

Vegetation indicators of Everglades water management

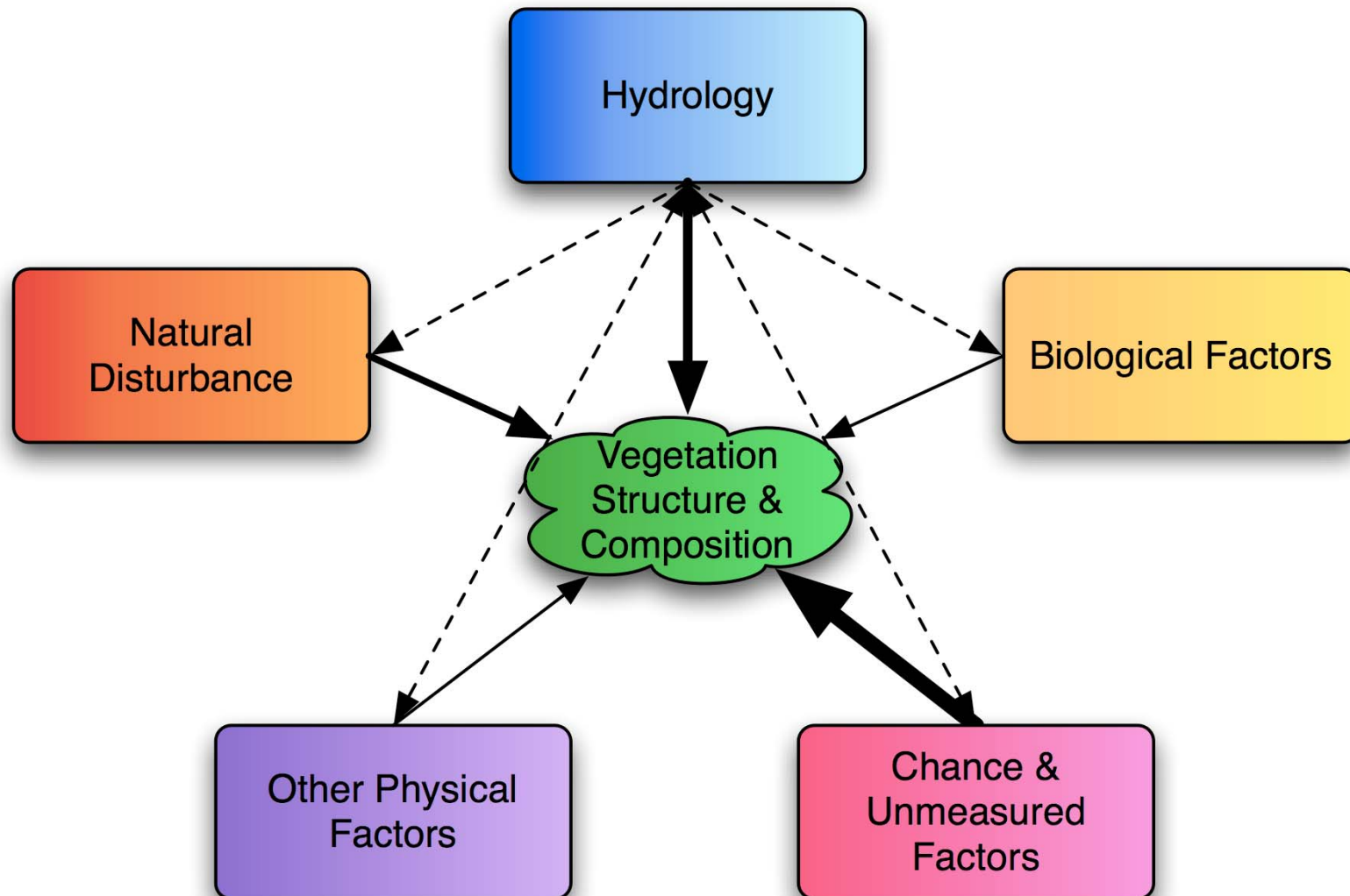
Michael Ross, Daniel Gomez, Xin Wang, Michael Kline, Brooke Shamblin, Jay P Sah, Pablo L Ruiz, Susana Stoffella, Erin Hanan, Steve Oberbauer, Leo Sternberg & Vic Engel



