Low Intensity Chemical Dosing (LICD)

A Hybrid Coagulation-Wetland System Designed to Decrease DOC, Hg, and Nutrient Loads from Subsided Islands in the Sacramento-San Joaquin Delta

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Department of LAND, AIR AND WATER RESOURCES University of California, Davis Climate Change • Sustainable Agriculture Environmental Quality • Landscape Processes

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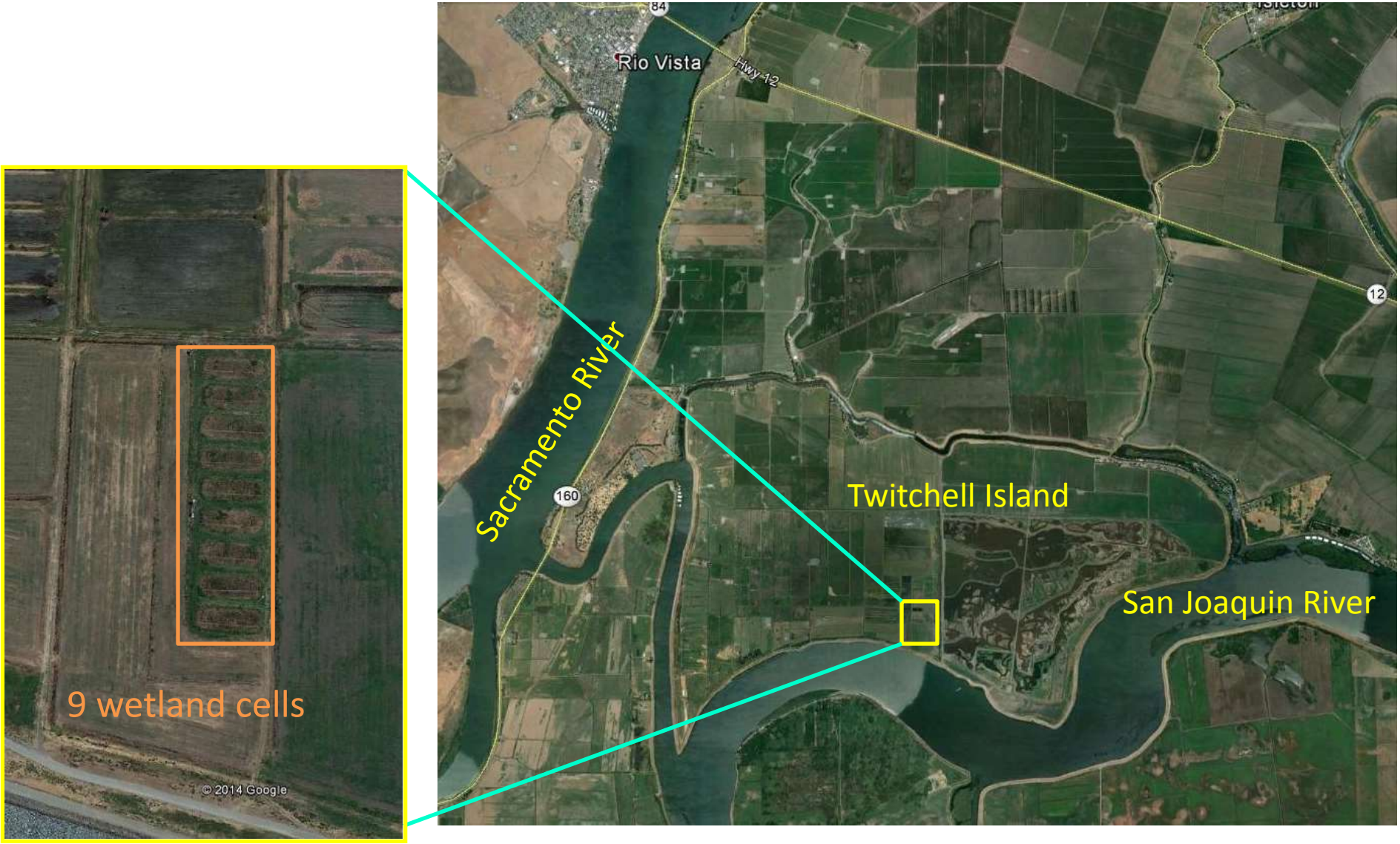
BACHAND & ASSOCIATES

