Wooded Boreal Fens: An Ecoregional Perspective

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Outline

- Ecoregions & Conservation
- Peatlands: Threats & Importance
- Boreal Wooded Fens: A Case Study
- Ecoregional Conservation Implications

Ecoregions

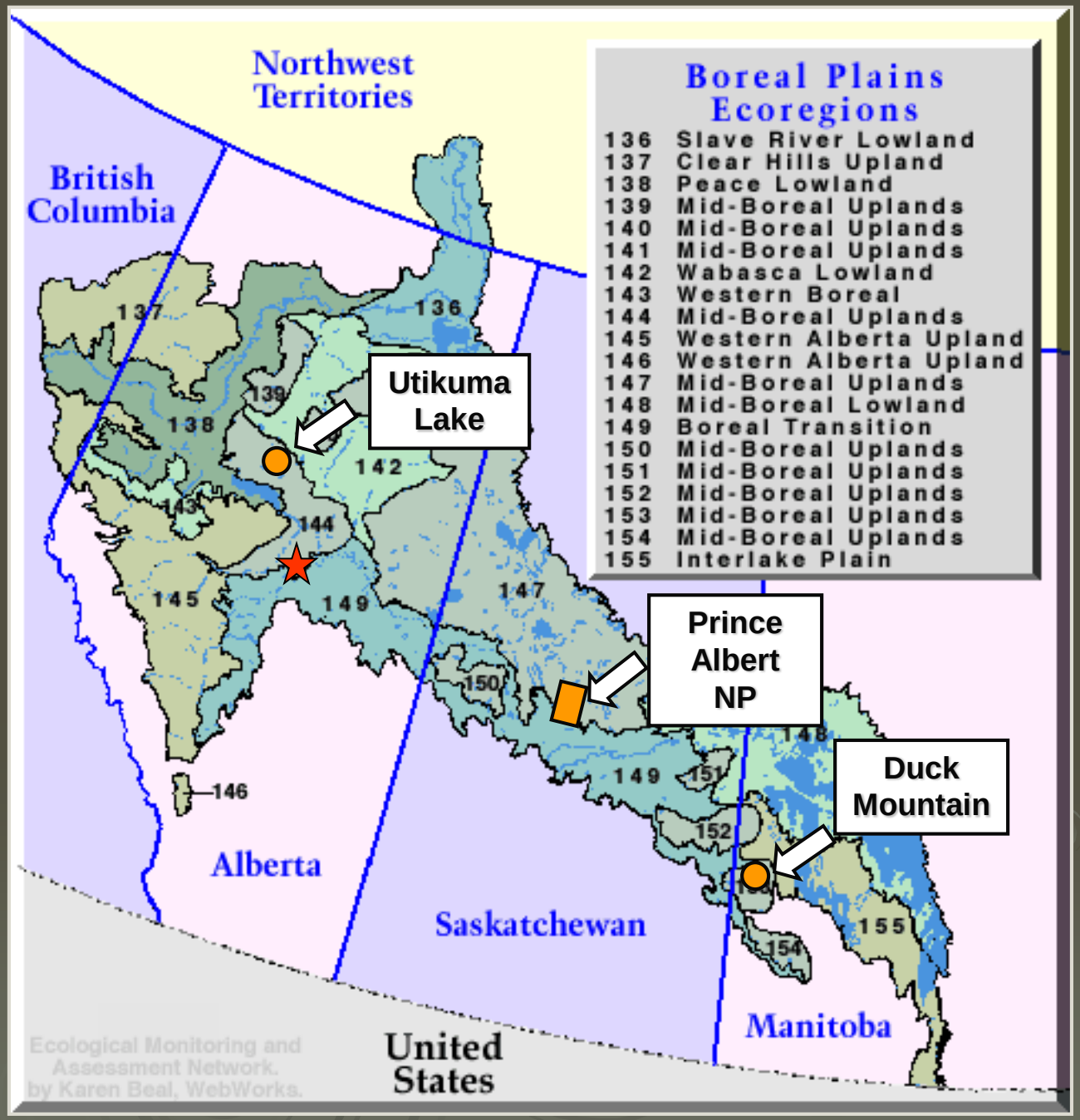
- Large enough to encompass natural processes (fire & flooding) & capture representative plant and animal species, & natural communities
- …yet small enough to serve as platforms for conservation planning and action

Ecoregions & Conservation

- More ecologically relevant planning unit than political boundaries
- Standard tool for conservation planning from local to continental scales - speed things up...
  - Nature Conservancy
  - World Wildlife Fund
  - USEPA
- Suitable for peatlands?

Boreal Plains Ecoregions

- Mid-Boreal Uplands Ecoregion: comprised of 10 Ecodistricts
- Study sites in Mid-Boreal Uplands Ecoregion: within 3 Ecodistricts



Adapted from the Ecological Monitoring and Assessment Network

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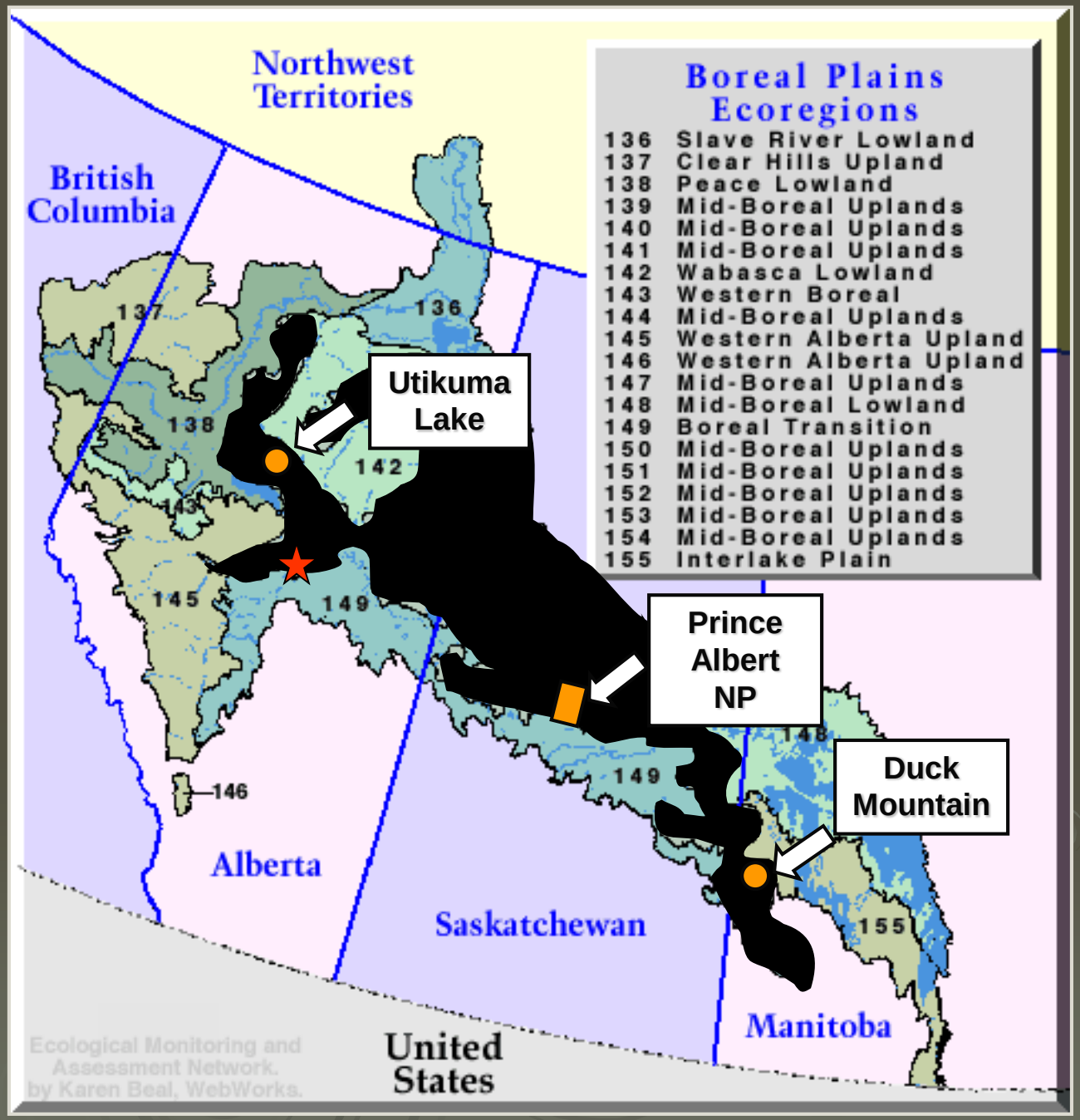