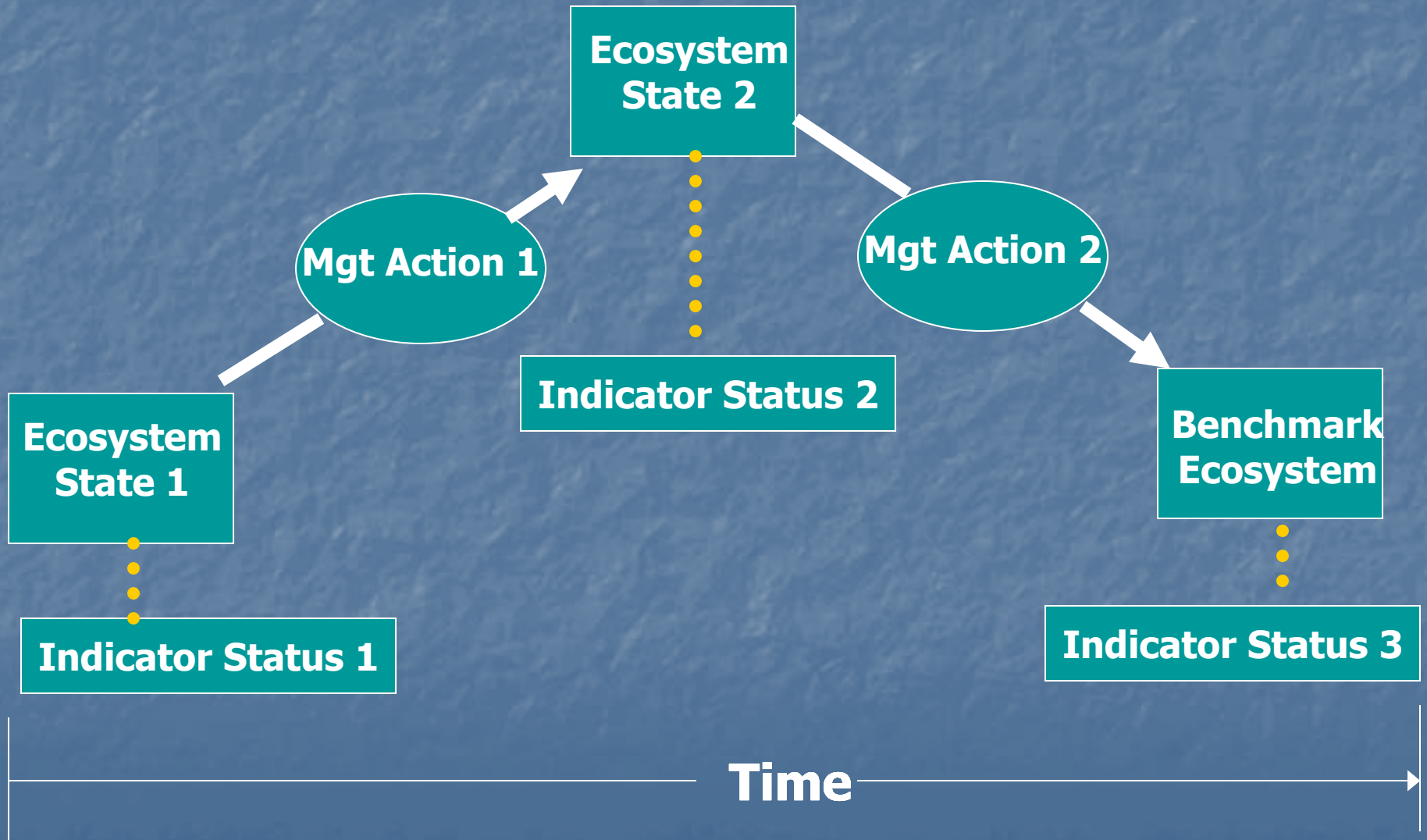
Some changes in vegetation from pre-development condition

- 1. Increase in exotic or invasive species**
- 2. Encroachment of mangroves into coastal prairies**
- 3. Homogenization of marsh – loss of ridge & slough pattern**
- 4. Urban development of former pine forest, hammock, and wet prairie habitat**
- 5. Loss of tree islands due to fire and/or high water**

Everglades vegetation and its drivers



Everglades vegetation monitoring should be ... goal oriented



Indicators of vegetation condition should be ... hierarchically structured



Landscape

Response: very slow
Data type: remote



Community

Response: slow
Data type: Field

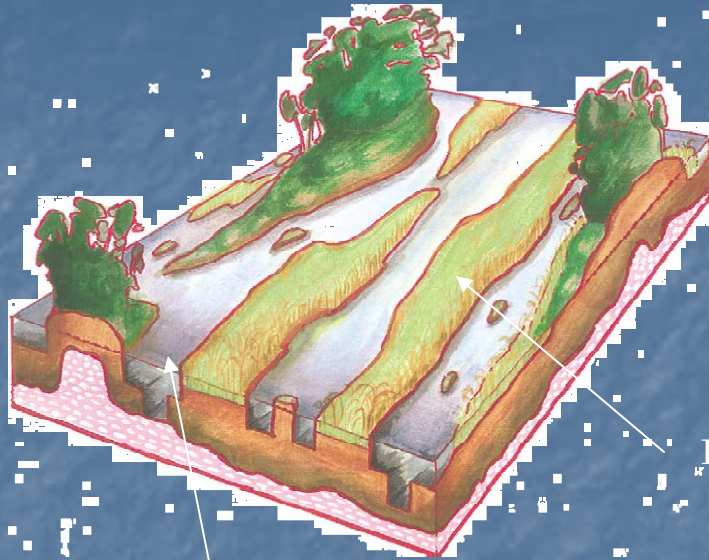


Organism

Response: rapid
Data type: Field

Ecosystems may be viewed as hierarchical arrangements, i.e., structure at higher levels are in part a product of processes taking place at lower levels, and lower level processes are constrained by higher level structure. Ecosystem monitoring should address all levels of the hierarchy.

