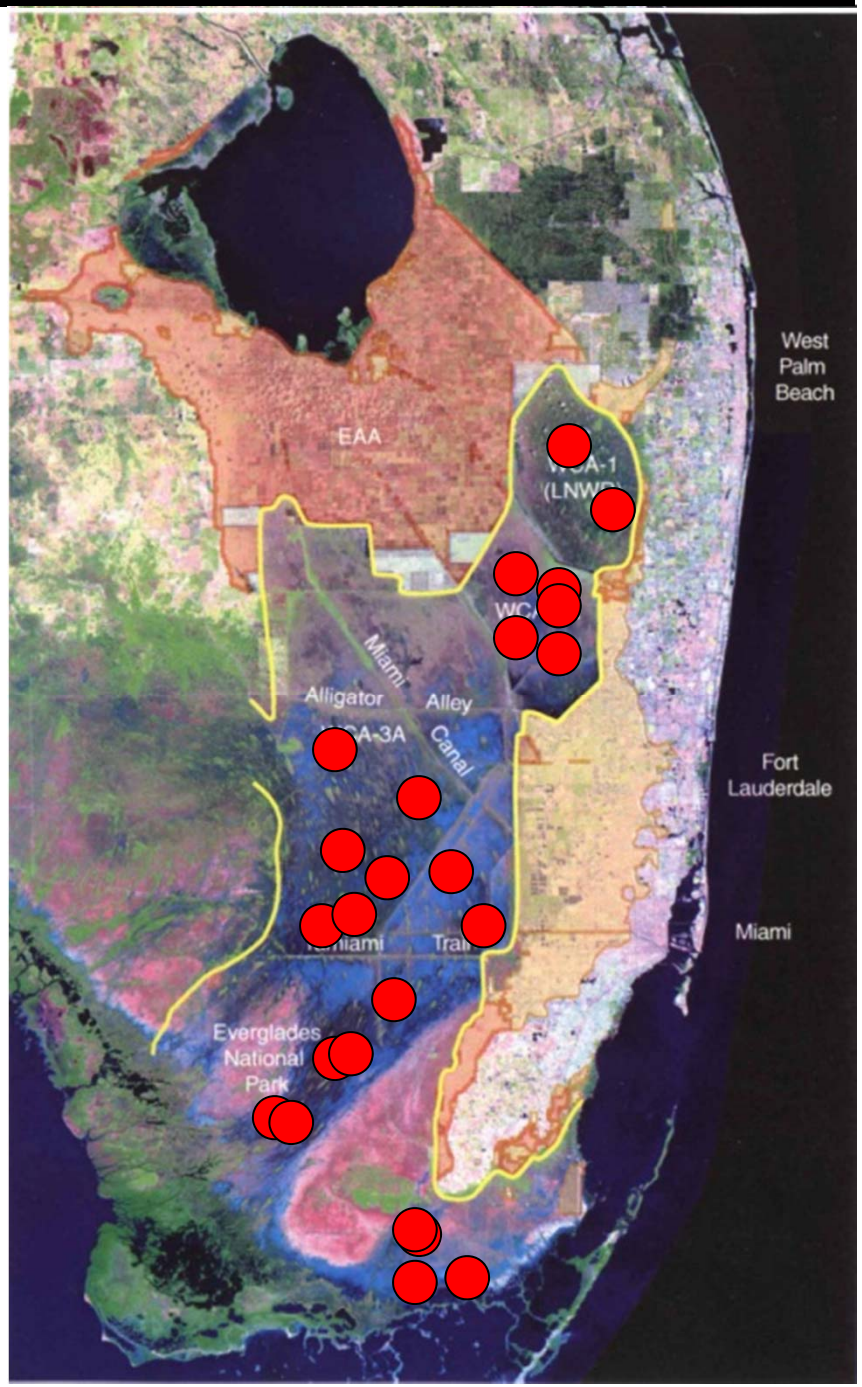
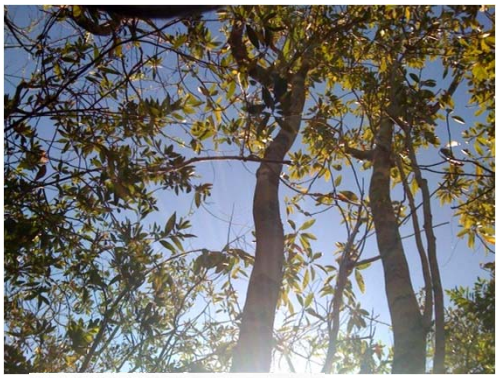
Sediment fossils as indicators of historic Everglades hydrology



Fossils as hydrologic indicators

Tree island



Morelia cerifera

Cephalanthus occidentalis

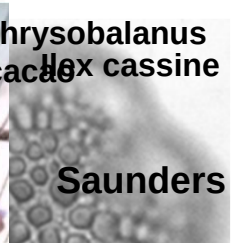
Bursera simaruba

Chrysobalanus icacao

Sawgrass

Cladium jamaicense

Salix caroliniana

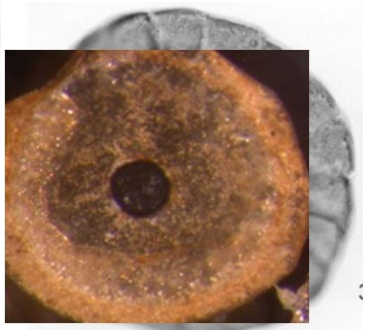


Ilex cassine

Wet Prairie

Eleocharis spp.

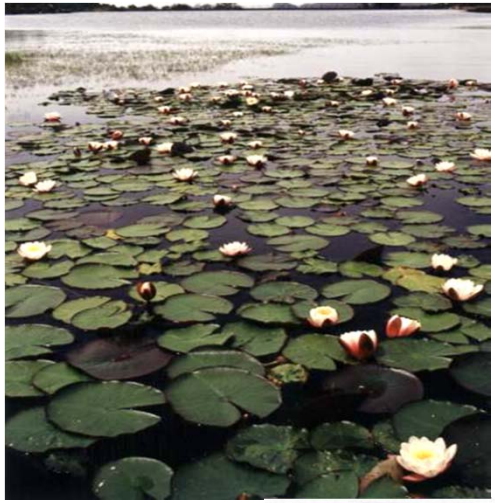
Rhynchospora colorata

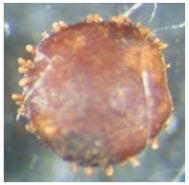


Utricularia foliosa

Charophytes

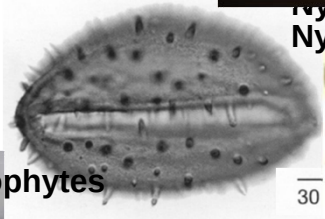
Slough





Nymphoides spp.