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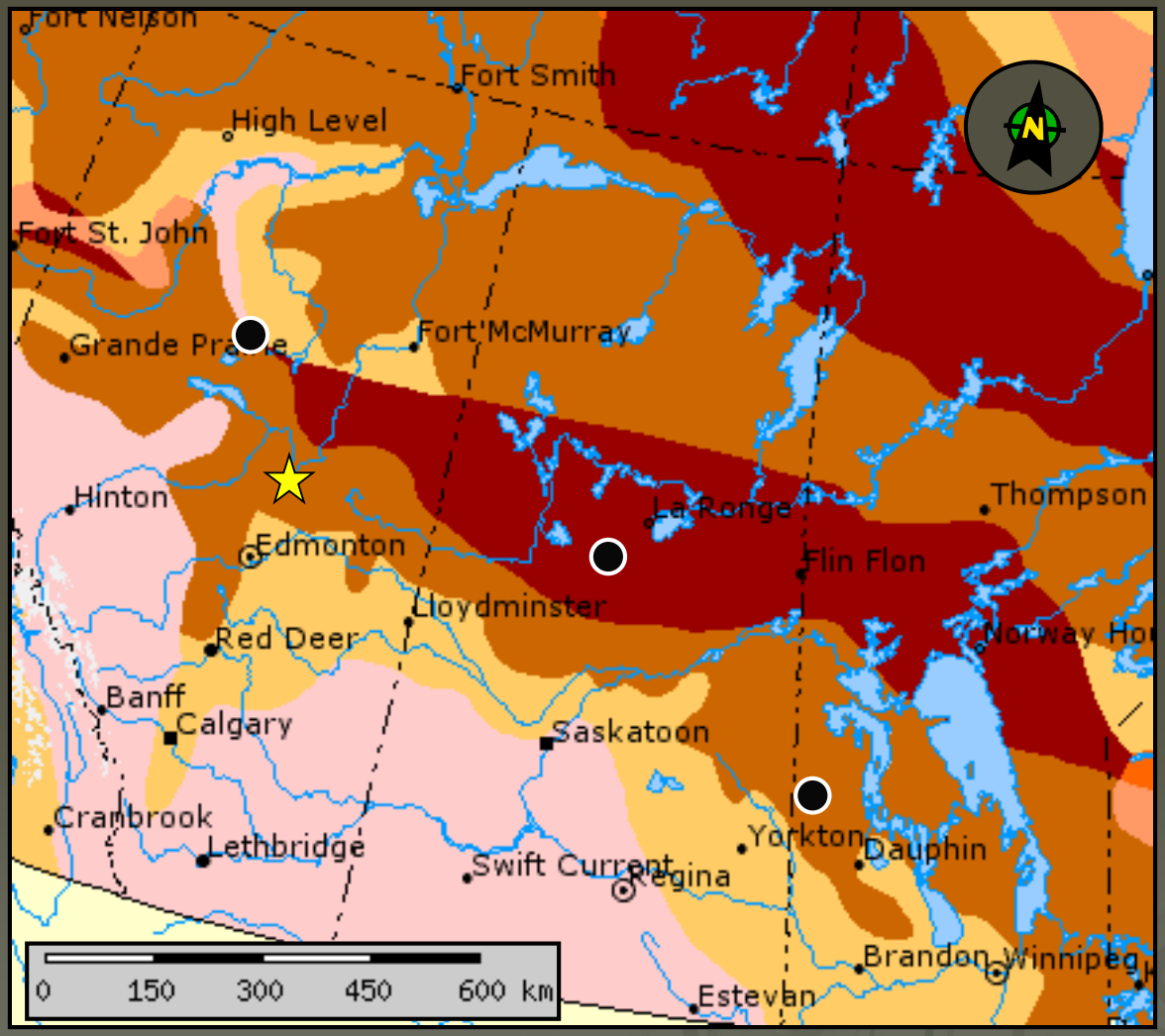
Peatland Threats: Direct

Peatland Threats: Indirect



Sensitivity Level

- No Change
- Very Slight
- Slight
- Moderate
- Severe
- Extremely Severe

The Atlas of Canada (1999)

