EVALUATING THE RANGE OF NATURAL VARIABILITY IN WETLANDS:

LESSONS LEARNED FROM THE ROCKY MOUNTAIN REMAP PROJECT

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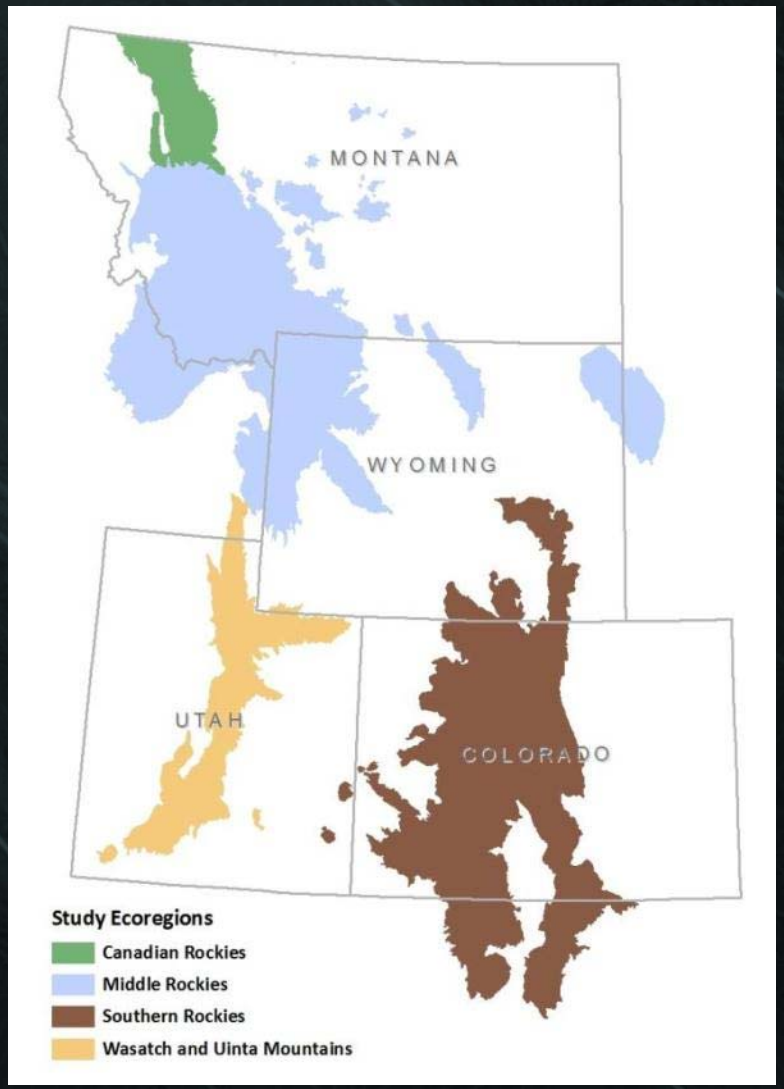
Study objectives

- Identify reference standard for 4 wetland ecological systems in 4 ecoregions;
- Describe range of natural variability
- Refine Level 1,2,3 EIA assessment protocols

Four systems in four ecoregions



- North American Arid West Emergent Marsh;
- Rocky Mountain Subalpine-Montane Fen;
- Rocky Mountain Alpine-Montane Wet Meadow;
- Rocky Mountain Subalpine-Montane Riparian Shrubland;

Three key components

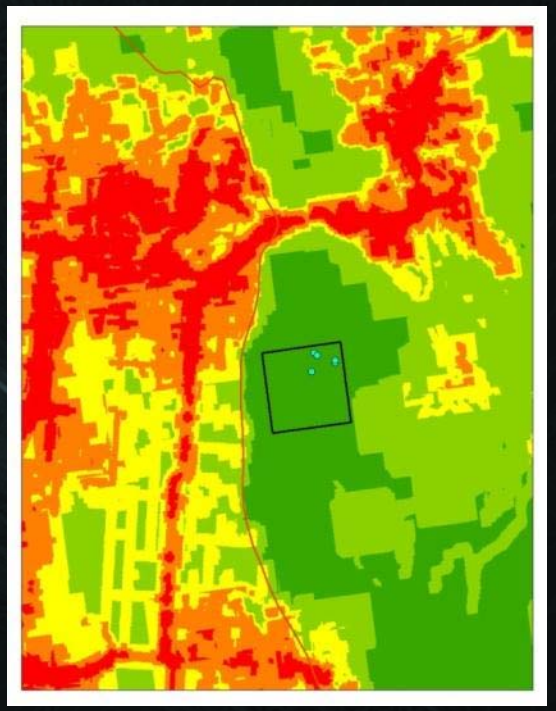
- A landscape integrity model for identifying minimally disturbed areas;

