# Calculating Mass Flux of Dissolved Inorganic Nitrogen and Chlorophyll-*a* at Blacklock Marsh, a Restored Site in Suisun Marsh

Shannon Strong[1], Alex Parker[2], Frances Wilkerson[1]

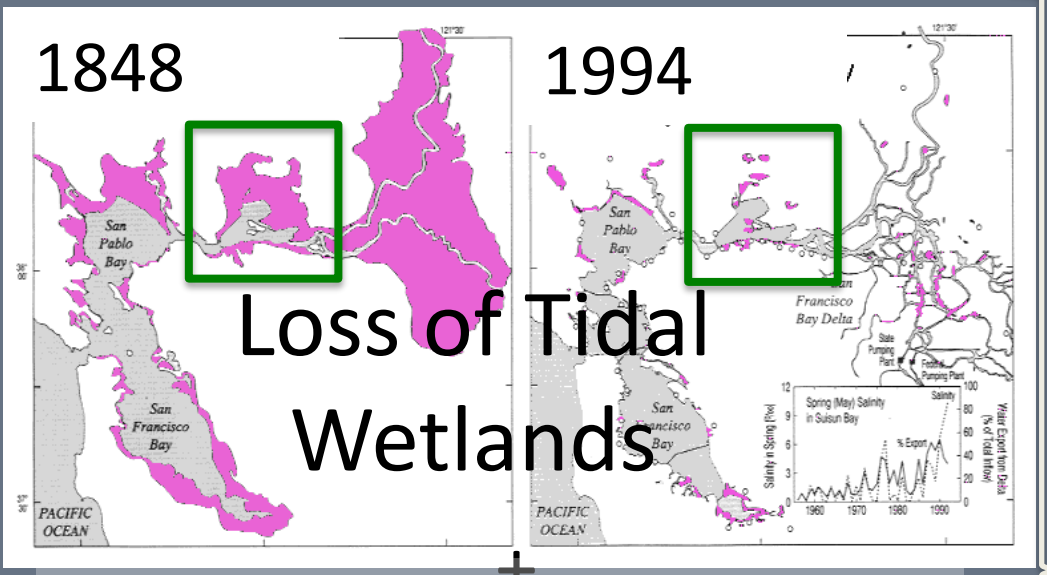
[1]Romberg Tiburon Center for Environmental Studies,

[2]California Maritime Academy

Bay-Delta Science Conference

October 28, 2014

Photo: Denise DeCarion




Loss of Tidal Wetlands

+

Increase in Anthropogenic Activity

↓

Water Quality

Photo: NOAA

↓

↑ Water Quality

↑ Chlorophyll-*a* (chl-*a*) (Odum 1980)

↓ Dissolved Inorganic Nitrogen ($NH_4$, $NO_2$, $NO_3$) (DIN) (e.g. Valiela & Teal 1979)

# Is the restored Blacklock Tidal Marsh (BTM) improving the water quality for proximal Suisun Marsh sloughs?

**FIGURE 3 – OCTOBER 12, 2006**
**AERIAL PHOTO**
**LOOKING SOUTHWEST**

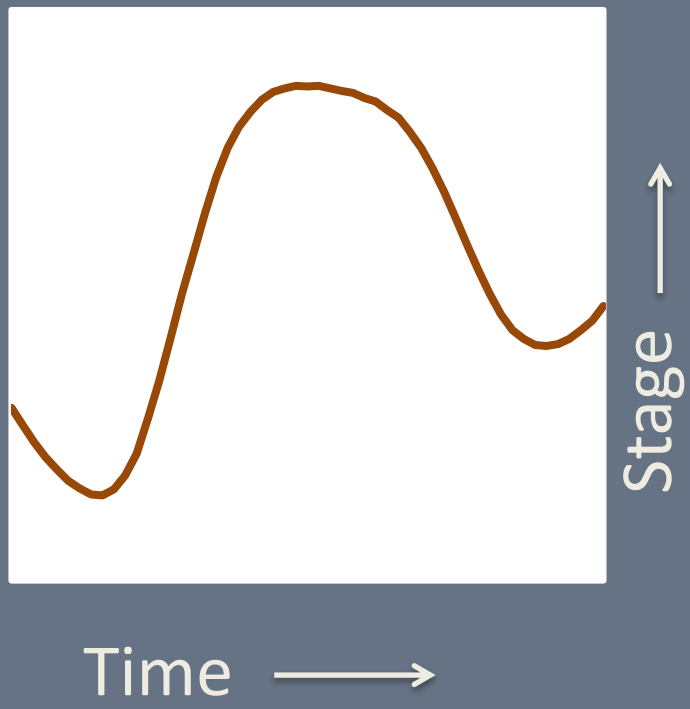
Blacklock Restoration Project
Solano County, California