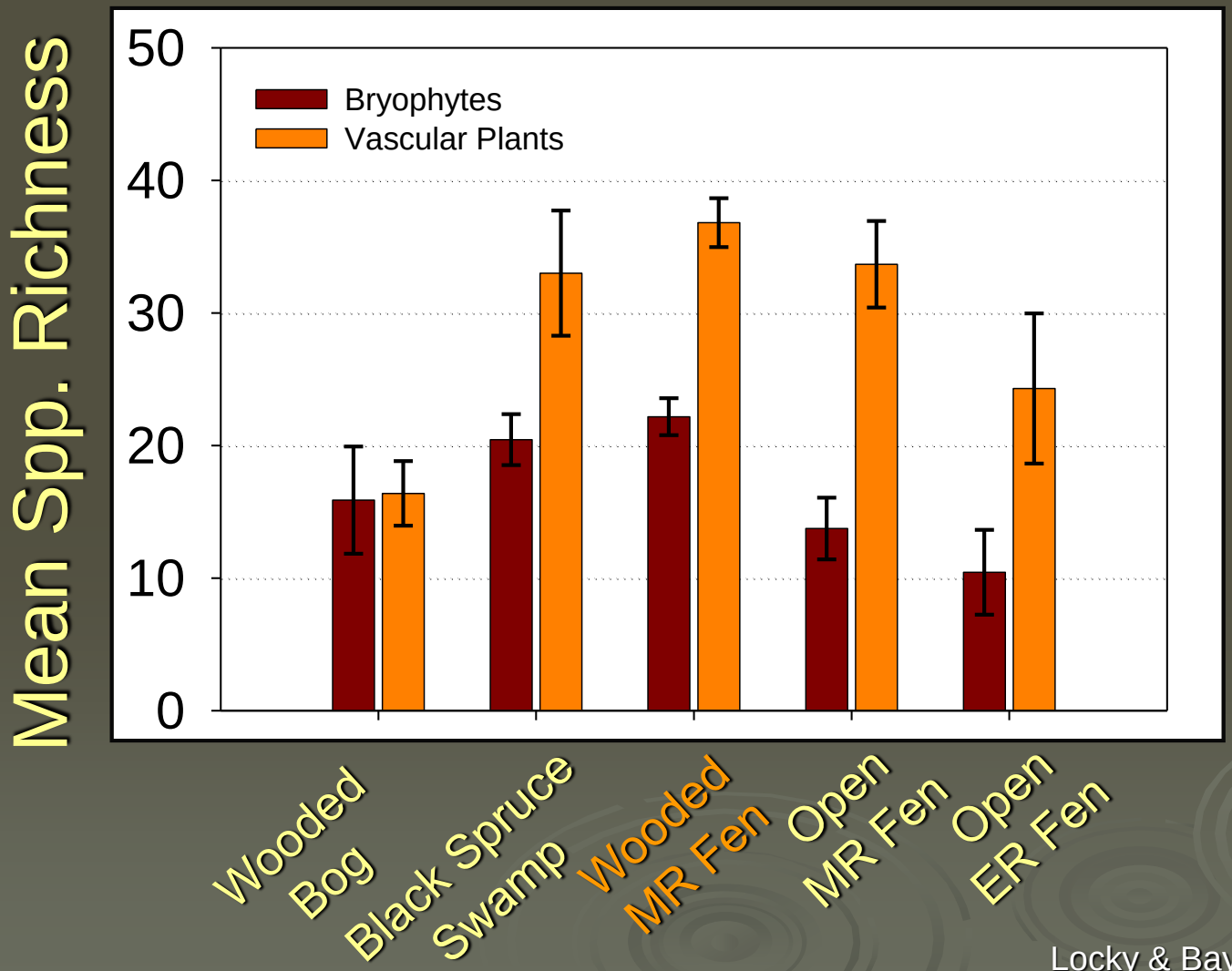
Importance of Peatlands

- BIODIVERSITY: Species diversity may be lower, but peatlands have a higher proportion of characteristic species than upland ecosystems in the same biogeographic zone

Importance of Peatlands

- Effects on biodiversity extend far beyond their borders:
  - maintain hydrological & microclimate features of adjacent areas
  - provide temporary habitats or refuge areas for upland species - can mitigate fragmentation

Plant Diversity in Boreal Peatlands



Dragon's Mouth
S2

White Adder's Mouth
S2

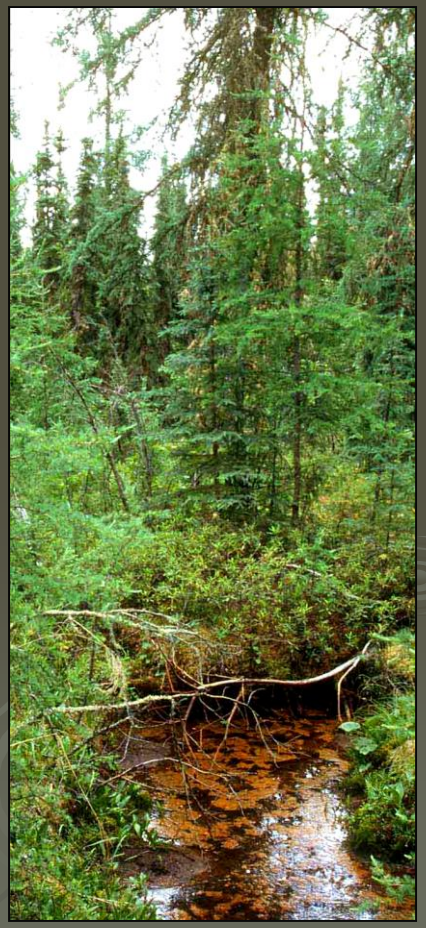
Bog Adder's Mouth
S1

Locky & Bayley 2006


Wooded Moderate-rich Fen

Case Study: Western Boreal Fens

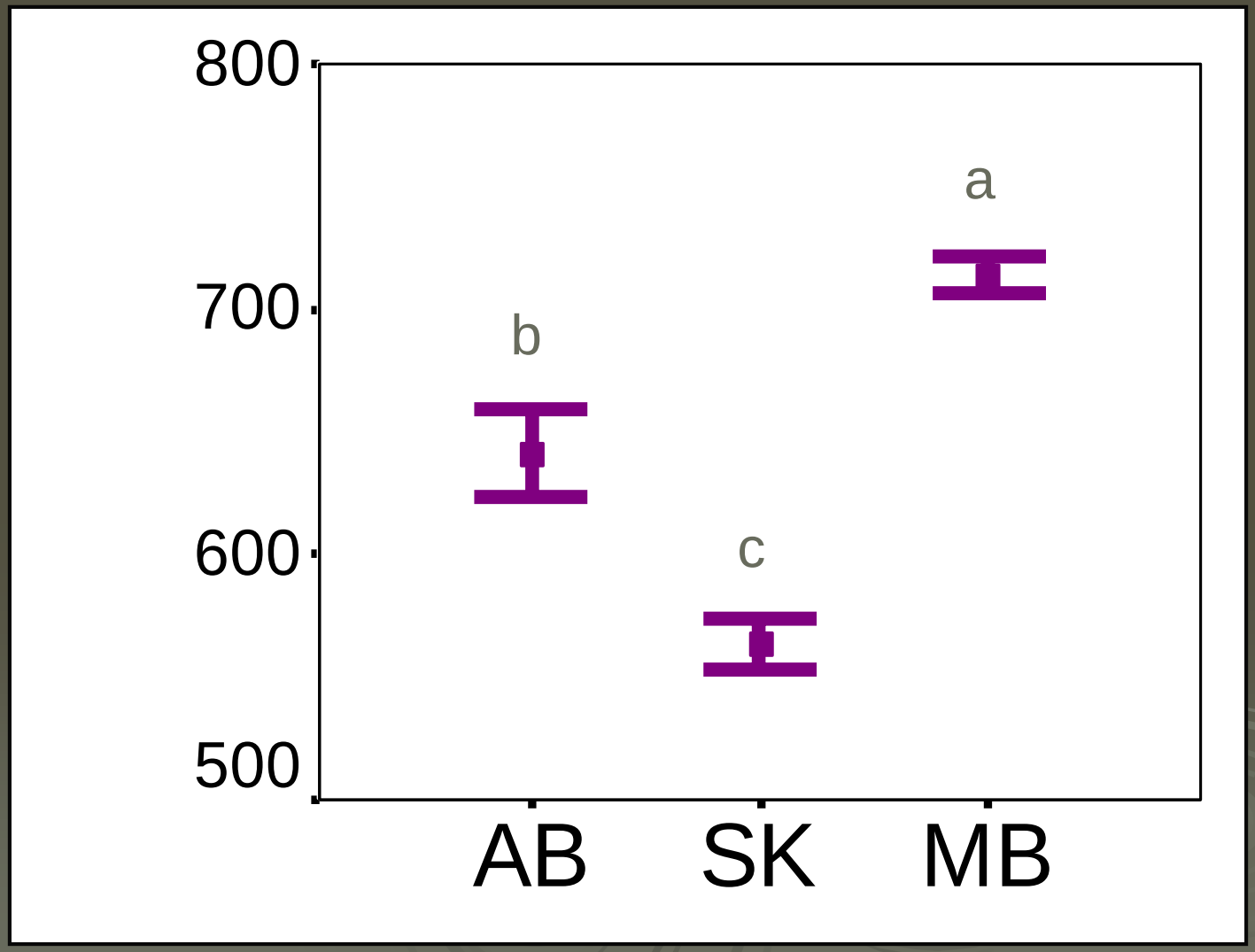
Examine patterns in the environmental factors and plant community in wooded moderate-rich fens along a longitudinal & a latitudinal transect within the Mid-Boreal Uplands Ecoregion