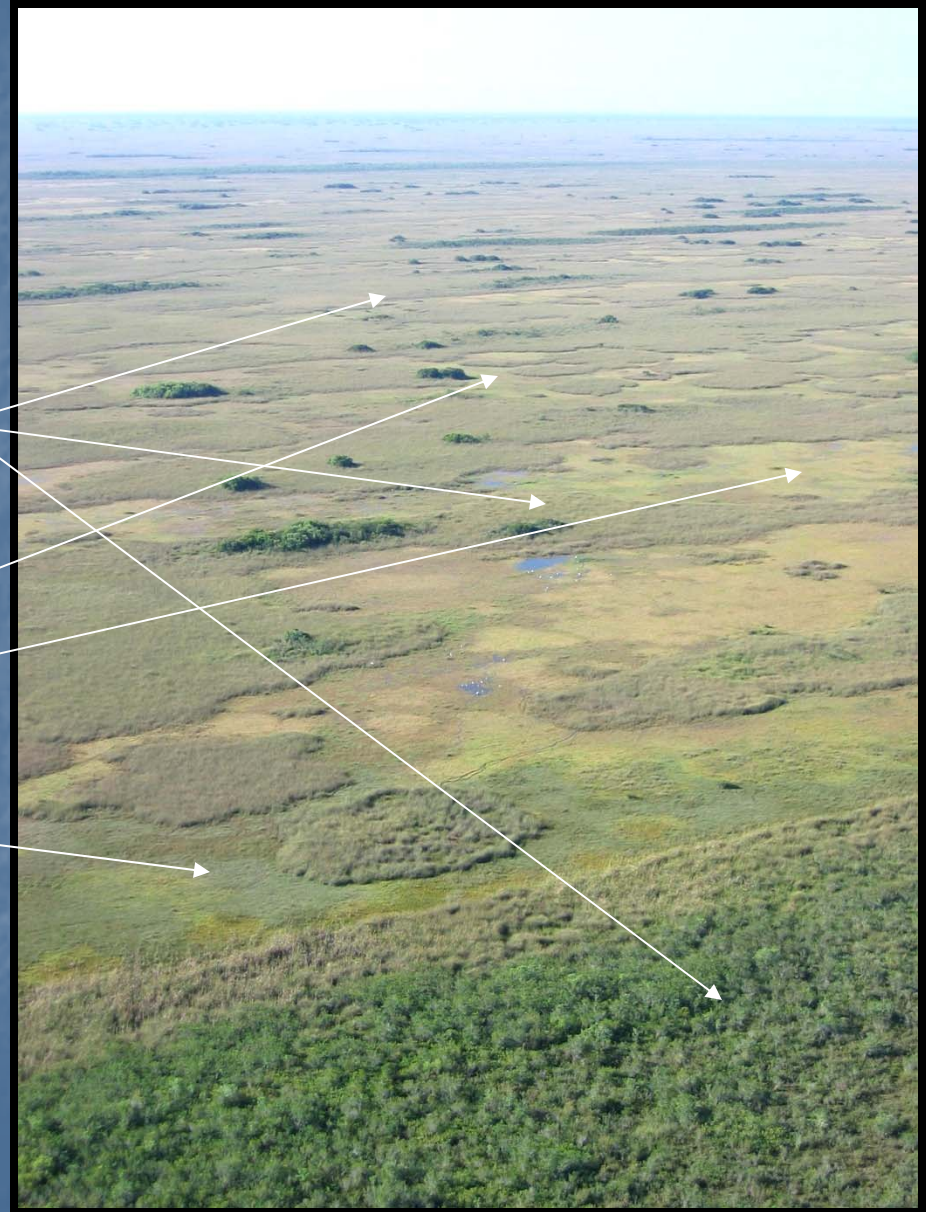
Goal: Restore Ridge and Slough landscape and physiography