Photo: Wetlands and Water Resources & Dept. Water Resources

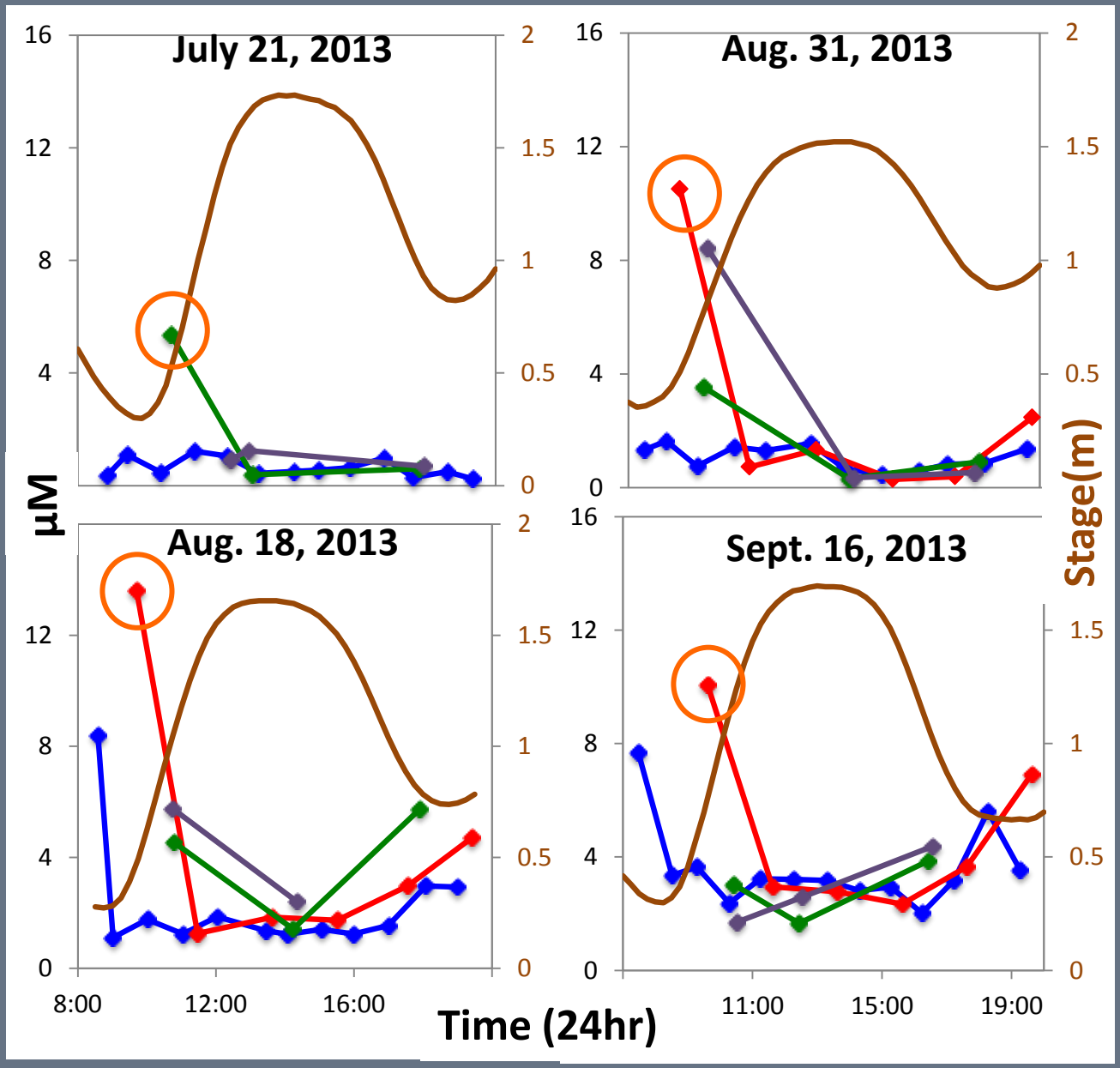
# Part 1: Characterizing BTM's $NO_x$, $NH_4$ and chl-*a* by…

