Greater Everglades Ecosystem Restoration Conference
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Deviations on a theme: peat patterning in sub-tropical wetlands

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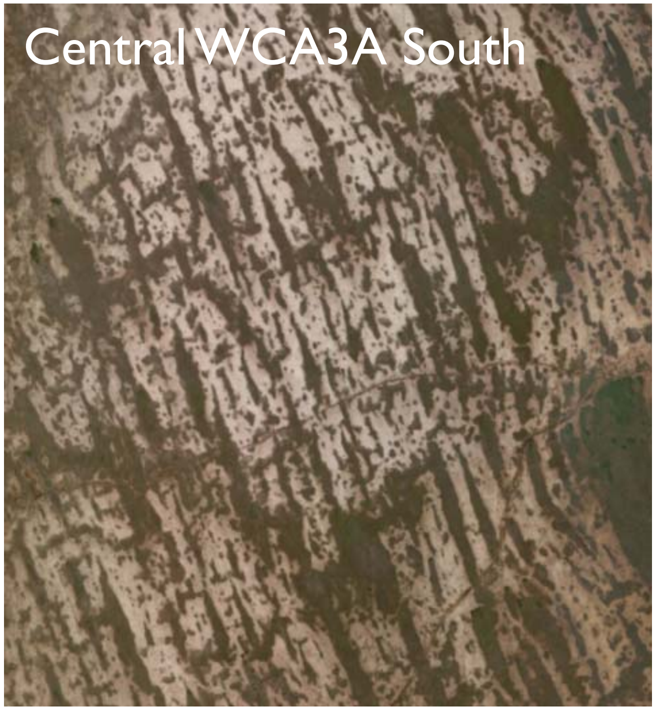
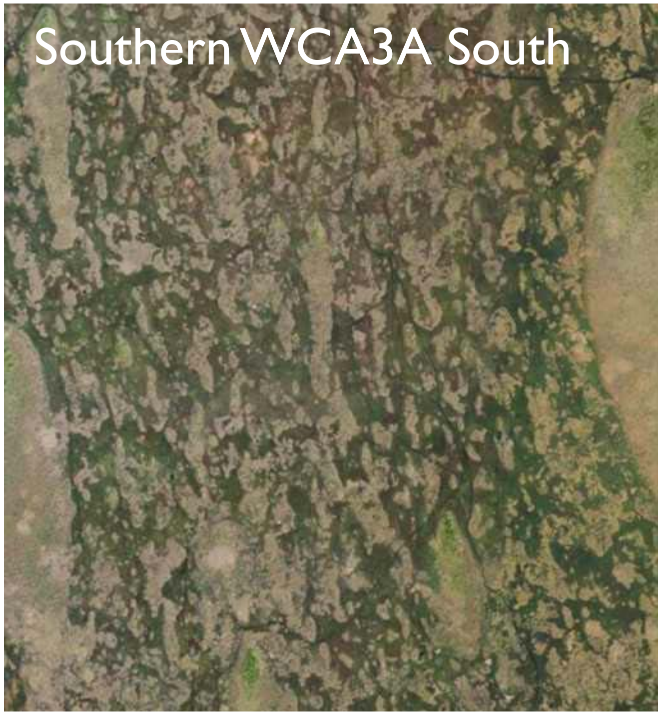
Ridge and Slough Landscape





1. How did the pattern develop?
2. Why is it changing?

Peat patterning mechanism

How did the pattern develop?