Nymphaea odorata



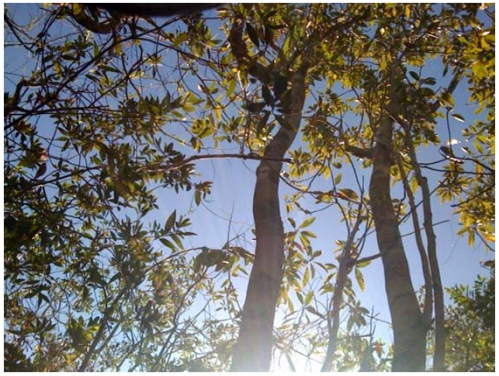
Nuphar lutea

Saunders *et al.*, 2008 Final Report to ENP

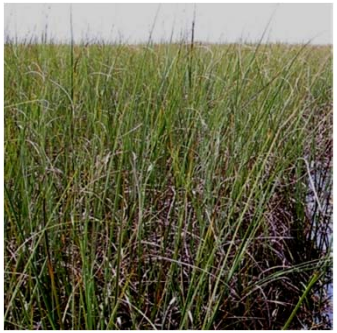
Willard *et al.*, 2004 *Palynology*; Ber… Willard 2009, *Ecol. Appl.*

Vegetation - Hydrology

Tree island

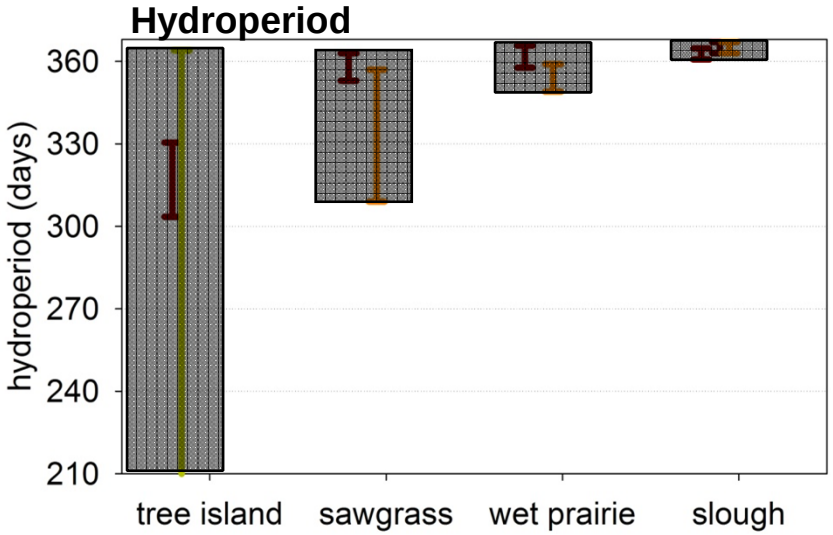


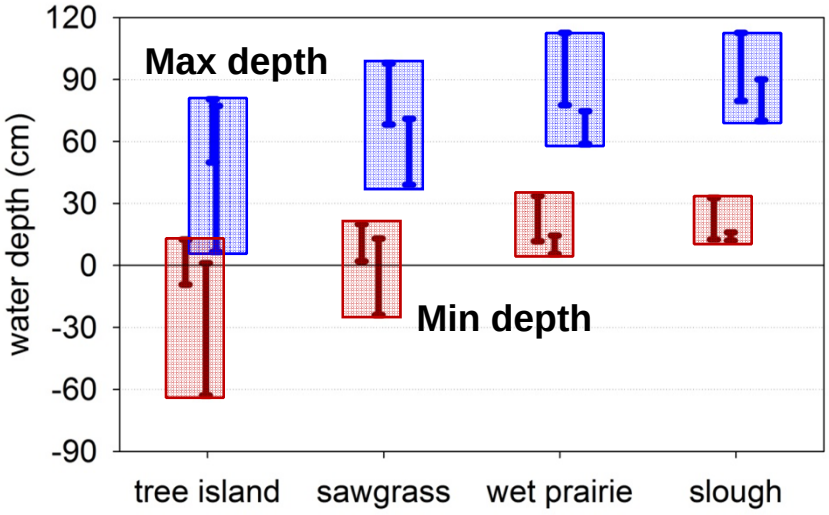
Sawgrass



Wet Prairie

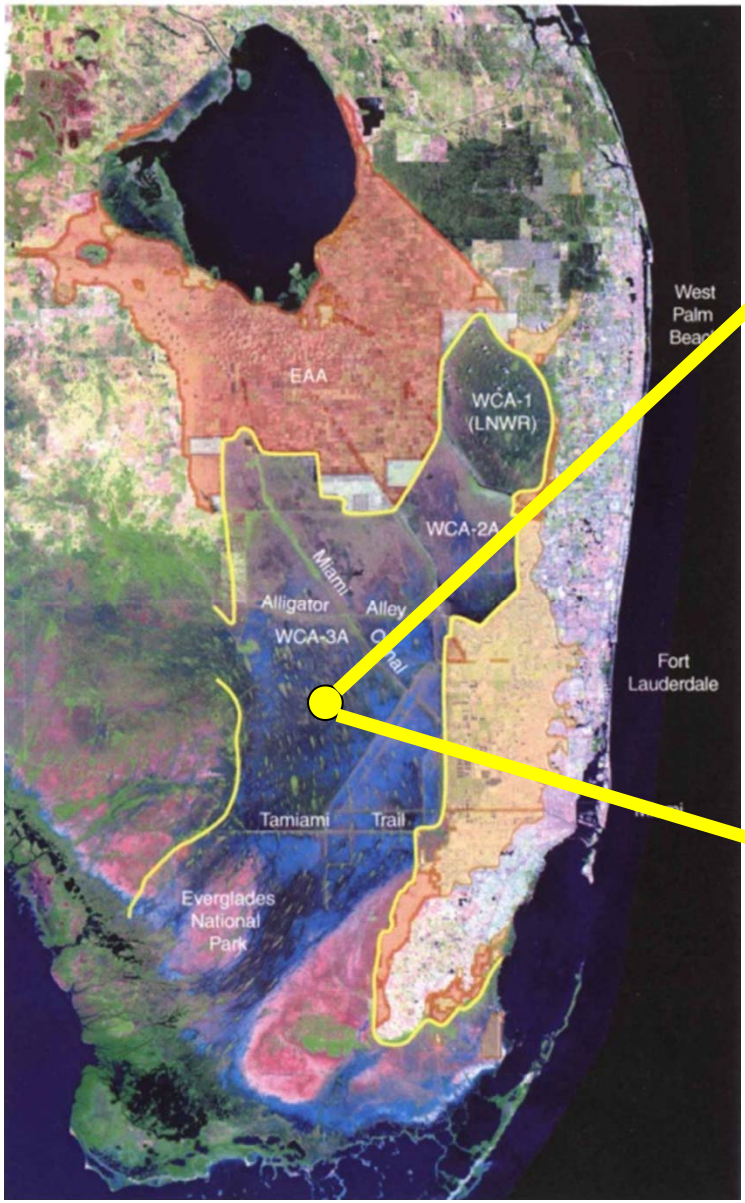
Slough

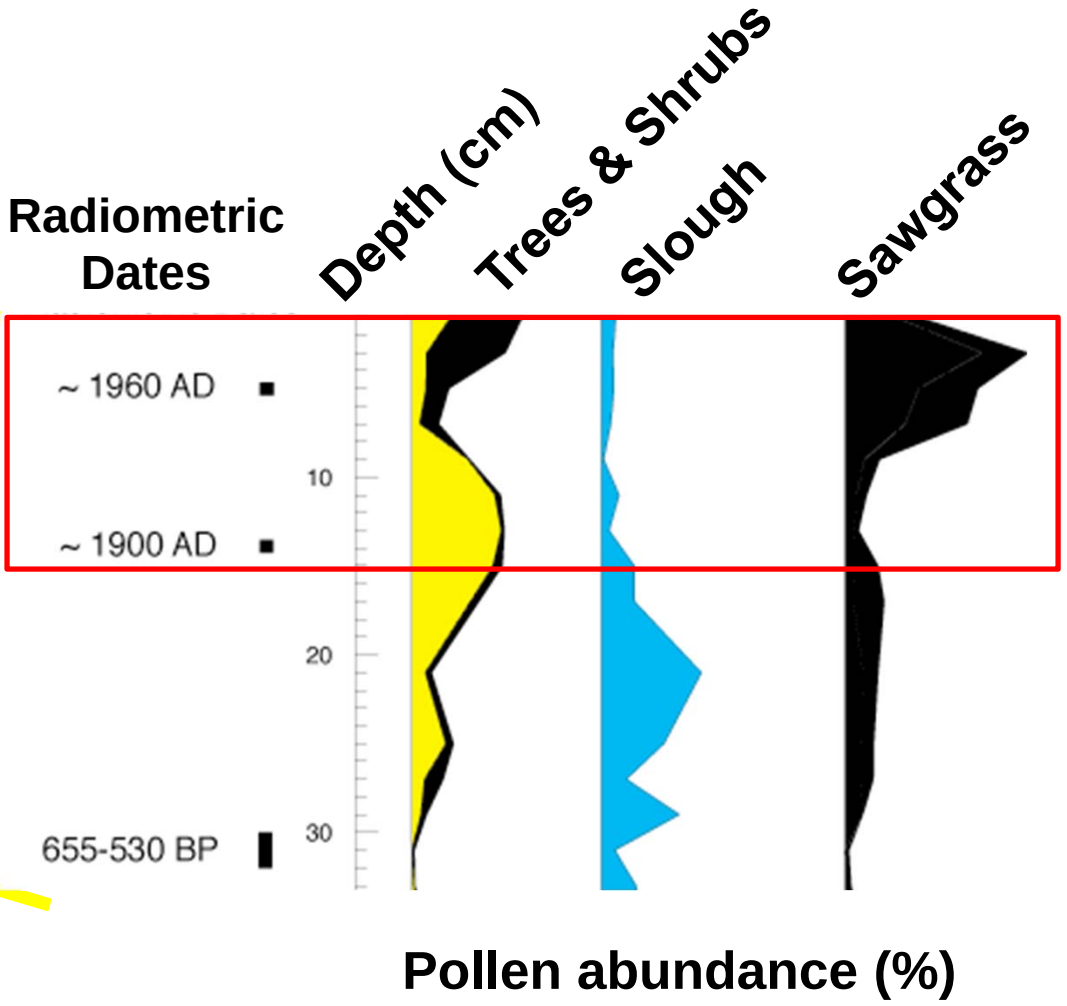




Givnish et al. 2007 *Global Ecol. Biogeogr.*; Saunders, unpubl. data; Lockwood et al., 2003 *Frontiers Ecol.*; Powers, 2005 M.S. Thesis, Univ. FL