## a. Sampling Sites


## b. Time (water level)



# $NH_4$

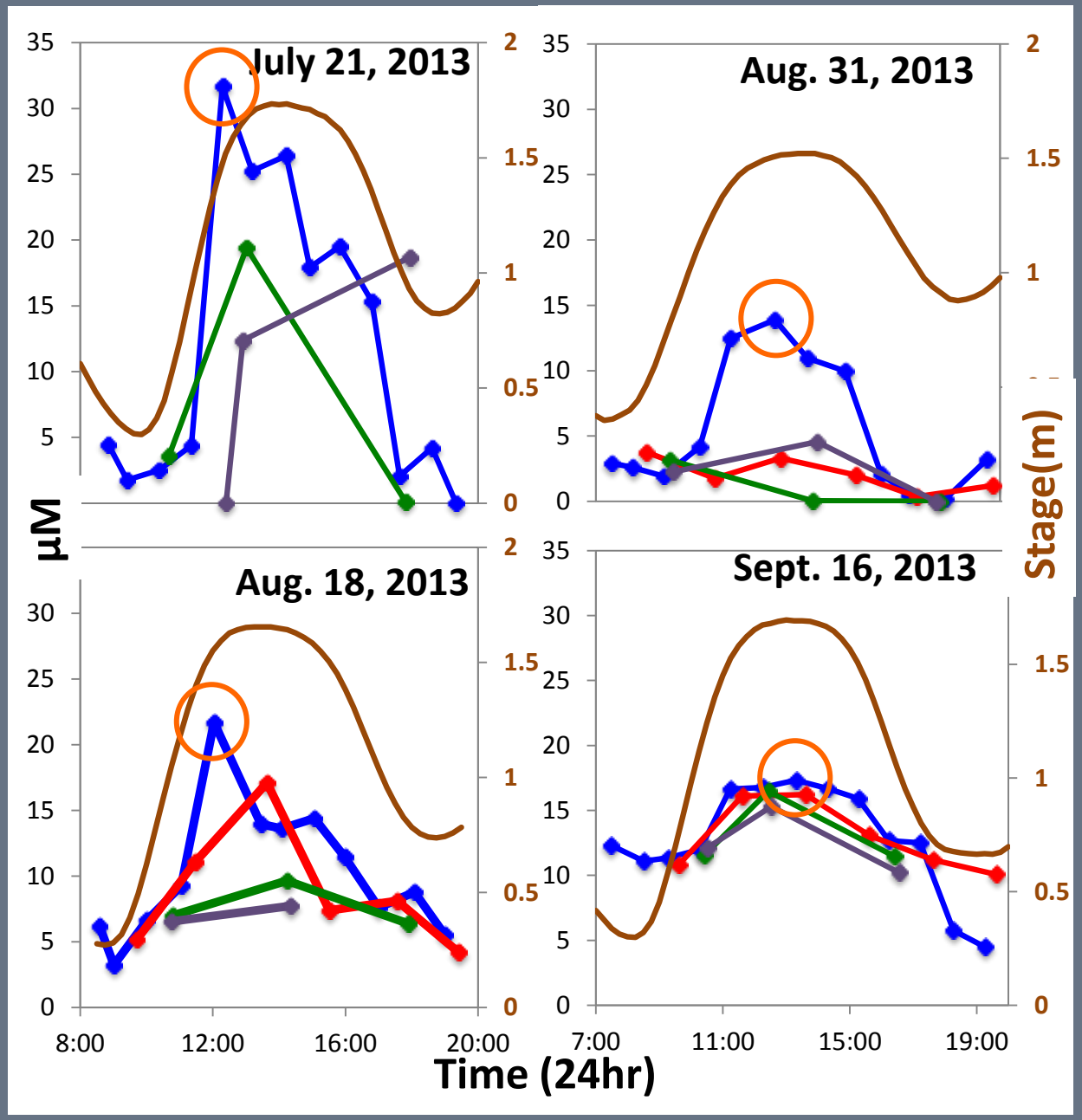




Channel & N Pond = Highest $NH_4$

Stage ↓ $NH_4$

# NO

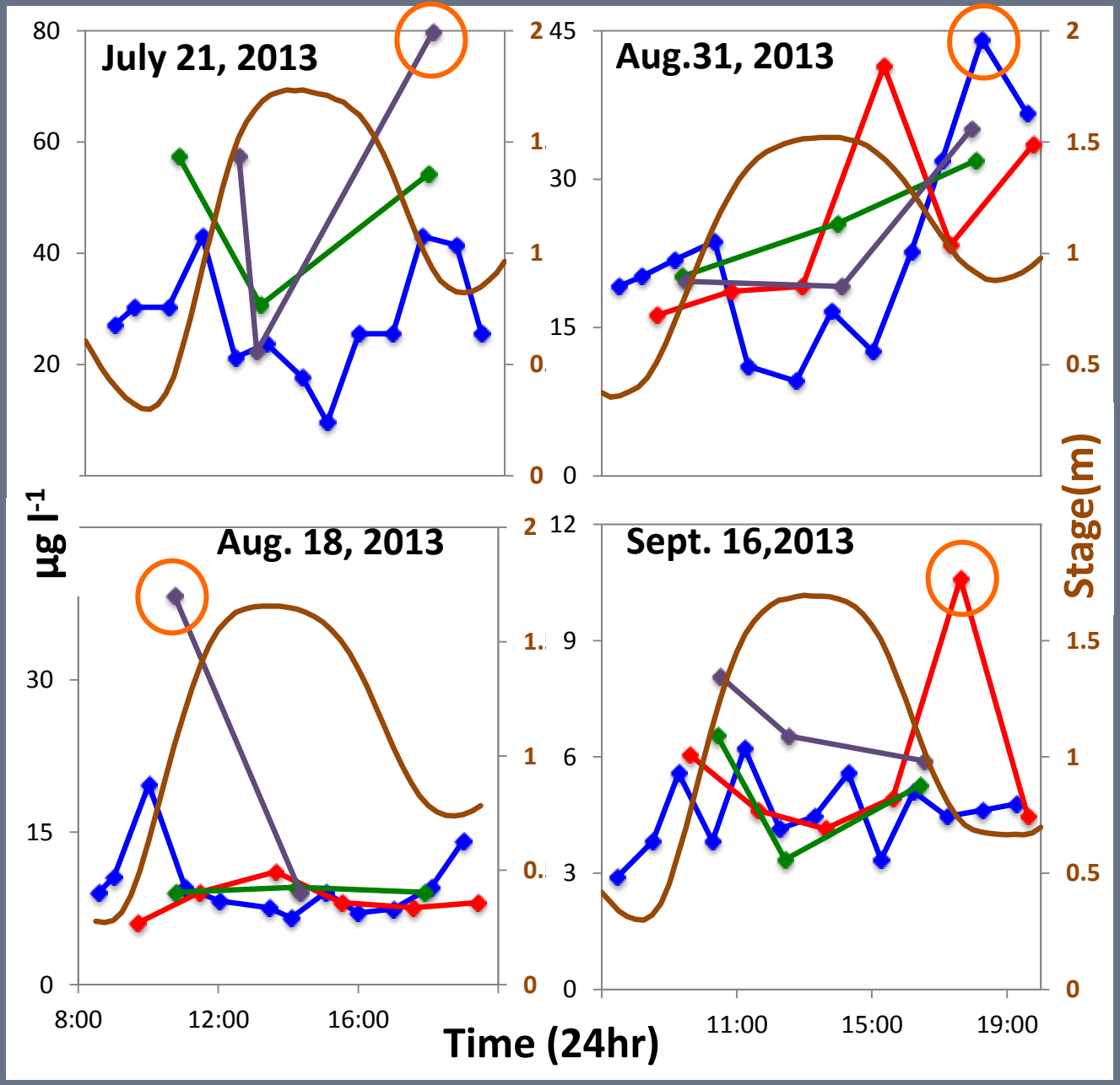




Breach = Highest $NO_x$

Stage $NO_x$

# Chl-*a*





Highest Chl-*a* in S Pond, Breach & Channel

Stage ↓ Chl-*a*

# Part 2: Calculating the net mass import or export of NOx, $NH_4$ and chl-*a* into or out of Blacklock

# Calculating net mass import or export

**[X] x ΔV/t = m/t x Δt = m**

Concentrations from hourly samples on flood-ebb

Flow Rate

60min

mass of

al

hr)

