Hydrologically induced seasonal changes in cypress forest aquatic fauna communities

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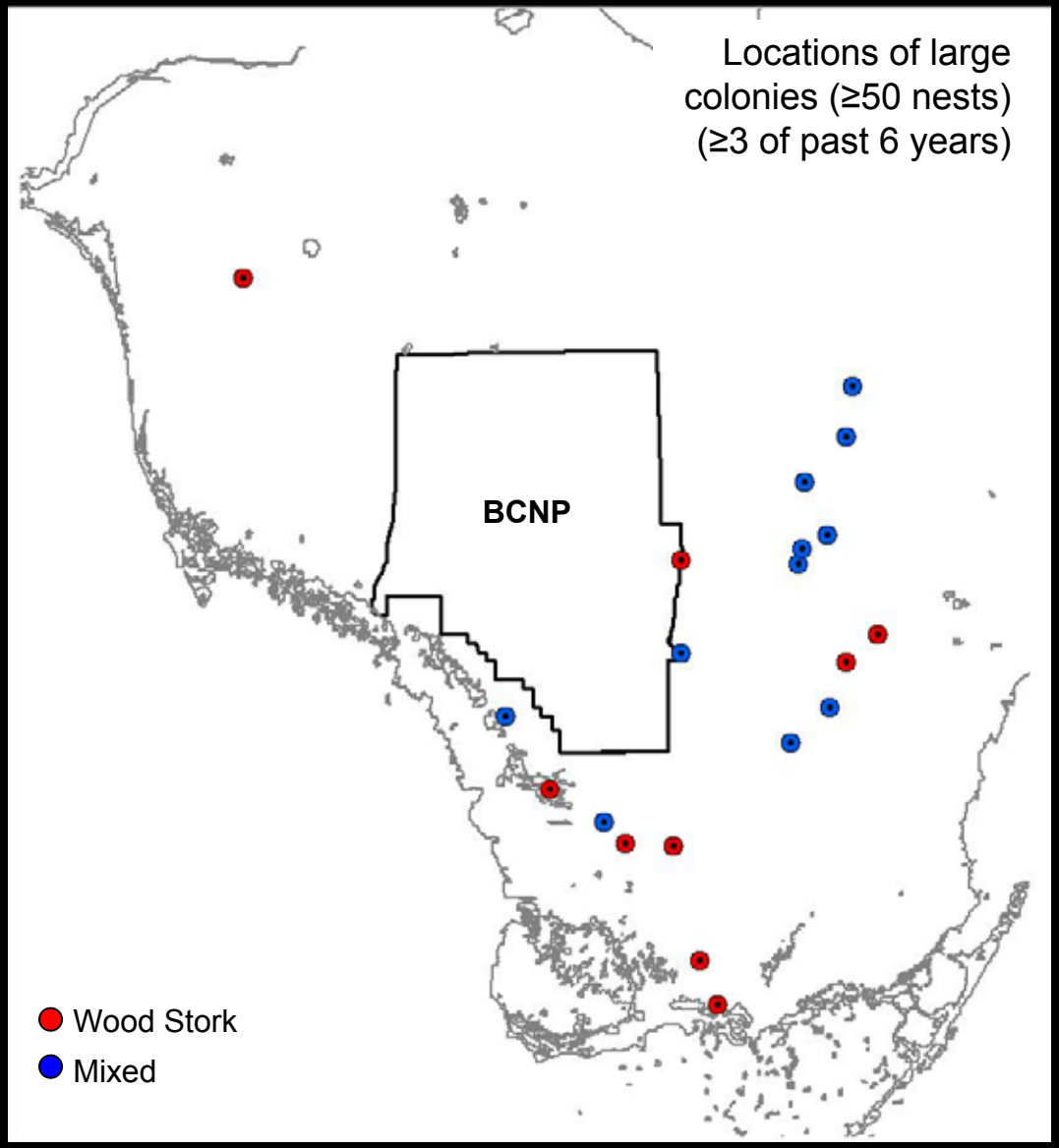
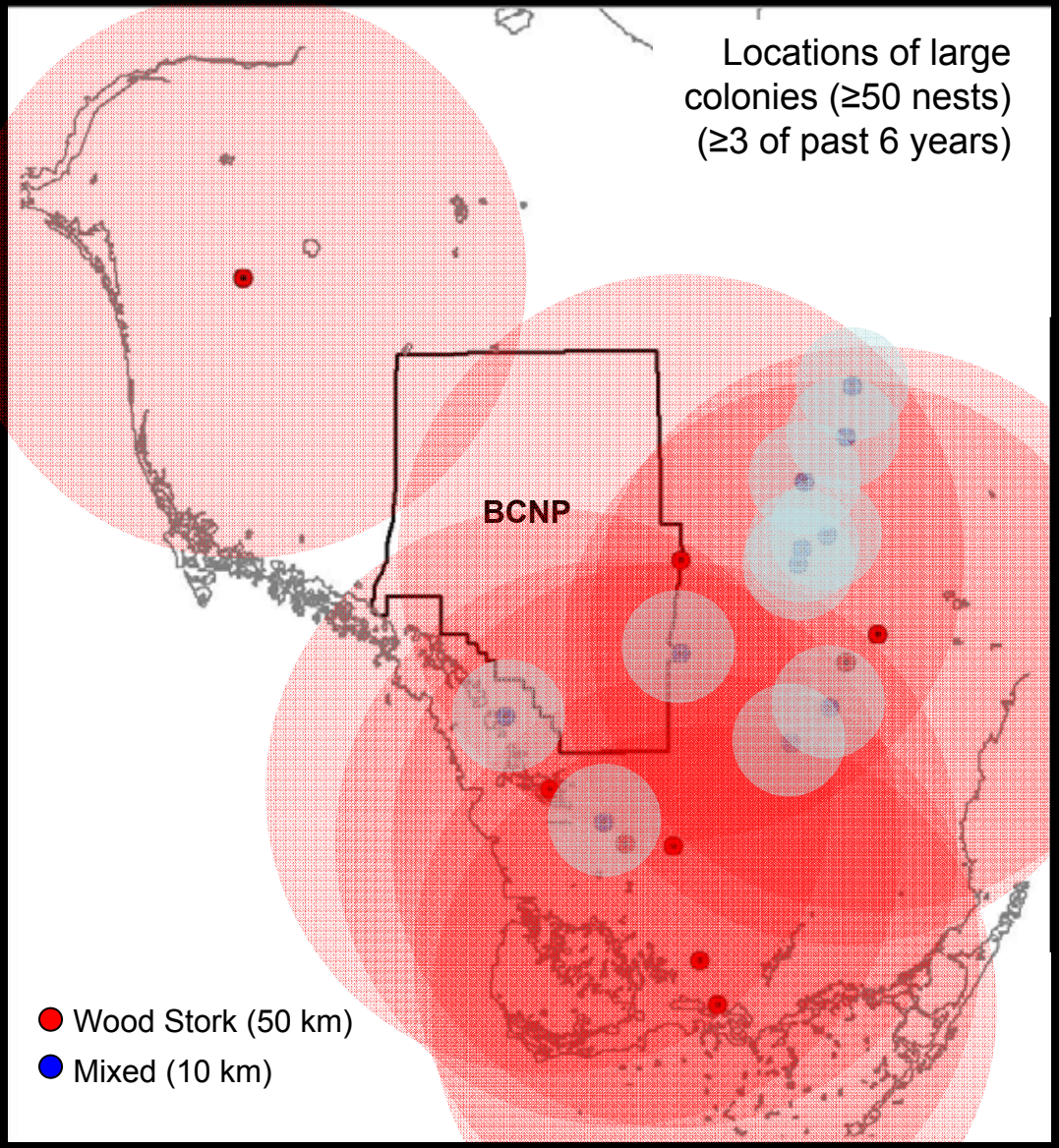
The Big Cypress Region

- Little is known about the long-term history of Big Cypress wading bird population
- Although large rookeries have never been documented in BCNP, it serves as a major foraging ground for many species of wading birds (esp. wood storks)

