

The Trophic Hypothesis: Long-Term Trends in Wading Bird Prey Species in the Freshwater Everglades

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FLORIDA COASTAL EVERGLADES



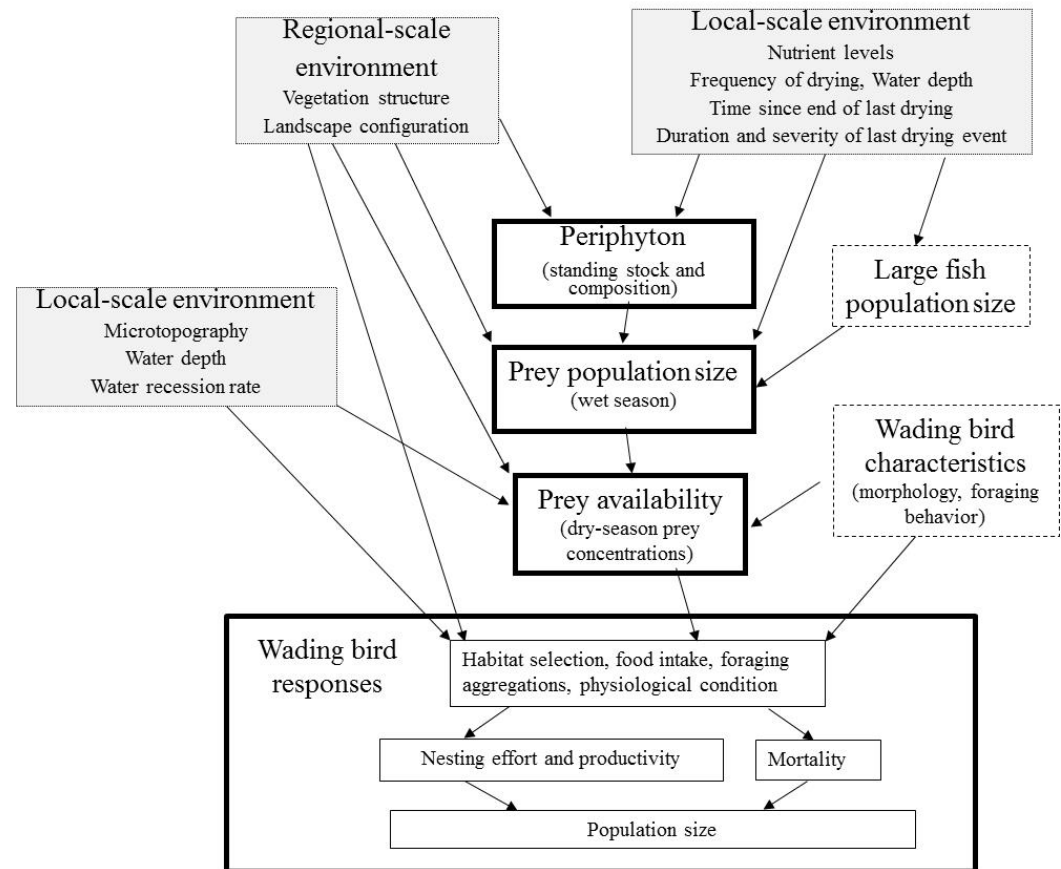
Overview

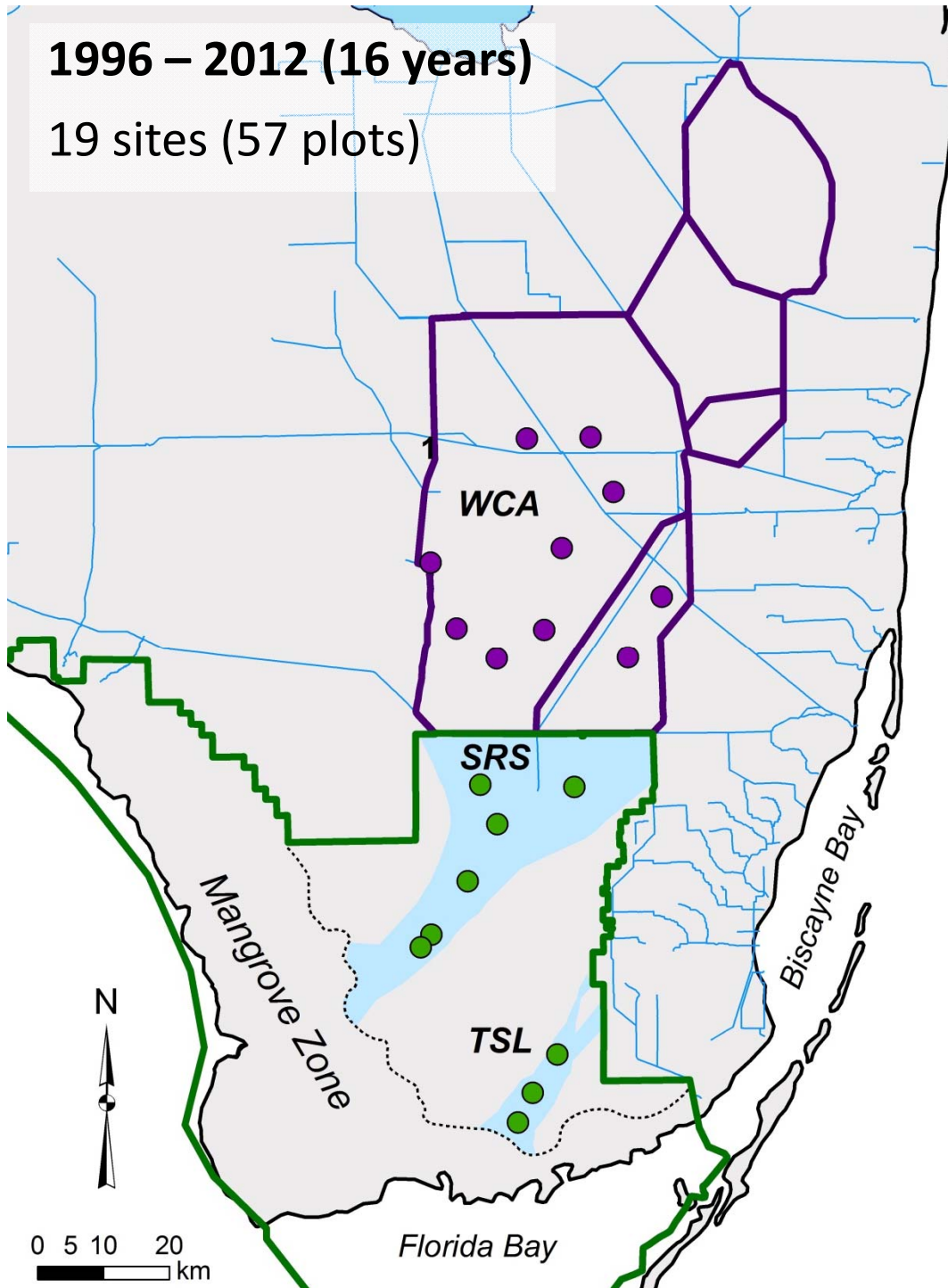
1. Contributions to the Trophic Hypothesis
2. Effects of increasing disturbance frequency and decreasing ecosystem size on trends in total fish biomass
3. Long-term trends in fish community structure and turnover rate
 - Abrupt vs. gradual change
 - directionally or non-directionally?



Trophic Hypothesis

- Why monitor fish and crustaceans?
- Sampling integrated with prey concentration project (FAU)
- Documents linkage with wading bird nesting success





Sampling Methodology

- Sampling method
 - Small fish: 1 m² throw trap
 - 5 or 7 samples /plot
 - July, Oct, Dec, Feb, April
 - 32,948 samples total