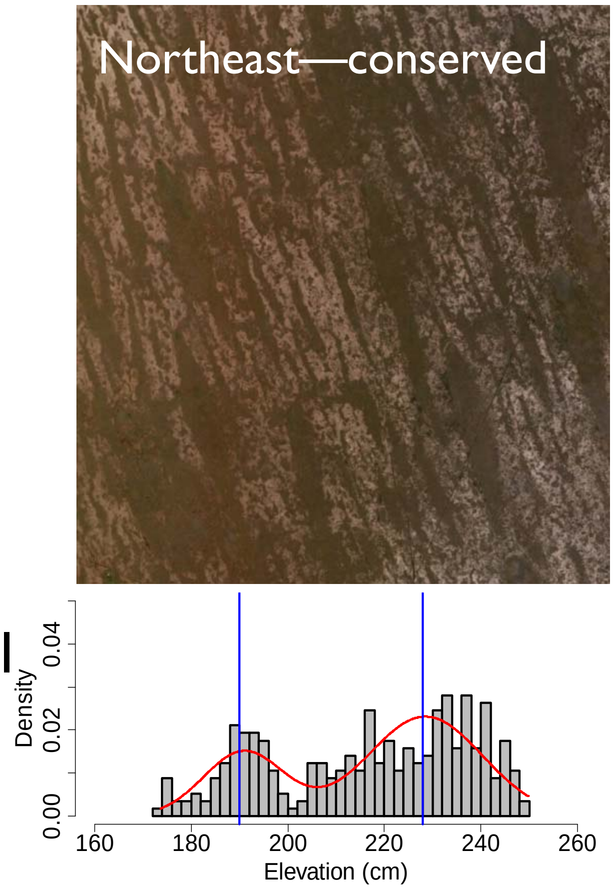
Peat accumulation mechanism

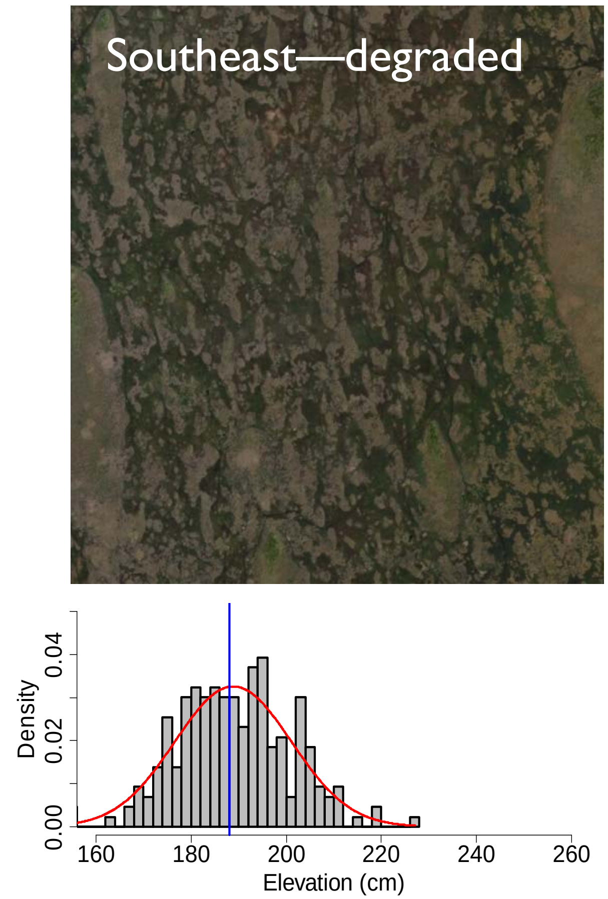
- Increased biomass production = higher elevations = more vascular plant biomass = increased peat production
- Evidence for peat accumulation mechanism—sharp microtopographical differences

Differential peat accumulation

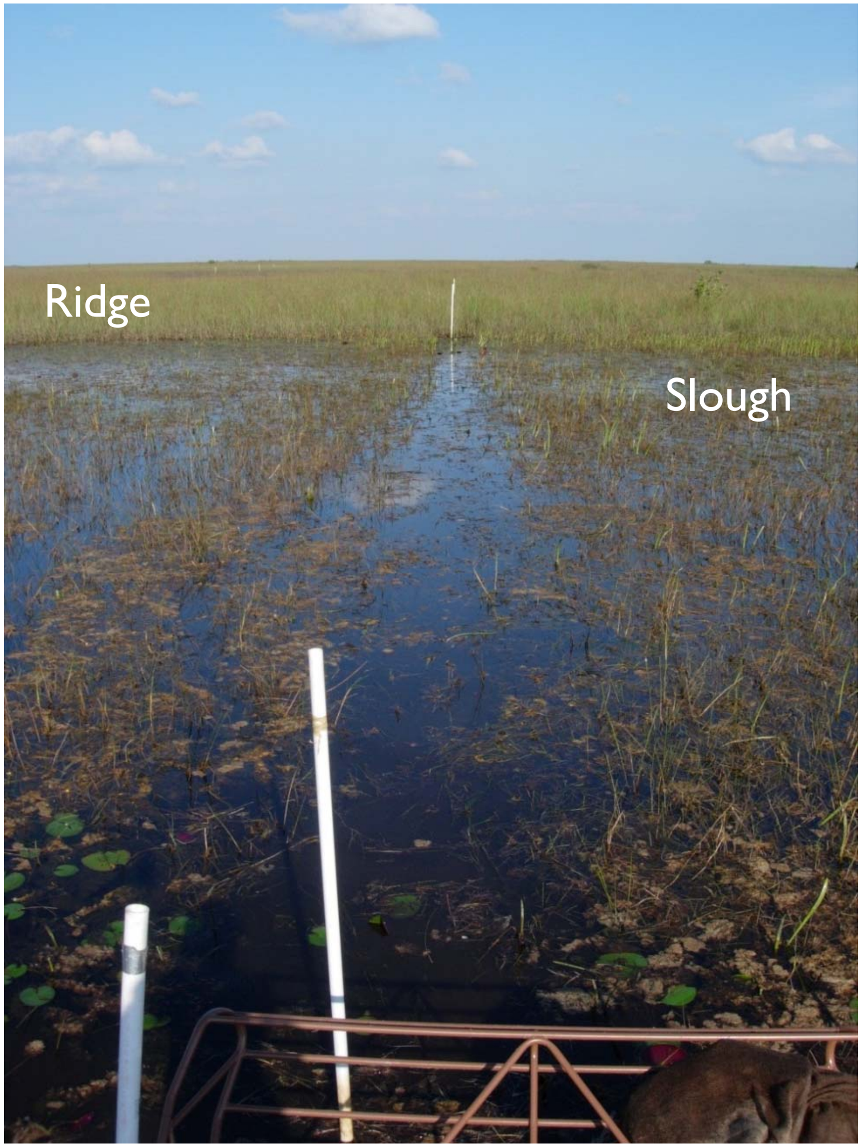
Statistical evidence of sharp micro-topographical differences:

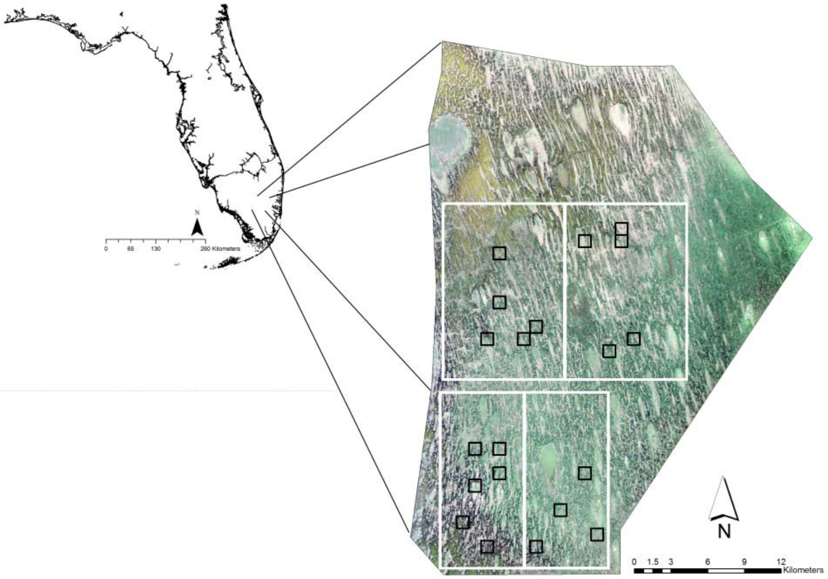
- Bimodal "frequency distribution of surface elements (vascular plant biomass or acrotelm thickness)" (Eppinga et al 2008)
- Watts et al (2010) demonstrated elevation bimodality in 'conserved' RSL





Differential peat accumulation





Bimodality?

Elevation	Yes (and no)
Biomass	No (and yes)