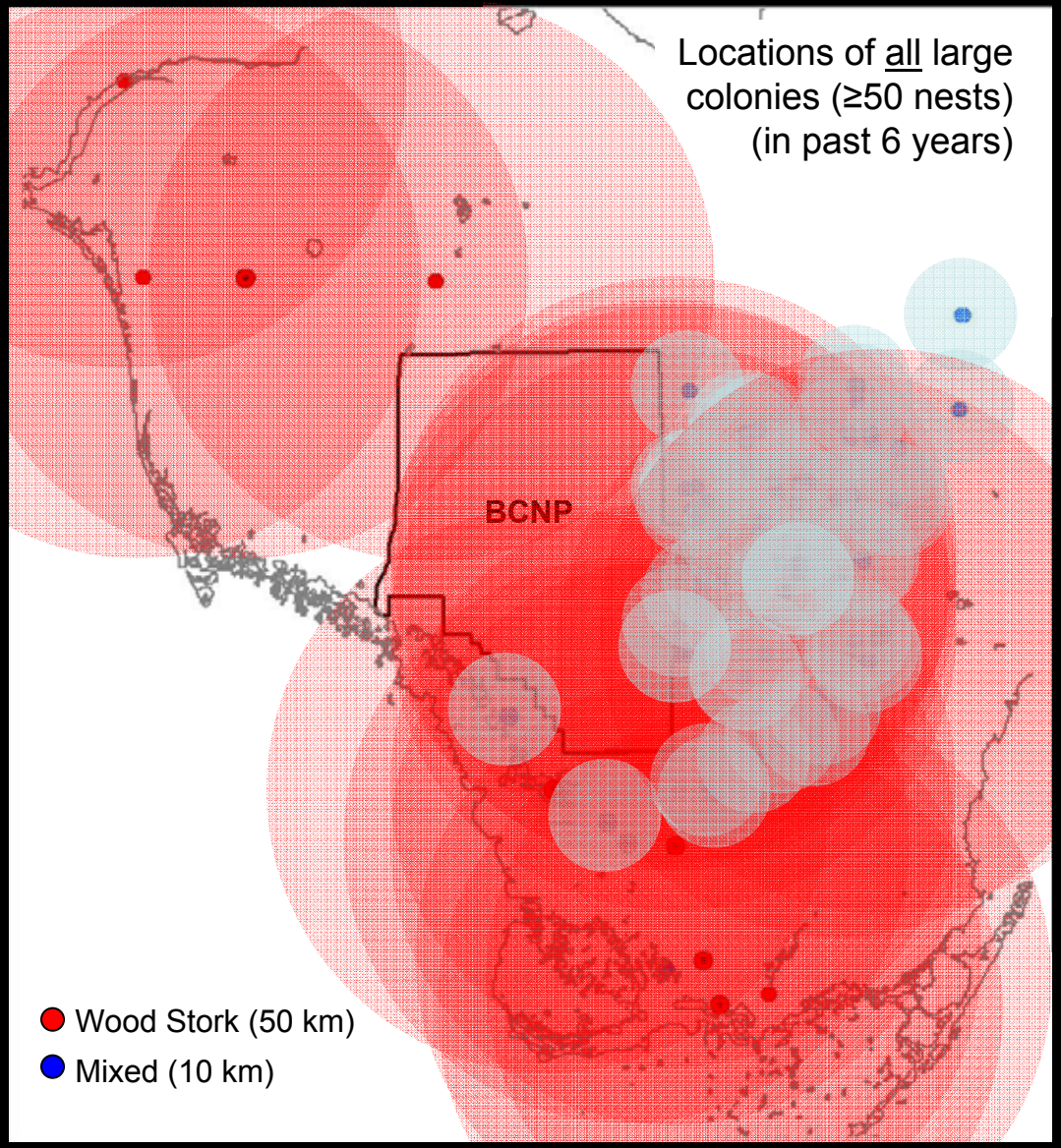
Wading Birds in Big Cypress



Wading Birds in Big Cypress

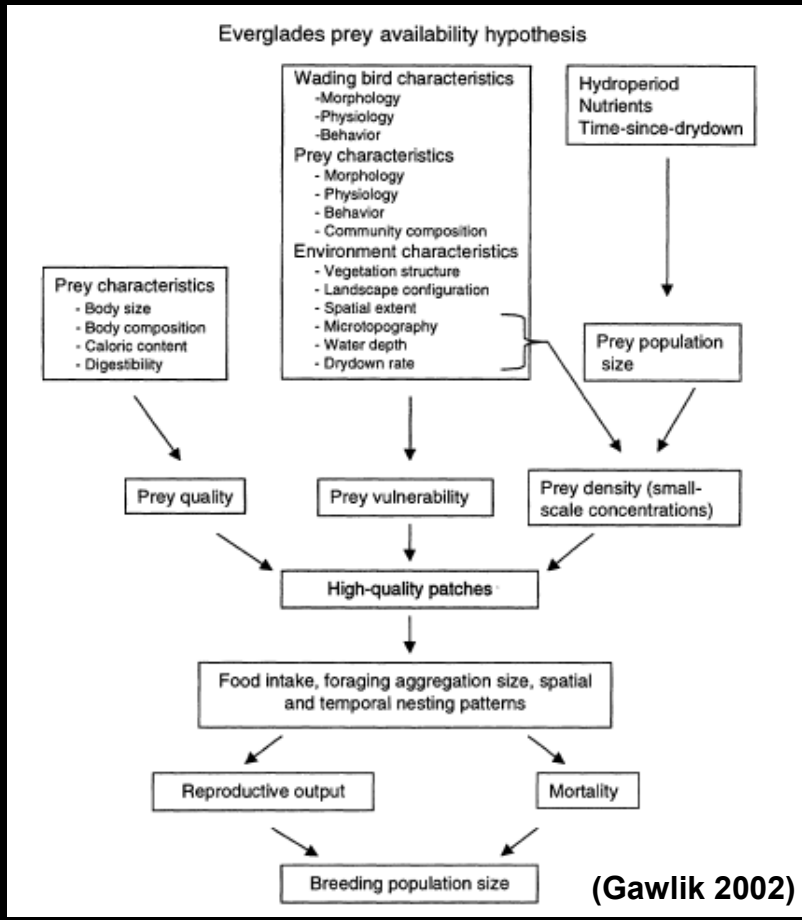


Wading Birds in Big Cypress



Wading bird prey

- Wading birds need high-density prey patches with relatively shallow water (prey accessible)
- Microtopographic variation is critical for creating these prey patches
- Topography of the Big Cypress Region is different from that of Everglades graminoid wetlands; long-distance movements of fish are impeded by topography



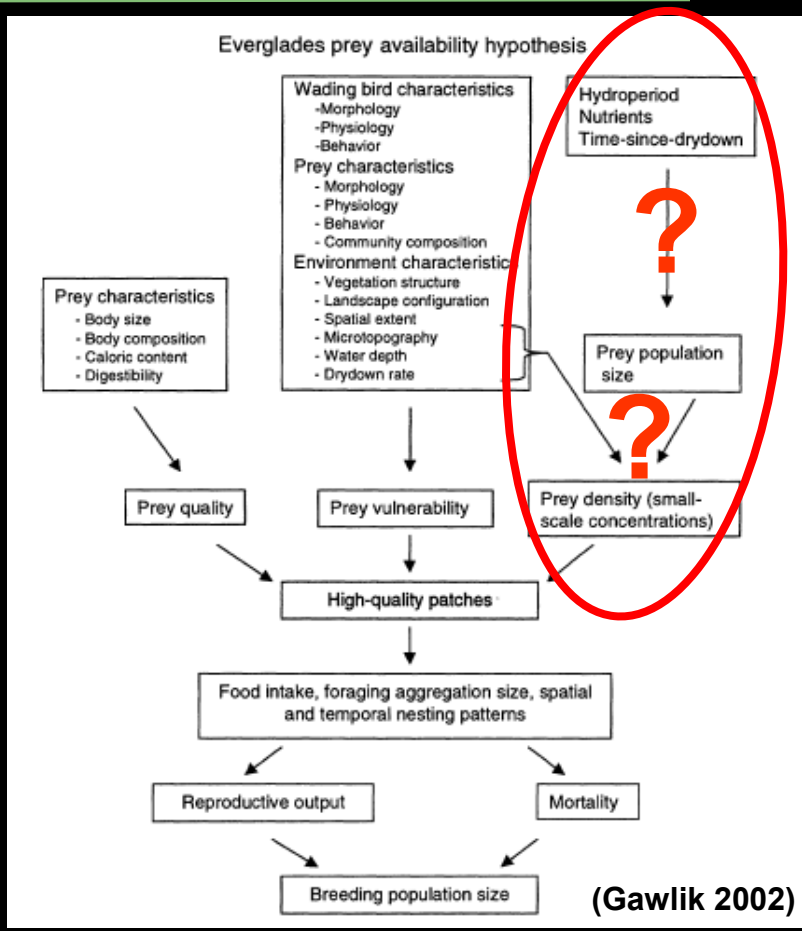
(Gawlik 2002)


Everglades National Park
More continuous matrix
2008 The Florida Department of Environmental Protection
Streaming 100%


Big Cypress National Preserve
More compartmentalized
Image © 2008 The Florida Department of
563 m
Pointer 26°01'08.46" N 80°58'02.21" W
Streaming

Wading bird prey

- Wading birds need high-density prey patches with relatively shallow water (prey accessible)
- Microtopographic variation is critical for creating these prey patches
- Topography of the Big Cypress Region is different from that of Everglades graminoid wetlands; long-distance movements of fish are impeded by topography



(Gawlik 2002)

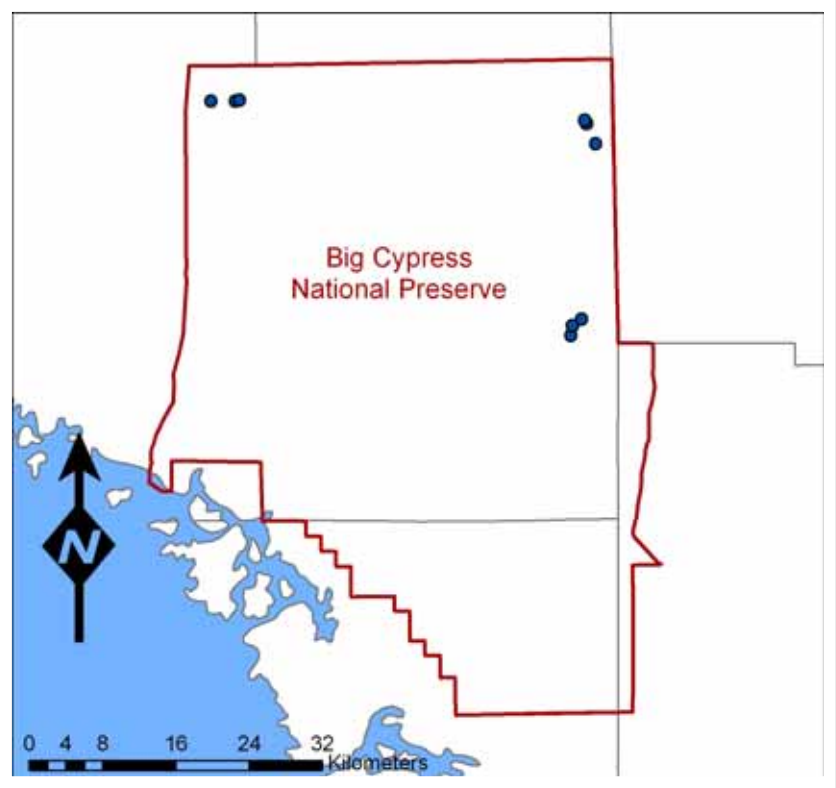
- Big Cypress is not well-studied -- we know relatively little about how aquatic fauna respond to hydrology in this region