Disturbance Dynamics



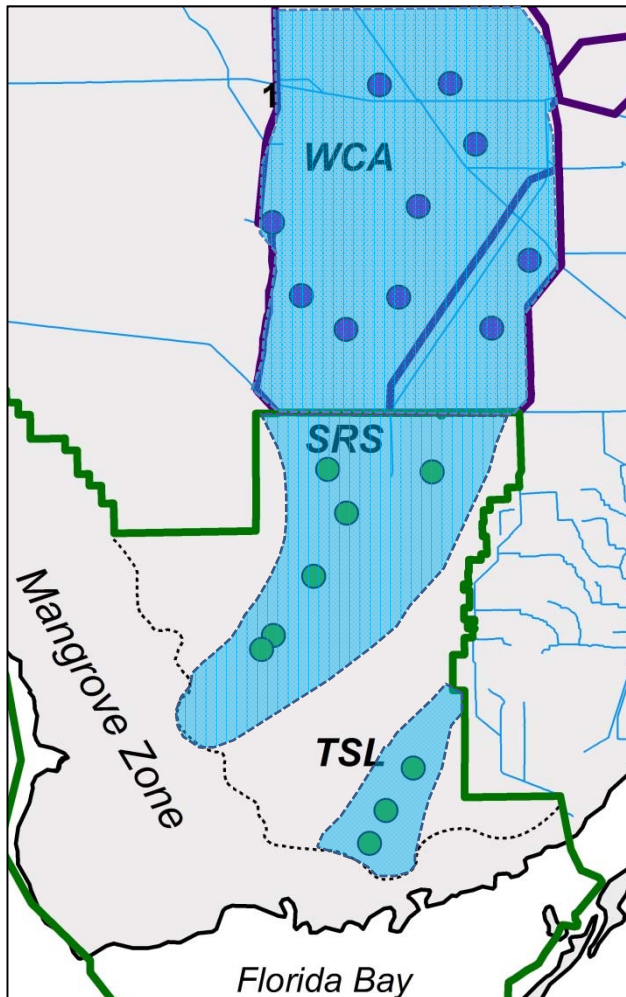
Wet Season



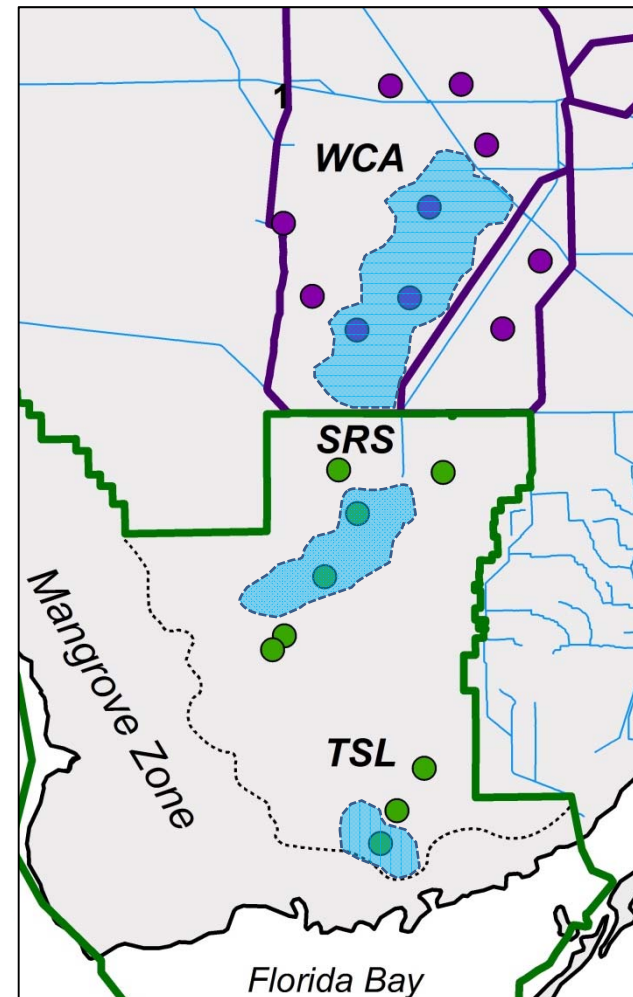
Dry Season

Ecosystem Size and Concentration

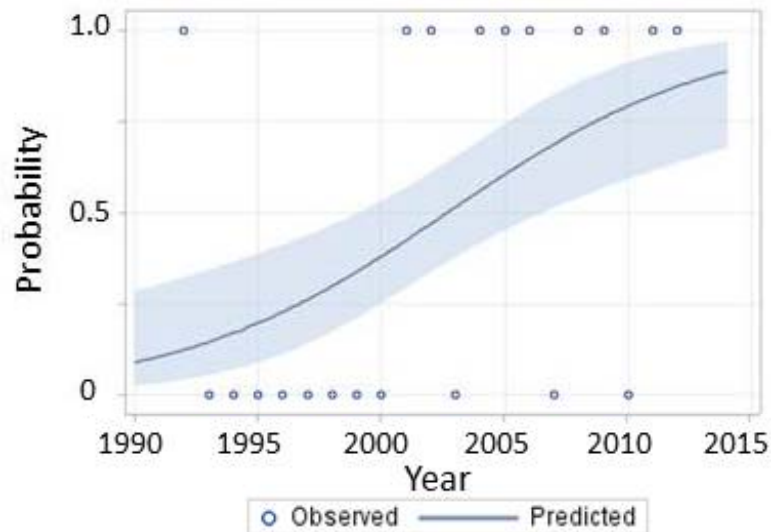
Wet Season



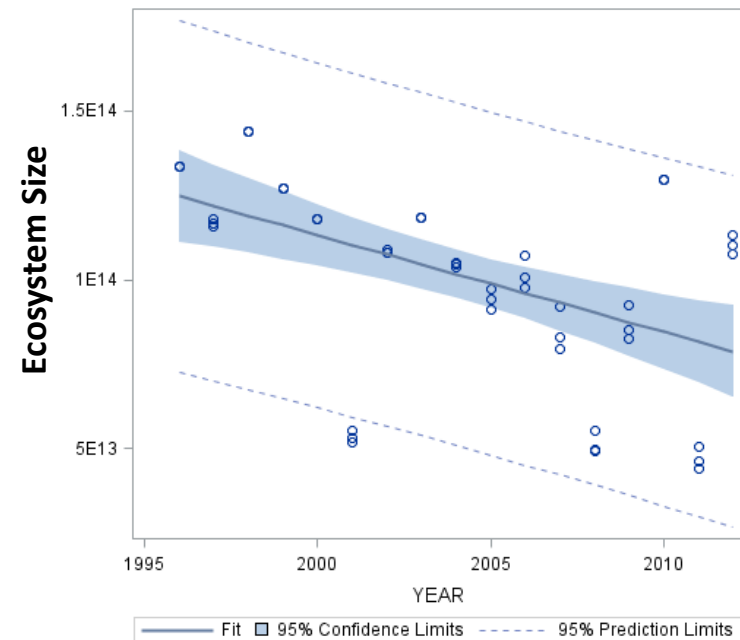
Dry Season



Long-Term Trends in Hydrology



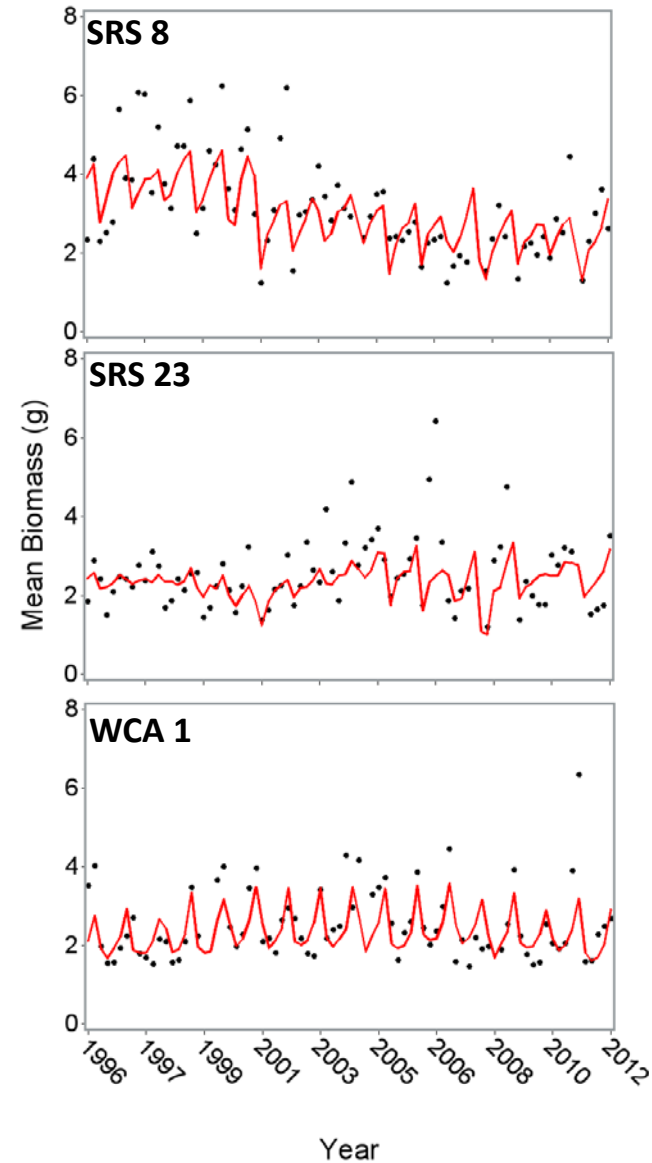
