

SAV Abundance in the Mangrove Lakes: Relationships to Water Quality



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RESEARCH QUESTION

Are there relationships between water quality and submerged aquatic vegetation in the Mangrove Lakes?

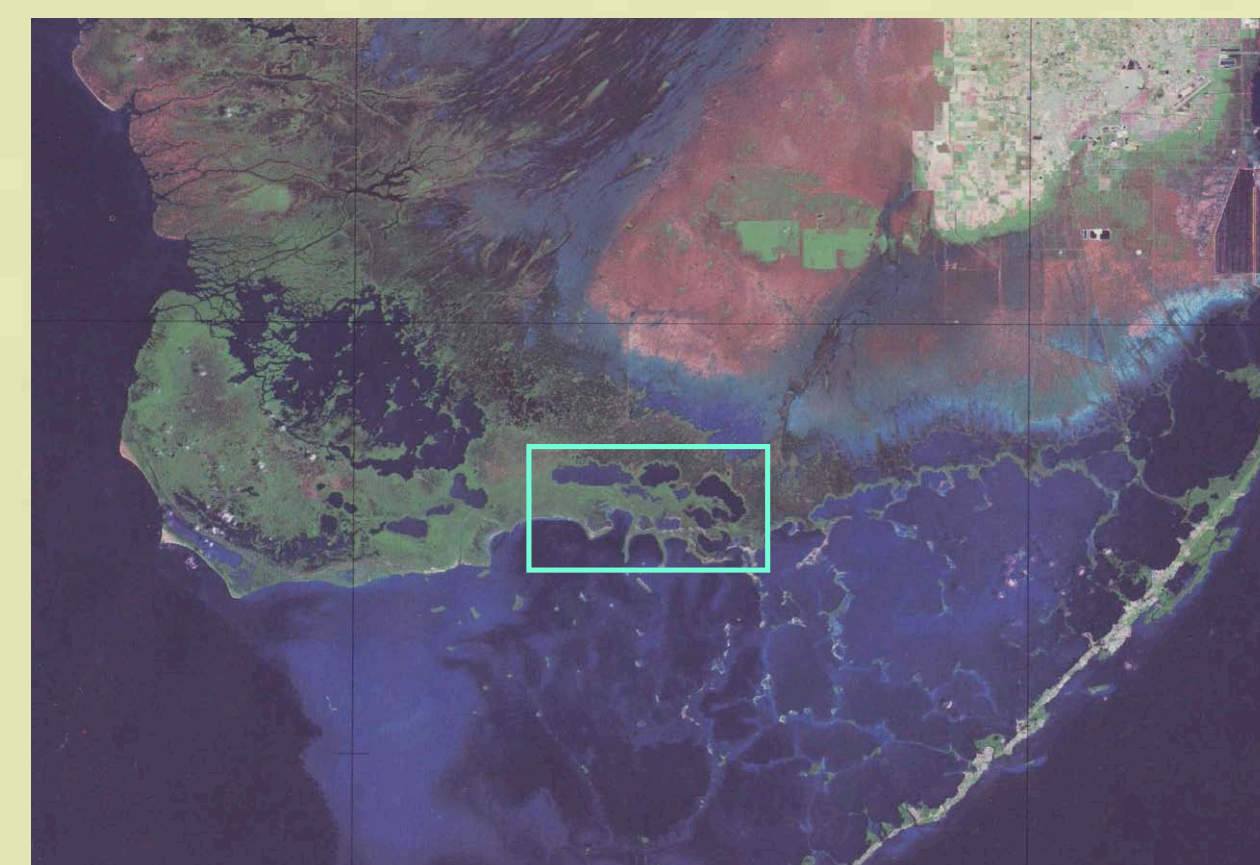
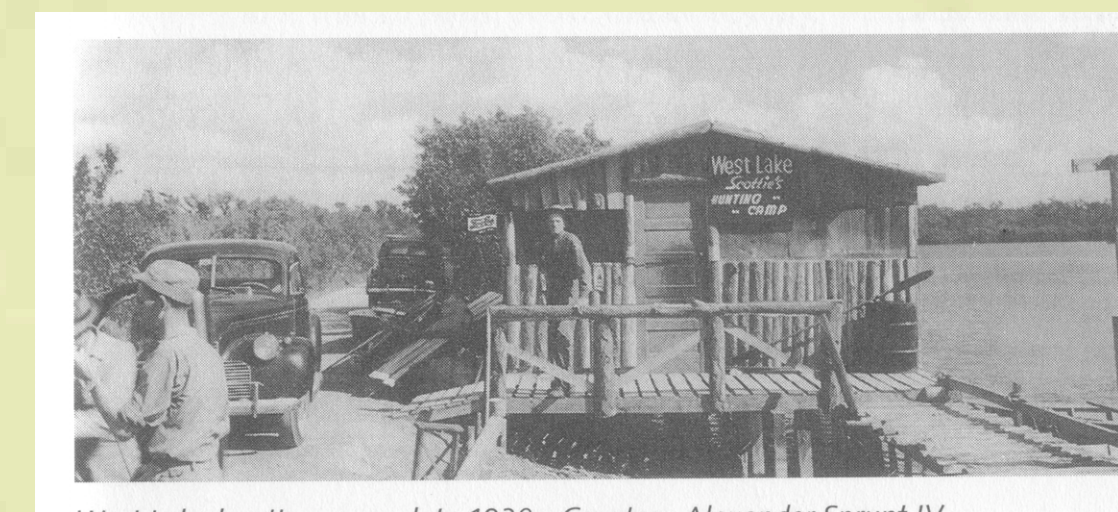