**Σ $m_1$ thru $m_{13}$ = M (mass over flood-ebb cycle)**

**Add M at both breaches to determine net import/export of material into/out of BTM**

# Method 1 in Calculating Flux: Measure Flow Directly

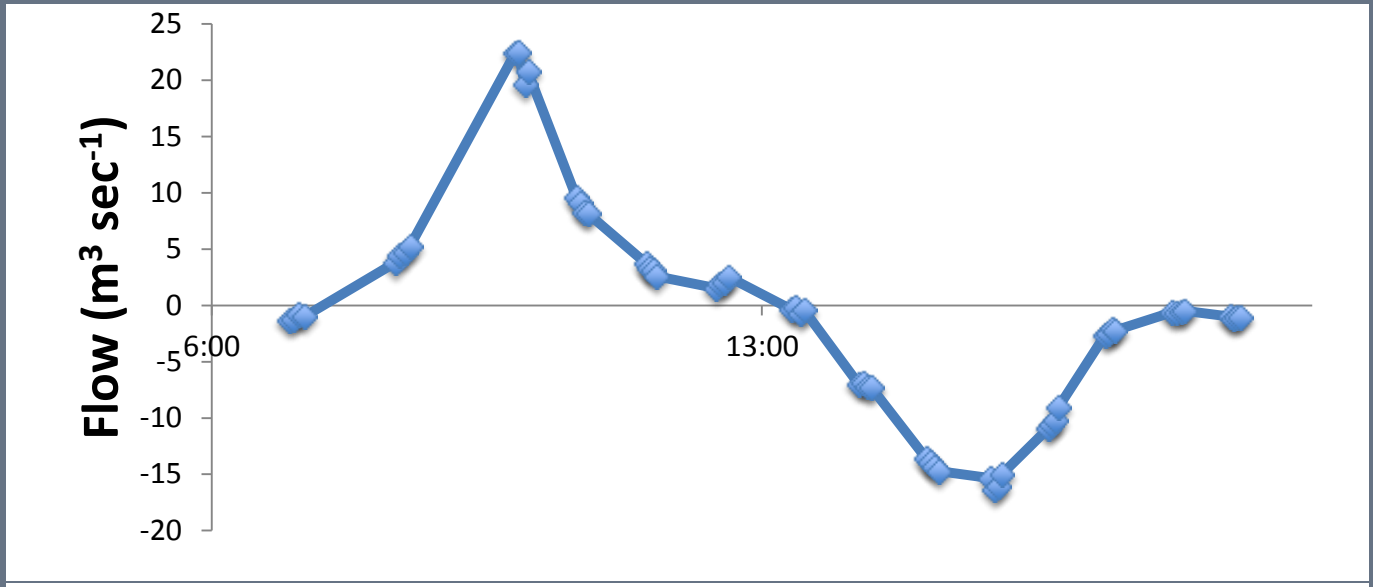
**ΔV/t**

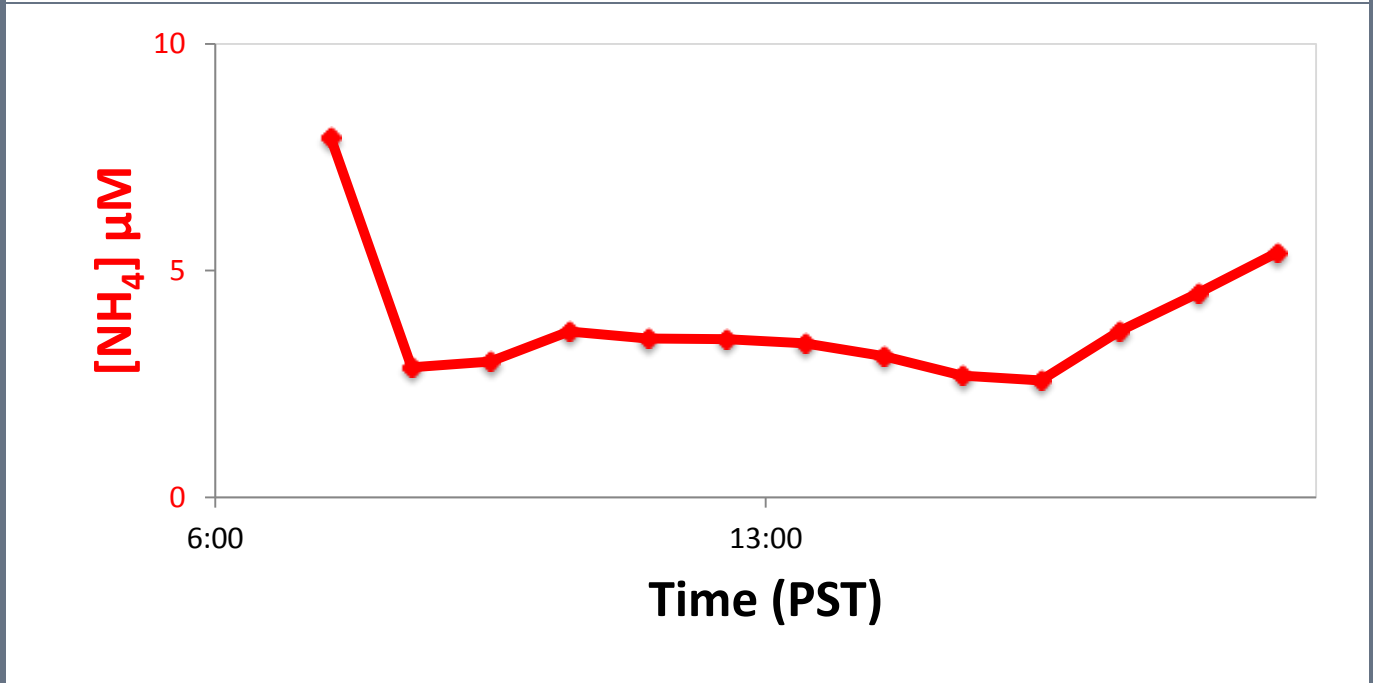
Flow Rate (ADCP)