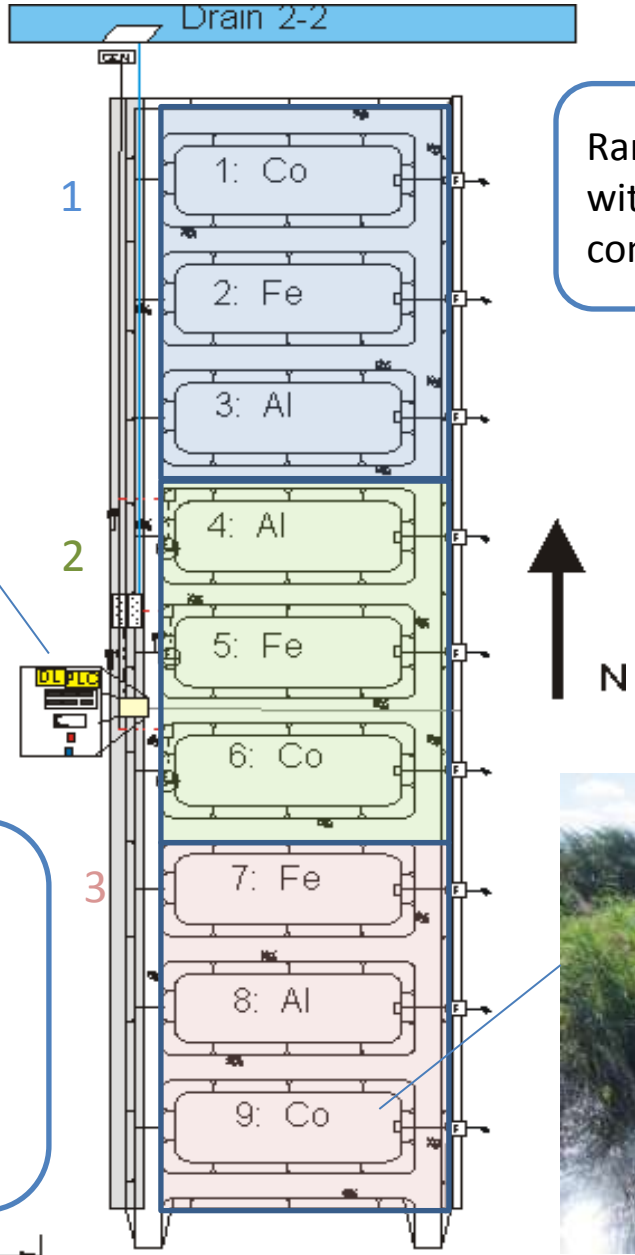
TETRA TECH



Project Location: Twitchell Island

Soil Type: Peat

Twitchell Island LICD Experimental Design



Randomized block design with 3 blocks. Each block contains 3 treatments.