Fig. 1 The Mangrove Lakes region of Florida Bay



West Lake hunting camp, late 1930s. Courtesy Alexander Sprunt IV, Simmons and Ogden, 1998

"I seen West Lake and Coot Bay that place be 200 cars bumper to bumper for 2-3 miles there. All of them hunting, and West Lake, and East Lake, and Cuthbert Lake, and all those lakes back there, The Lungs they call it on the map. It sounded just like a war."

Buddy Roberts (Everglades pioneer), interviewed 1985, age 96, referring to the Mangrove Lakes in the 1930s

Wintering waterfowl in the Mangrove Lakes were historically much more abundant.

OBJECTIVES

- * Determine the linkages between SAV species abundances and water quality to refine salinity and SAV restoration targets.
- * Build statistical models that will be used as management tools to link freshwater delivery, water quality, and SAV abundance

METHODS

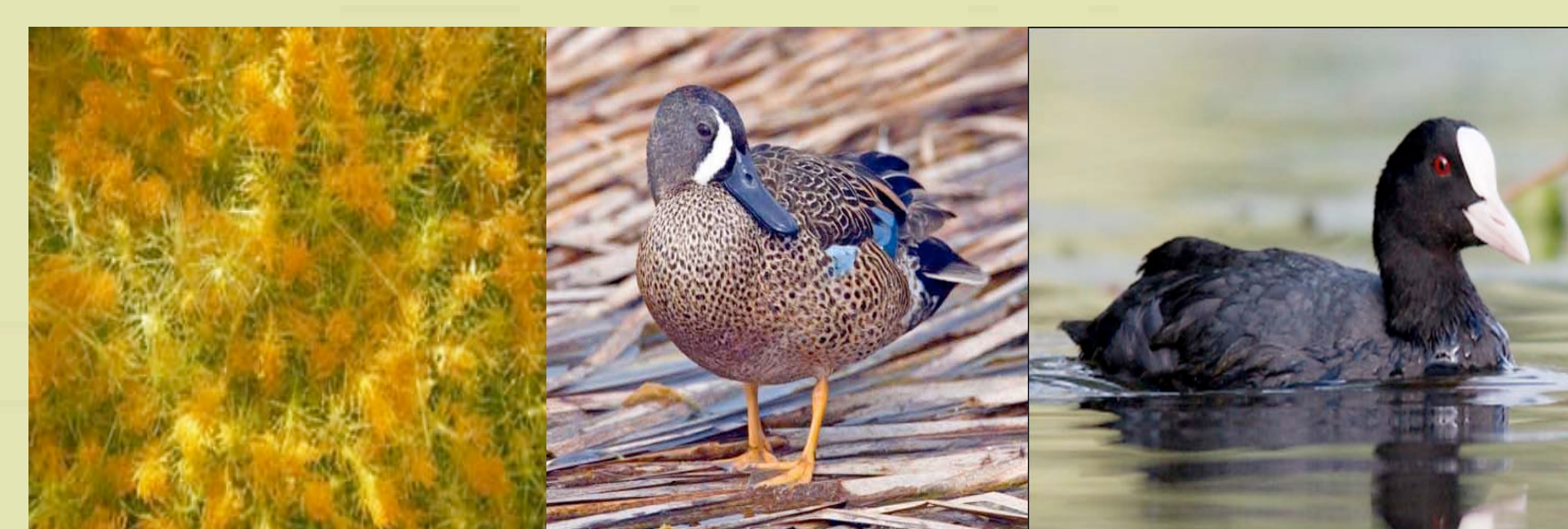
- SAV % cover, quarterly (41 sites)
- 1/4 m² quadrat (5% intervals)
 - all benthic macrophytes
 - 15 replicates per site
- WQ monitoring, monthly
- temp, sal, water depth, secchi depth (41 sites)
 - TotN, TotP, Phytoplankton chl-a (each basin -8 sites)
 - Vertical light attenuation (K_d) start-Sept. 2008

Hourly water temperature, salinity, and water level
 - datasondes in West Lake, The Lungs, 7 Palms Lake