- Probability of drying increased at study sites in ENP
* after accounting for rainfall



- Summed area flooded (ecosystem size) has decreased

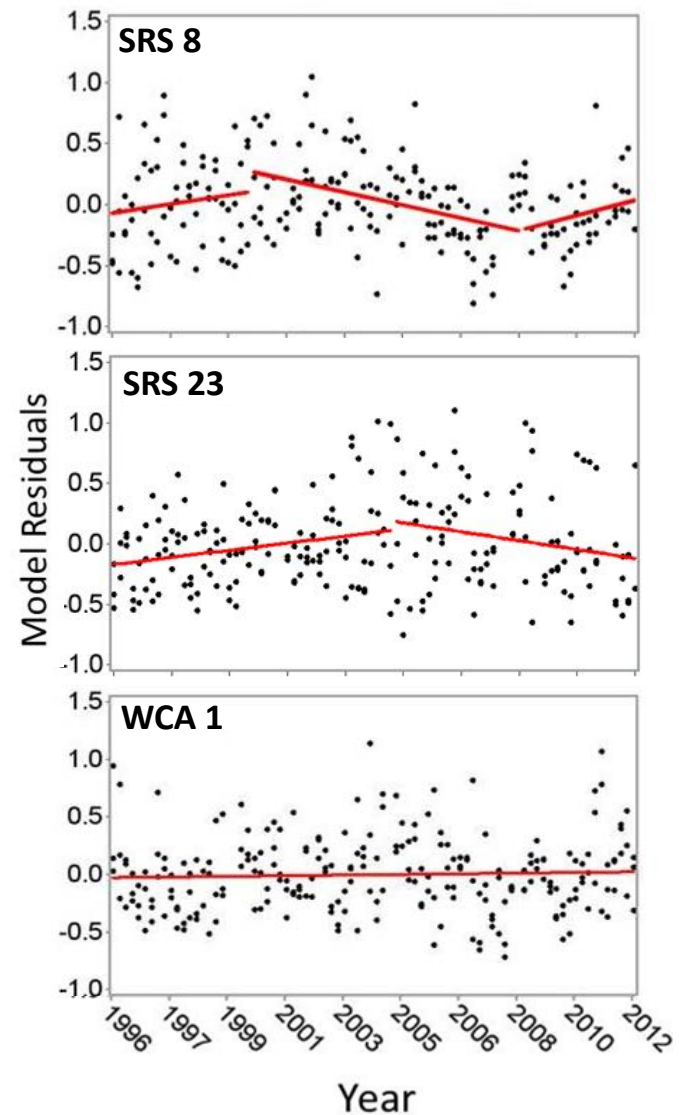
Long-Term Trends in Biomass

- Generalized Linear Mixed Model (GLMM)
- Parameters: Depth, DSD, Expansion/Recession Rate, Season