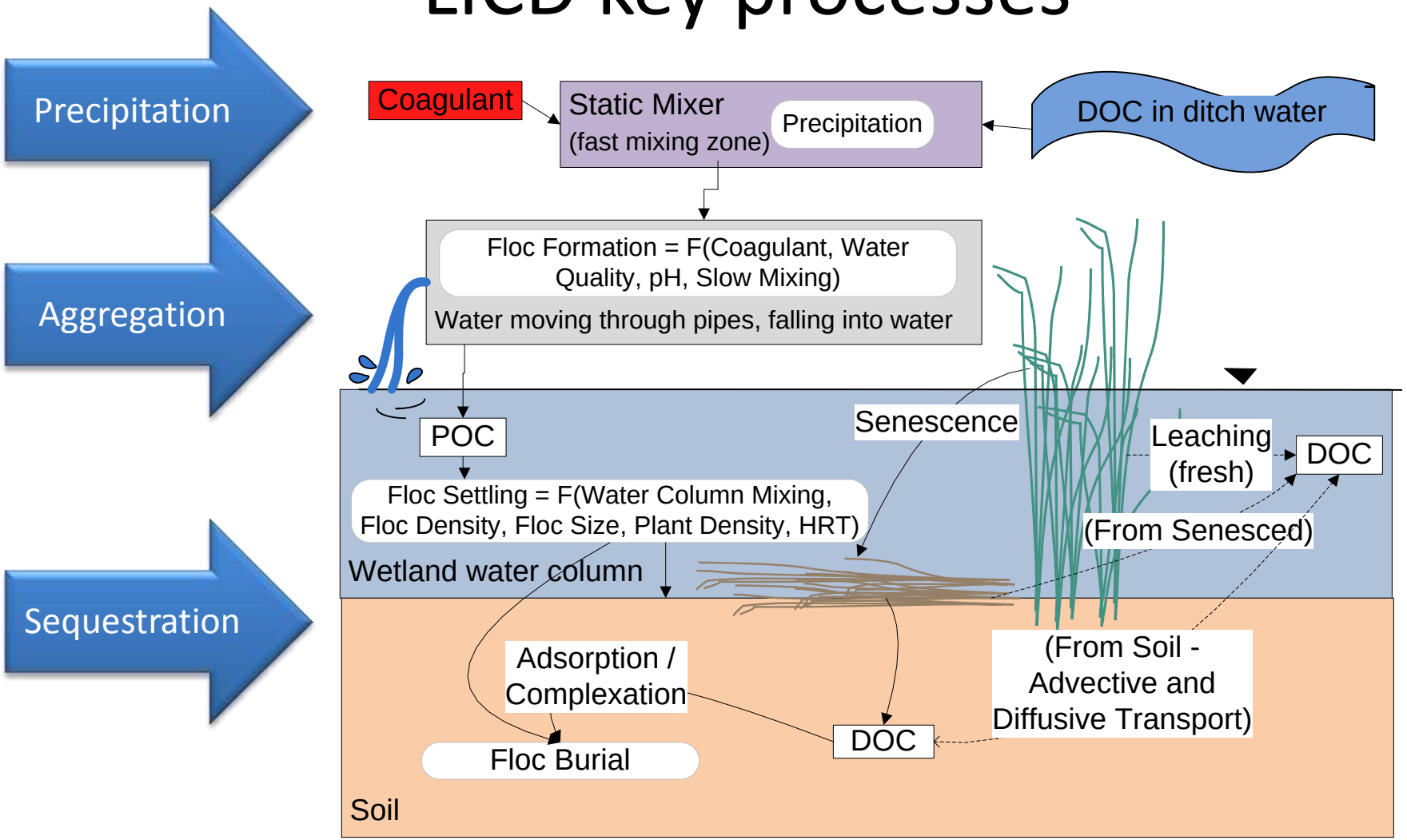
Cell Dimension: 36 x 12 m

Three treatments:

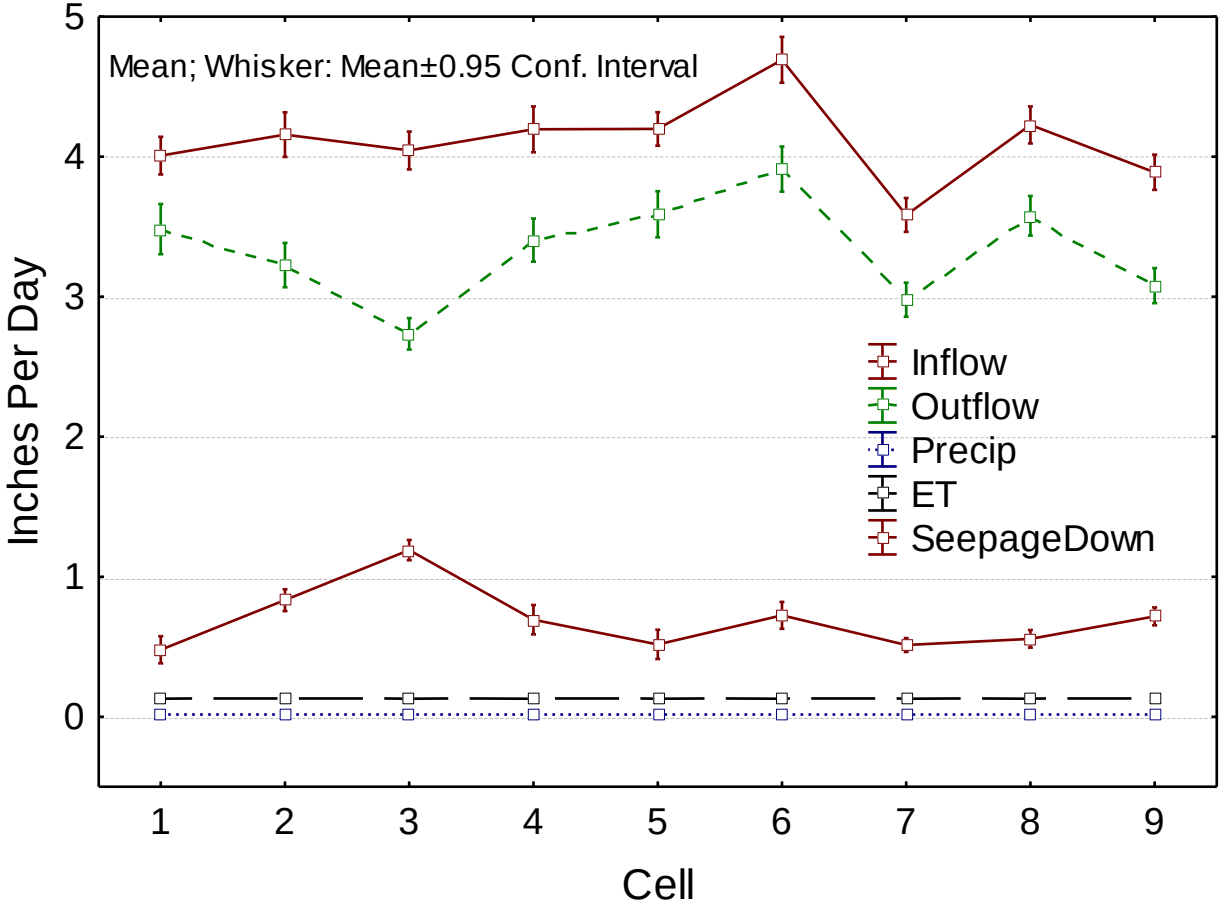
- Control (no dosing)
- Al, Polyaluminum Chloride, PAC XL-19 (12.4%)
- Ferric Sulfate, $Fe^2(SO4)^3$ (12.1%)