Data collection ongoing – April 2006 – May 2009

Exploratory statistics and statistical model

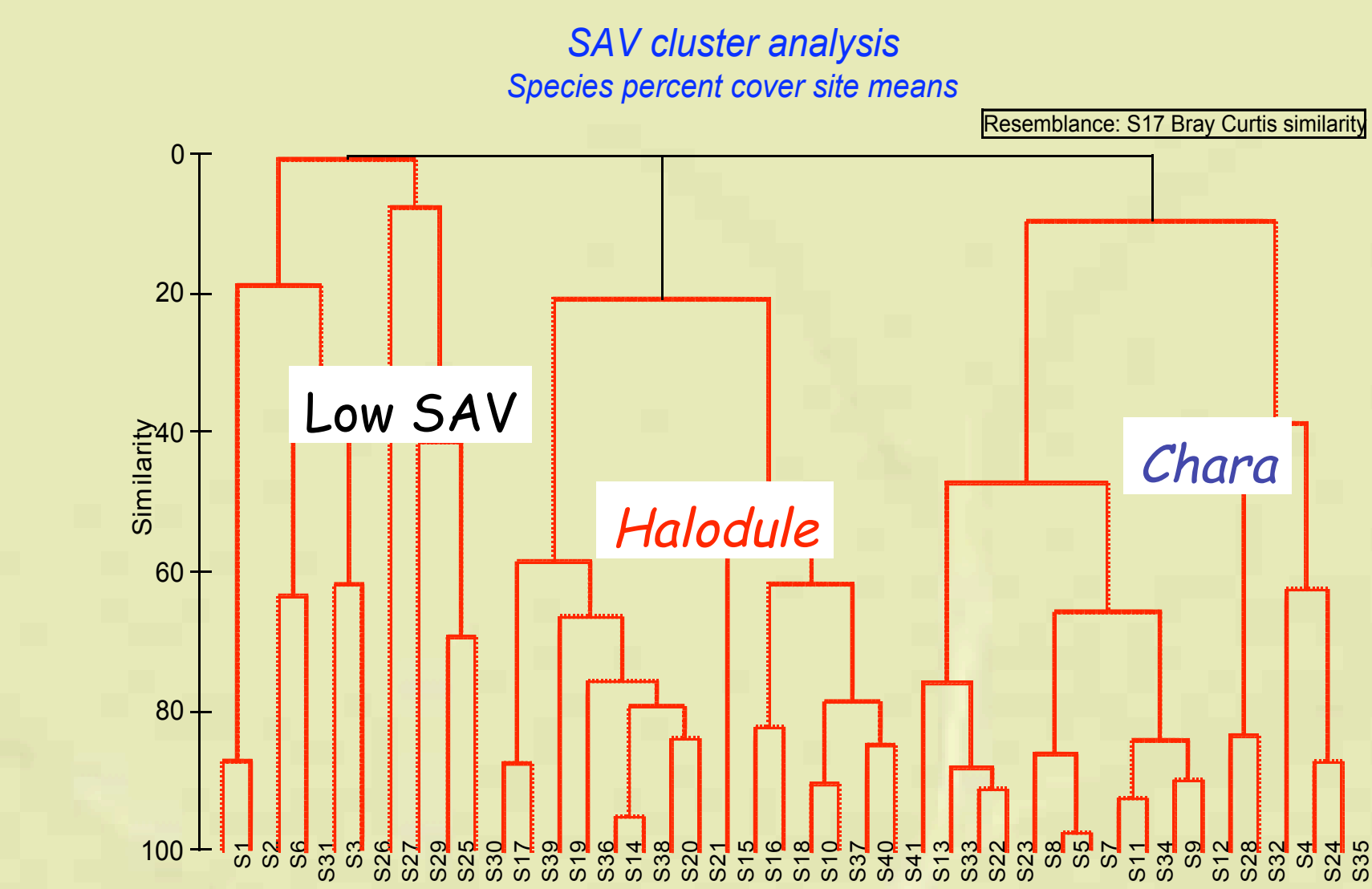
- Cluster analysis
- NMS ordination
- Regression analyses
- Discriminant Function Analysis