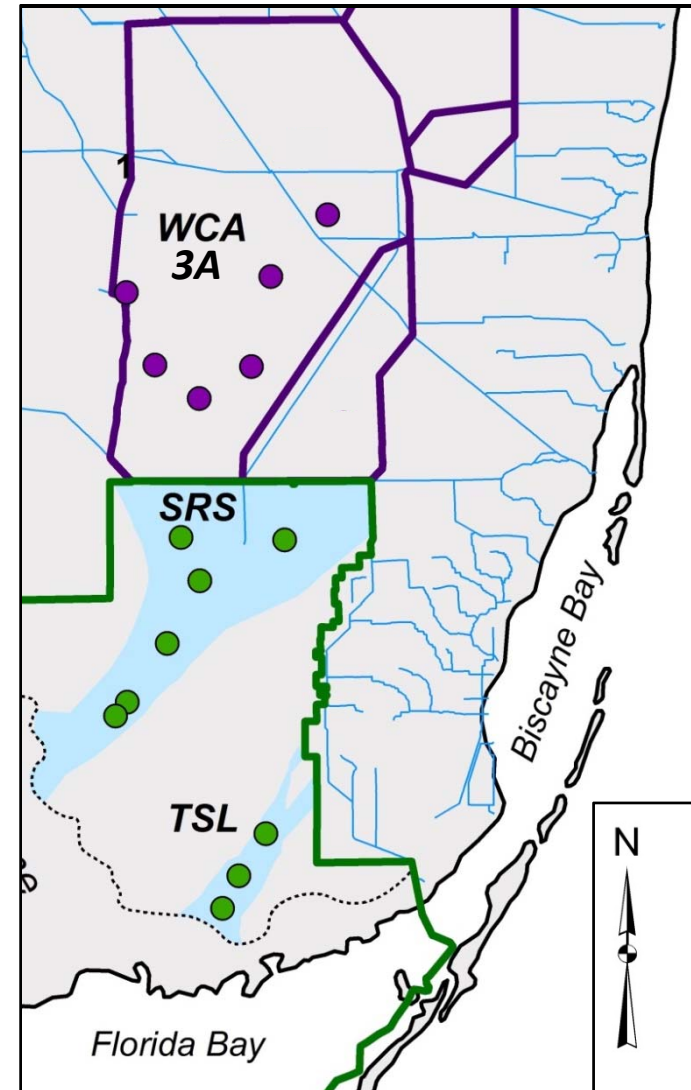
Long-Term Trends in Biomass

- Same three sites
- GLMM residuals fitted w/ piecewise regression
- Significant trends present after accounting for local hydrology
- Additional time series analysis in talk by James Herrin at 4:15 in Sandpiper Room



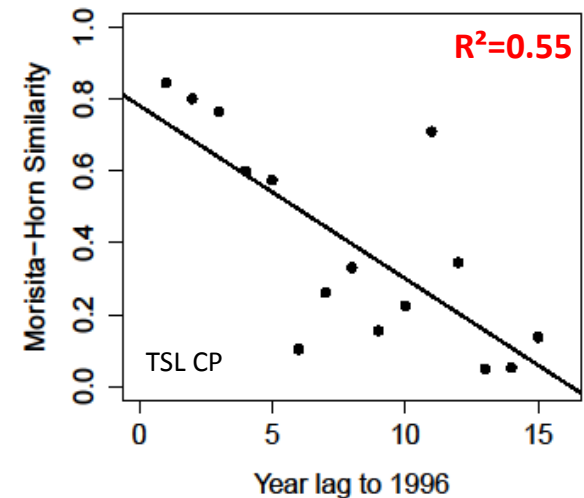
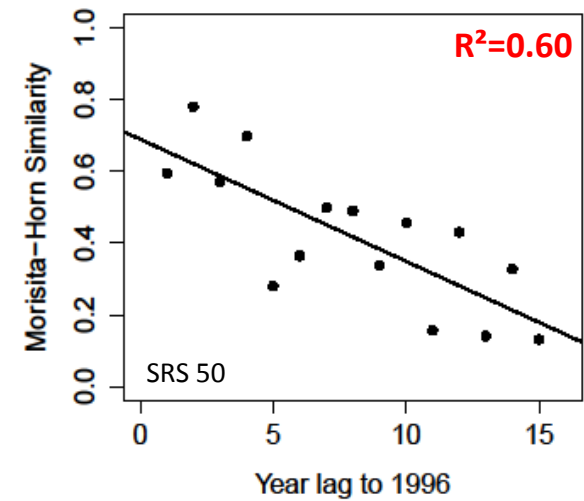
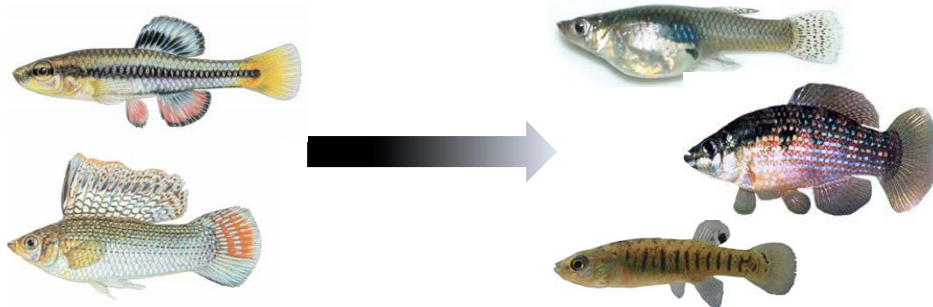
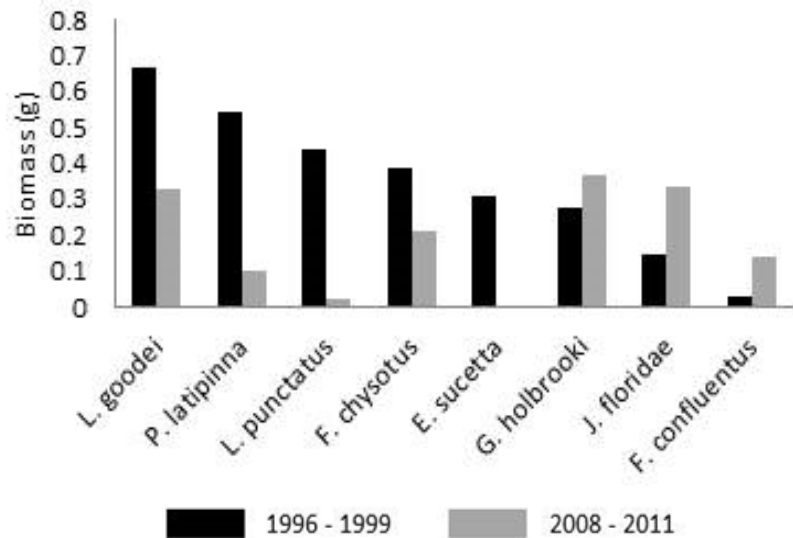
Biomass Summary (1996-2012)