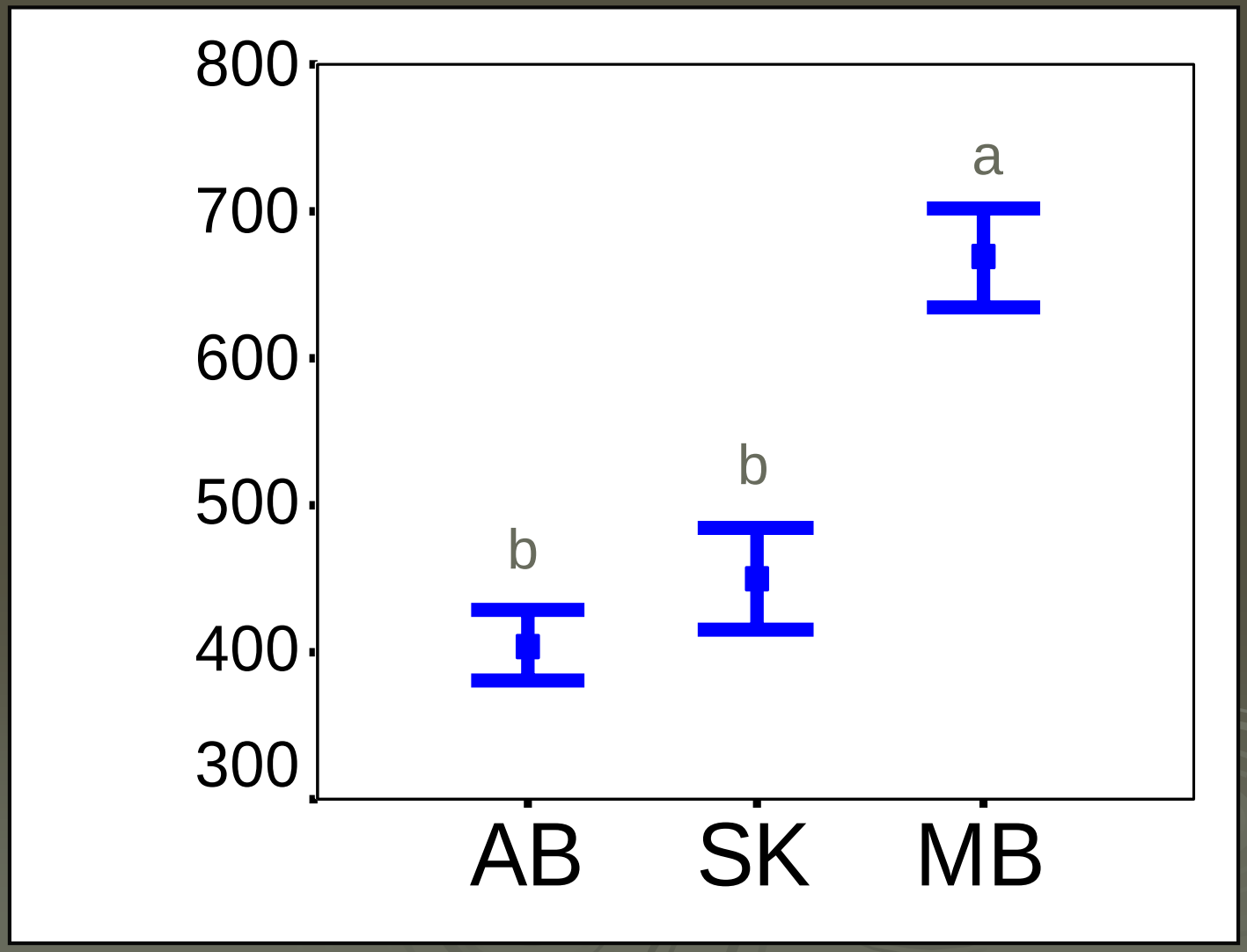
Research Questions

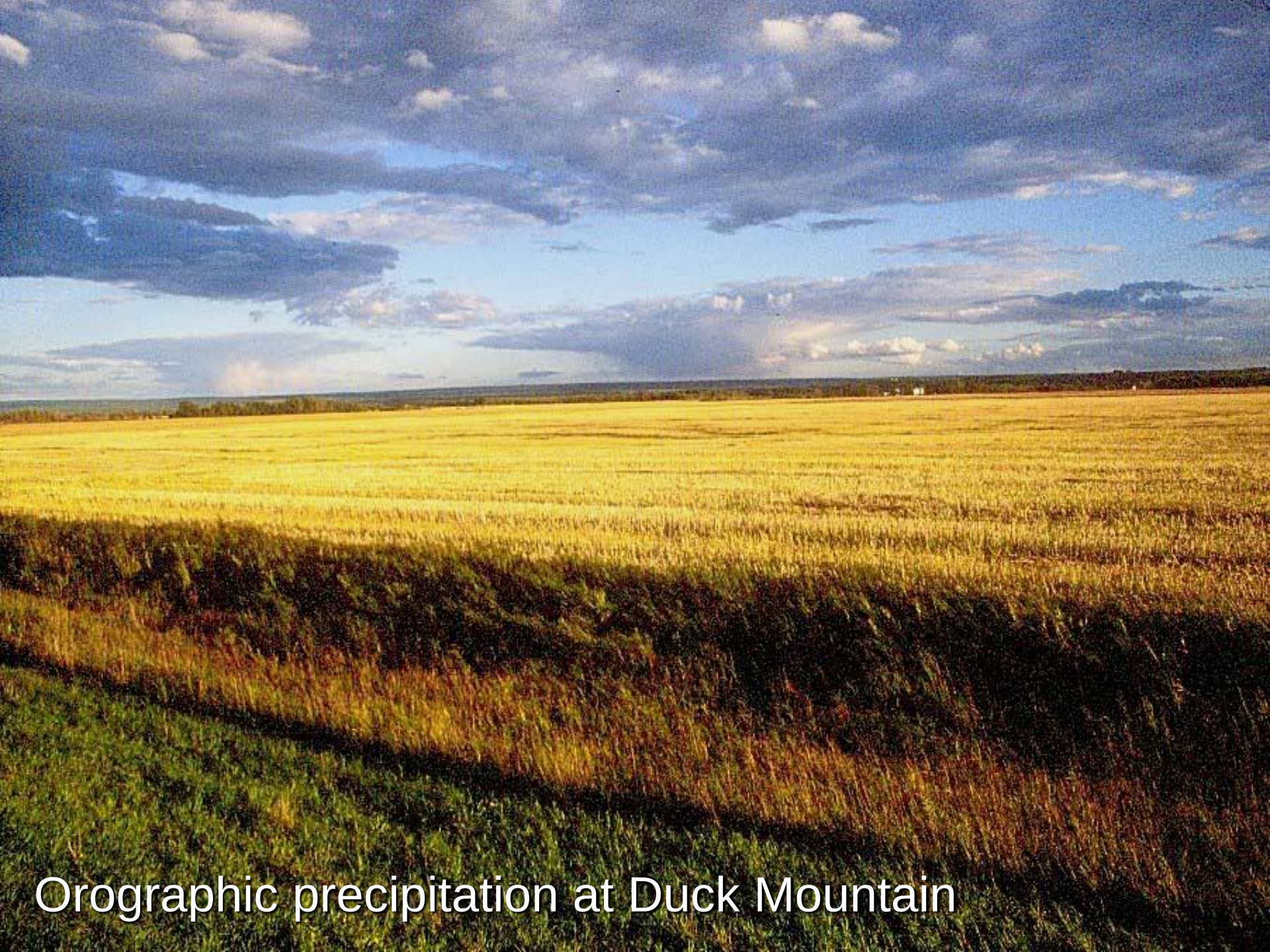
- Differences in environment variables (regional, local)?
- Differences in plant community and diversity (gamma, alpha, beta)?
- Interactions between community / diversity & environmental variables?
- Ecoregional conservation implications?