**X**

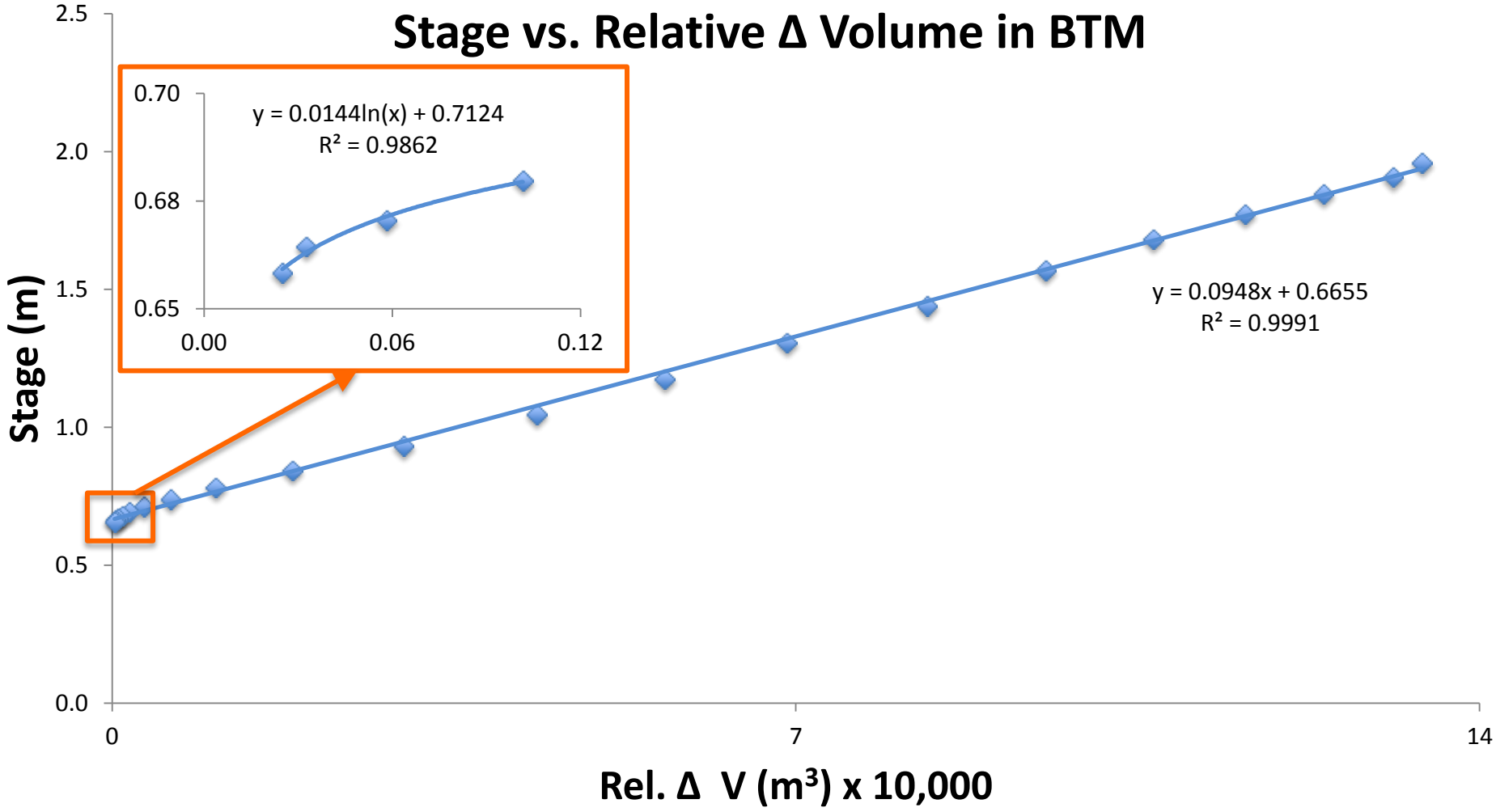
**[X]**

Concentrations from hourly samples on flood-ebb



# Method 2 in Calculating Flux: Use Hypsograph Created by using ADCP Flow Measurements



# Future Directions

- Continue to sample seasonally in both BTM and Suisun Sloughs
- Use hypsograph to calculate DIN and chl-*a* flux for 4 flood-ebb periods in 2013

# Acknowledgements


- Kathy Boyer, thesis committee member
- Chris Enright, Stuart Siegel, Lisa Lucas, Jon Burau, & USGS-West Sacramento
- SFNERR & Solano Land Trust
- Moyle Lab (UC Davis)
- Boyer & Carpenter Labs (RTC)
- Central Valley Regional Water Quality Control Board
- Wetlands and Water Resources
- CA Department of Water Resources
- SFSU-IRA Funding


# Summary

- Chl-*a* and $NH_4$ varied inversely with stage; NOx varied directly with stage
- Concentrations varied more between sites at lower stages
- Shallow ponds had the highest chl-*a* on the first 2 days; Breach and Channel sites on the last 2 days