Objective…

to describe seasonal changes (with hydrology) in aquatic fauna community in BCNP

(2005-2007)

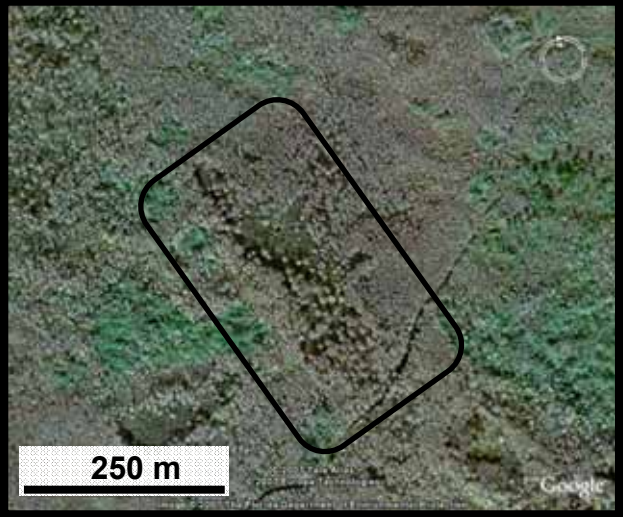
Study Sites & Design

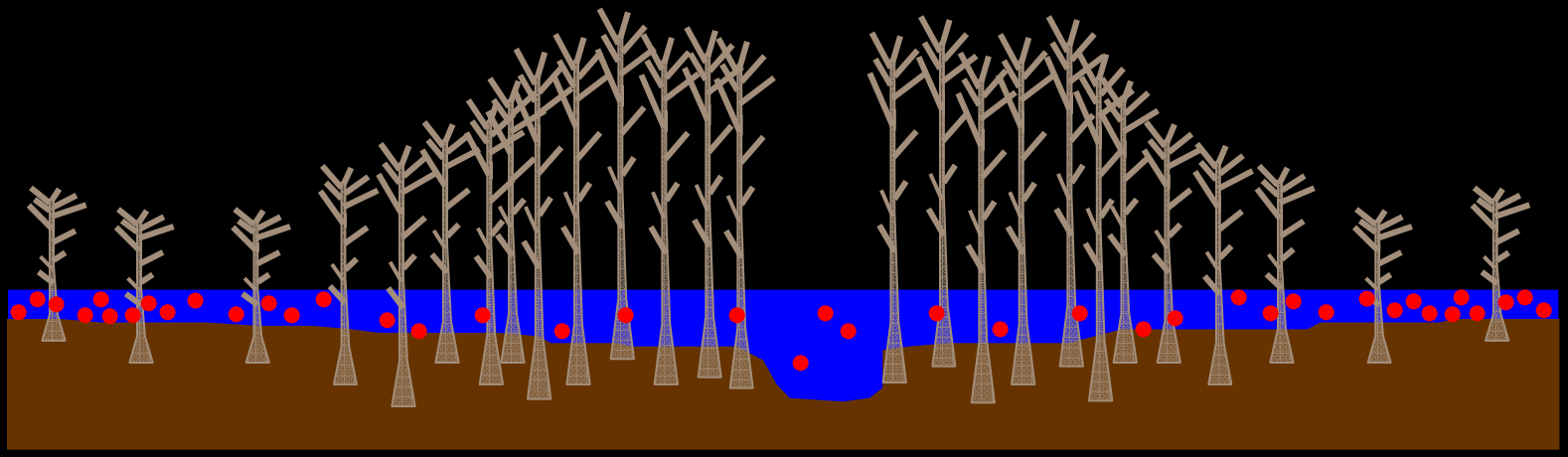


- 3 sites (3 replicate 1-ha plots per site)
- Sampled 5X annually
  - Early-wet season* (Jul/Aug)
  - Mid-wet season (Oct)
  - Transition (Dec)
  - Mid-dry season (Jan/Feb)
  - Late-dry season (Mar/Apr)

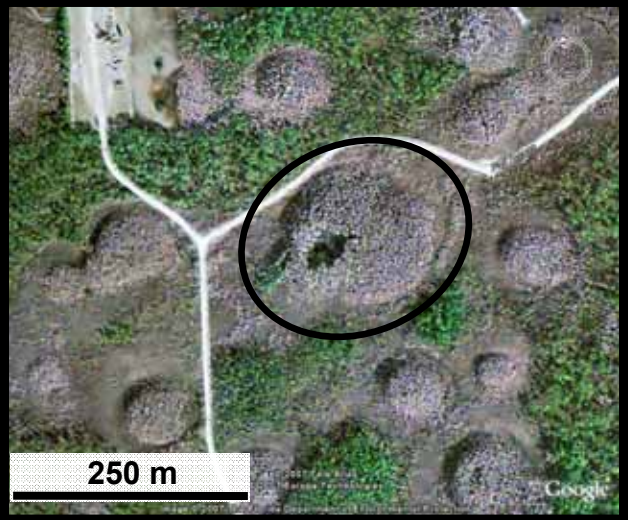
* 2nd year only

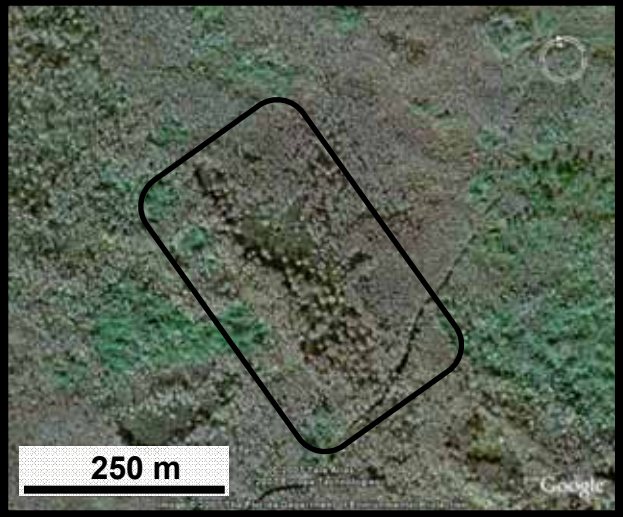
Stratified sampling

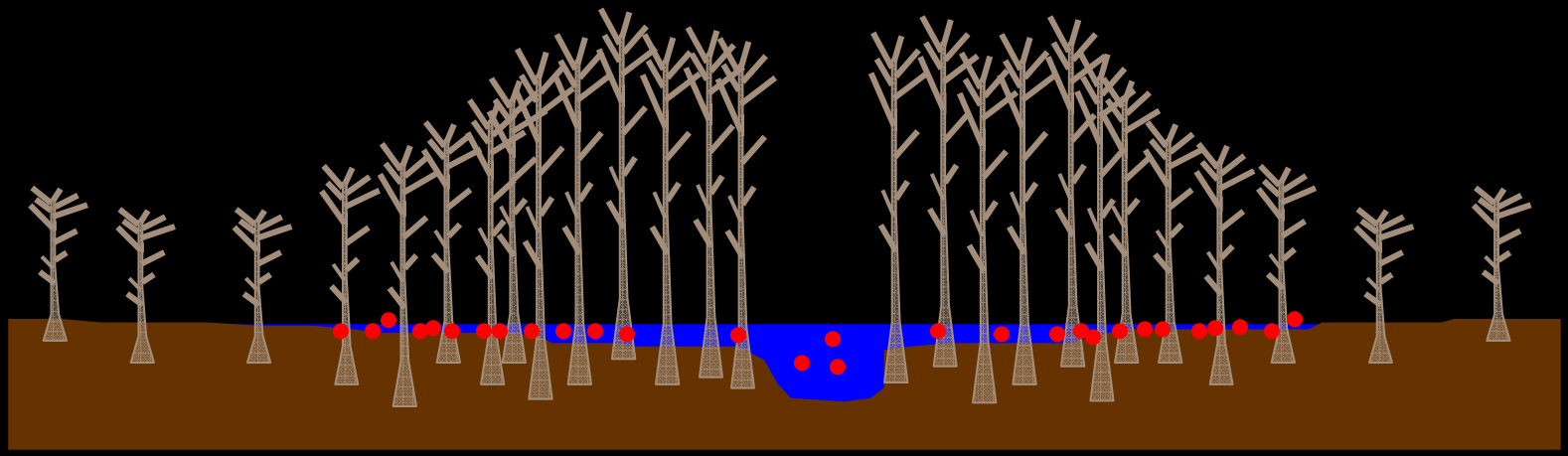




Stratified sampling







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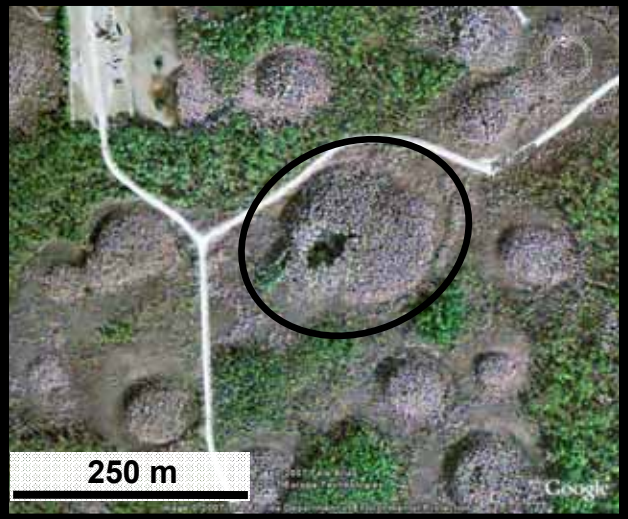