- Coagulants were injected into static mixers at dosing rates set to achieve 60-80% DOC removal
- Dosing control
  - Al: Al and Co -- Fluorometer
  - Fe: Fe and Co -- pH

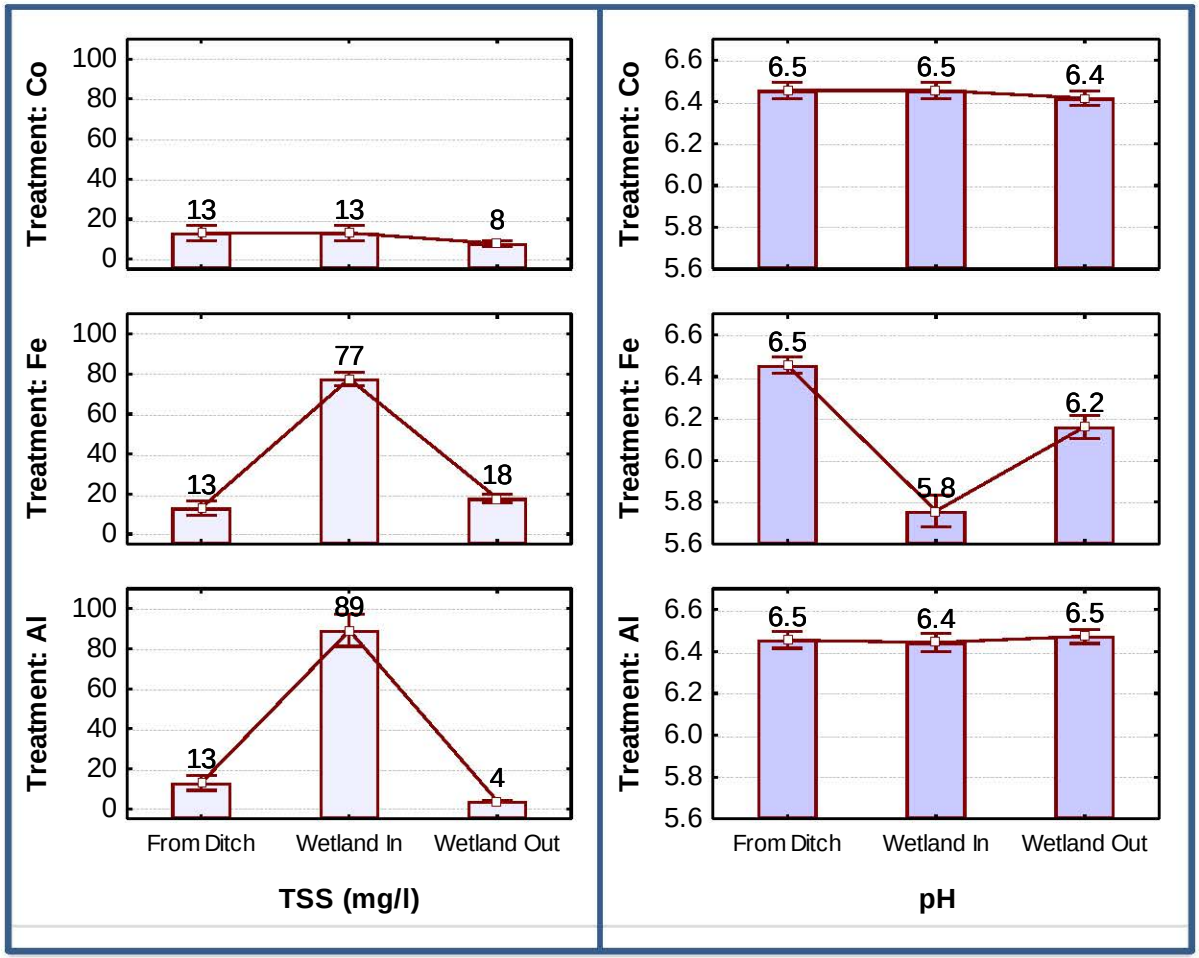