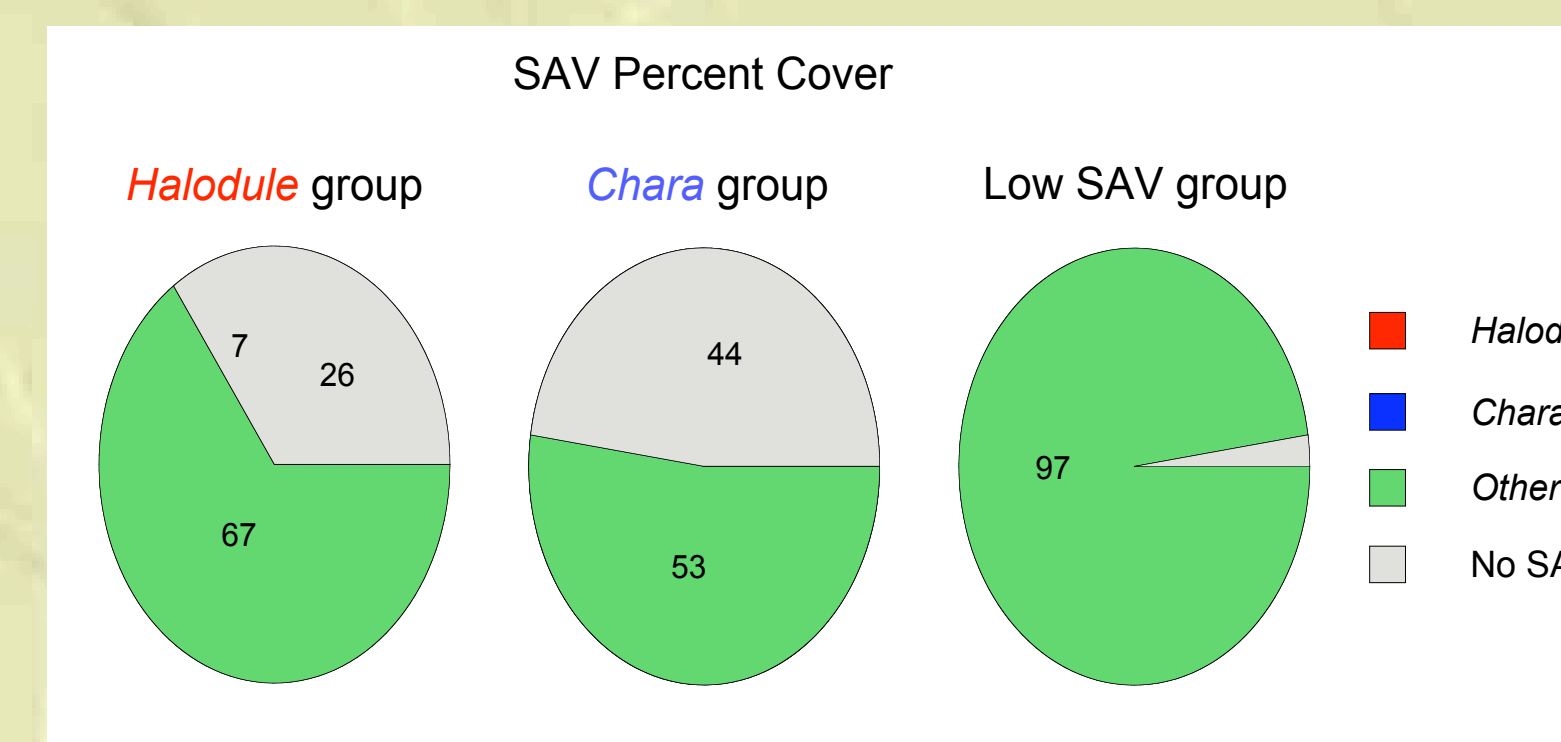
Chara hornemannii, Blue-winged Teal, American Coot