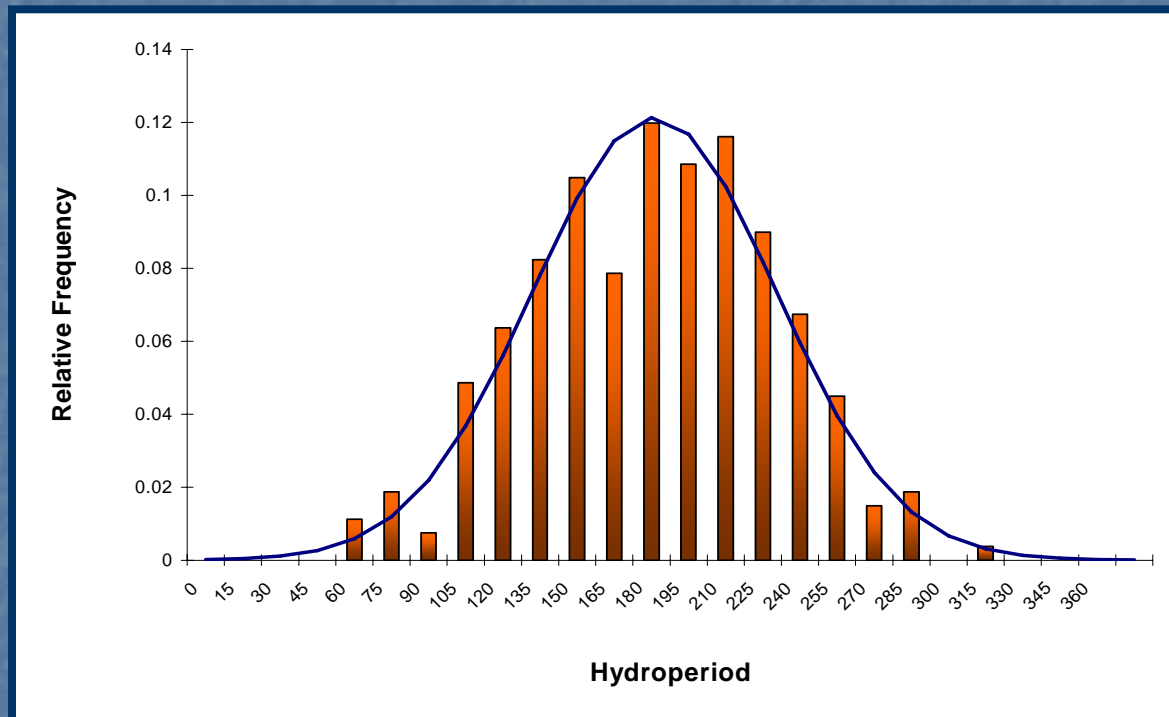
Ridge

Slough

**1⁰ stressors: reduced flow rates
and water levels**

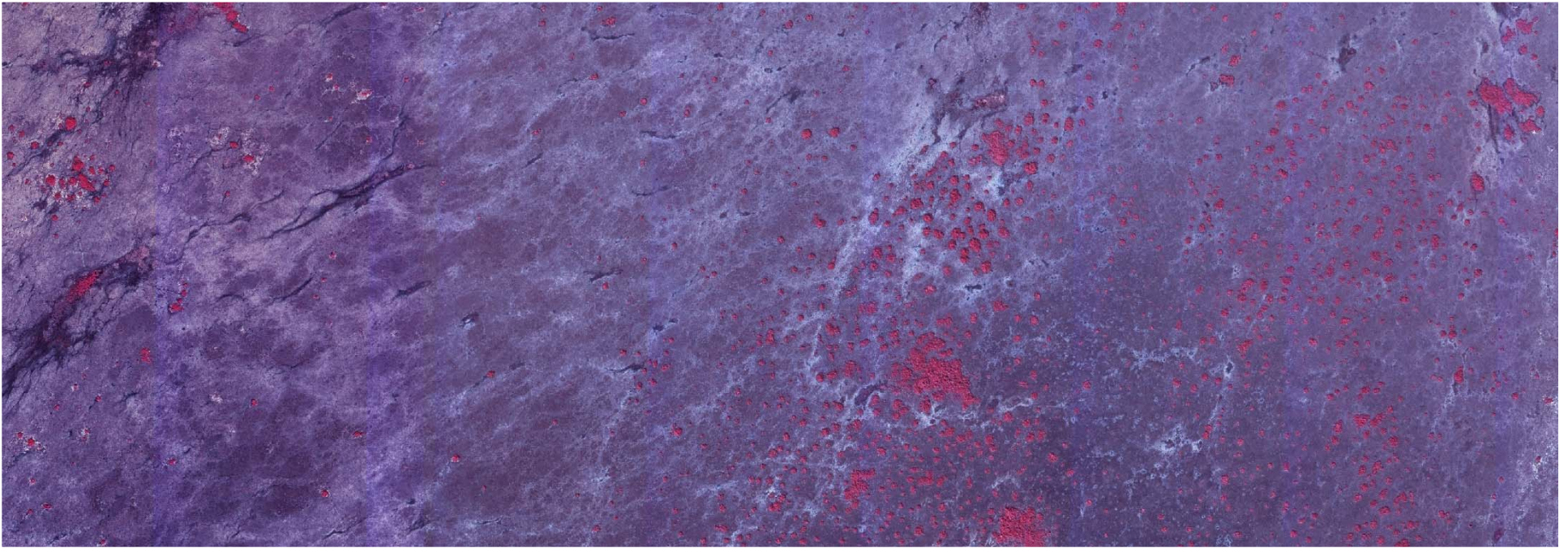


Goal: Maintain significant acreage of open marl prairie habitat



**1⁰ stressors: altered water levels; reduced fire frequency,
punctuated by very intense fires**

Goal: Maintain/restore tree islands' historical distribution and function in the Everglades landscape, especially the provision of diverse forest habitat for resident plants and animals