Regional: Elevation



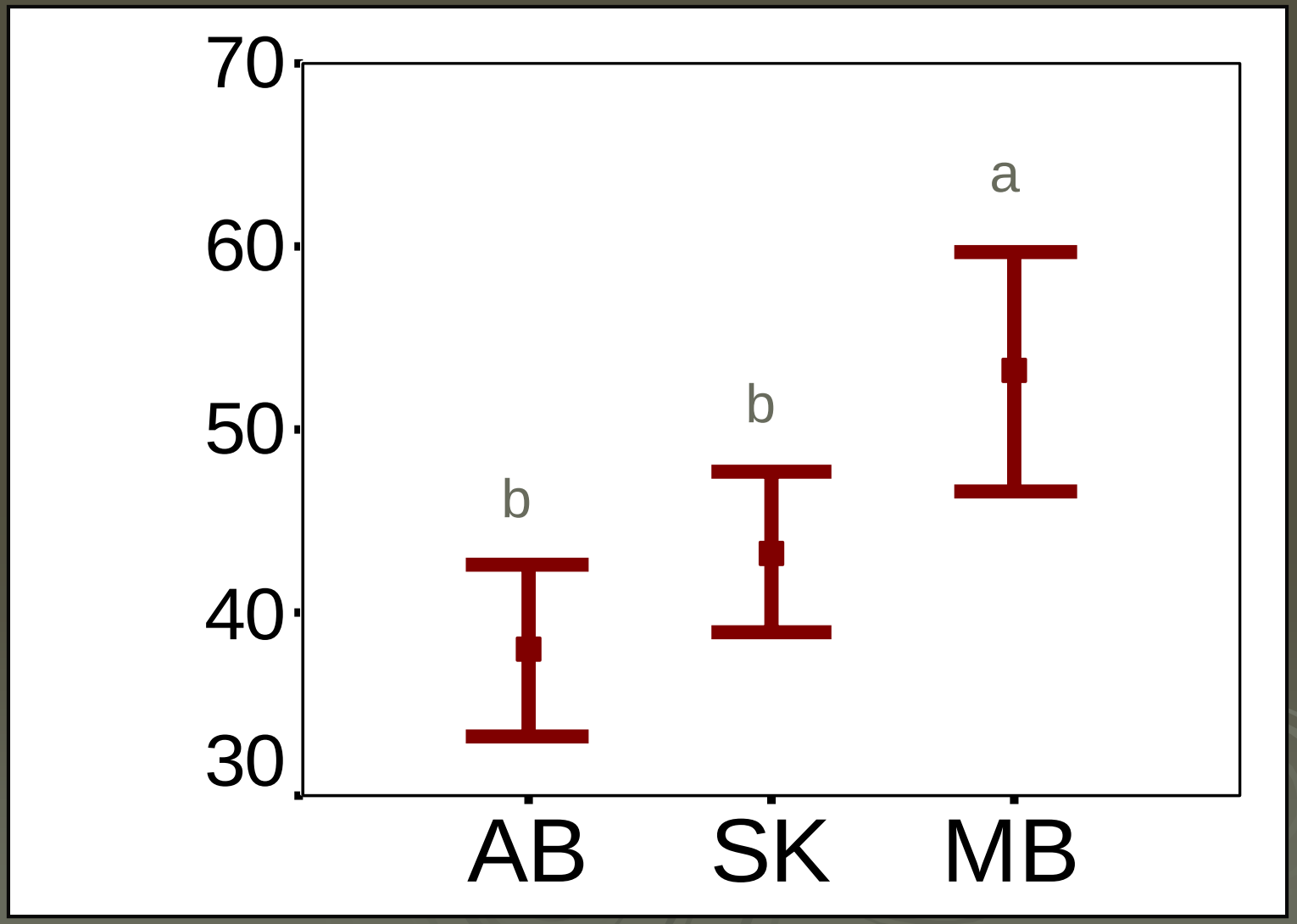
Regional: Precipitation



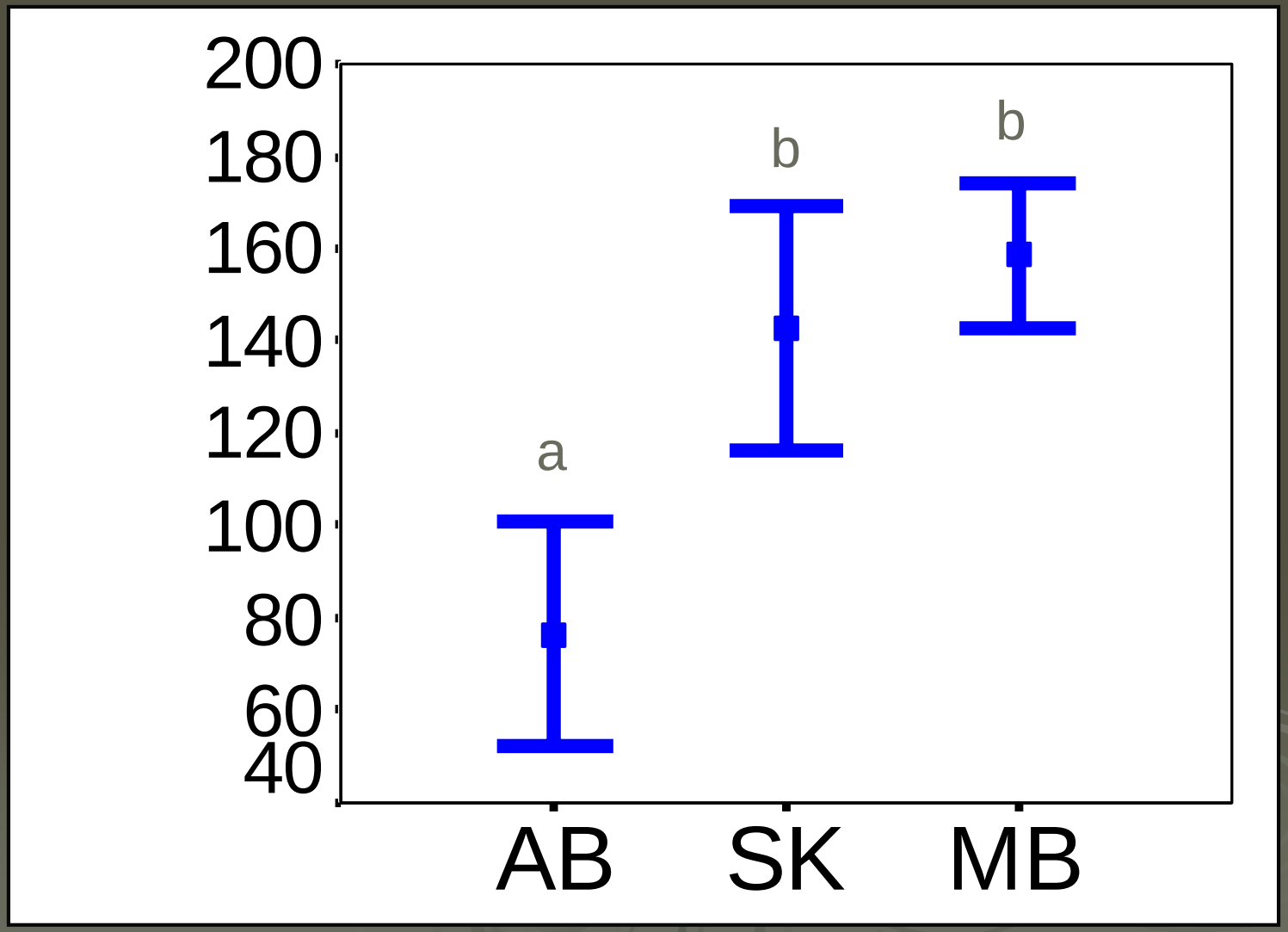


Orographic precipitation at Duck Mountain

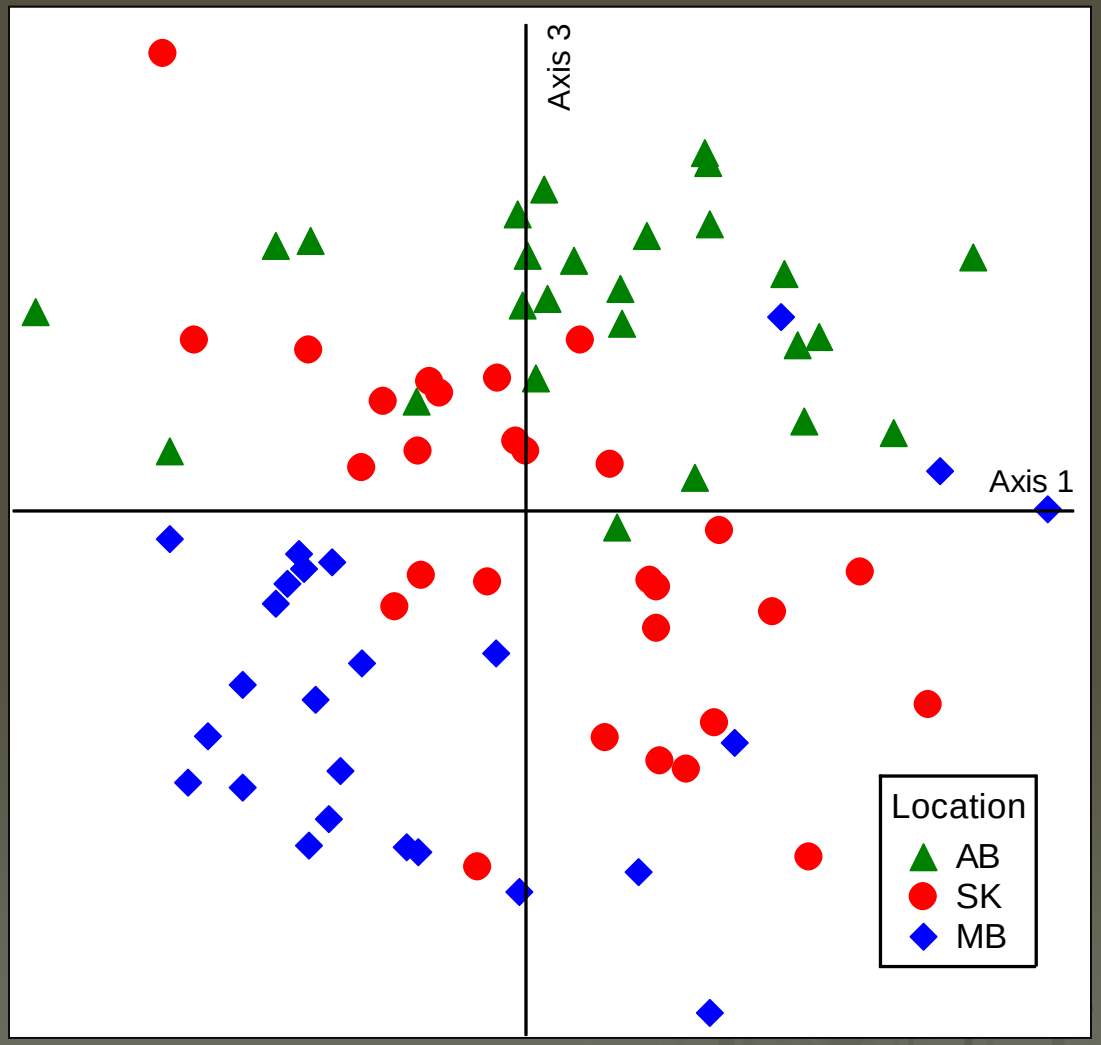
Local: Overstory Density



Local: Alkalinity



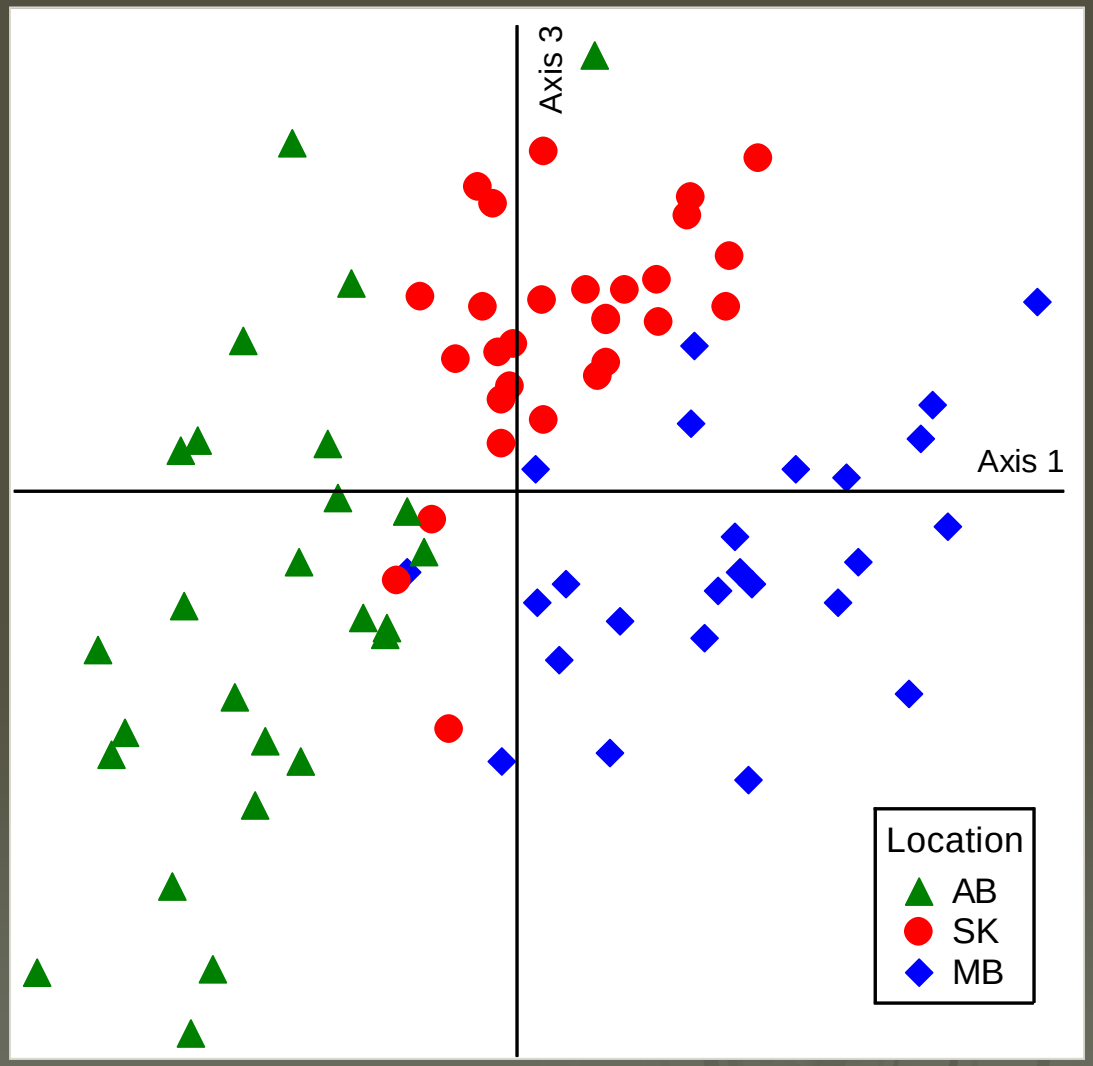
Bryophyte Community



N = 80
Stress = 9.8
3-Dimensional Solution

24% of variation is explained by environ. variables

Vascular Plant Community



N = 80
Stress = 6.99
3-Dimensional Solution

30% of variation is explained by environ. variables

Diversity: Regional (Gamma)