Submerged aquatic vegetation supports waterfowl

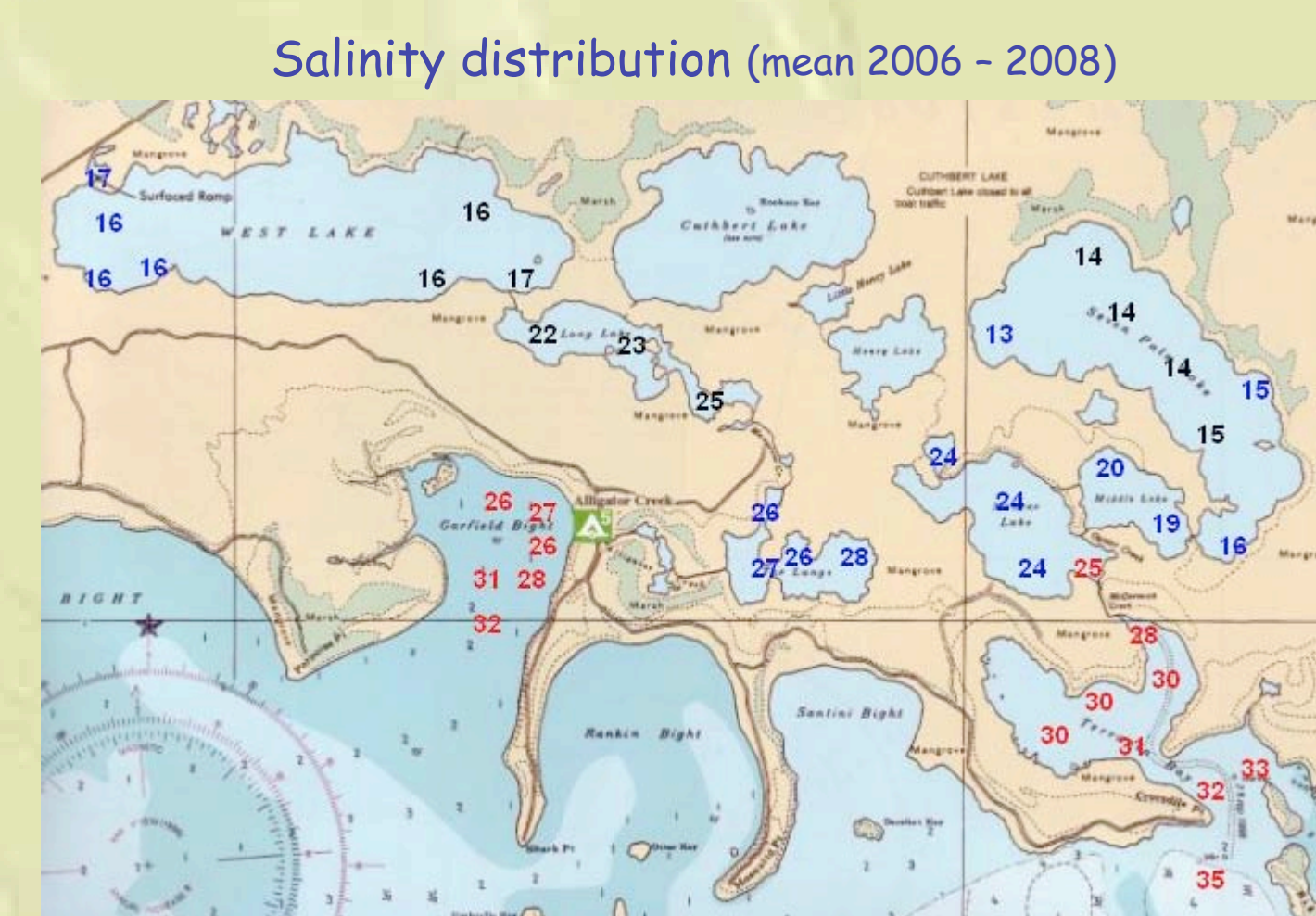
RESULTS AND DISCUSSION



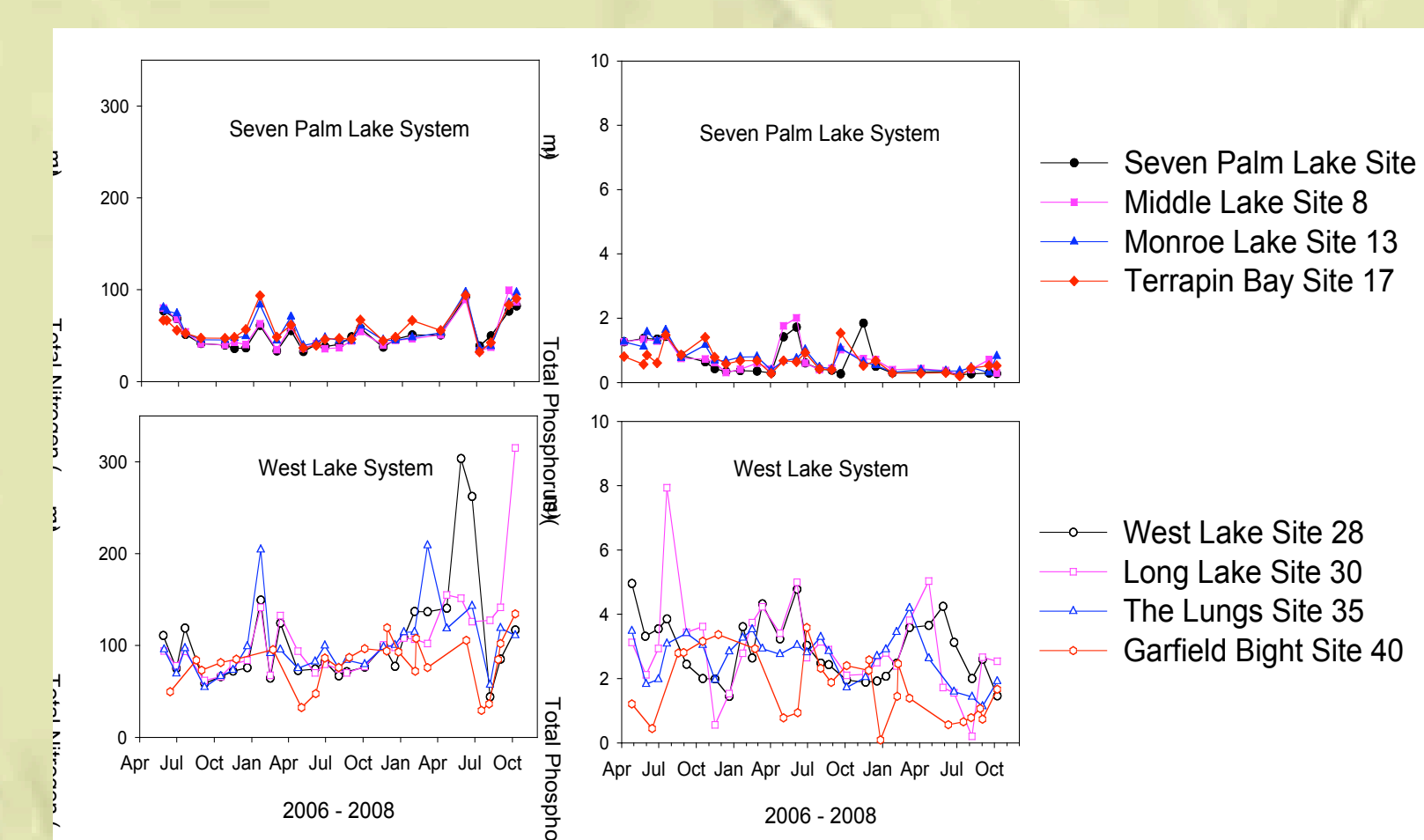
Low SAV, Halodule and Chara groups identified