1^o stressors: direct human impact; prolonged flooding; fire

Study Design

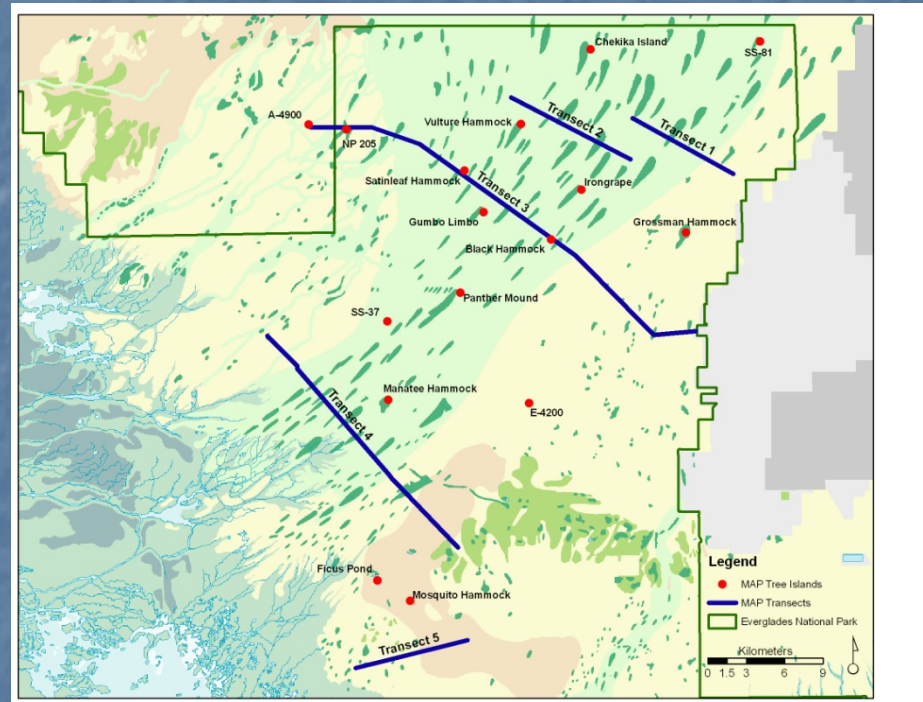
Marsh (R&S & Prairie)

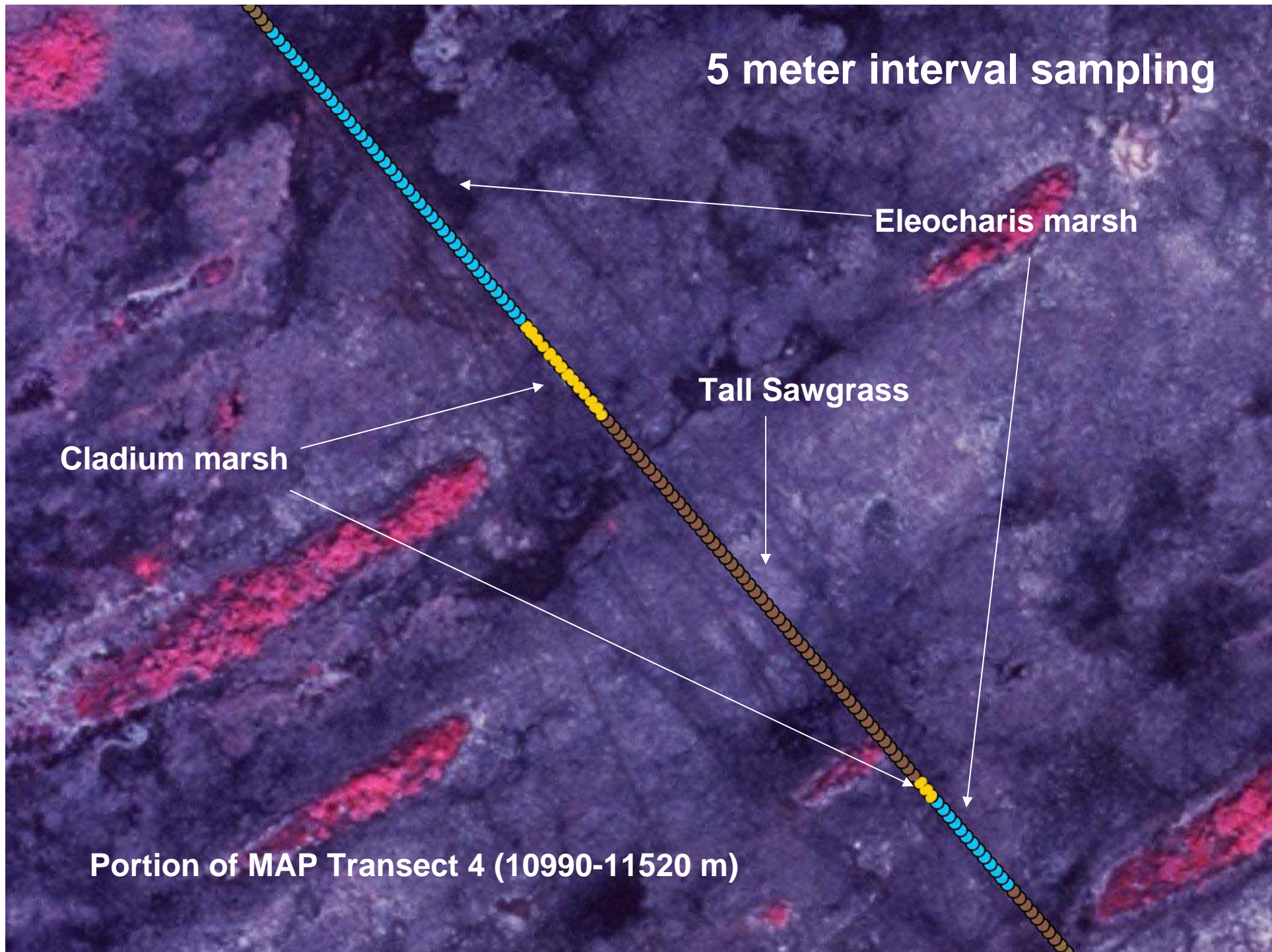
Cross-slough Transects; 5, with total length of XX km

