

# If you restore it, will they come? Functional restoration trajectories in a Southern CA Wetland

C. R. Whitcraft, T. M. Champieux, and B. J. Allen

California State University Long Beach

## BACKGROUND

Brookhurst – Pre-restoration 2008

Brookhurst – Post-restoration 2009

### Wetland restoration in southern California

- Coastal wetlands provide key ecosystem functions
- Extensive loss of coastal wetlands has occurred
- Wetland managers use restoration as a potential solution
- Evaluation often focuses on structural, not functional, attributes
- Staggered restoration timing offers unique insight into process



Google earth



Google earth

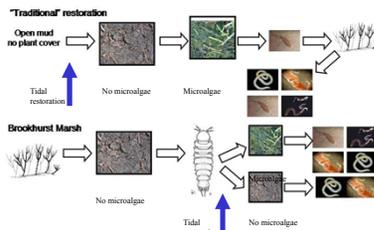
## ABSTRACT

In an effort to reclaim degraded wetland habitat, the Huntington Beach Wetlands Conservancy restored tidal influence to three marshes (Talbert, Brookhurst, and Magnolia) that had been isolated from tides for almost 100 years. Talbert Marsh was restored in 1989, Brookhurst Marsh in 2009, and Magnolia Marsh in 2010. One portion of our research in these systems evaluates whether the benthic macroinvertebrate communities and trophic structure will return to a pre-disturbance state (as compared to a reference marsh). Twenty years post-restoration, Talbert Marsh resembles other natural marshes in southern California. One commonly accepted theory of marsh community succession is a trajectory from an unvegetated, microalgae and insect-dominated system to a vegetated system with a diverse invertebrate community of detritivores and insects. Given that Brookhurst and Magnolia were restored as a vegetated marsh while Talbert was largely unvegetated pre-restoration, will Brookhurst and Magnolia develop in similar ways and over similar time-scales to Talbert? Within two months of tidal reintroduction, there was increased microalgal biomass and a similar invertebrate community in Brookhurst relative to Talbert, our reference marsh. Our study demonstrates the potential effectiveness of tidal restoration for California wetlands and provides information about efficient and effective methods by which to evaluate the restoration of important marsh ecosystem functions, such as trophic support.

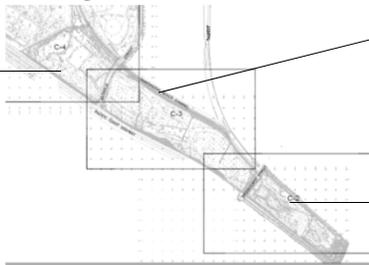
## OBJECTIVES

- Characterize the structure and function of a restored wetland in the Huntington Beach Wetlands
- Will a vegetated marsh follow a similar trajectory to an unvegetated marsh?
- Over what timescale will this restoration occur?
- To what degree are structural measures of success indicators of functional recovery?

### Hypothesized trajectories



## LOCATION: Huntington Beach Wetlands (Huntington Beach, CA)



## METHODS



- All data presented are from high marsh plain
- Edaphic parameters (salinity, temperature)
- Core sampling of infauna; 300 μm sieve
- Biomass of microalgae (Plante-Cuny 1973)
- Stable isotope analysis (food web structure)

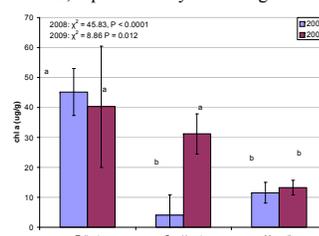


Extracting a core sample from unvegetated habitat

## RESULTS

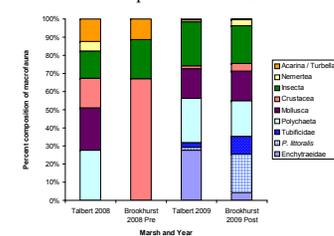
### MICROALGAL BIOMASS

Pre-restoration chlorophyll a levels in BH were significantly lower than TB; rapid recovery following restoration



### INVERTEBRATE COMMUNITY

Percent composition between BH and TB differs pre- and post-restoration



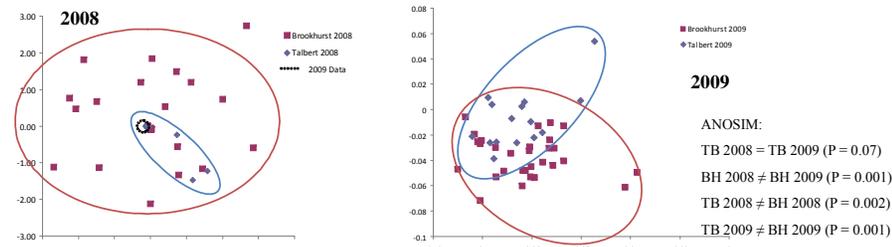
TB > BH  
P < 0.0001  
X<sup>2</sup> = 18.64



TB < BH  
P = 0.006  
X<sup>2</sup> = 7.60

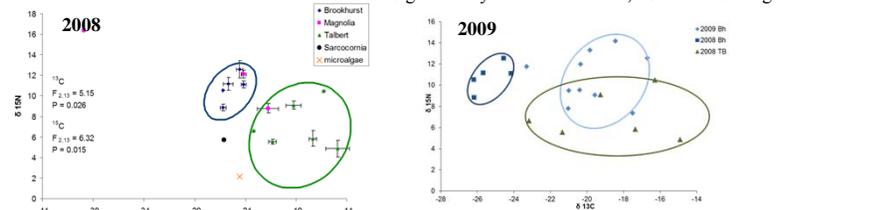
### INVERTEBRATE COMMUNITY

Pre-restoration communities in BH were significantly different than TB (less diverse, more terrestrial organisms); Slower recovery than microalgae following hydrologic restoration



### TROPHIC STRUCTURE

Pre-restoration communities in BH were significantly different than TB, Potential convergence



## CONCLUSIONS

- \* Hydrologic integrity restored
- \* Subsequent functional equivalency
- \* Resilience in the face of change
- \* Rapid recovery of primary producers
- \* Need for long-term monitoring

## ONGOING WORK

- \* Fish community surveys and caging experiments (C. Espasandin, E. Fox, C. Lowe)
- \* Decomposition analysis (litter bags)
- \* Sequencing and stable isotope labeling to explore microbial community (J. Dillon)

## ACKNOWLEDGMENTS

Huntington Beach Wetlands Conservancy, Kristen Bender, Jessica Vazquez, Erika Fox, Jeremy Browning, Sasha Harvey, Rachel Wigginton, Anastasia Shippey, Jess de Jesus, Colin Sayre, Randall Holder, Alayna Petre. Calvin Won  
CSULB start-up funds, NOAA MSRP, CA SeaGrant