SAV groups distinguished by SAV species abundances



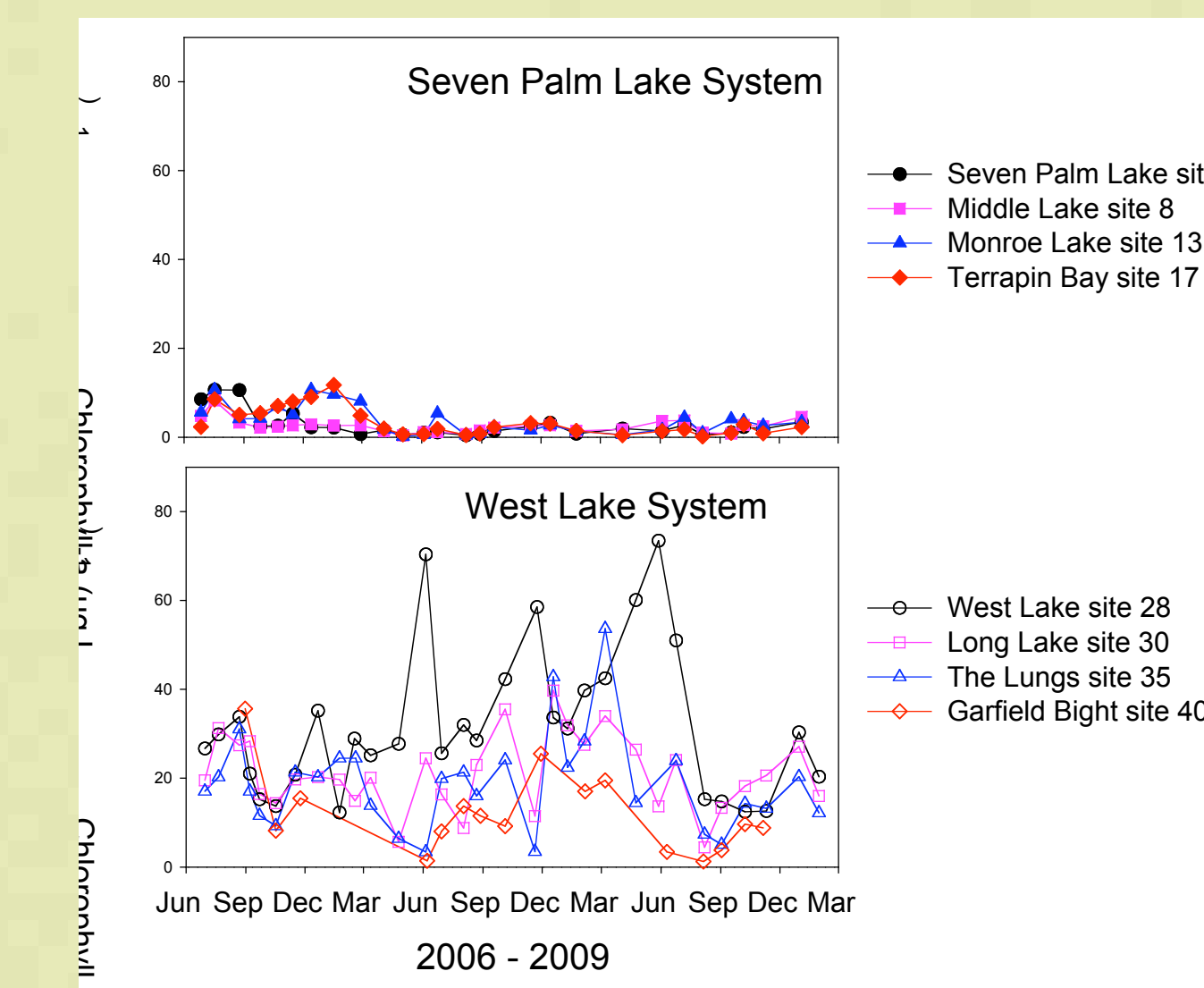
Chara and Halodule differentiate along salinity gradient