- Total Species: 273
- Bryophytes: 86
- Vascular Plants: 187

Diversity: Local (Alpha)

- Greatest in MB, and decreases in a longitudinal trend to west

AB	SK	MB	Total
171	195	223	273

Diversity: Local Rarity

Taxa/Life-form	Location			
	AB	SK	MB	All
Bryophytes	8	2	15	21
Vascular Plants	9	20	42	64
Total Plants	17	22	57	85

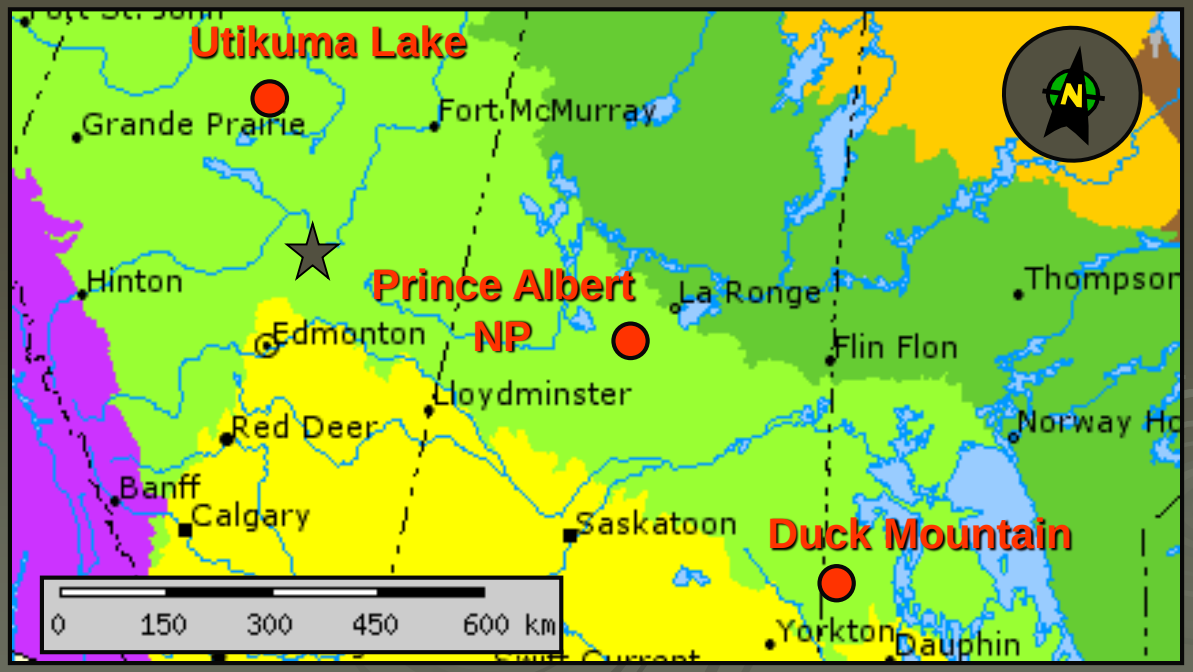
- Similar trend of east – west decrease in diversity

Diversity & Environment

- Bryophytes: Location (Precipitation)
- Vascular plants: Location (Precipitation), Elevation, Overstory Density

Diversity & Environment

- LATITUDE: Bryophytes increase, vascular plants decrease
- Environmental Energy (Growing Degree Days)



Diversity: Provincial Rarity

Location			
AB	SK	MB	All
Lonicera caerulea (S3)			1
Galium labradoricum (S3)	*Campanula aparanoides* (S2S3)	*Liparis loeselii* (S2)	5
Carex prairieae (S3)			
Carex tennuifolia (S3S4)			
Cypripedium acaule (S3)	*Platanthera dilatata* (S2)	*Listera borealis* (S2)	4
	Malaxis monophylla (S1S2)		
5	3	2	10

Plant Diversity: Beta

Species Turnover

- Vascular plants > bryophytes
  - Bryophytes have longer climatic & geographic ranges
- Highest overall in Manitoba