AND VERY LITTLE NWI MAPPING

Random Tesellation Stratified (GRTS) sampling design

- An assessment protocol

Landscape Integrity Model



An inverse-weighted distance approach that “scores” each 30m pixel in a raster based on its distance from disturbances: roads, land use (e.g., agriculture, timber harvest, urban development, mining), and hydrologic disturbances (canals and ditches, water right points of use, section 404d permits), so that minimally disturbed landscapes can be identified

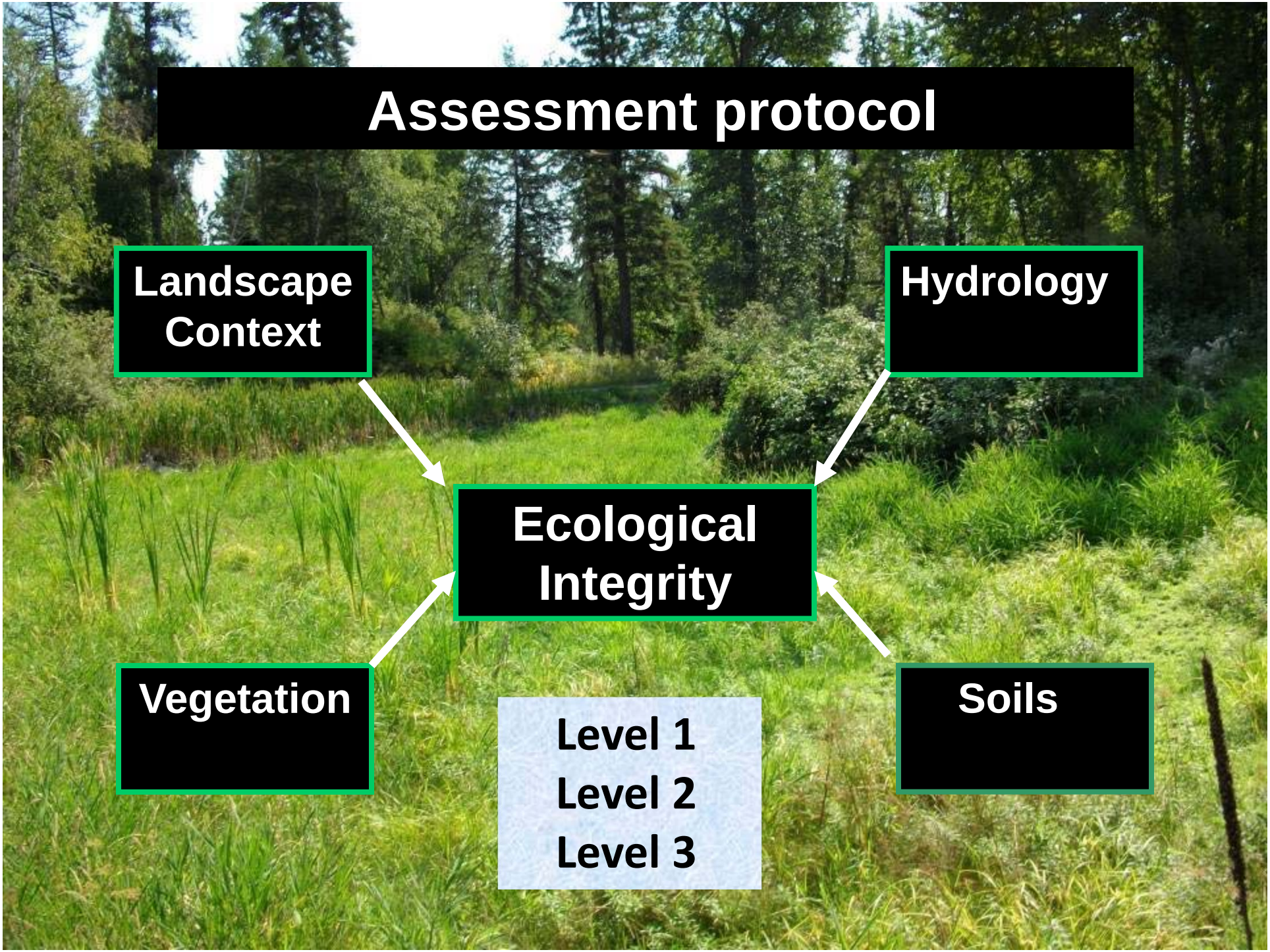
GRTS Design

- In each Level III ecoregions,
  - 50 two mile x two mile grid cells:
  - in minimally disturbed landscapes
  - within 10 miles of a four wheel drive road

