Phragmites



Mackinnon et al. 2015 Can J Fish Aquat Sci

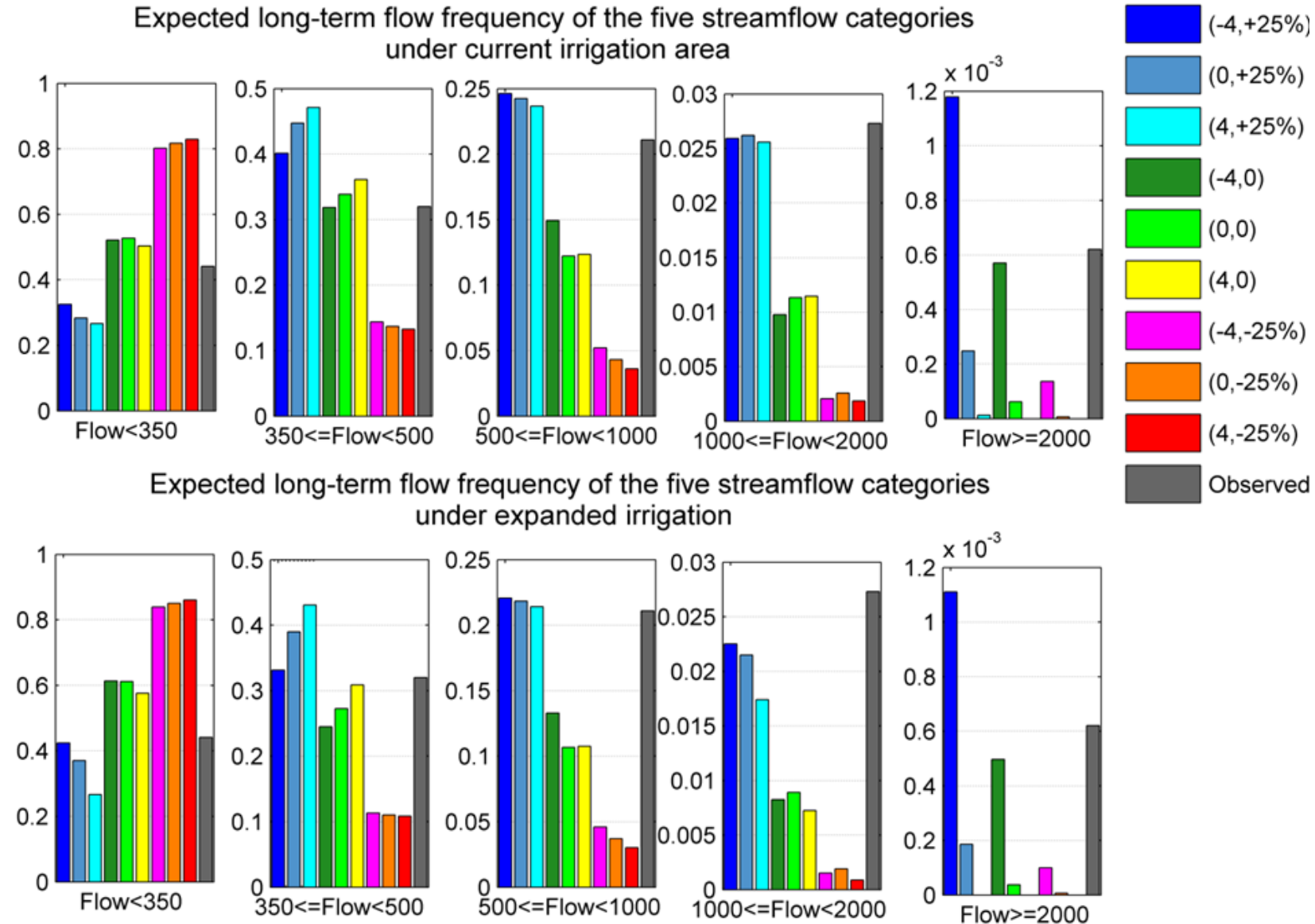
Endangered lake sturgeon have better juvenile survival when flows are $>1000 \text{ m}^3/\text{s}$ during spring



This provides a very clear target for flow releases from Gardiner and EB Campbell Dams

What does the future hold?

- Develop flow-ecology relationships under current conditions
- Develop and test flow hypotheses
- Assess future scenarios
 - Future “acceptable” performance
 - Relative to economic and social objectives



Acknowledgments

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