Sawgrass - Central WCA-3A

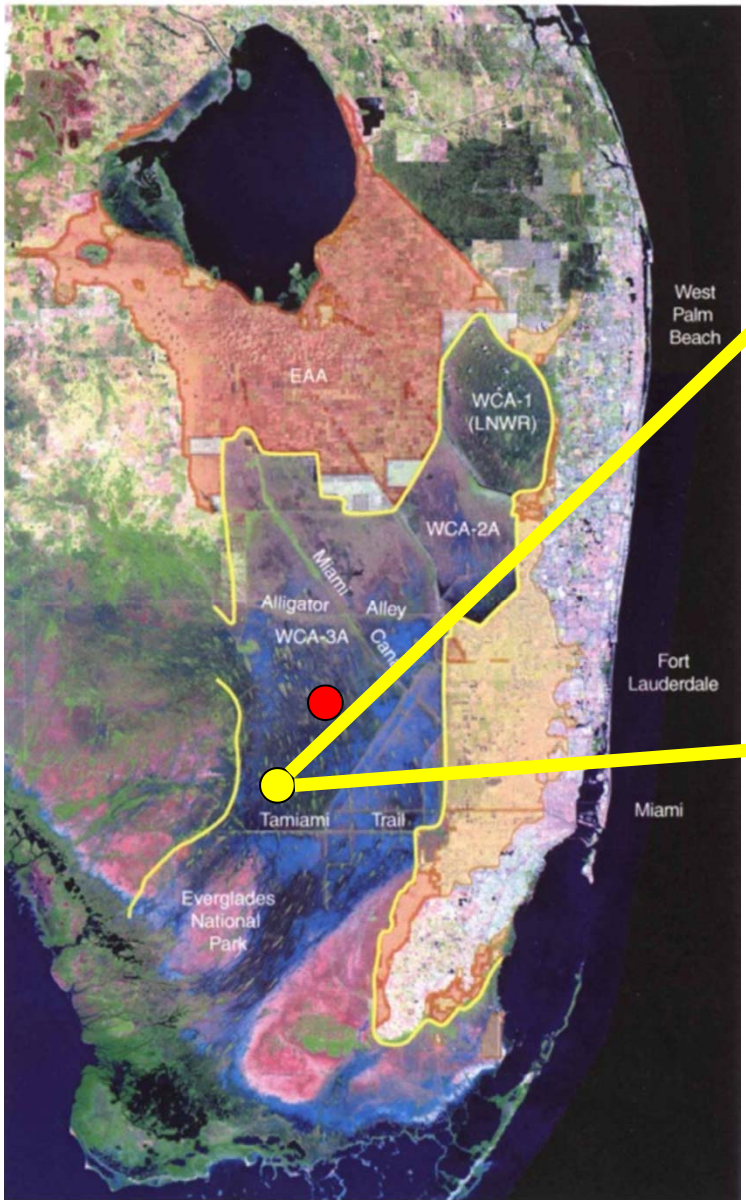




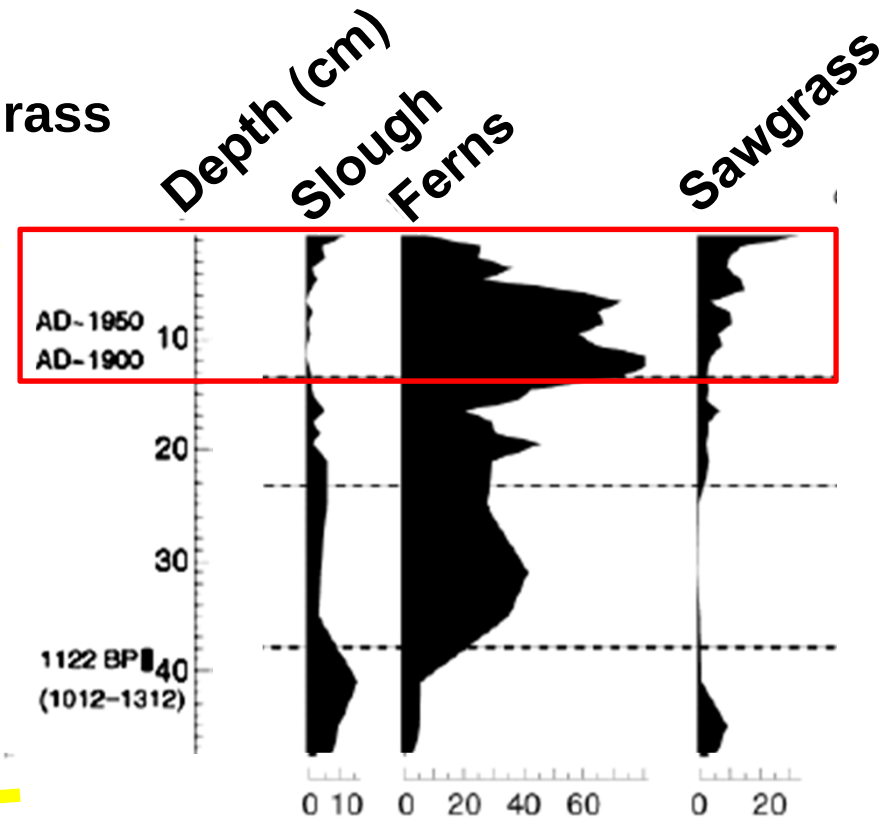
Willard et al., 2001 ***Bulletins of American Paleontology***

USGS

Ridge & Slough – southern WCA-3A



Sawgrass core

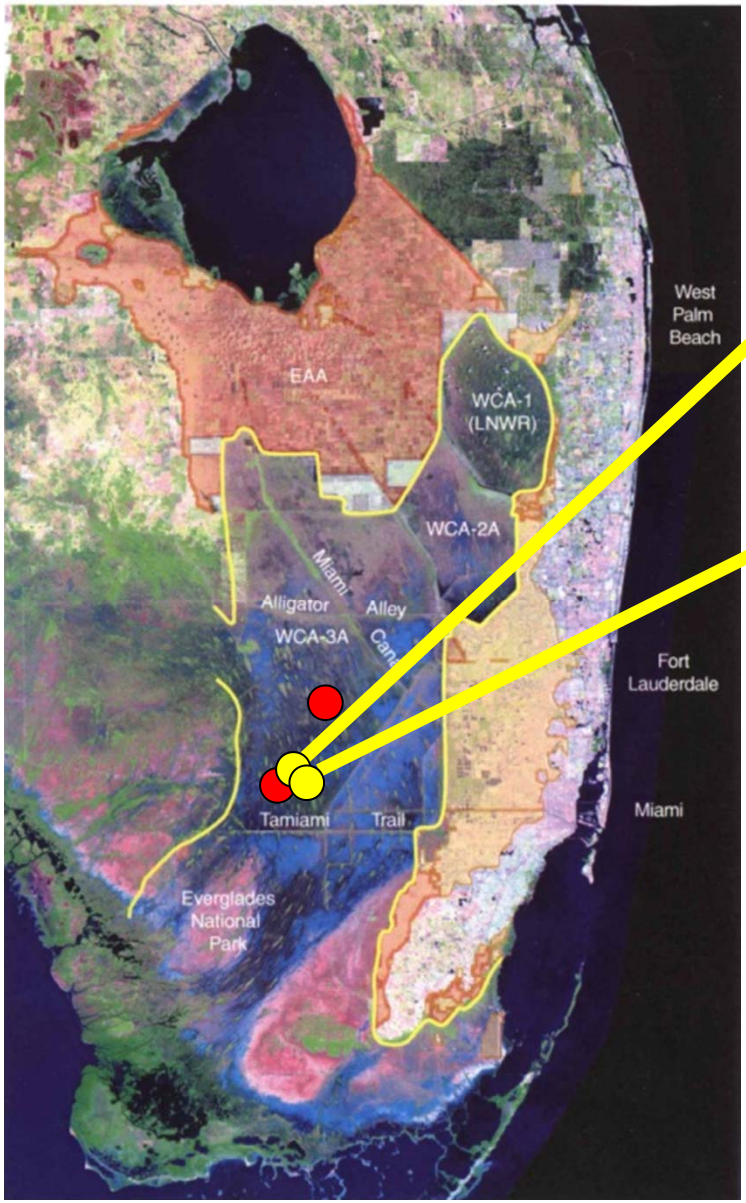


Pollen abundance (%)