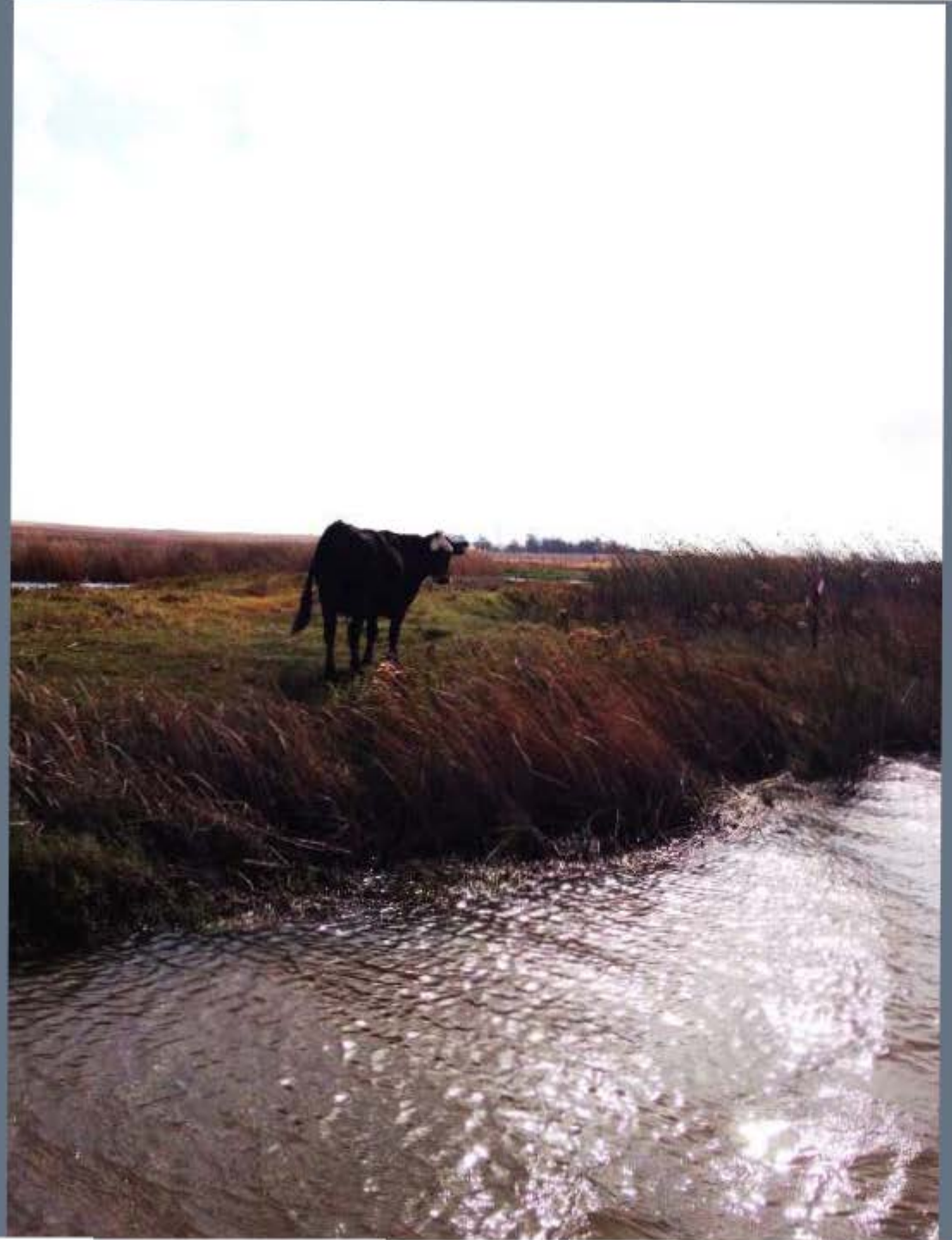
# Channel
# NH4 vs. River Stage


<.8m
y = -55.017x + 45.346
R² = 0.56385

y = 0.398x + 4.2921
R² = 0.0023

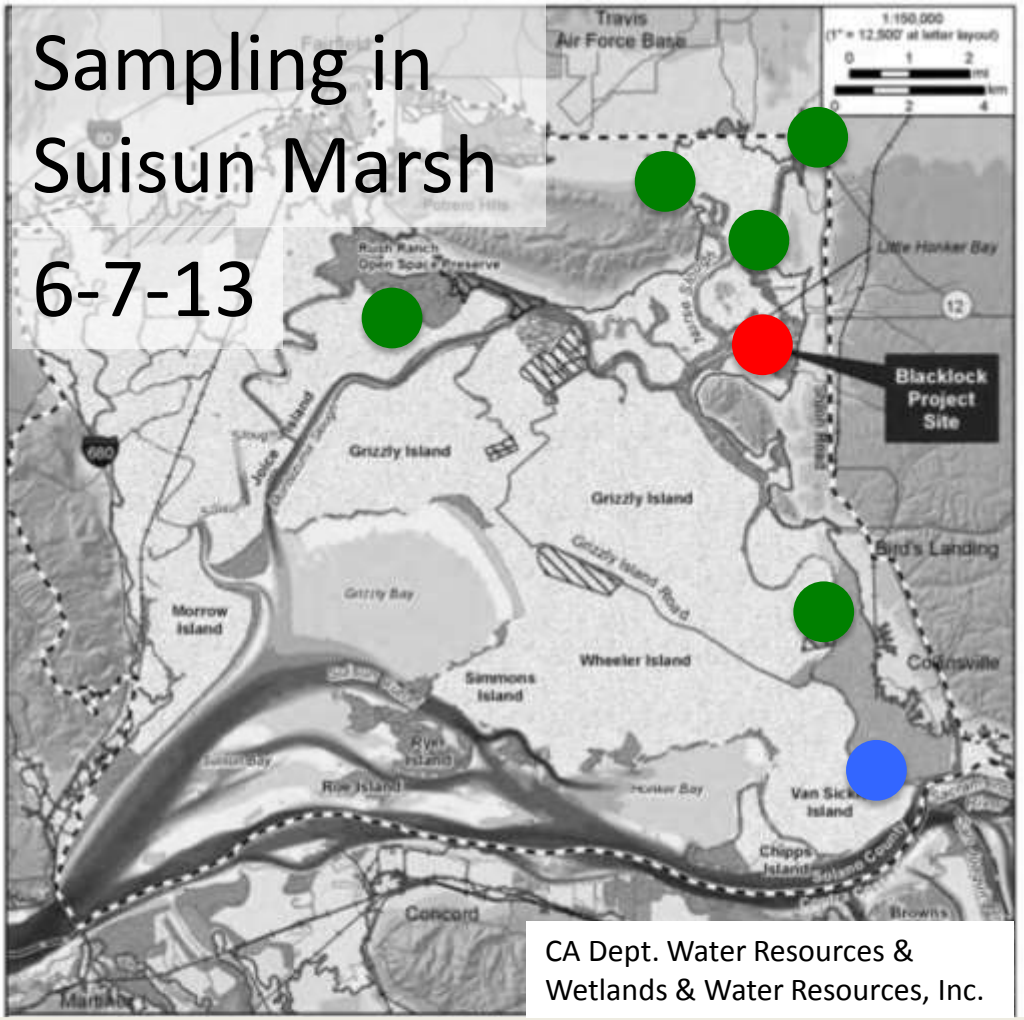
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00