LICD key processes



Water Balance For Wetland Cells

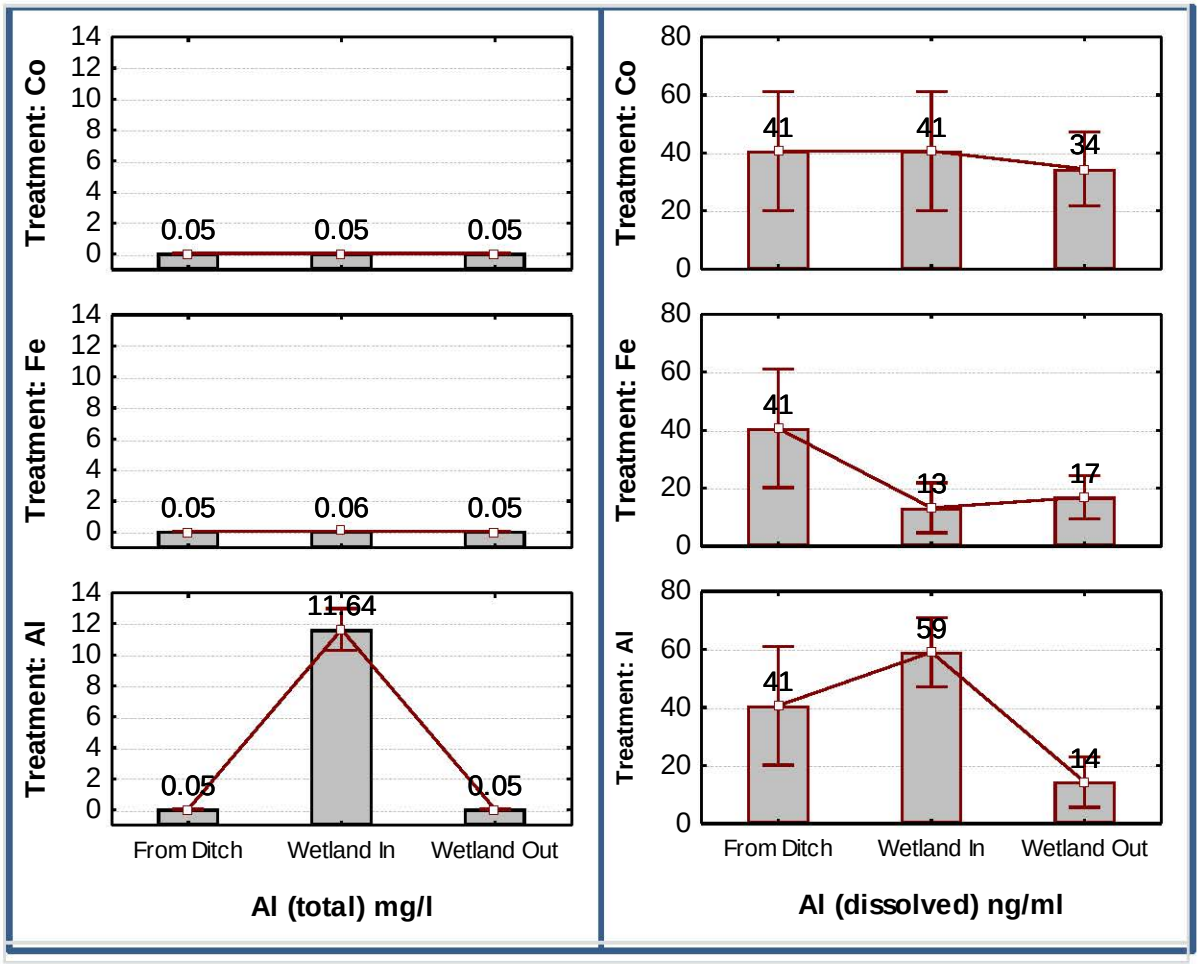


Effect of Treatment on TSS and pH



Mean±0.95 Conf. Interval