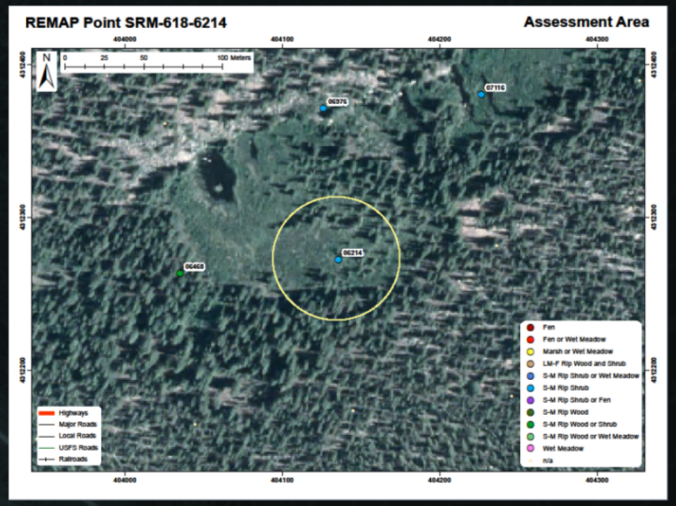
- Within selected cells, created an array of points at 100 meter intervals, and determined which points fell within the high integrity landscape ;

- Visually examined each point to determine if it occurred within one of the targeted wetland ecological systems.

- Continued to evaluate all of the points within each selected cell until we selected 3 to 5 five examples of each wetland ecological system occurring within the cell.


Assessment protocol
Landscape Context
Hydrology
Ecological Integrity
Vegetation
Soils
Level 1
Level 2
Level 3

Field sampling 2009-2011



Study results

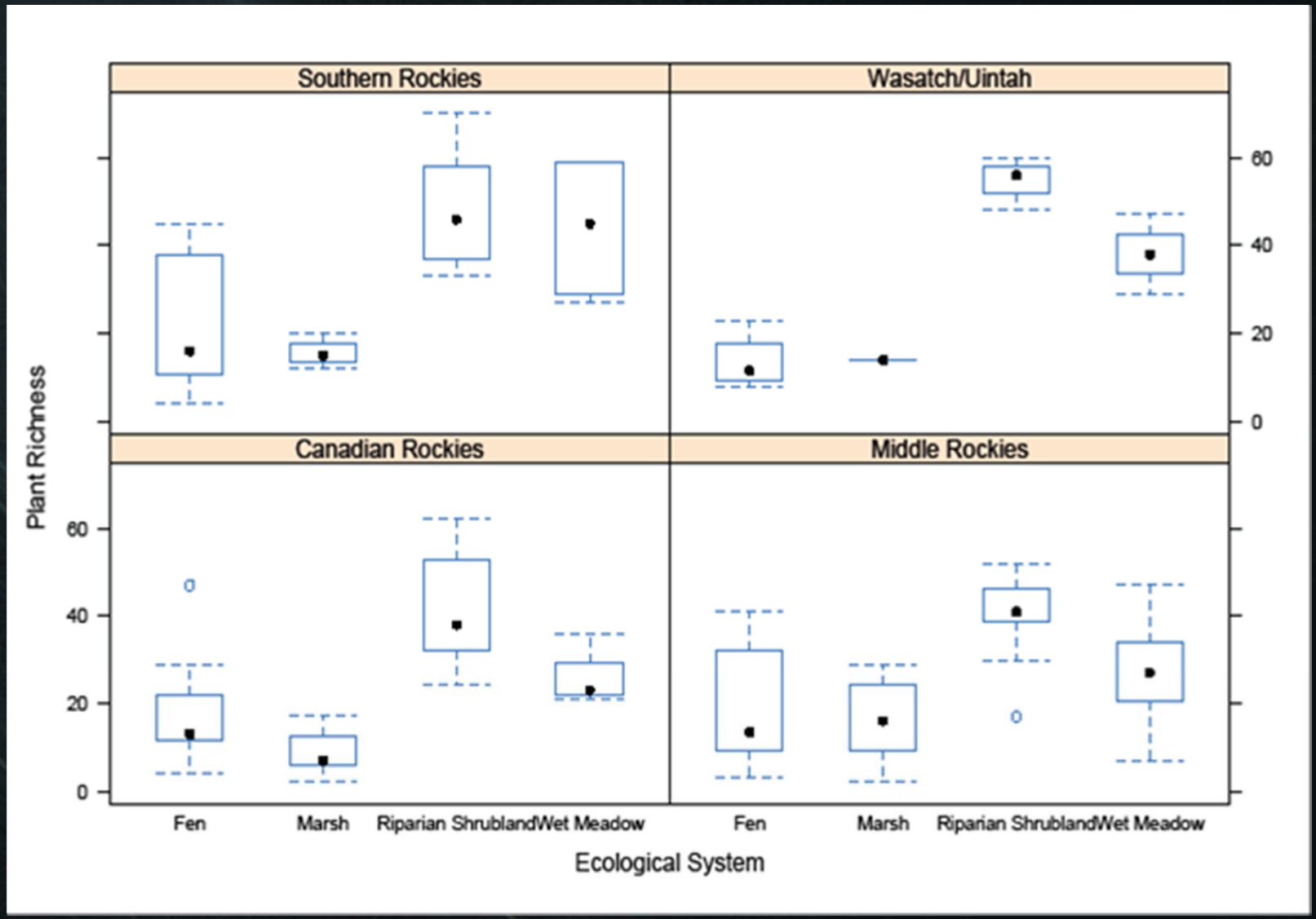
- The Landscape Integrity Model worked well
- The probabilistic design was cumbersome but constrained bias
- There was considerable regional and typological variability at Level 3
- Some of our cherished metrics were all noise