0.00
0.50
1.00
1.50
2.00
2.50

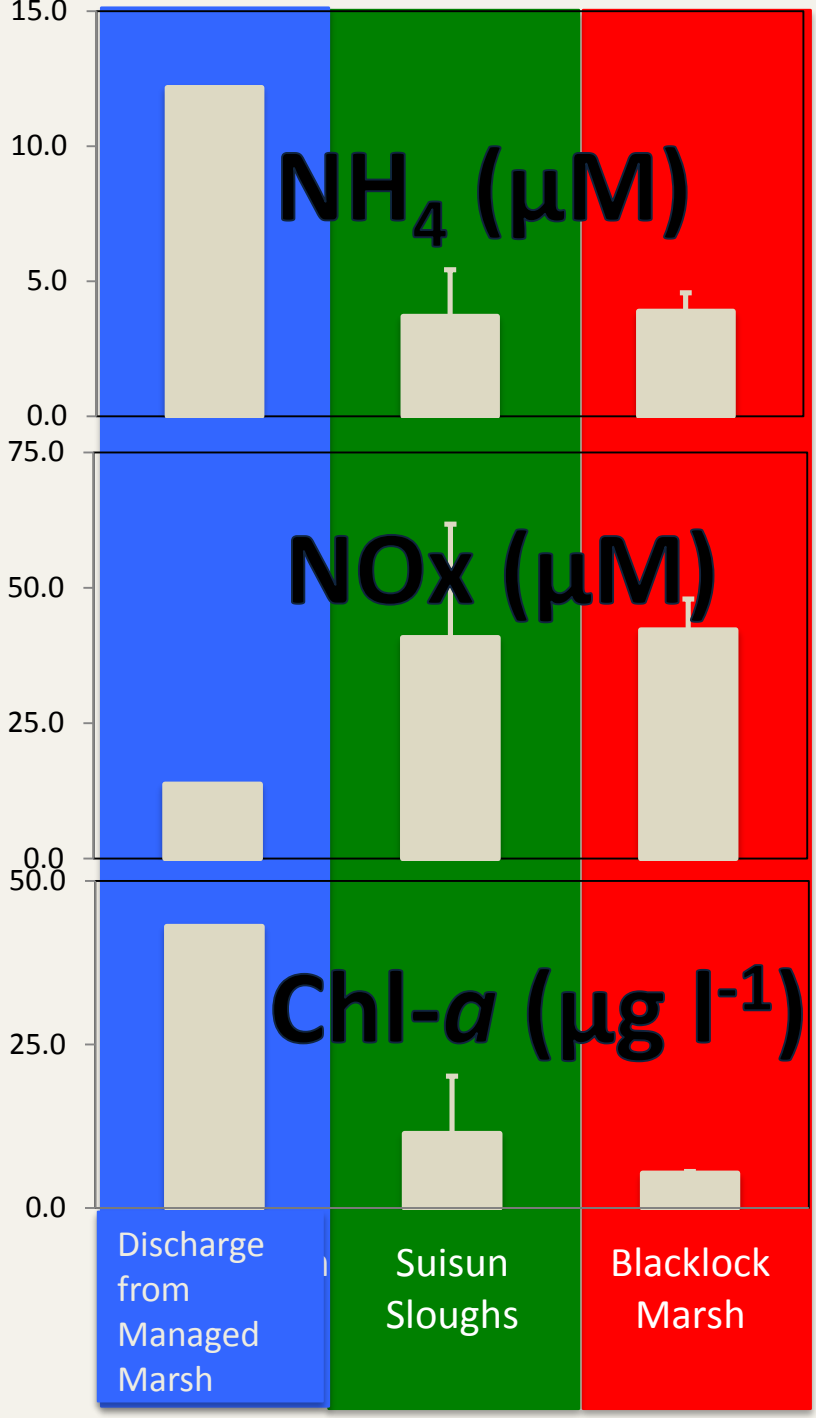


# Sampling in Suisun Marsh

6-7-13




CA Dept. Water Resources & Wetlands & Water Resources, Inc.



# Summary

| | Blacklock vs. Suisun Marsh Sloughs |
|---|---|
| Average $NH_4$ | Blacklock ≤ Sloughs |
| Average NOx | Blacklock < Sloughs |
| Average Chl-*a* | Blacklock ≥ Sloughs |