- After accounting for local hydrology, fish biomass declined significantly at:
 - 4 of 6 (67%) sites in SRS
 - 2 of 3 (67%) sites in TSL
 - 2 of 6 (33%) sites in WCA 3A
- Average regional decline:
 - -11.2% in TSL
 - -9.50% in SRS
 - -3.77% in WCA 3A



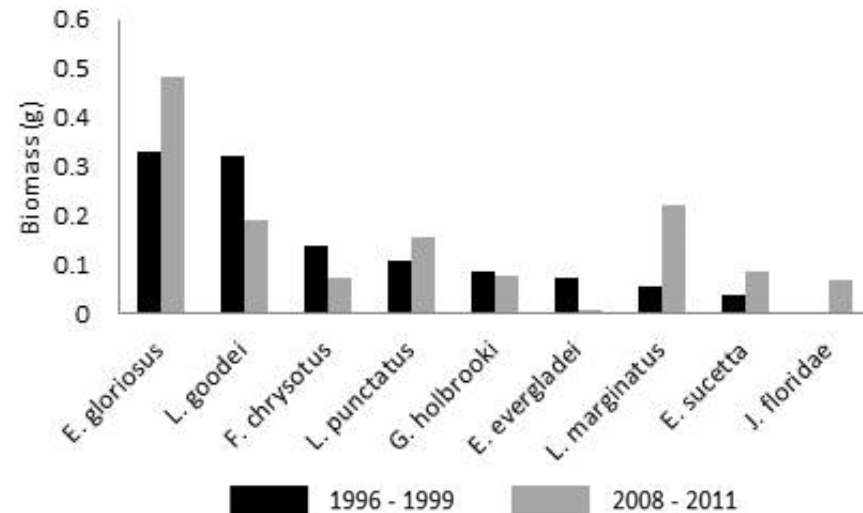
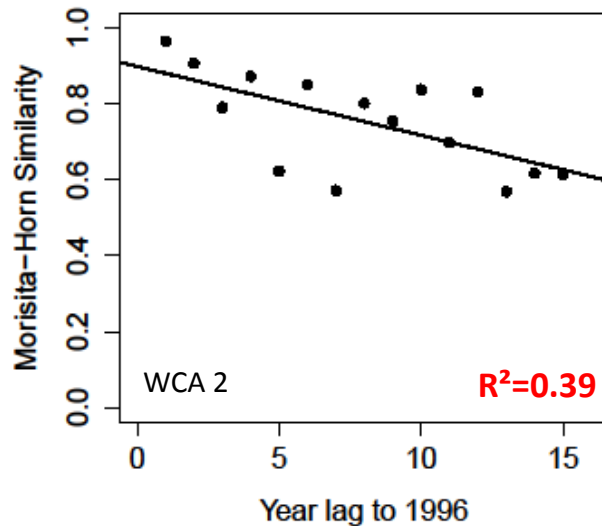
Long-Term Trends in Community Composition