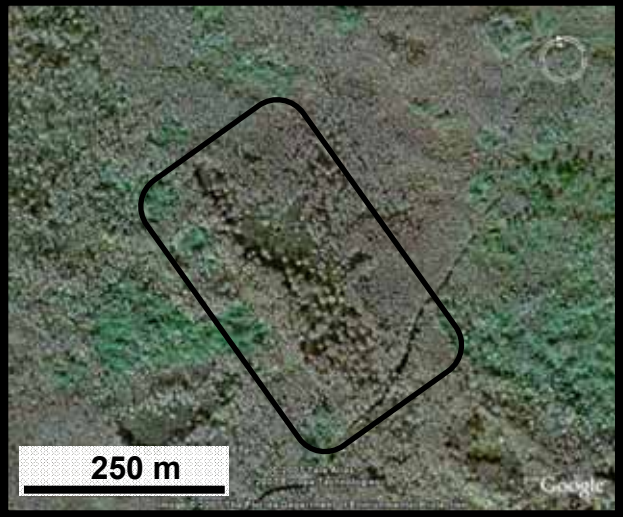

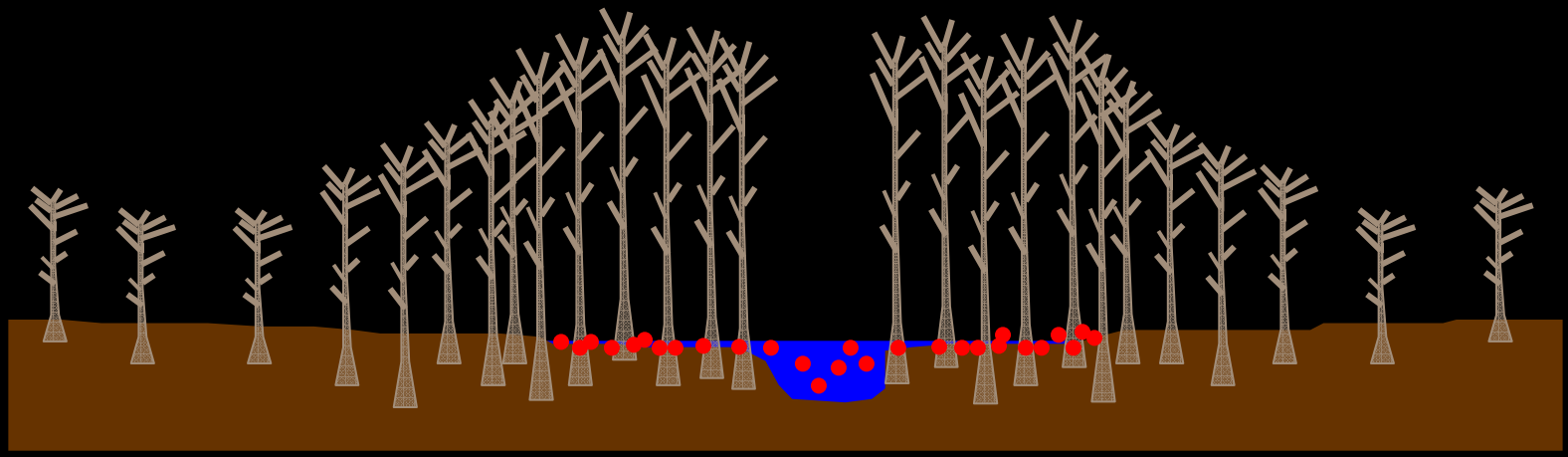

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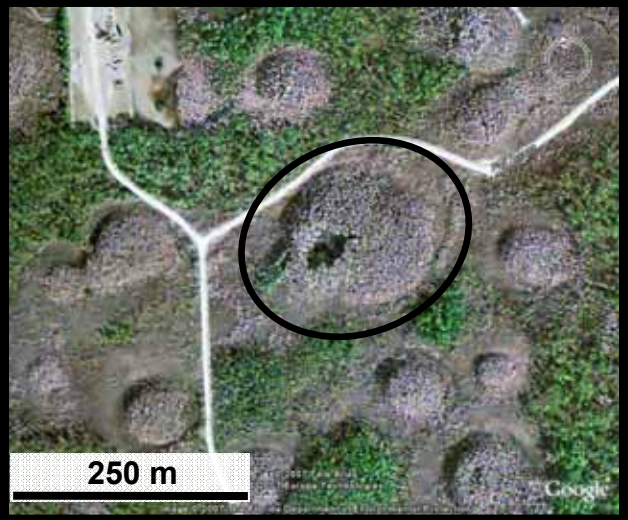
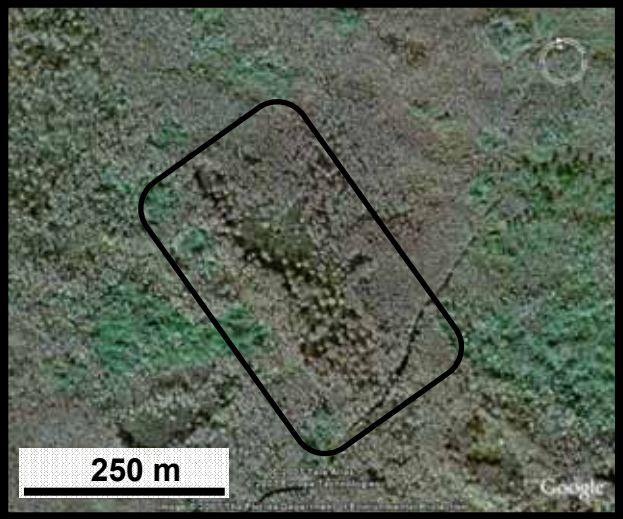
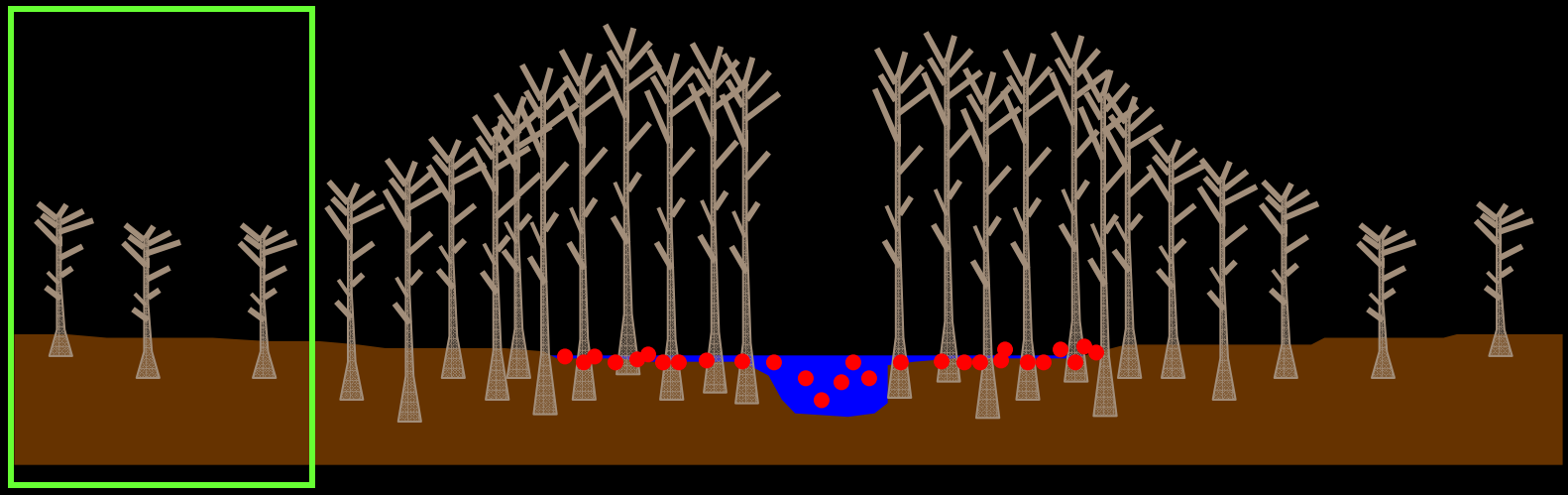
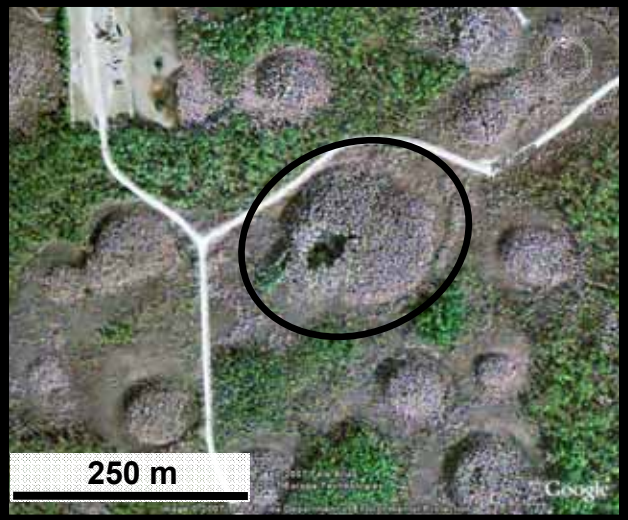