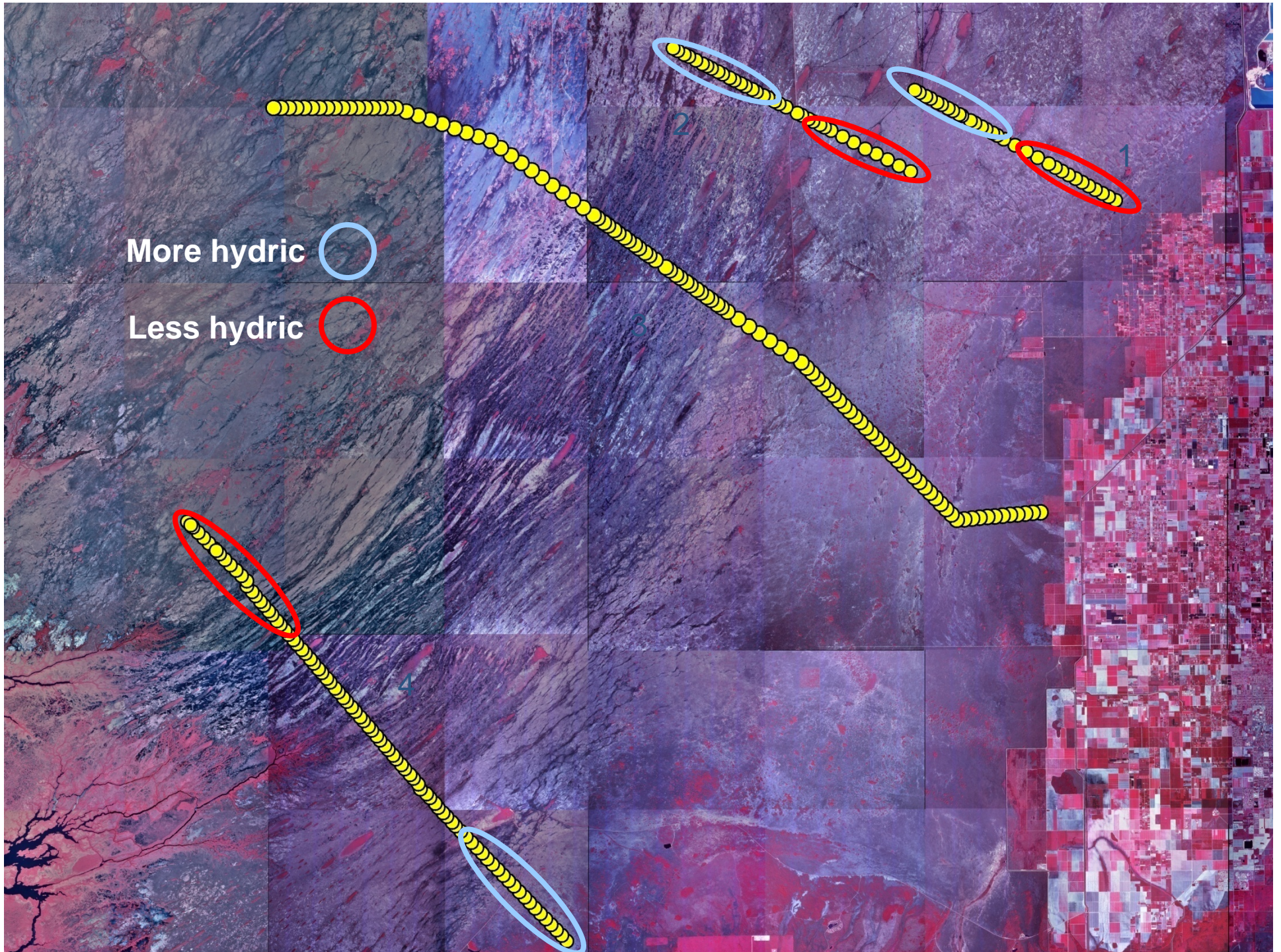
- 1. Fixed Plots** – every 300-500 meters
- 2. Vegetation type** – characterized @ 5 m interval