Shark River Slough & Taylor Slough

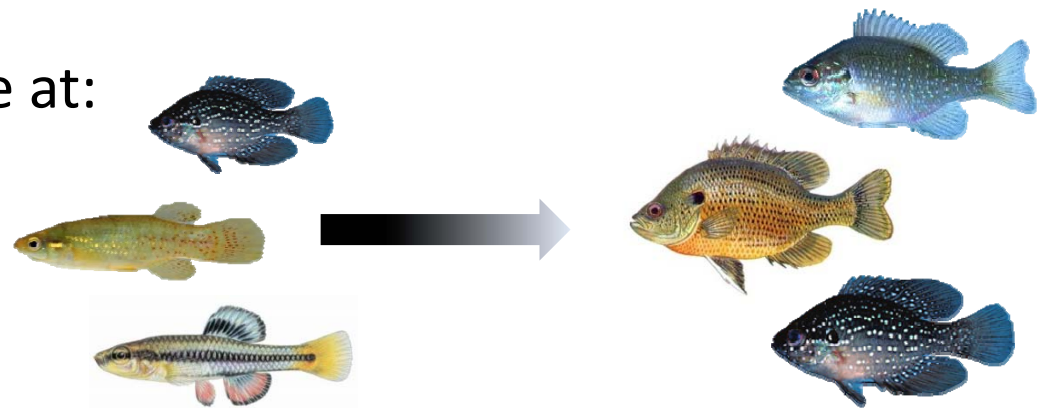


Long-Term Trends in Community Composition

Water Conservation Area

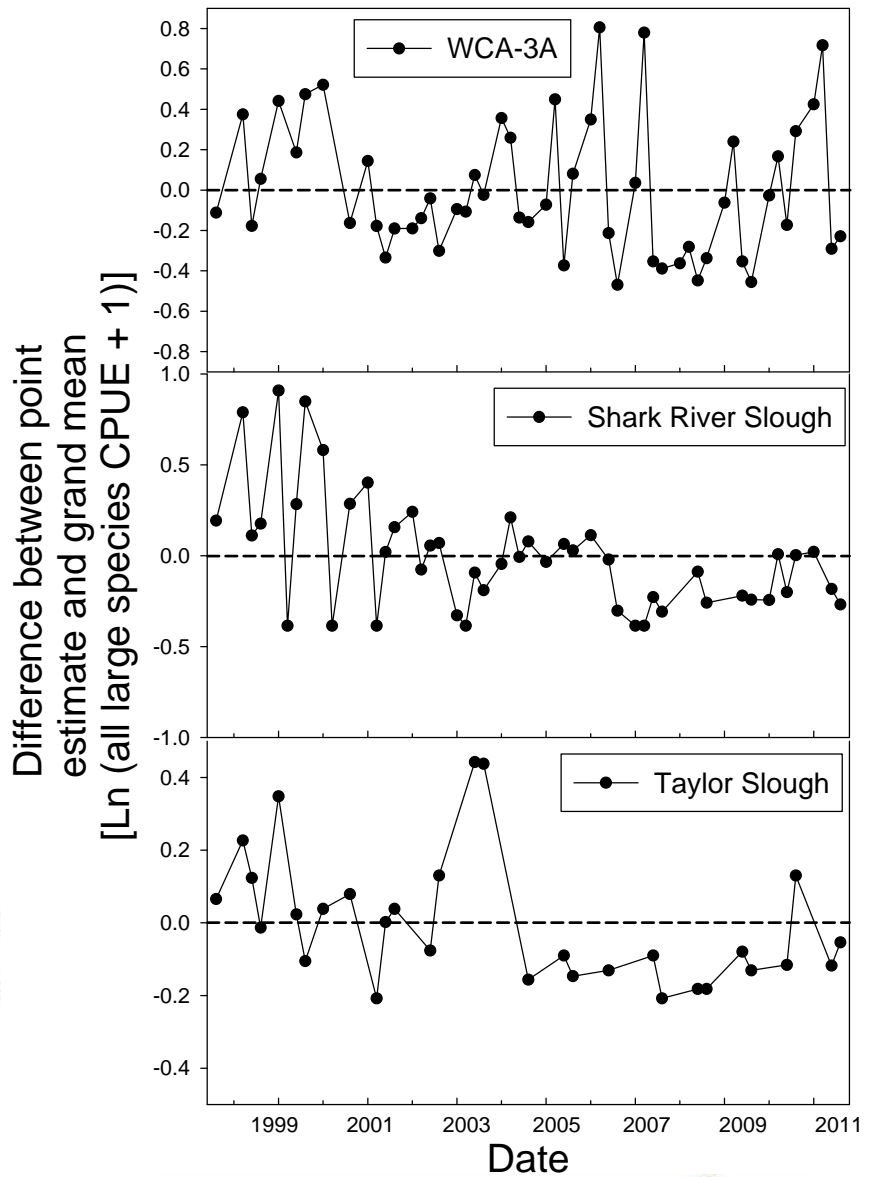
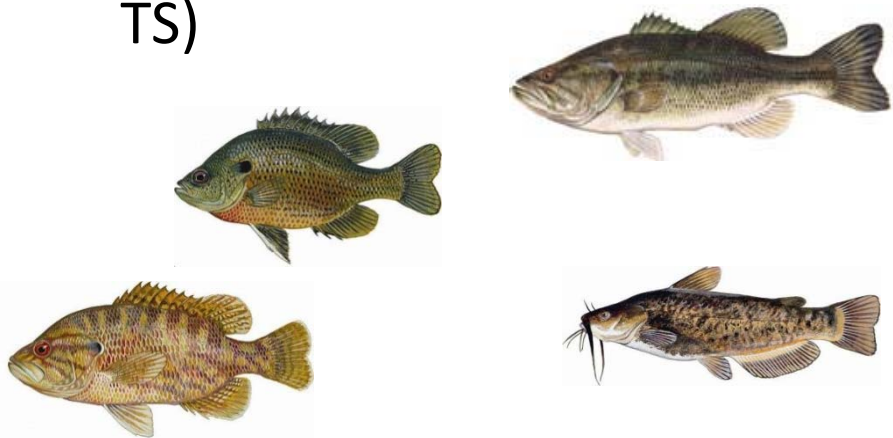