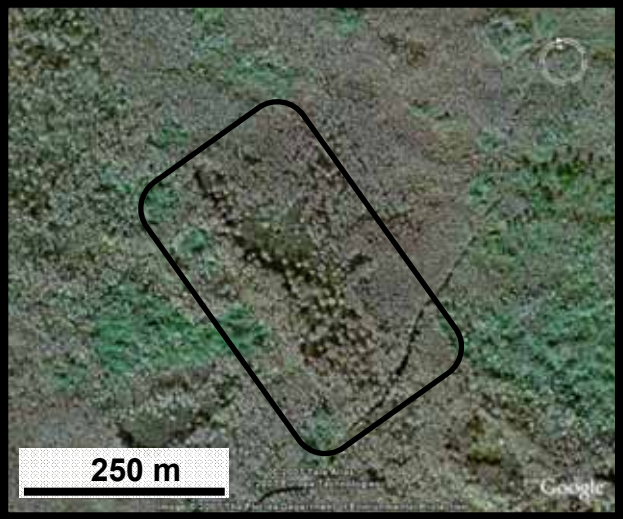


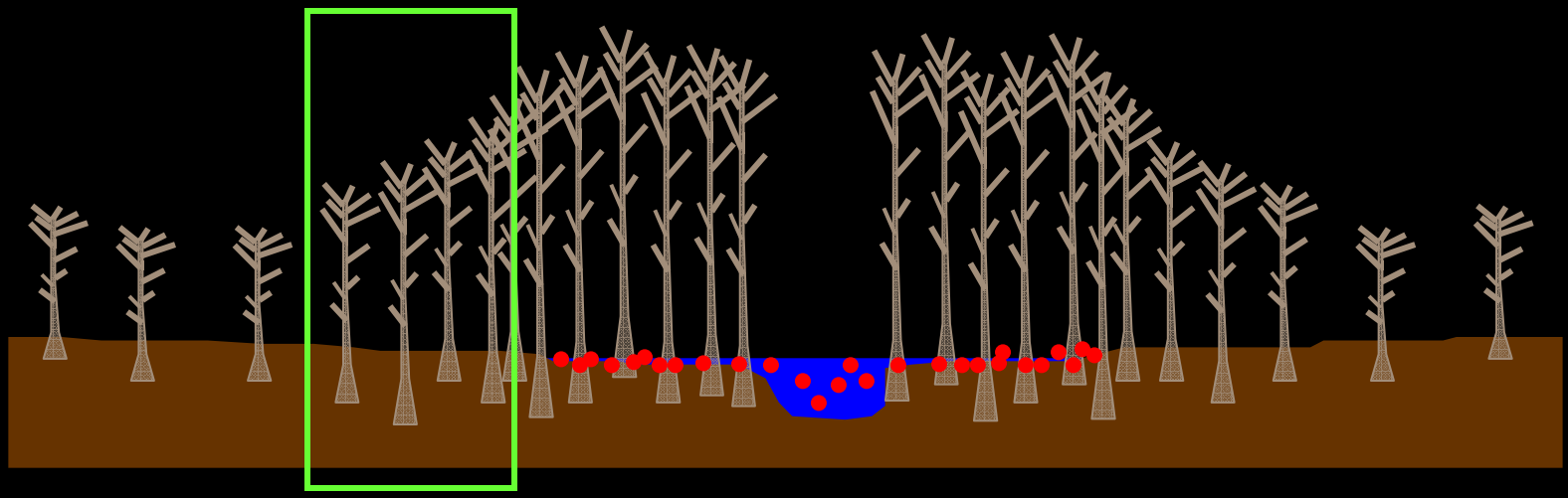


Wet prairie (inundated ~5 mo/yr)

Stratified sampling

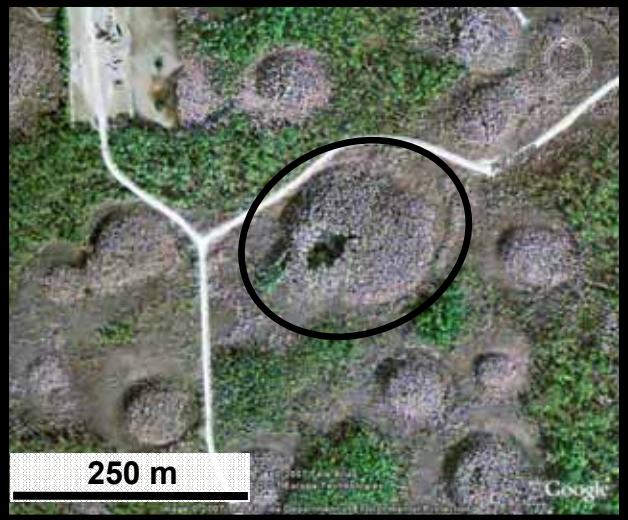


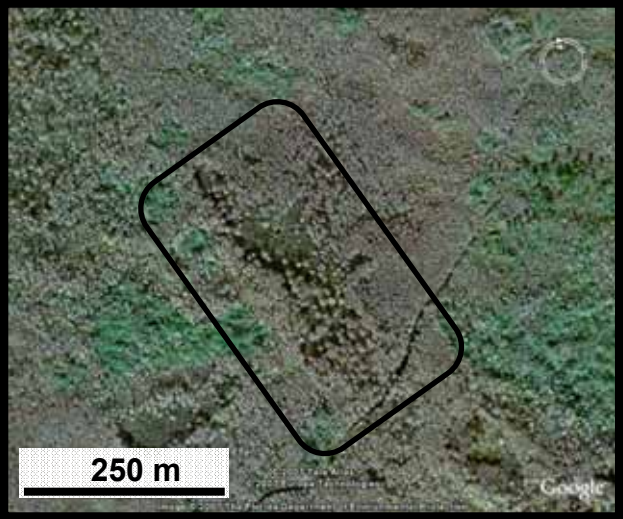


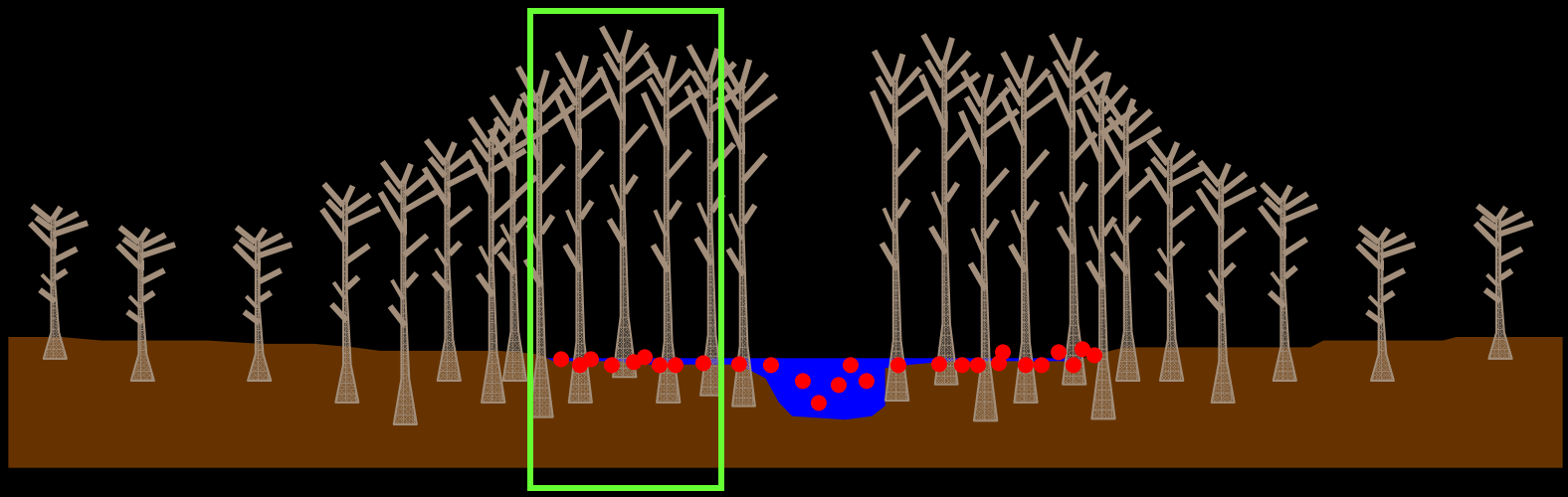


Intermediate hydroperiod (inundated ~8 mo/yr)