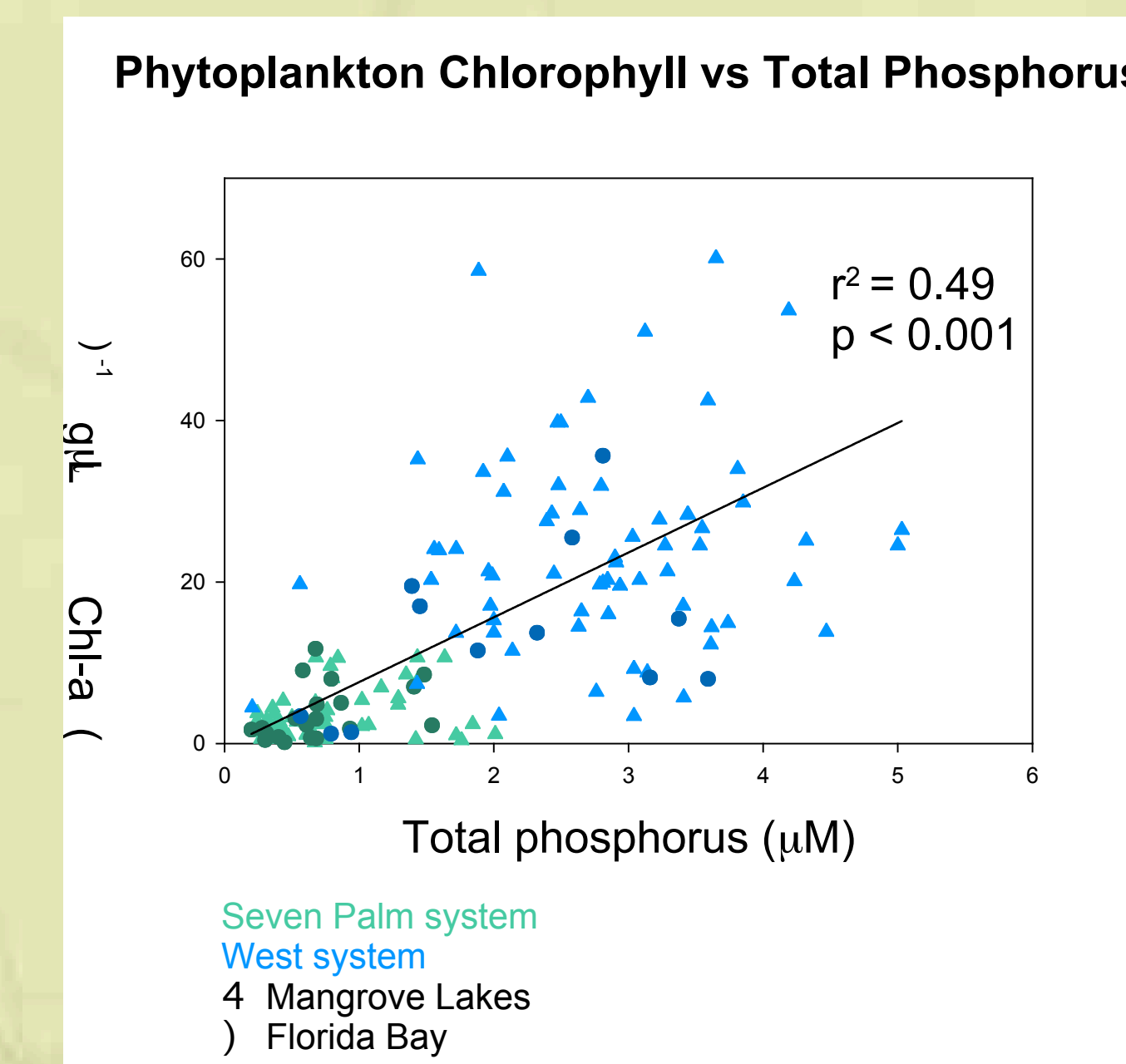
N:P ≈ 90:1

N:P ≈ 30:1

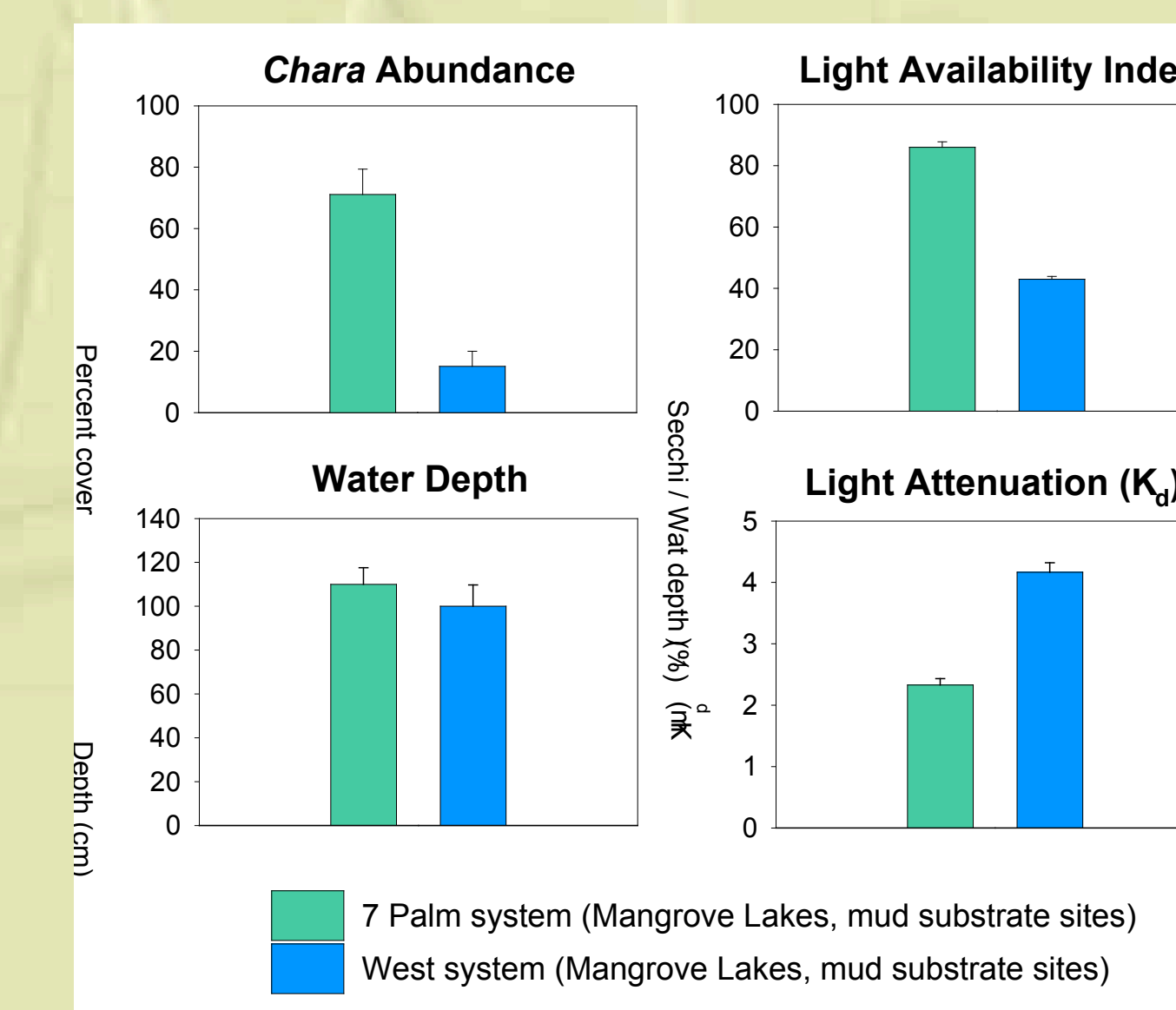
More nutrients, less severe P-limitation in West Lake system.