The Landscape Integrity Model

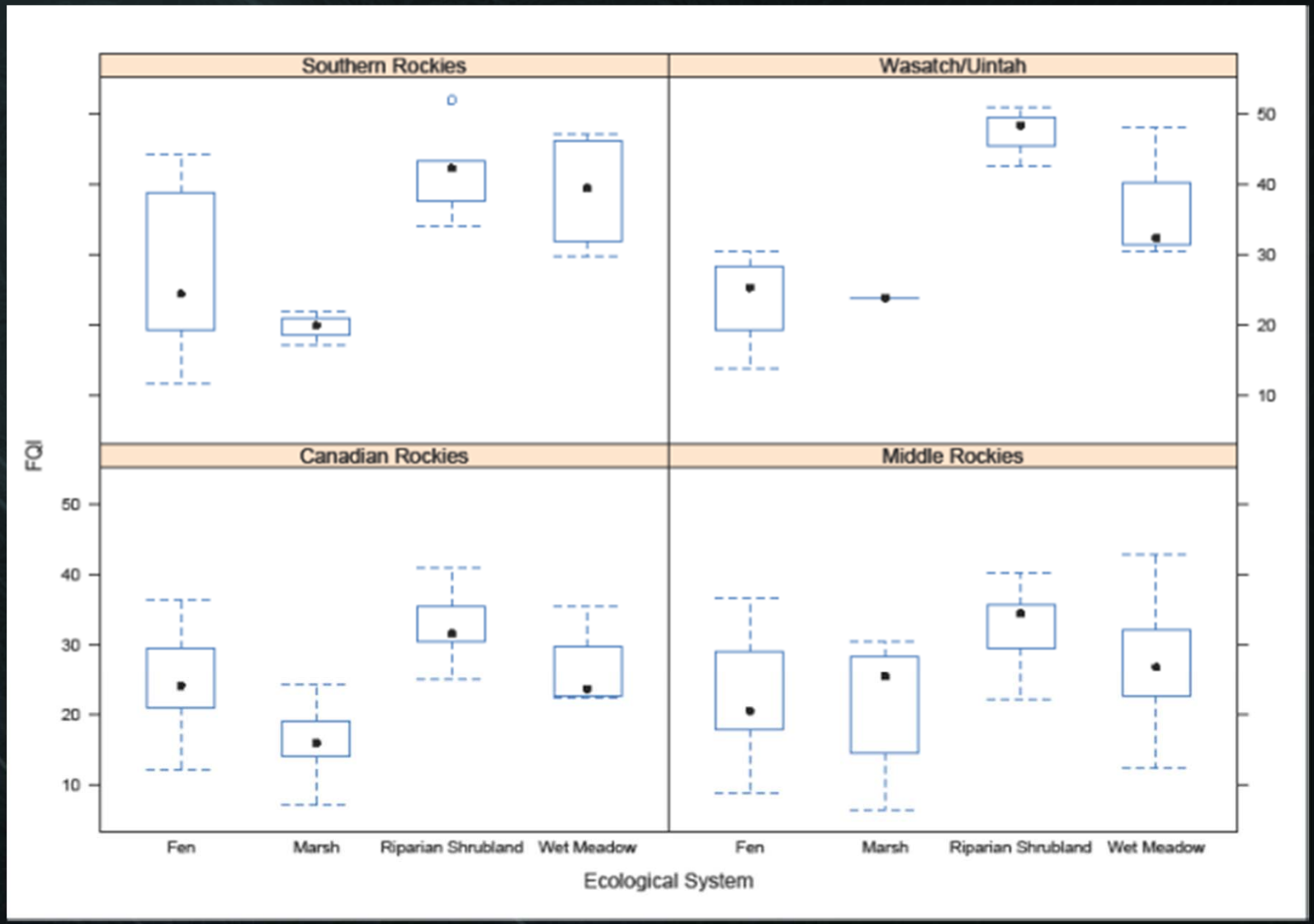
- 2nd round photoinspection verified landscape integrity; in Montana, only 9% of model-selected sites rejected at this stage
- In Montana, only 2 sites rejected in field because of site specific impacts (heavy grazing)
- Field assessment of landscape context and stressors validated success of model.
  - Of 105 sites, only 2 had less than 90% unfragmented landscape within a 500m envelope;
  - 96% of sites had > 95% native vegetation cover and < 5% cover of non-native plants with a 250m envelope.
  - 97% had a buffer extent of 100% and a buffer width of >187m