Stratified sampling

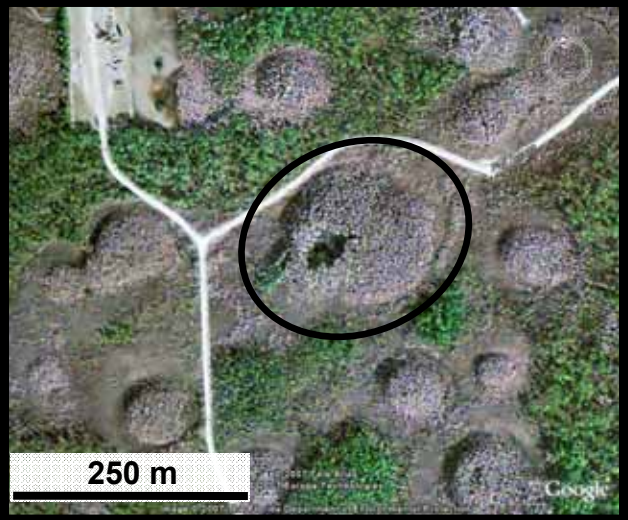


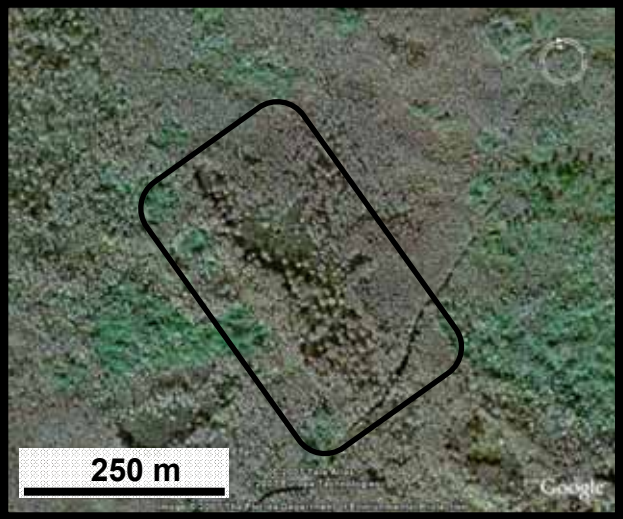


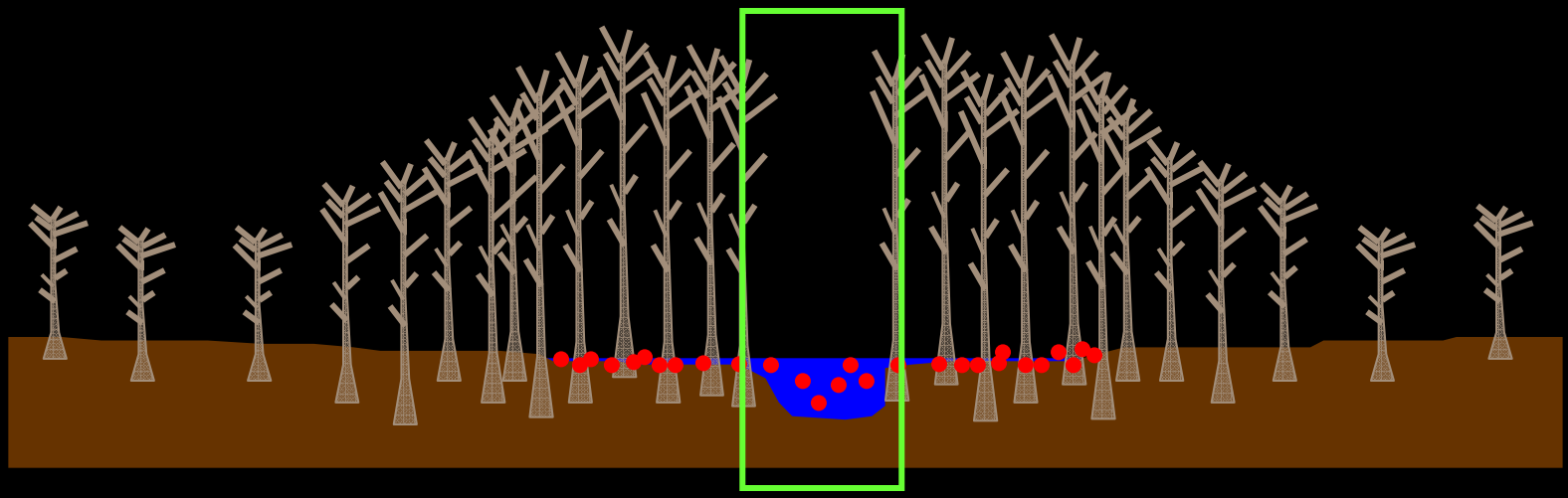


Long-hydroperiod (inundated >10 mo/yr)

Stratified sampling

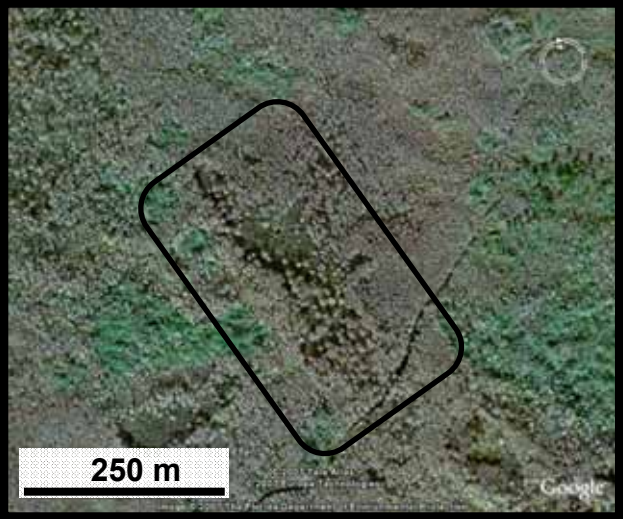


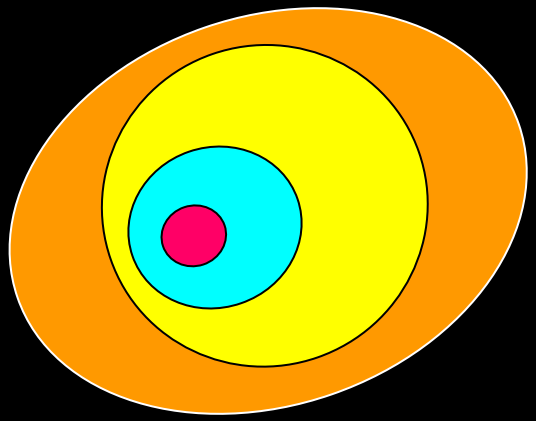




Deep-water refuge (continuously inundated)