Tree Islands (tropical hammocks only)

- 1. Intensive islands (3) -**
Sampling frequency: every two months
- 2. Extensive islands (13) -**
Sampling frequency: every six months







“Vegetation-inferred hydroperiod” as an indicator of community response

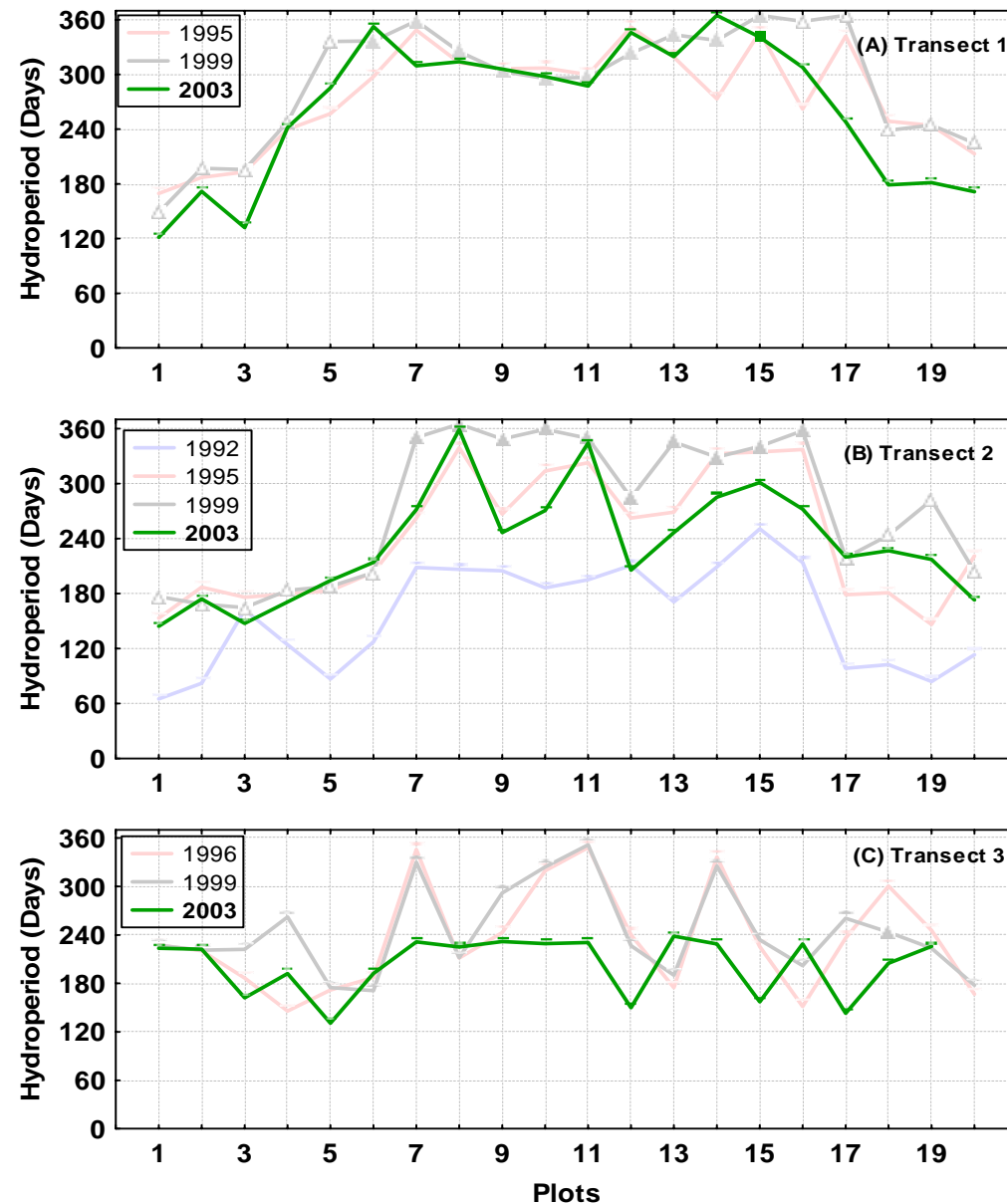
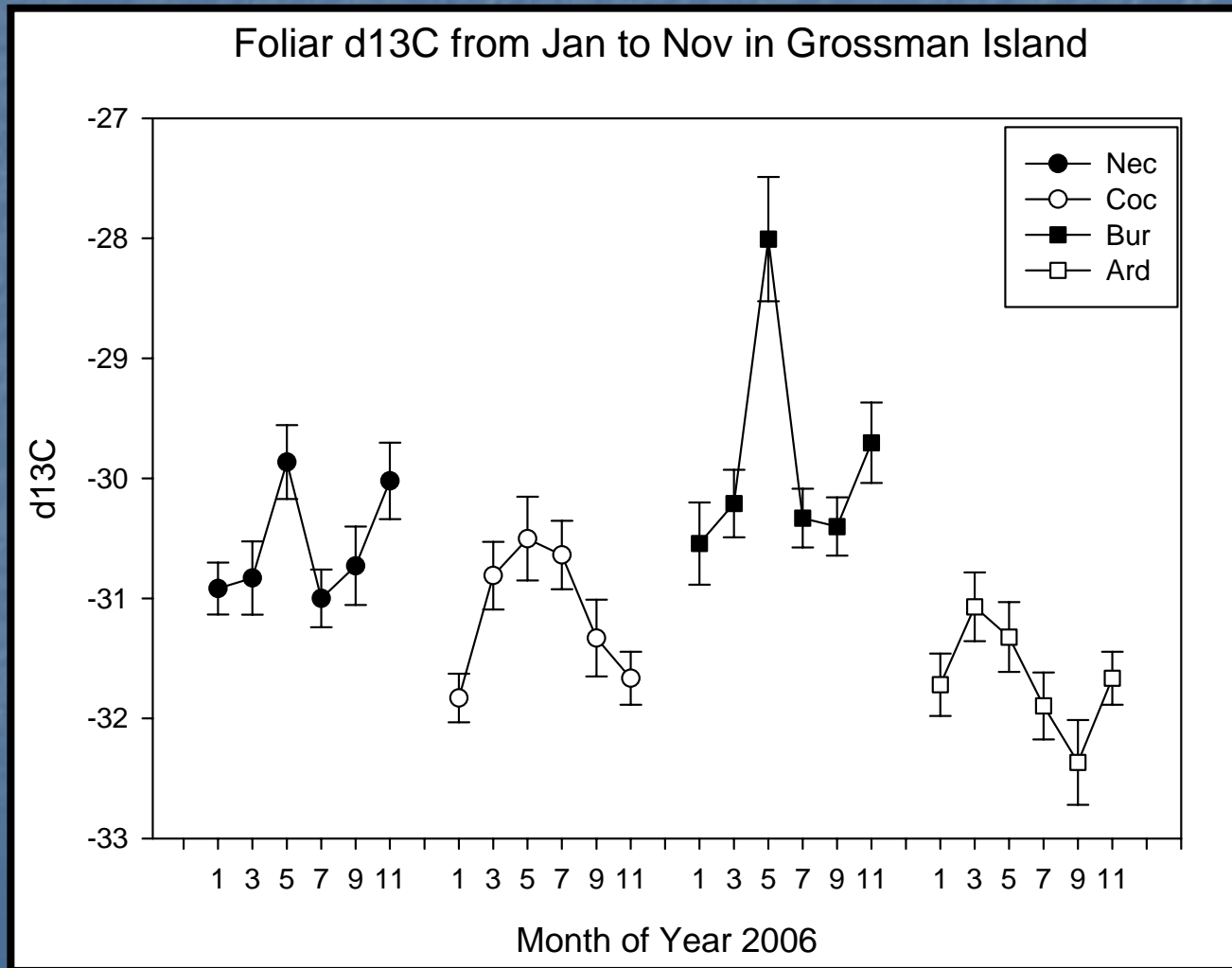


Figure 11: Plot level vegetation-inferred hydroperiods estimated in Muhly and Cladium plots along the Transects 1, 2 and 3, 1992 - 2003. Open symbols = Muhly plots; Closed symbols = Cladium plots.



Seasonal Change in leaf $\delta^{13}\text{C}$ in slough and prairie islands



Potential Tree island Monitoring Metrics

Individual tree (1)

e.g., Gas exchange, water transport, growth

Understory (2)

e.g., Exotics; tree regen;
herb composition

Stand (3)

e.g., Canopy composition & structure,
diversity, productivity

Substrate (4)

e.g., forest floor depth; soil accretion

Landscape (5)

e.g., Island size, shape, direction

Environment

e.g. Hydrology, soil moisture,
microclimate



Gumbo Limbo Hammock

← 2001

2006 →