Bernhardt and Willard, 2009 *Ecological Applications*

USGS

Tree islands – Southern WCA-3A



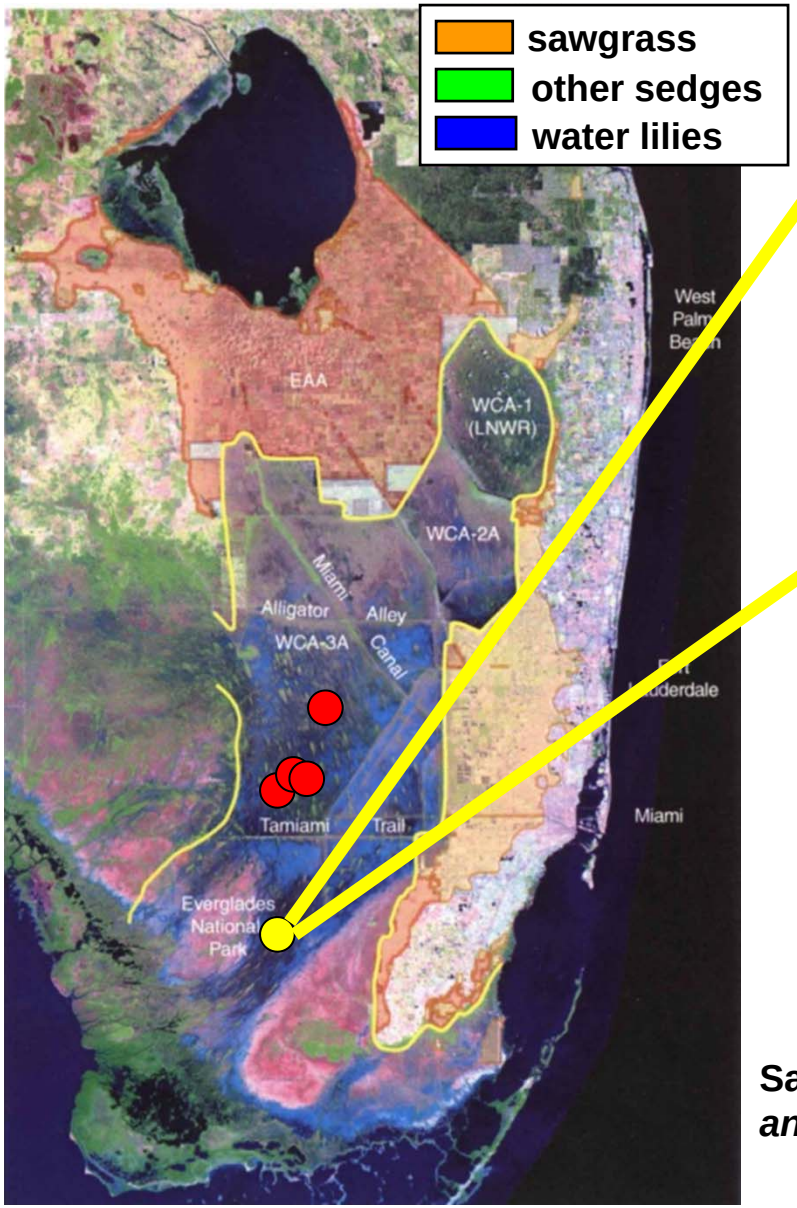
Island 3AS3 – "…fern spores indicate *shift from wetter to drier conditions*."

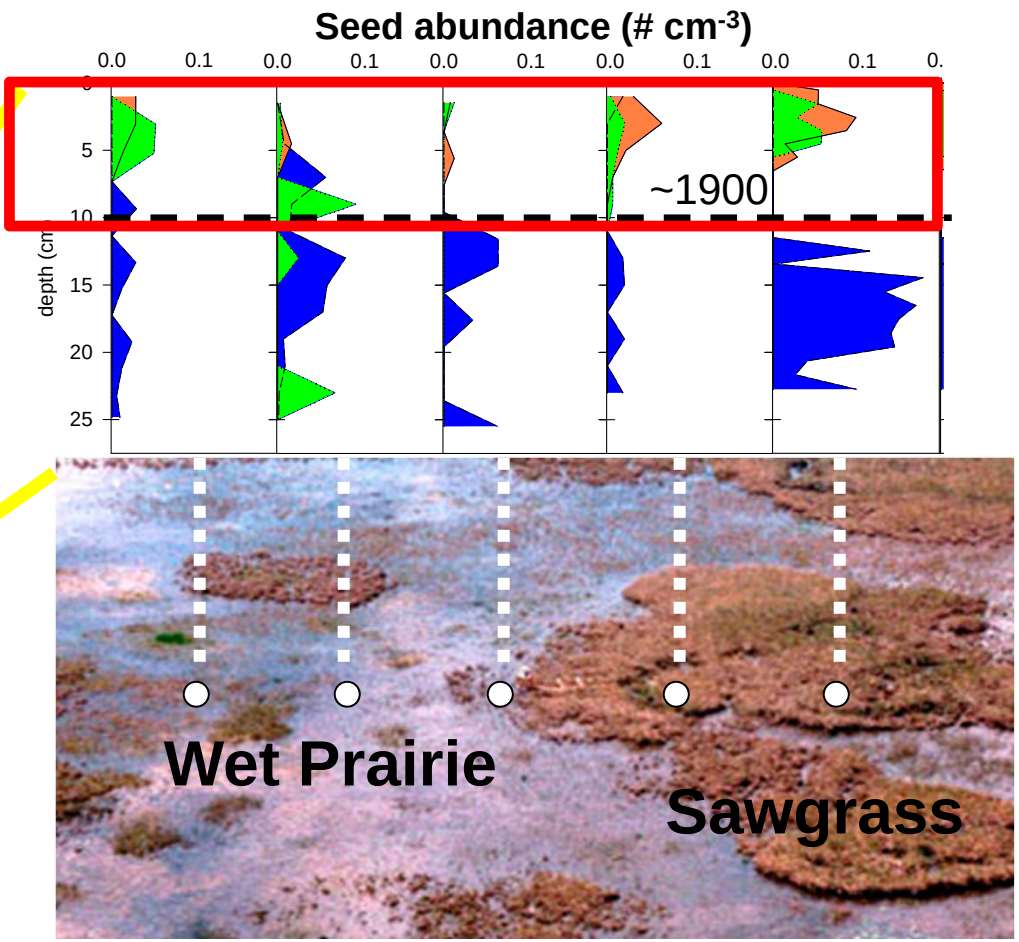
Skinner's Island– fern spores indicate *shift from drier to wetter conditions*