Stratified sampling



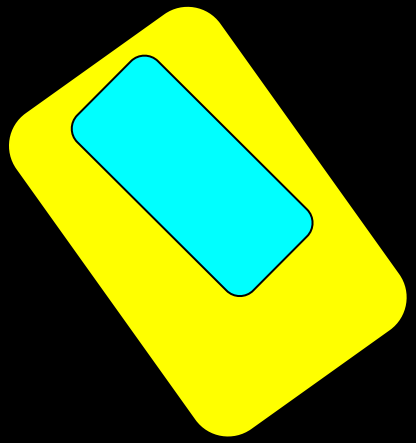


Wet prairie

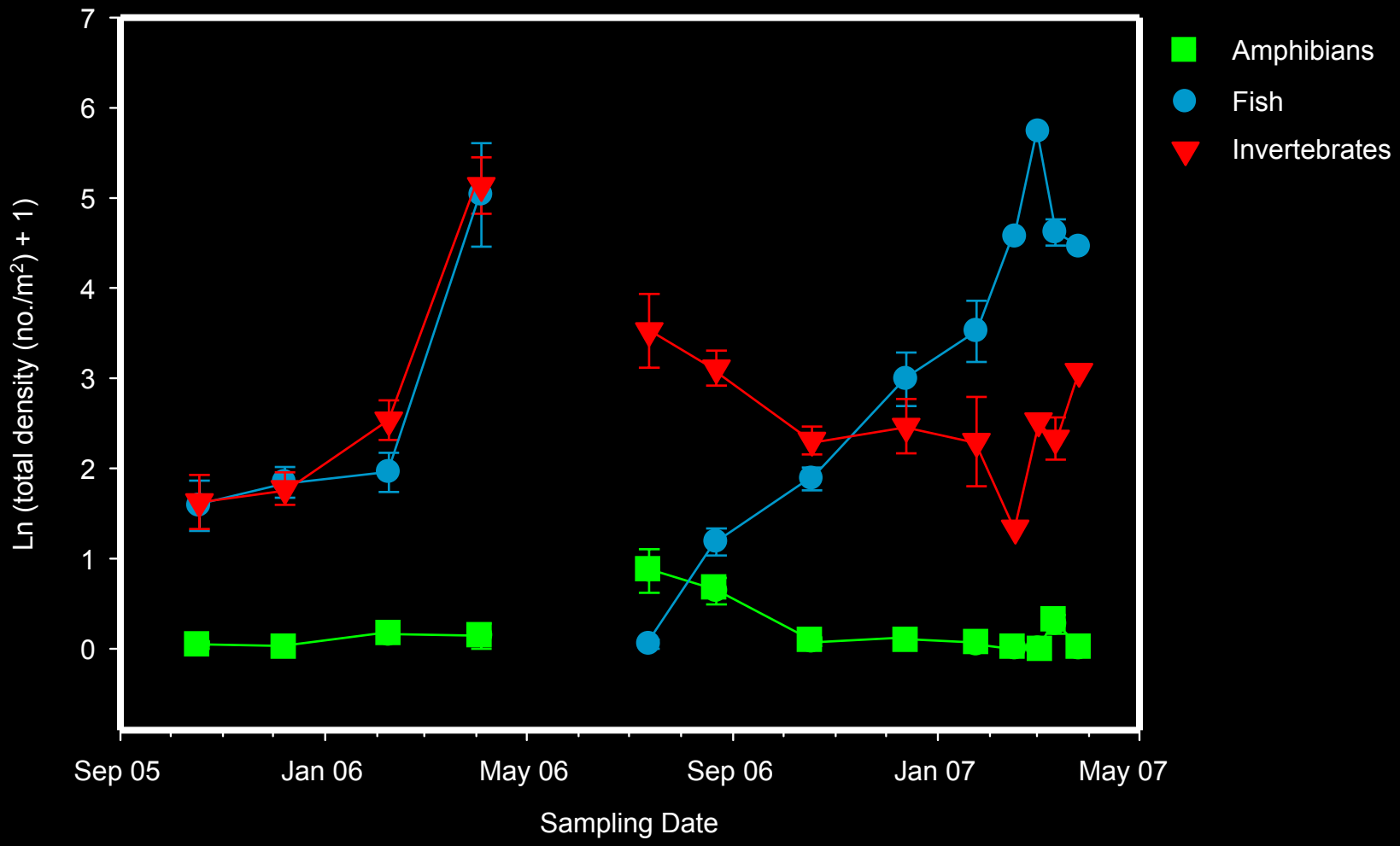
Intermediate hydroperiod

Long hydroperiod

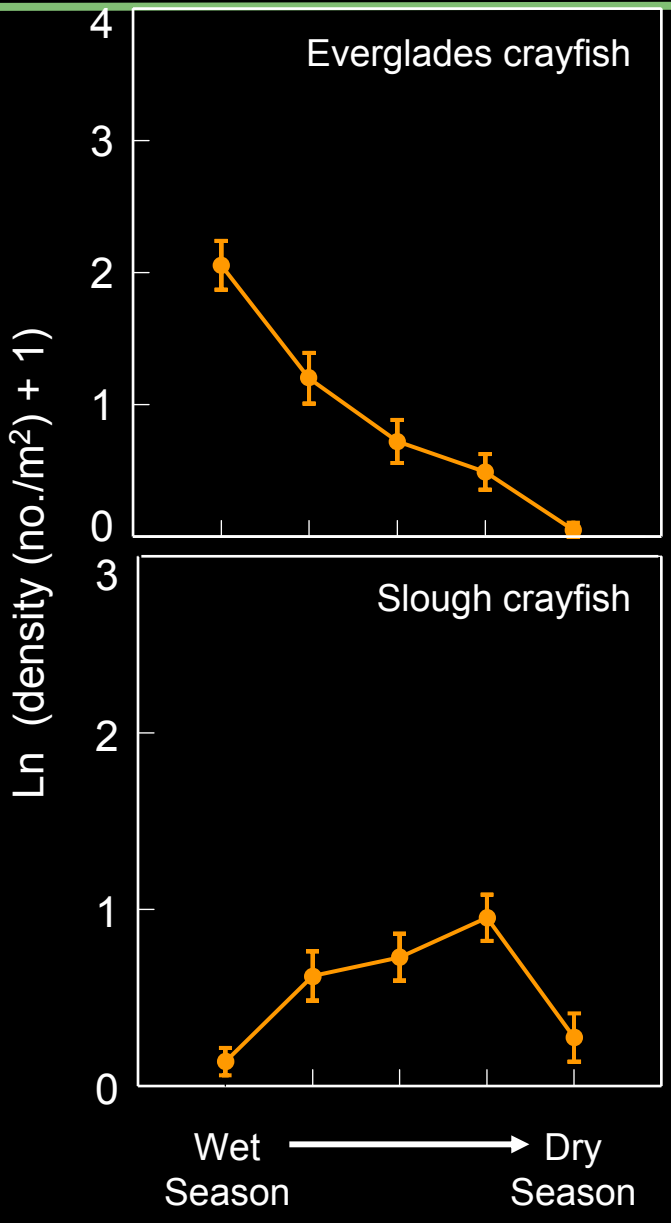
Deep-water refuge



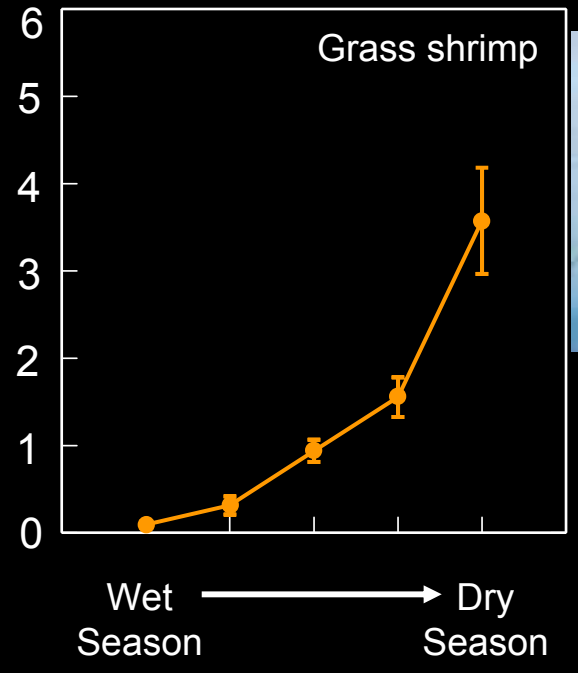
Seasonal variation in fauna density



Seasonal variation in macroinvertebrate density

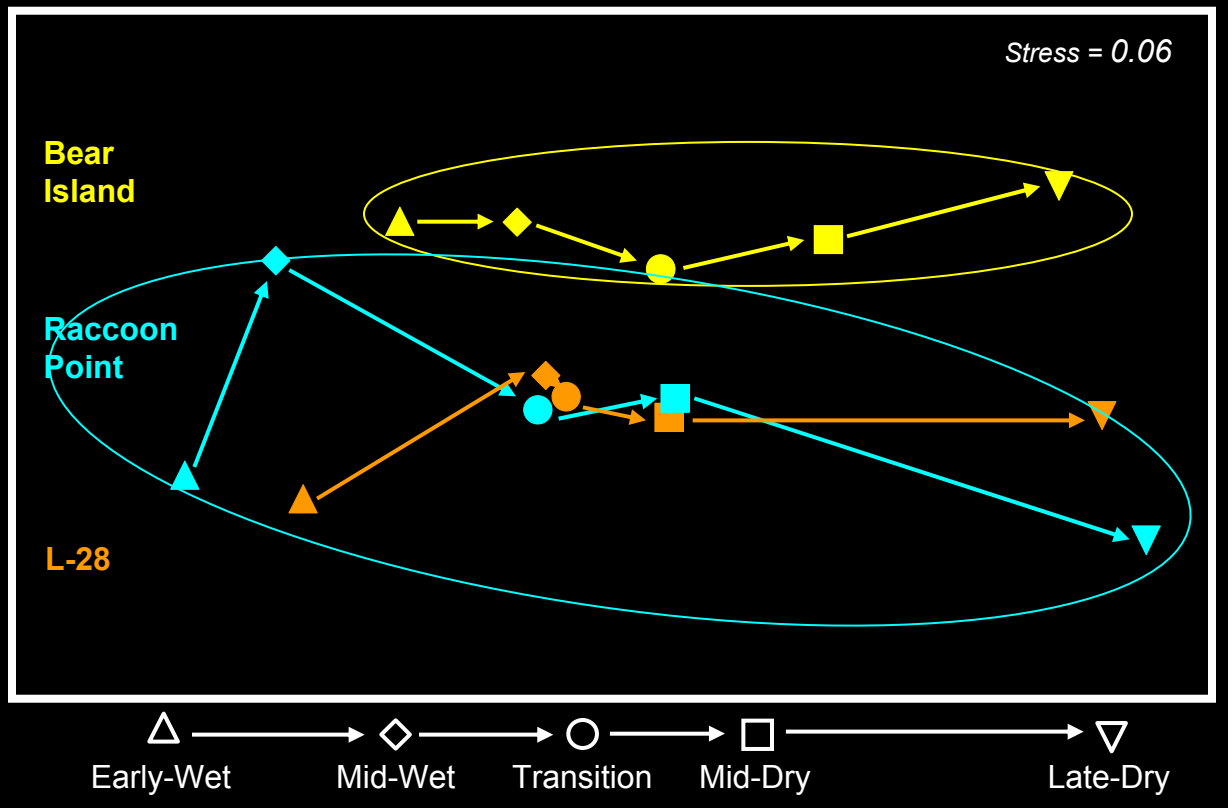


- Everglades crayfish decrease through hydrologic year; Slough crayfish increase through mid-dry season, then decrease sharply
- Grass shrimp increase through the hydrologic year



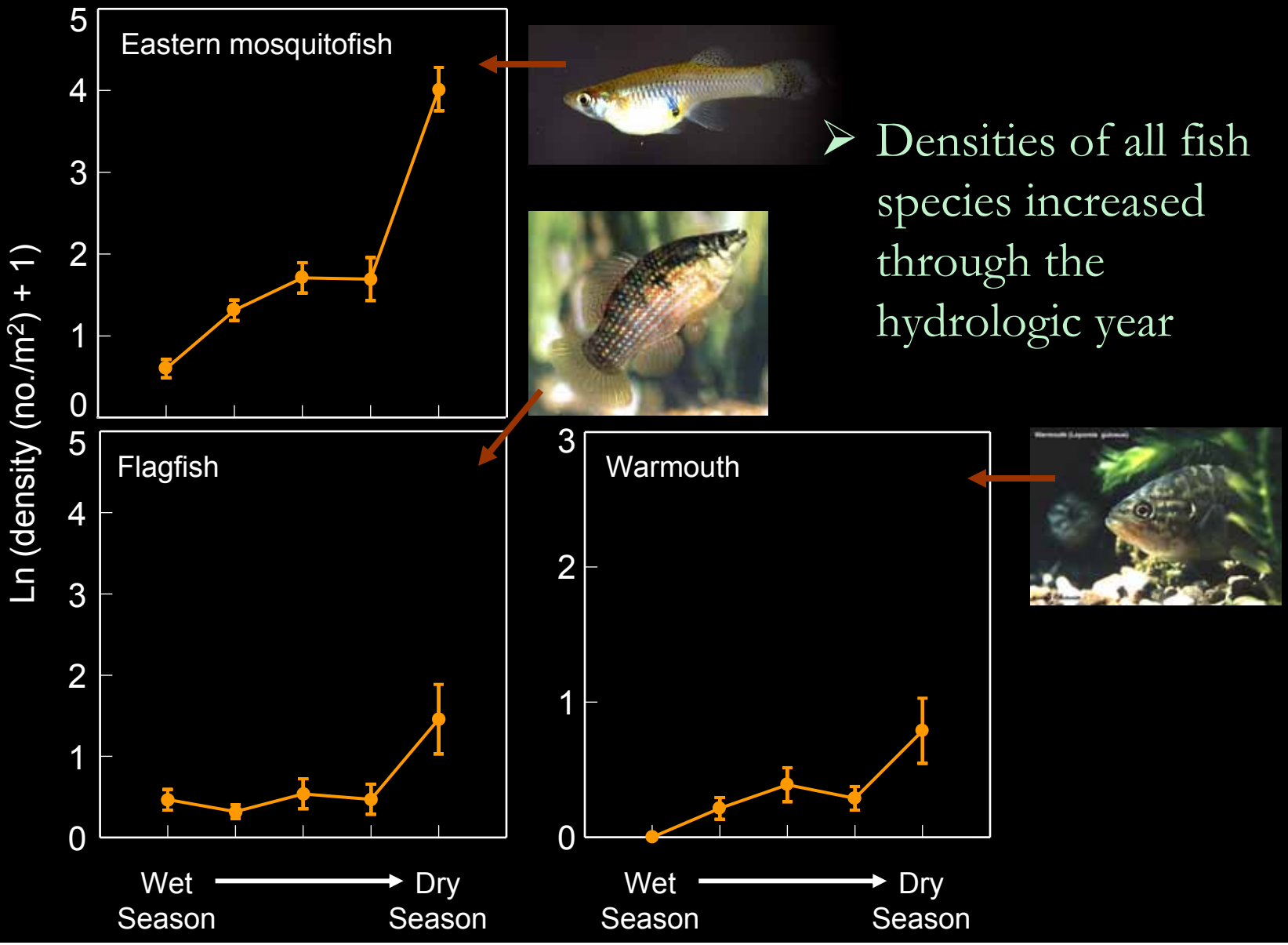
Seasonal variation in invertebrate community structure