Probabilistic design constrained bias

Regional and typological variation at Level 3



Regional and typological variation at Level 3



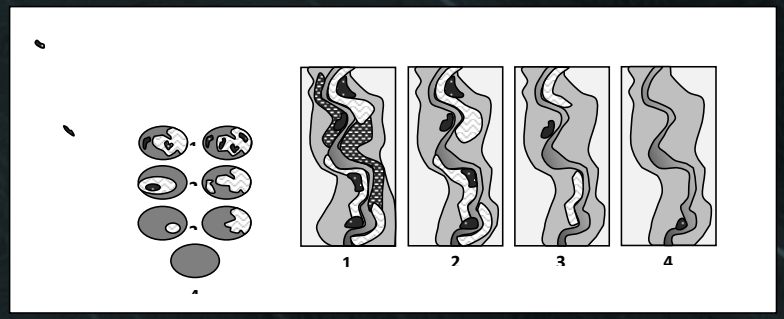
Some cherished Level 2 metrics were noisy

- ***Regeneration of Native Woody Species*:**
  - 76% riparian shrublands had all age classes of woody species present;
  - One site had the middle age groups absent, but all other age classes present;
  - 20% of sites had stands comprised mainly of mature individuals with all other age classes absent.

- ***Vertical Overlap of Vegetation Strata*: :**
  - For fen sites, 76% had only one stratum in at least a part of the AA; 52% had two strata in some part of the AA; only 24% had 3 or more strata in some part of AA
  - For marshes, 93% had only one stratum in at least a part of the AA; 21% had two strata in some part of the AA; only 7% had 3 or more strata in some part of AA

Some cherished metrics were noisy

- Horizontal interspersion: wet meadows had 4 sites ranked high, 4 sites ranked medium high, 9 sites ranked medium low, and 6 sites ranked low



- Structural patch type: while riparian shrublands had the highest number of patches, the data ranged widely:
  - Mean = 5
  - Standard deviation =3
  - Range of values 0 to 12

Lessons learned

- Typically, the FQI is sensitive to species richness, so species poor sites will receive a lower FQI value despite being in or close to a natural state.
- There is a need for regional and typological reference standards
- There may be a need for finer typological standards

Lessons still to be learned

- Is there undetected within-system variation that should be accounted for?
- What are the factors that drive natural variability of species richness and diversity, both within and between classes?
- Do differences in regional C of C values reflect reality or subjectivity?

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Questions?