Willard et al., 2006 *Ecological Monographs*

USGS

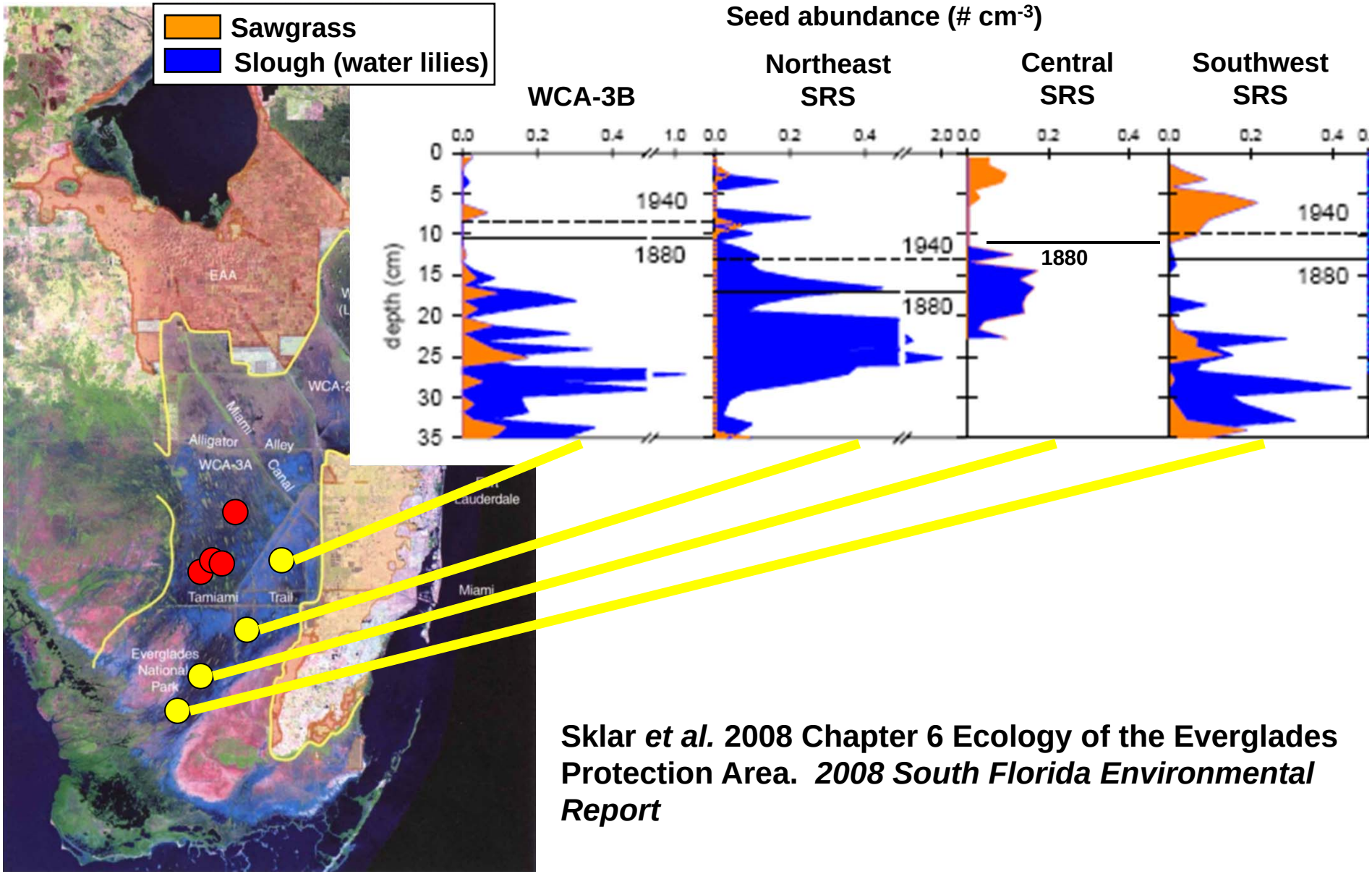
Ridge & “Slough” – central Shark Slough





Saunders *et al*. 2008. ***Decadal to Millenial Dynamics of Ridge-and-Slough Wetlands***. ENP Final Report (GA) 5280-00-007. 72 pp.