- Significant directional change at:
 - 3 (50%) sites in SRS
 - 2 (67%) sites in TSL
 - 3 (50%) sites in WCA



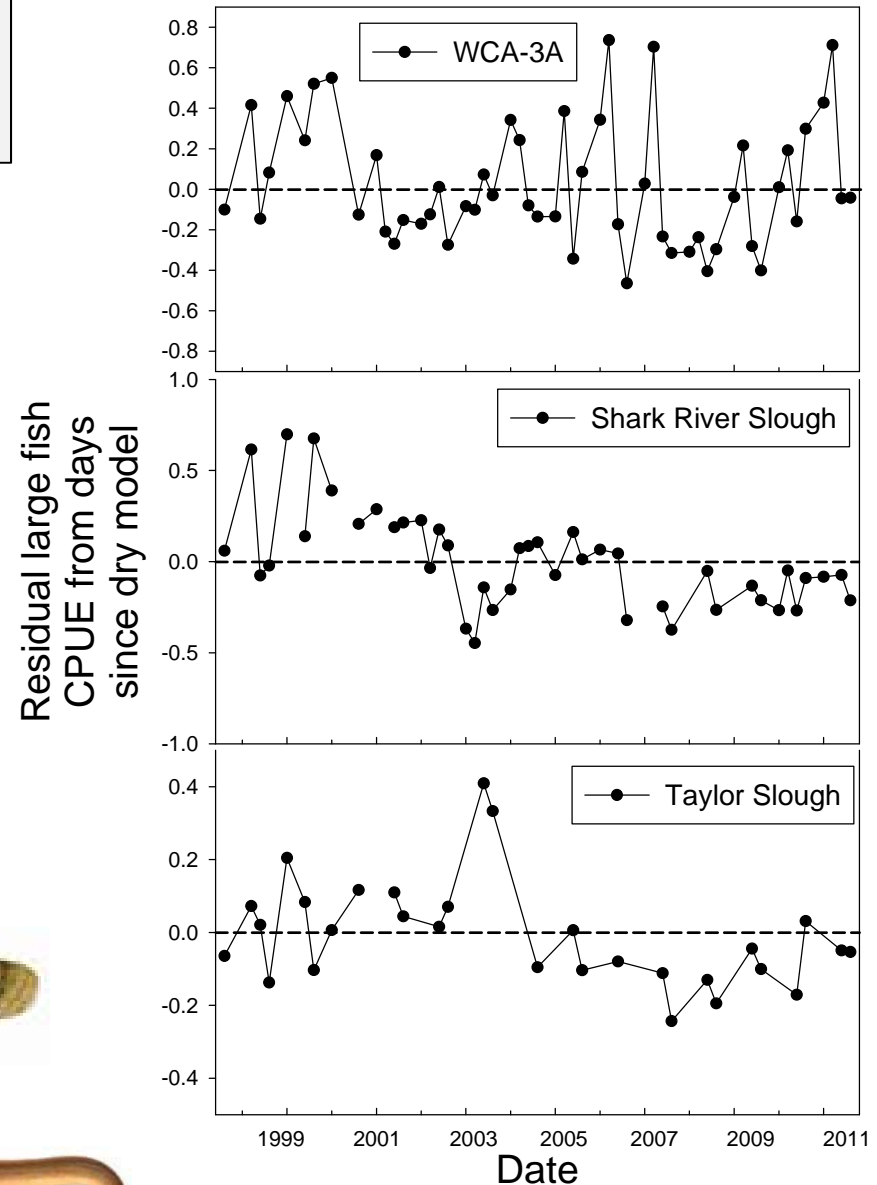
Large fish collected by marsh electrofishing

- All species summed. Mostly Florida gar, warmouth, largemouth bass, lake chubsuckers
- Residuals from grand mean (highest CPU in WCA, lowest in TS)



Large fish collected by marsh electrofishing

- All species summed. Mostly Florida gar, warmouth, largemouth bass, lake chubsuckers
- Residuals from model with days since last dry (DSD)



Conclusions

1. Ecologically important reductions in fish and crayfish biomass in Shark River and Taylor Sloughs, not WCA 3 (south of Alligator Alley... north of AA is deteriorating fastest in dataset).
2. Changes mostly from decreasing density rather than average size of fish, however. Changes in crayfish species composition.
3. Gradual, directional composition change;
4. Declines can not just be explained by shortened hydroperiod.
 - Flow from built system is primary driver of hydrology at study sites
 - Increased frequency of disturbance and decreasing ecosystem size



Acknowledgements

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LONG TERM ECOLOGICAL RESEARCH