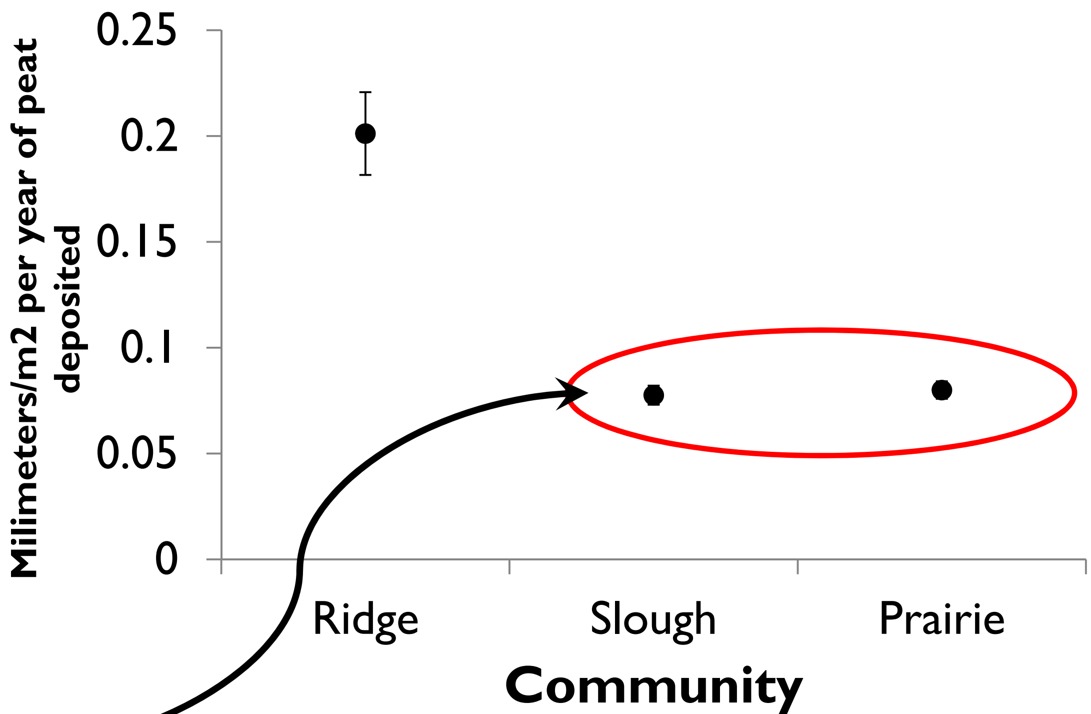
Differential peat accumulation

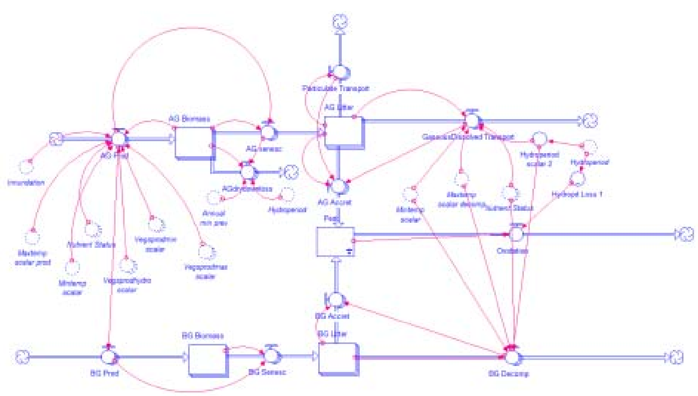
No biomass bimodality

Two reasons

1) Degradation

- Wet prairies—artifact of disturbance?





Differential peat accumulation

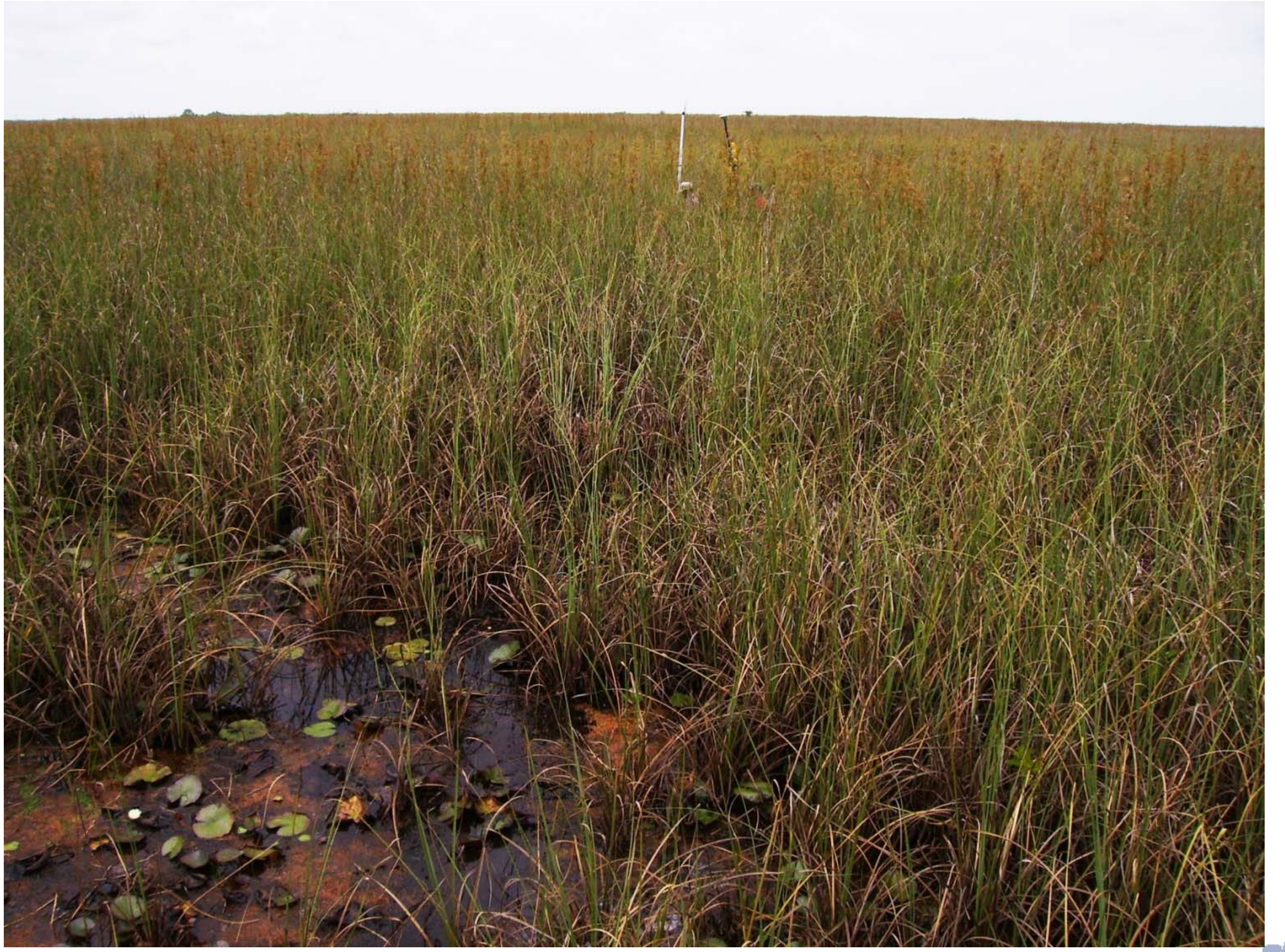
2. **Differences in sub-tropical climate/ species pool**