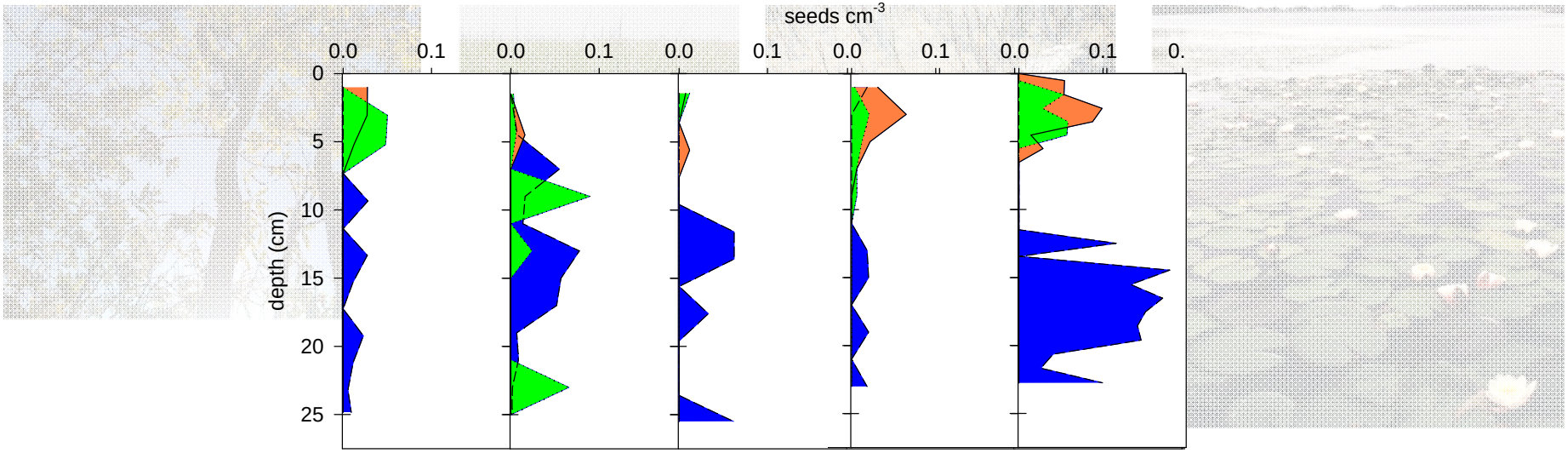
Sawgrass – WCA-3B to Shark Slough



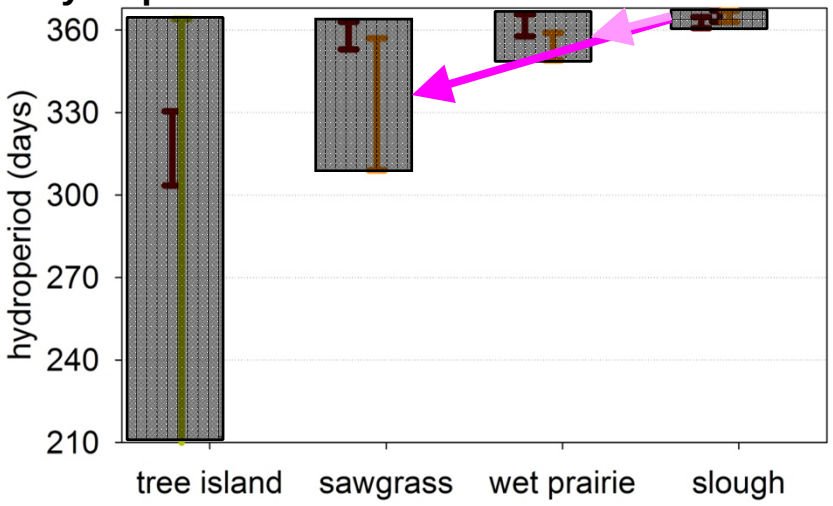
Sklar *et al.* 2008 Chapter 6 Ecology of the Everglades Protection Area. *2008 South Florida Environmental Report*