Causal Agents

- Exact causal agents of diversity changes can be challenging to extract from latitude, longitude, elevation, & other climatic gradients
- These gradients are often surrogates for more elemental variables that are commonly interrelated (Williamson 1981, Glaser 1992)

Conservation Implications

- Plant community & environmental variables over a continental scale within a single Ecoregion shows a continuous change even in a single wetland type
- …within an Ecoregion and not across Ecoregional boundaries

Conservation Implications

- For common wetland types, even those with a higher likelihood of rare plants, Ecoregion level conservation may not make sense…

Conservation Implications

- Conservation plans need to account for changes in abiotic conditions (i.e., regional & local) & biotic conditions (like transition zones)

Conservation Implications

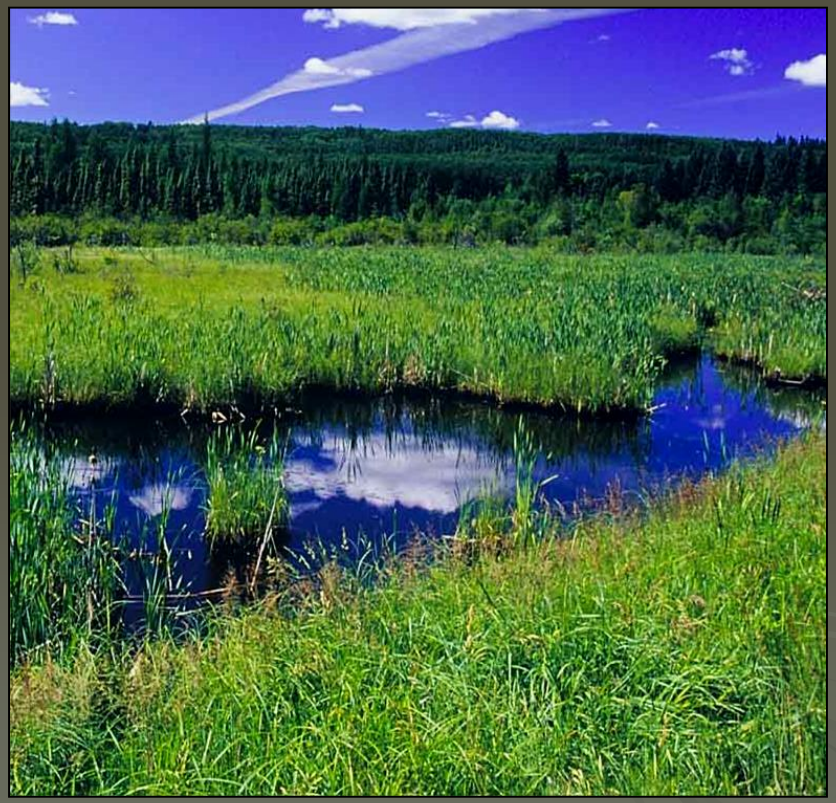
A matter of scale…

- Management at finer scale, i.e., Ecodistrict-level, may be more appropriate

- Other wetland types?

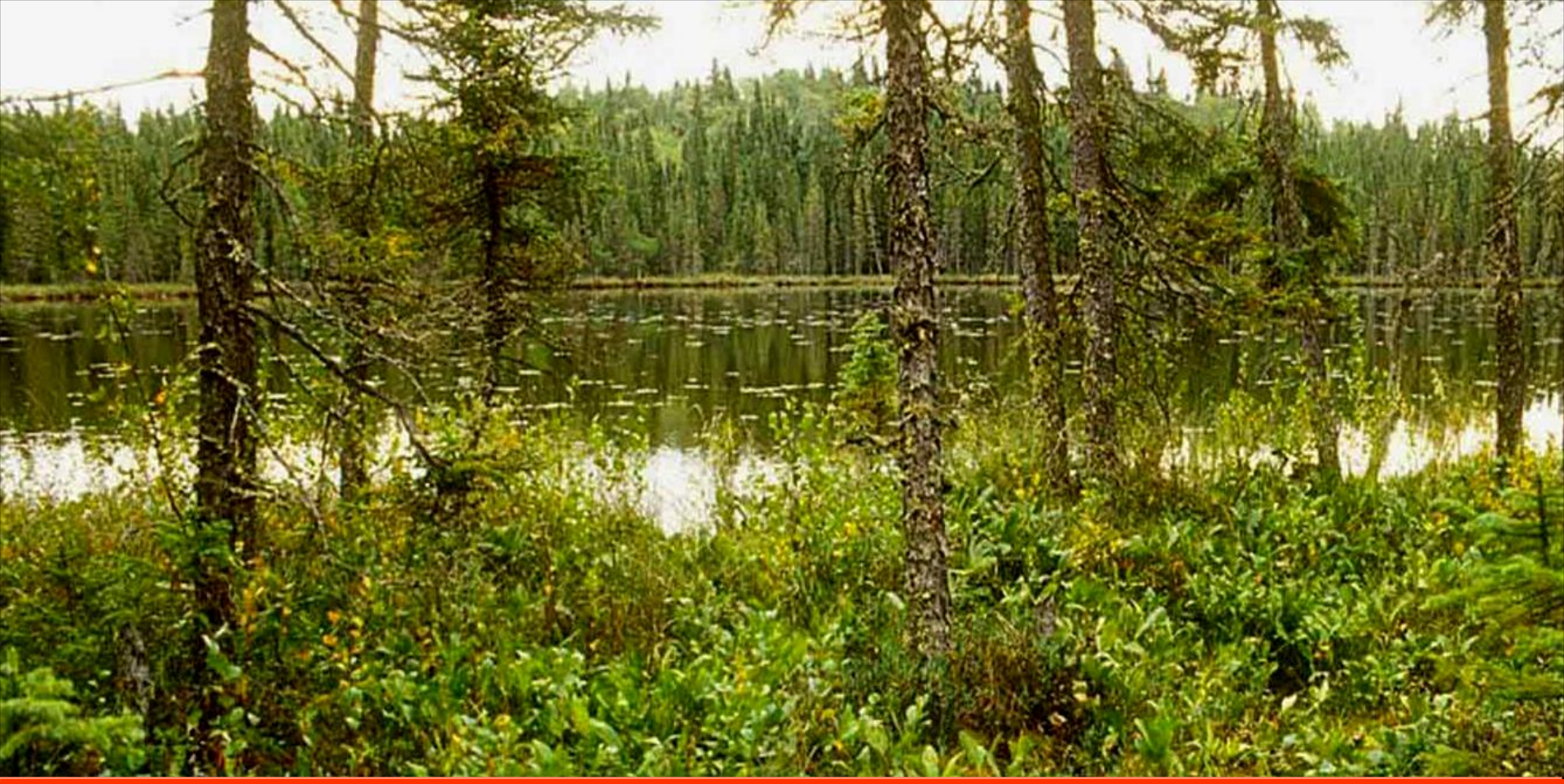
Conservation Implications

- Rare boreal wetland types
  - Marshes
  - Spring Mound Fens



Conservation Implications

- Ecoregions provide a biogeographical framework for conservation at broad scales that is preferable to political boundaries.
- However, use of single Ecoregions for conservation needs to be approached cautiously.



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