- Disconnect between biomass production and peat accumulation (elevation)
- Decomposition is the key
  - Serna et al. 2013(Everglades plant decomposition) –***species*** not habitat or water depth

Different processes (species-based decomposition and temperature) are important for sub-tropical patterned peatlands than boreal peatlands

Why is it changing?

Local vs. landscape



Transition probability model of local dynamics

- Multistate models are a specialized population model that calculates **transition probabilities between states**
- Biomass/density data for repeated samples ~ 10 years apart
- Clustered data into states (ridge, wet prairie, slough)—not 'pure' clusters
- Local elevations = tailored hydrology for each point; and global hydrology (Site 65)
- 5, 15 year means for hydrology (minimum, maximum, amplitude (max-min))

Transition probability model of local dynamics

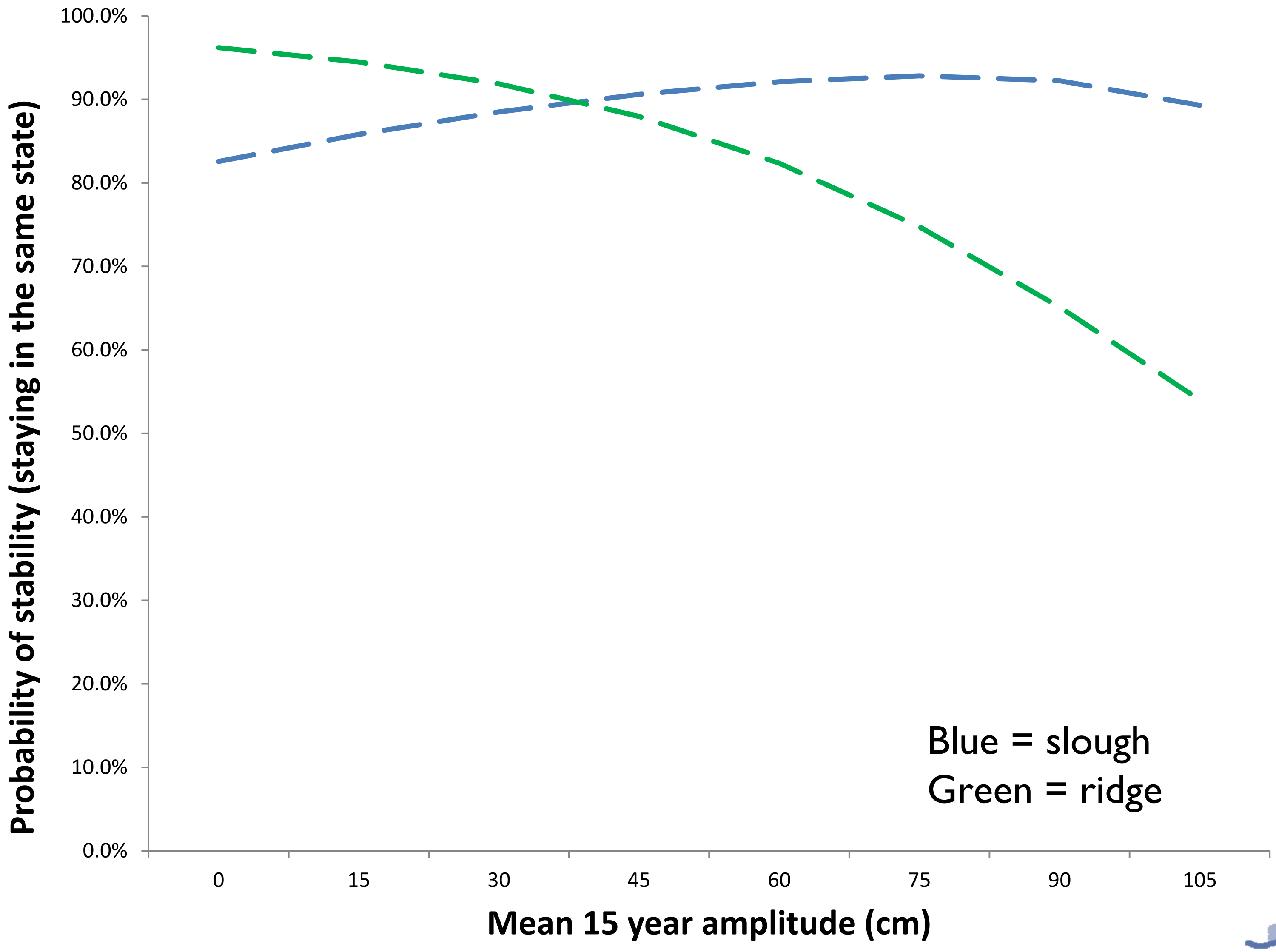
Best model:

- 15 year mean hydrologic amplitude
- 15 year average hydrologic maximum
- Elevation
- Peat depth
- Northing

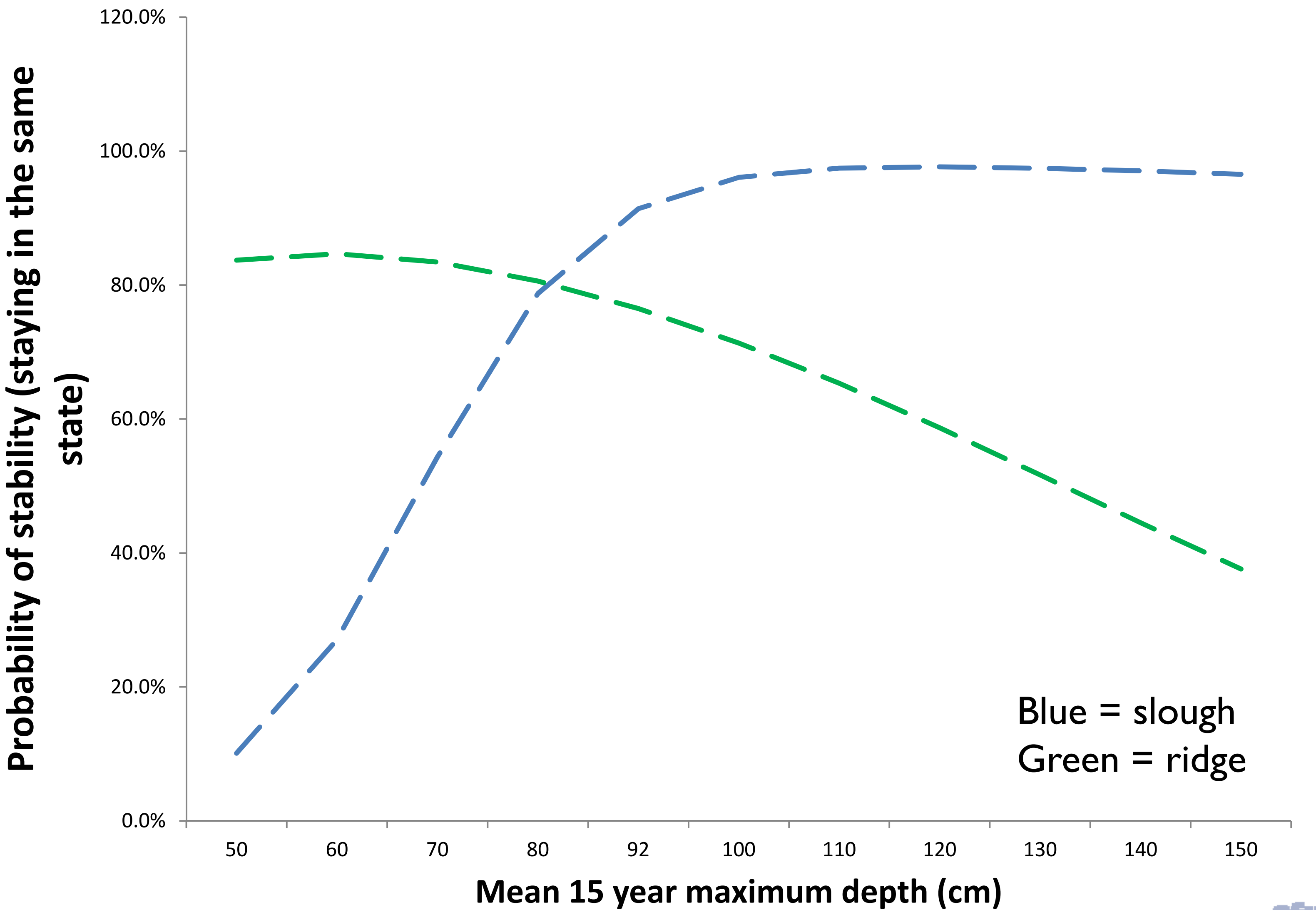
Output:

1. Decadal transition probabilities
2. Targets for management
3. Predictive model

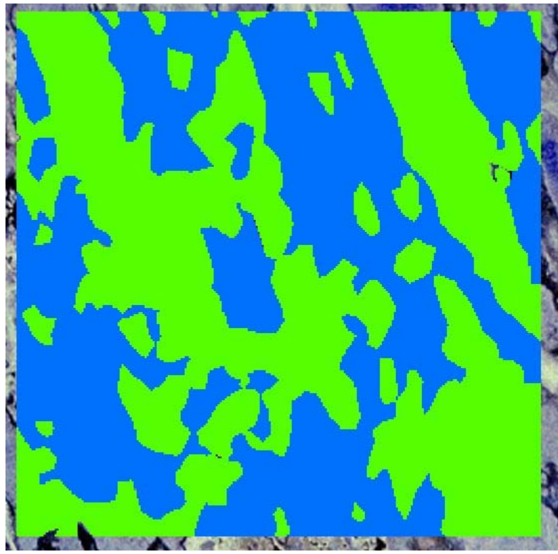
Probability of stability—amplitude



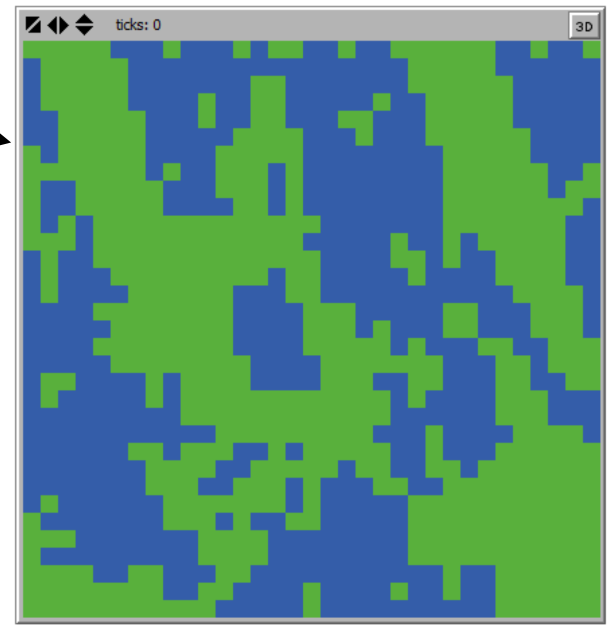
Probability of stability—depth



Dynamic stability based on transition probability model

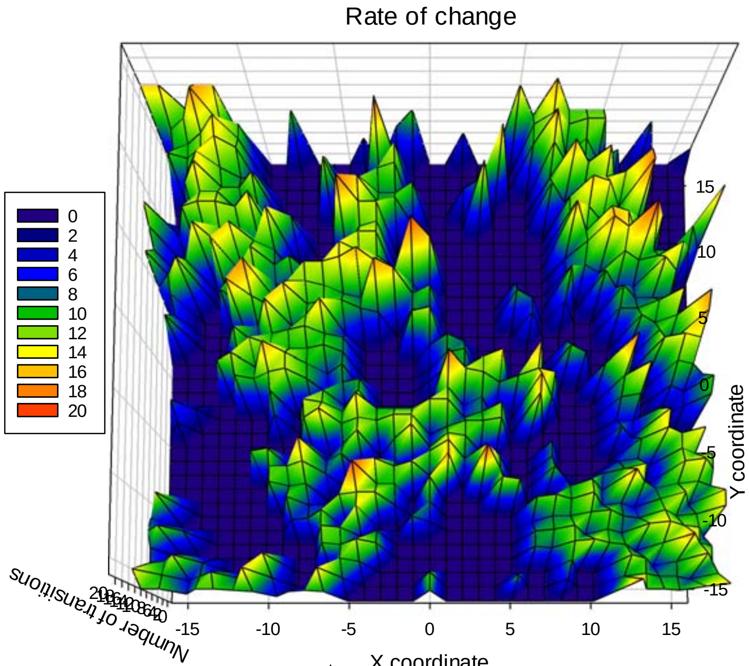


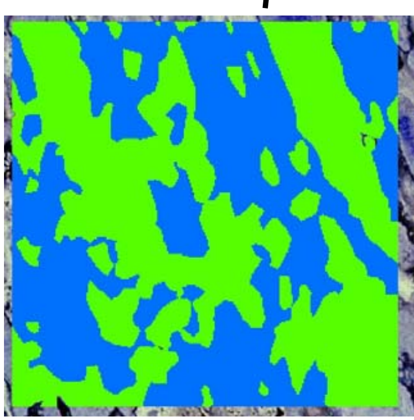
- Digitized ridge/slough (1984)
- Loaded into CA software
- Kriged elevation map
- Applied MS model to pixels with custom hydrology—transition probabilities

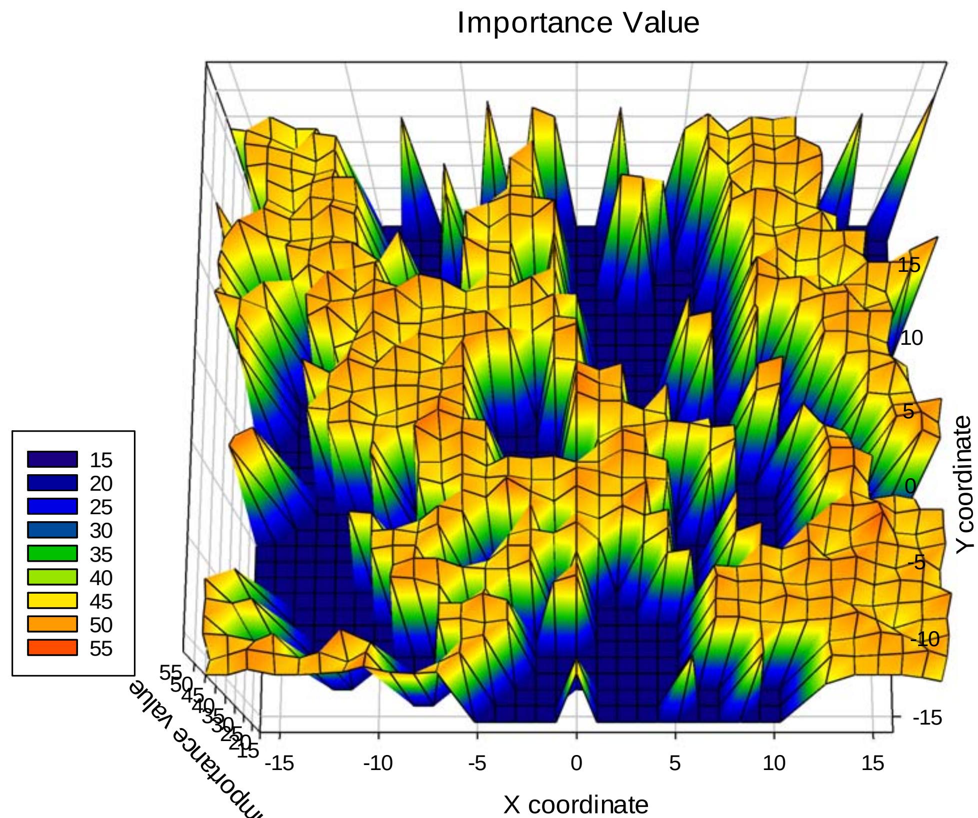


- 50 separate runs (decadal)
- Averaged runs for rate of change and landscape
- Compared to 1995 imagery

Landscape expression of dynamic stability







Final importance value: (% ridge * 51) + (% slough * 21)

How and why

Importance of species and decomposition in future RSL modeling

Local elevation is more important than landscape

Long-term hydrology factors for landscape stability

- 15 year average amplitude
- 15 year average maximum depth

Now what?

Improve upon existing peat patterning models

Hydrologic targets for water management

Model landscape changes over time:

- Restoration scenarios
- Water management scenarios

Questions?

Co-authors: Sue Newman, Fred Sklar, Wiley Kitchens

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