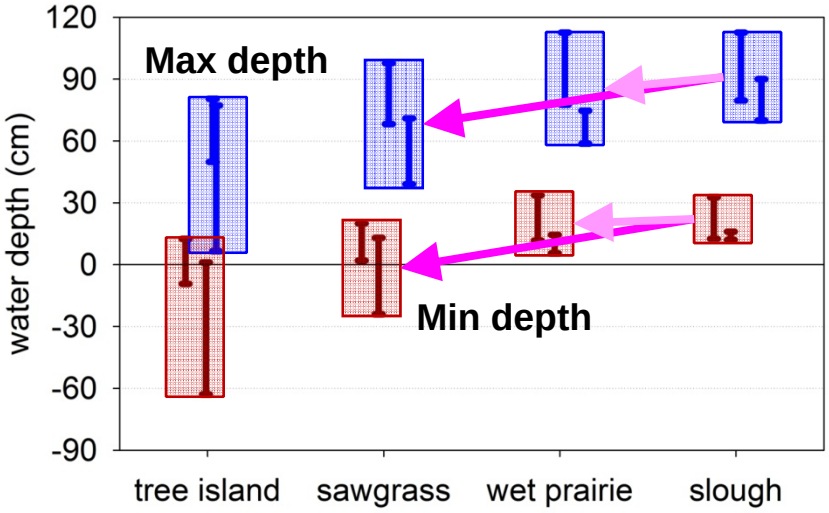
Vegetation - Hydrology

Tree island **sawgrass** **wet prairie** **deep water slough**



Hydroperiod

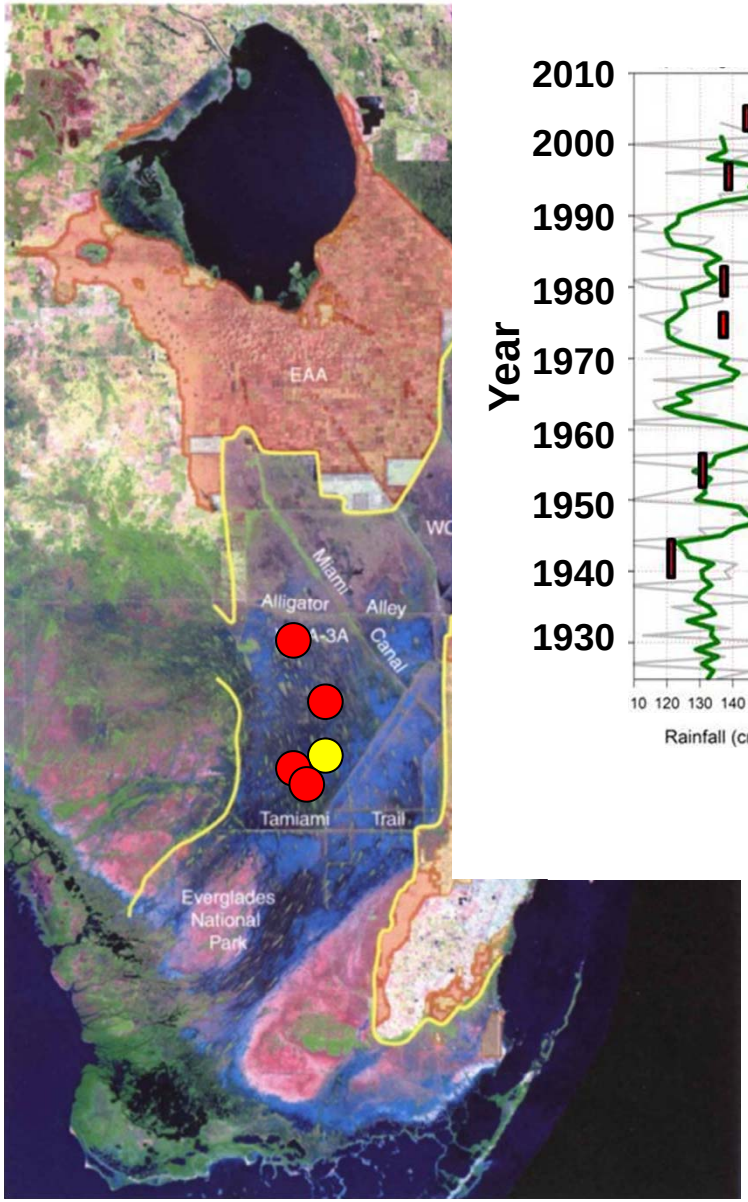


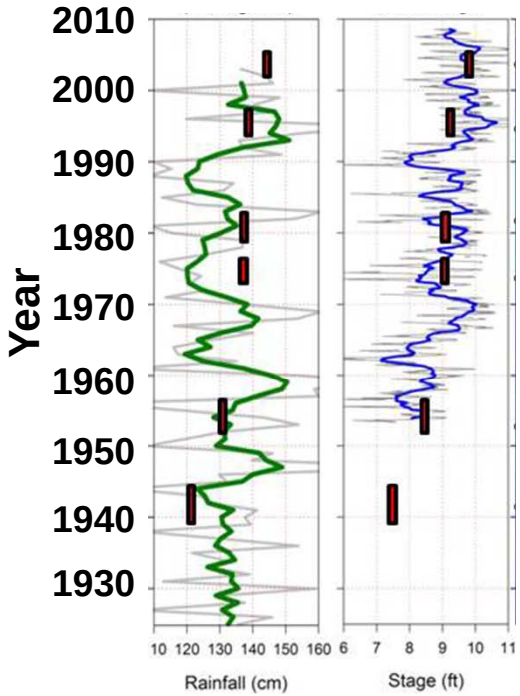


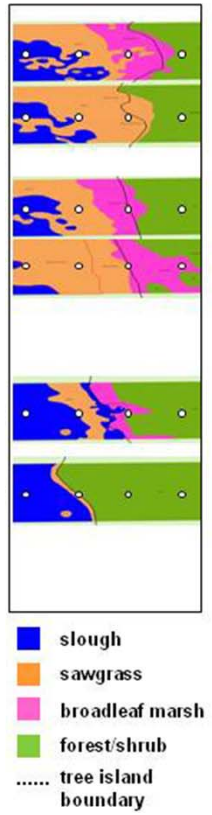
Conclusions

- Pre-1900, water lily is abundant throughout WCA-3, ENP
- Water diversions led to increased sawgrass abundance
- Several types of paleo-data consistently show this
  - pollen, spores, seeds, molecular biomarkers, diatoms
- Vegetation-Hydrology relationships indicate …
  - Hydroperiod decreased 2-weeks to 1-month