Effect of Treatment on Aluminum Concentrations



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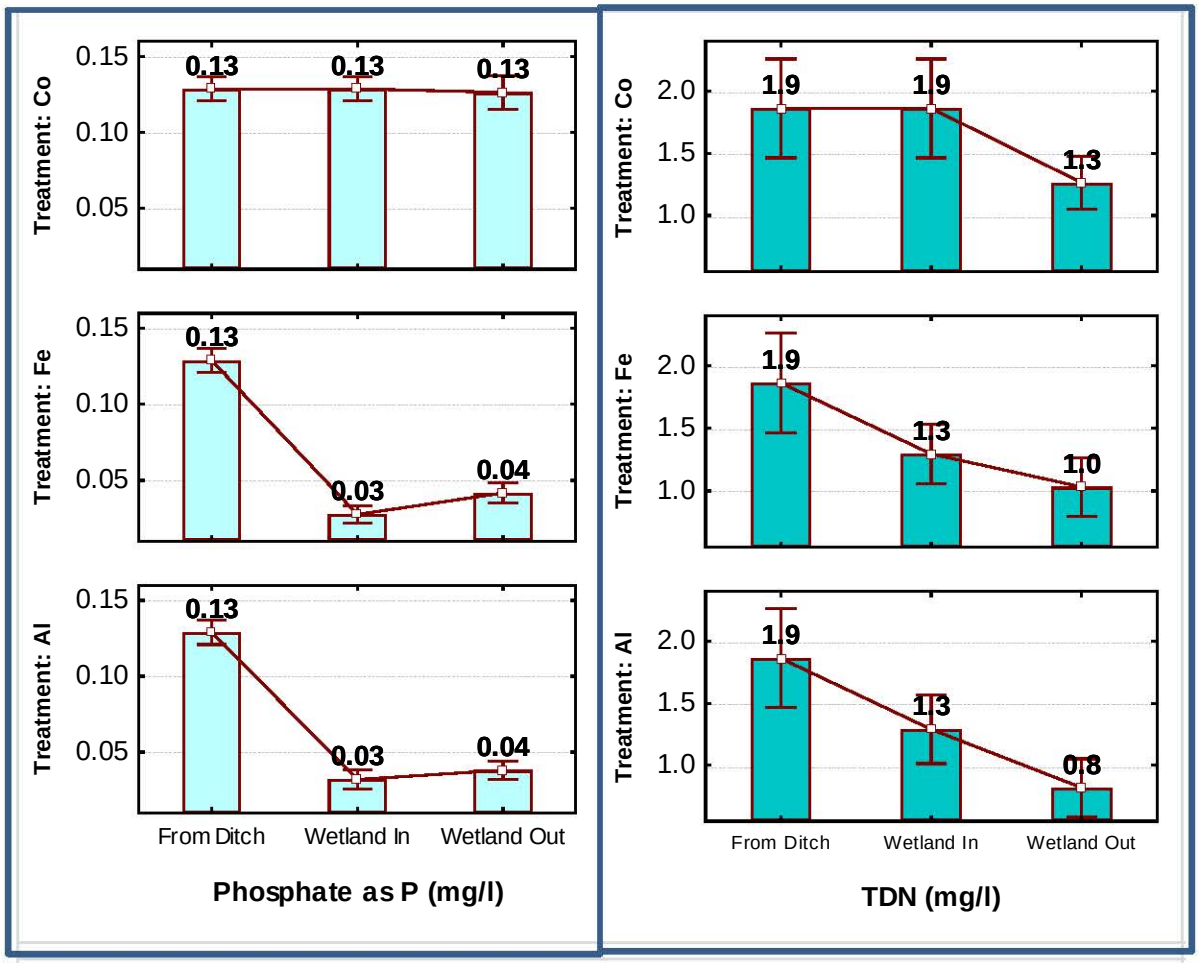
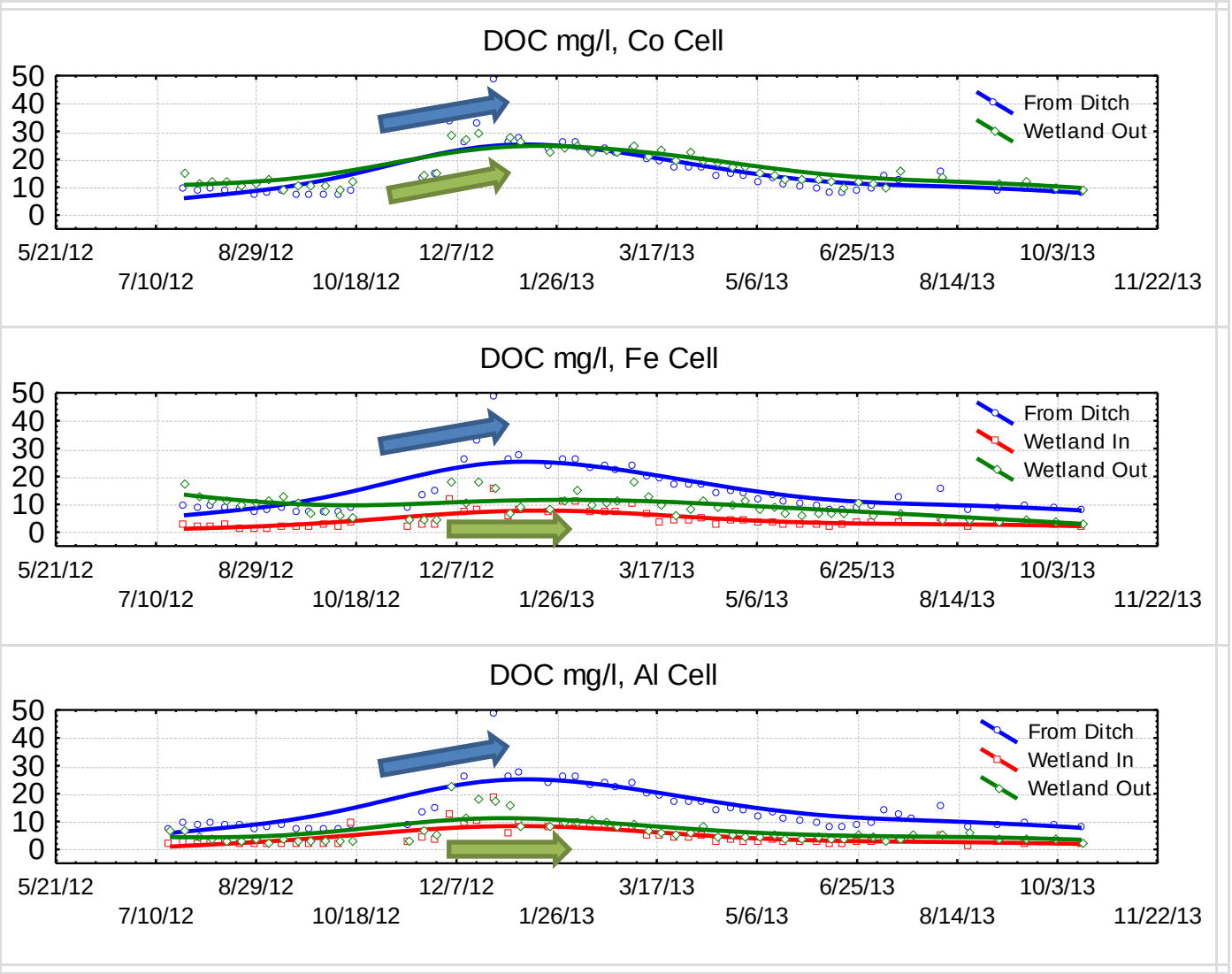
Effect of Treatment on Nutrients