- BI slightly different than other sites
- Similar pattern among sites
- Community structure changes throughout the season



Standardized
(independent of abundance)

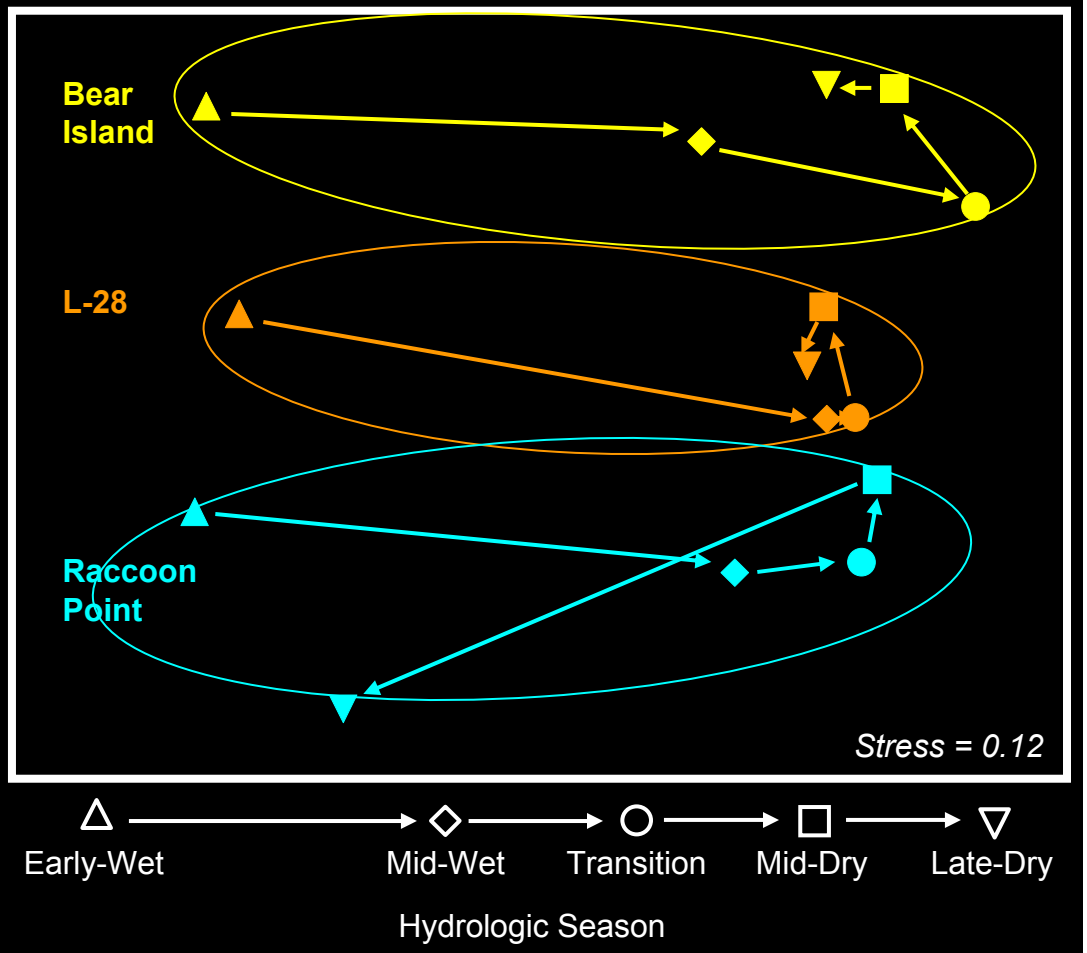
Seasonal variation in fish density



- Densities of all fish species increased through the hydrologic year

Seasonal variation in fish community structure

- 3 Sites were different, but displayed similar shifts through the season
- Community structure changes a lot early in the season, less change later



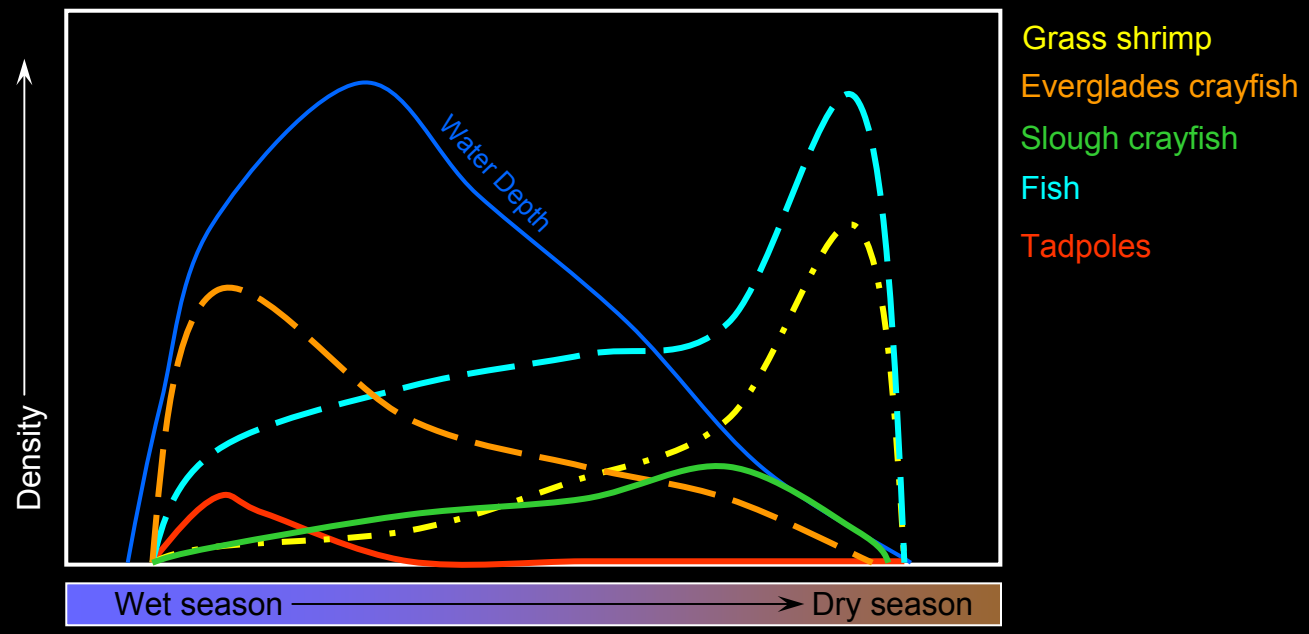
Standardized
(independent of abundance)

Spatial variation

- Variation in fish and macroinvertebrate communities among sites was subtle
- Fish were not different between zones (used all habitat available)
- Invertebrate density was highest in shorter hydroperiod zones (wet prairie & intermediate hp)

Conclusions

- Macroinvertebrates (Everglades crayfish) dominate aquatic fauna biomass early in the hydrologic season (short hp wetlands); fish and grass shrimp dominate late in the season



- Cypress domes & strands provide critical dry-season refuge for aquatic fauna (fish & shrimp) --- 'high-density prey patches'

Conclusions

- BCNP provides important foraging grounds for wading birds
  - Esp. tactile-feeders (invert-eaters) early in the hydrologic year
  - BCNP may provide better wet season foraging opportunity than eastern freshwater marshes
  - Wading birds do forage in cypress forests, especially in the mid- to late dry season
- BCR aquatic fauna community is very sensitive to hydrologic variation; Due to topography BCR may be more sensitive to restoration than other parts of the Everglades system

'The Big Picture'

Studies suggest that Everglades water management practices have resulted in a shift from a system dominated by tactile-feeding wading birds, to a system dominated by visual-feeders

Increase in % tactile feeding wading birds is an indicator of ecosystem health (Frederick et al. 2008)

Tactile feeders (esp. White Ibis) tend to be more dependent on macroinvertebrates

Data from this study (and others) suggest macroinvertebrates dominate fauna standing crop in short hp wetlands

The loss of short hp wetlands throughout the Greater Everglades is likely linked to this shift in wading birds

Implications & future work

- Future work will focus on delineating the relationship between short-hp wetlands and Wood Stork nesting success
- BCR's short-hydroperiod wetlands are undervalued – value for foraging wading birds must be considered in development & mitigation decisions
- What about wading birds in BCNP?
- What about ORV trails?

Thanks to…

- RECOVER: Jennifer Stiner, Jana Newman, Vic Engel, Elmar Kurzbach, Pamela Telis, Eliza Hines
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- Colleagues: Dale Gawlik