  - Water depths decreased 10-cm to 30-cm
  - *These estimates need substantial refinement*
- Southern WCA-3 impounded by L-29 & L-67
  - Some tree islands indicate drier or wetter conditions
  - Uncertainties – elevation, subsidence, …

Tree island – Southern WCA-3A

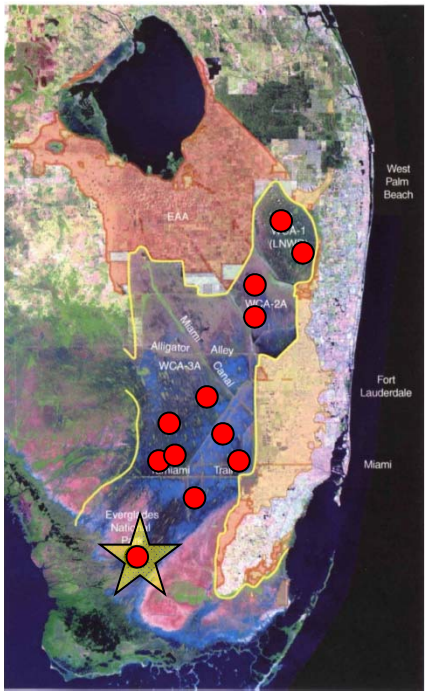


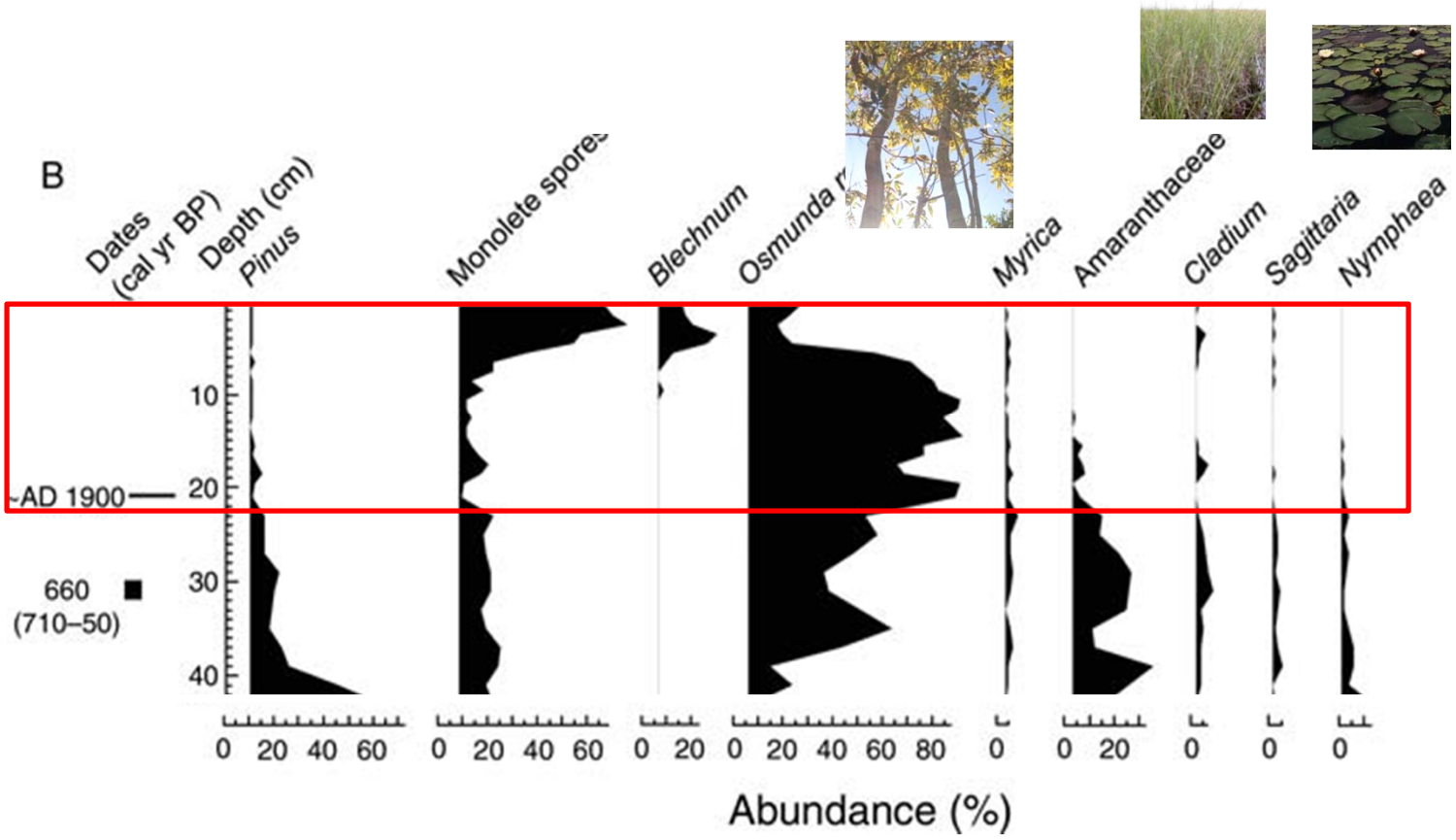




Sklar *et al.*, 2011 Chapter 6 Ecology of the Everglades Protection Area. ***2008 South Florida Environmental Report***

Tree island Paleoecology





Willard et al., 2001 *Bulletins of American Paleontology*;
Willard et al., 2006 Ecological *Monographs.*