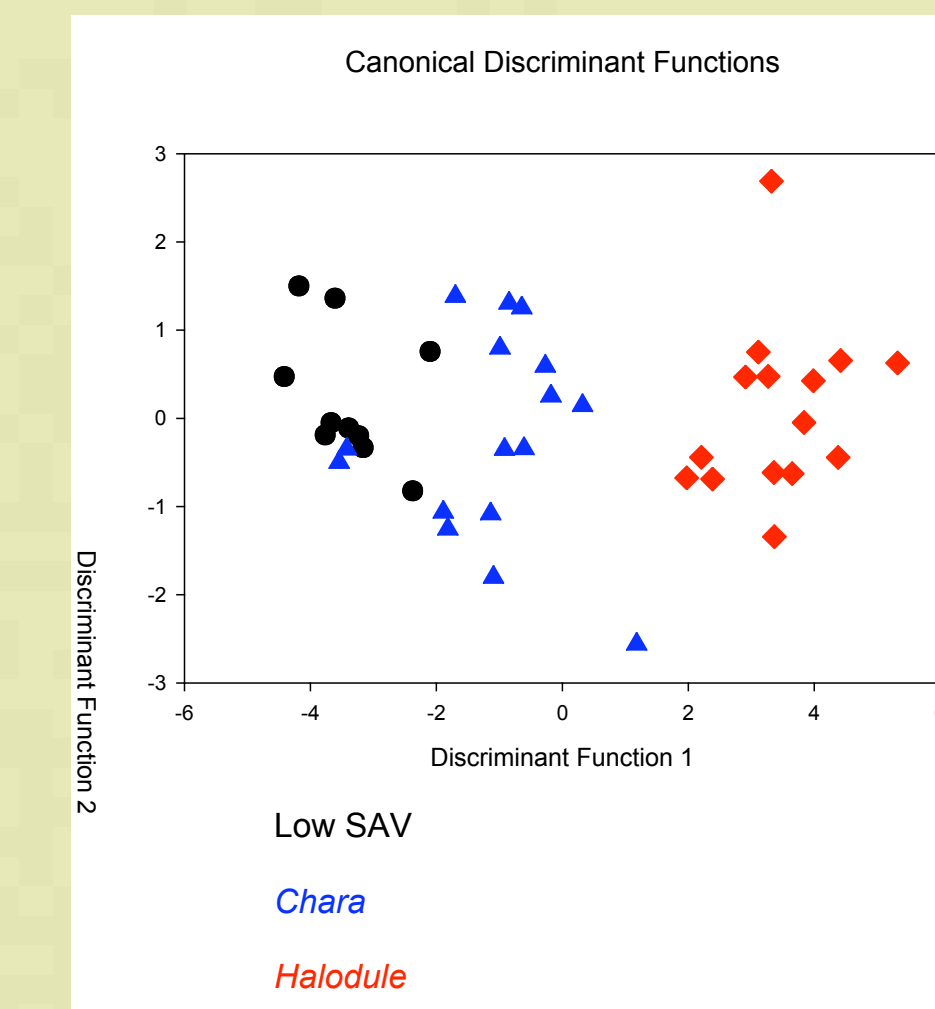
Phytoplankton ≈ 6X greater in West Lake system



Phytoplankton correlated with P-availability



Greater Chara abundance associated with increased light availability



Discriminant Function Model
 Correctly classifies 93% of sites
 DF1 describes >99% of variance

Correlations with DF1

Salinity	0.45
Water depth	-0.40
Sediment depth	0.39
LAI	
(light availability index)	0.24
Salinity variability	-0.18

SAV groups well predicted by WQ variable

In Discriminant Function (DF) models, variables are added to the model in the order that reveals the greatest distinction between the two closest groups.

The two closest groups in the DF model were the Chara and Low SAV groups

The variables retained by the DF model in the order of their entry were:

LAI, salinity variability, sediment depth and salinity

LAI was best predictor in the DF model and differentiated the Low SAV from Chara group

CONCLUSIONS

Three SAV groups (Low SAV, Chara, Halodule) identified

SAV groups were well predicted by light availability, salinity, and sediment depth

Low SAV and Chara groups differentiated by LAI

Greater water clarities in 7 Palm system coincide with ≈5X greater Chara abundances relative to West Lake system.

P concentrations are ≈3X greater in West Lake system than in 7 Palms system, fueling ≈6X greater phytoplankton densities.

ACKNOWLEDGMENTS

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REFERENCES

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