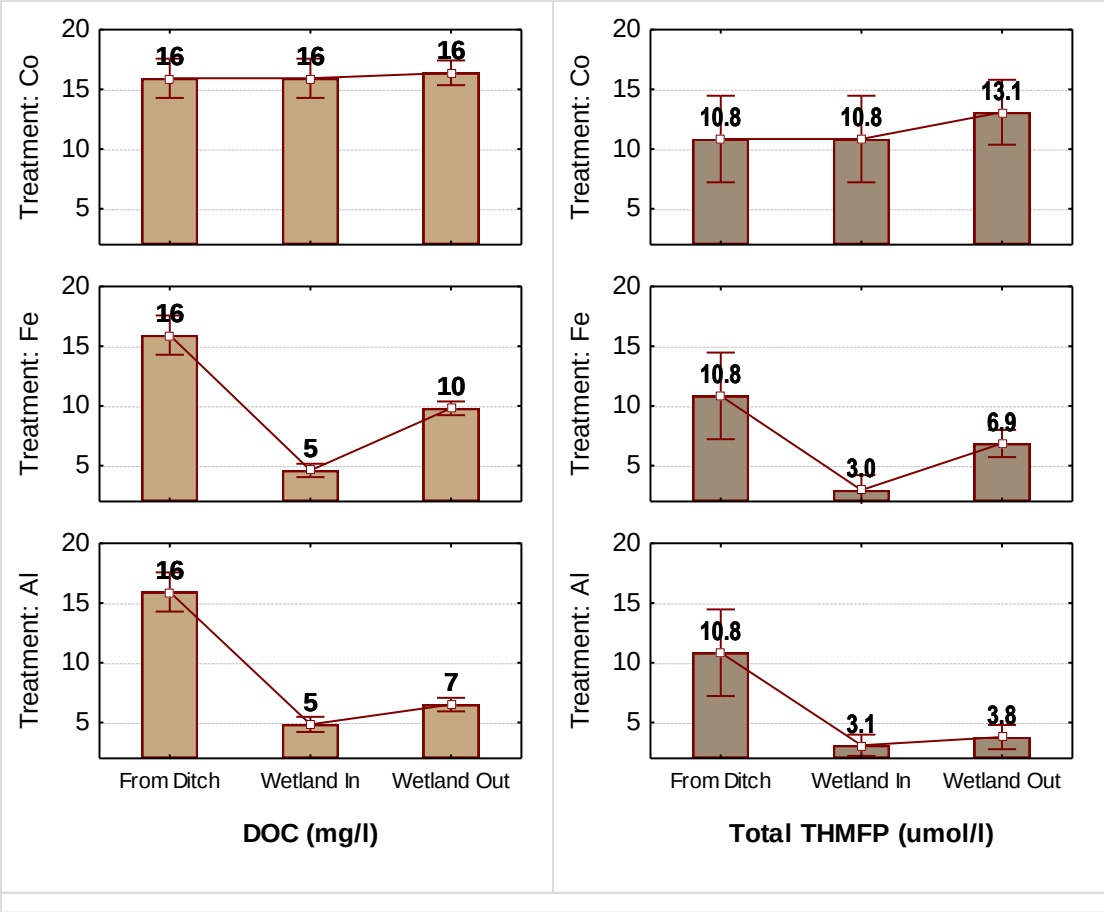


Mean±0.95 Conf. Interval

Temporal changes in DOC under different dosing regimes

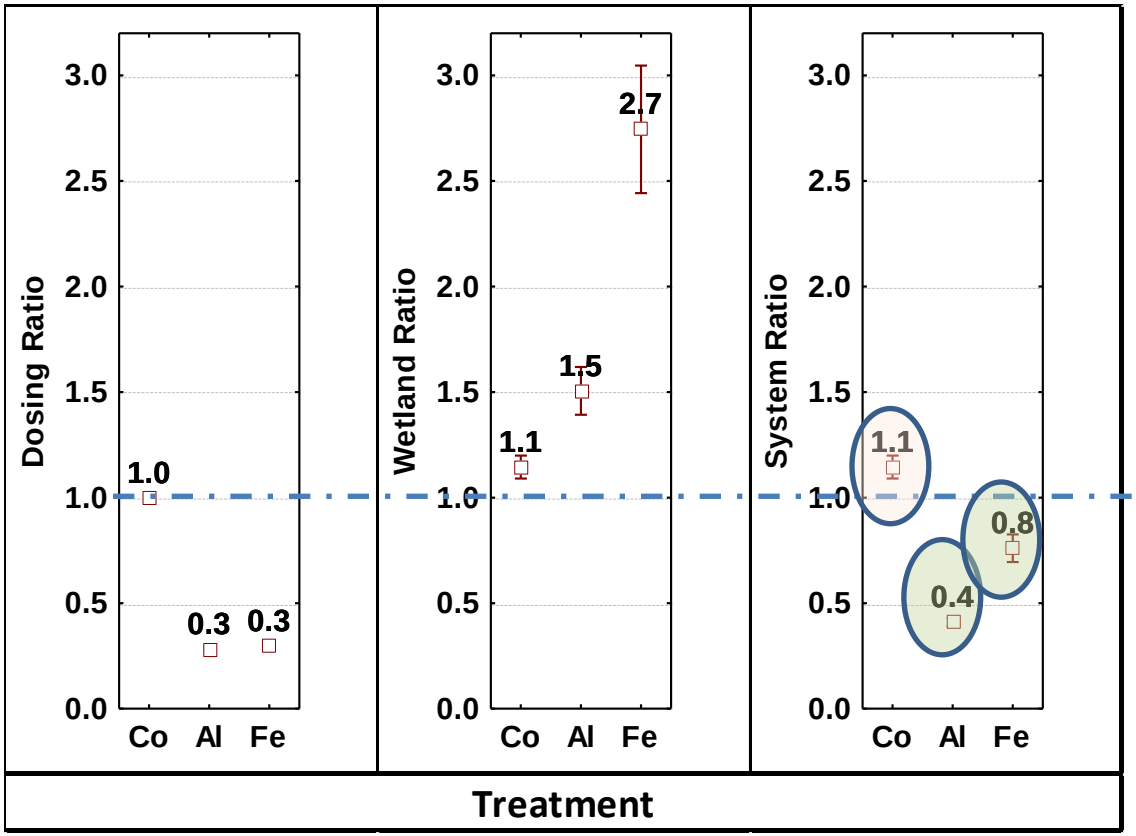


Effects of treatments of DOC



Mean±0.95 Conf. Interval

Production and Sequestration of DOC



$$Ratio = \frac{COC_{out}/COC_{in}}{Cl_{out}/Cl_{in}}$$

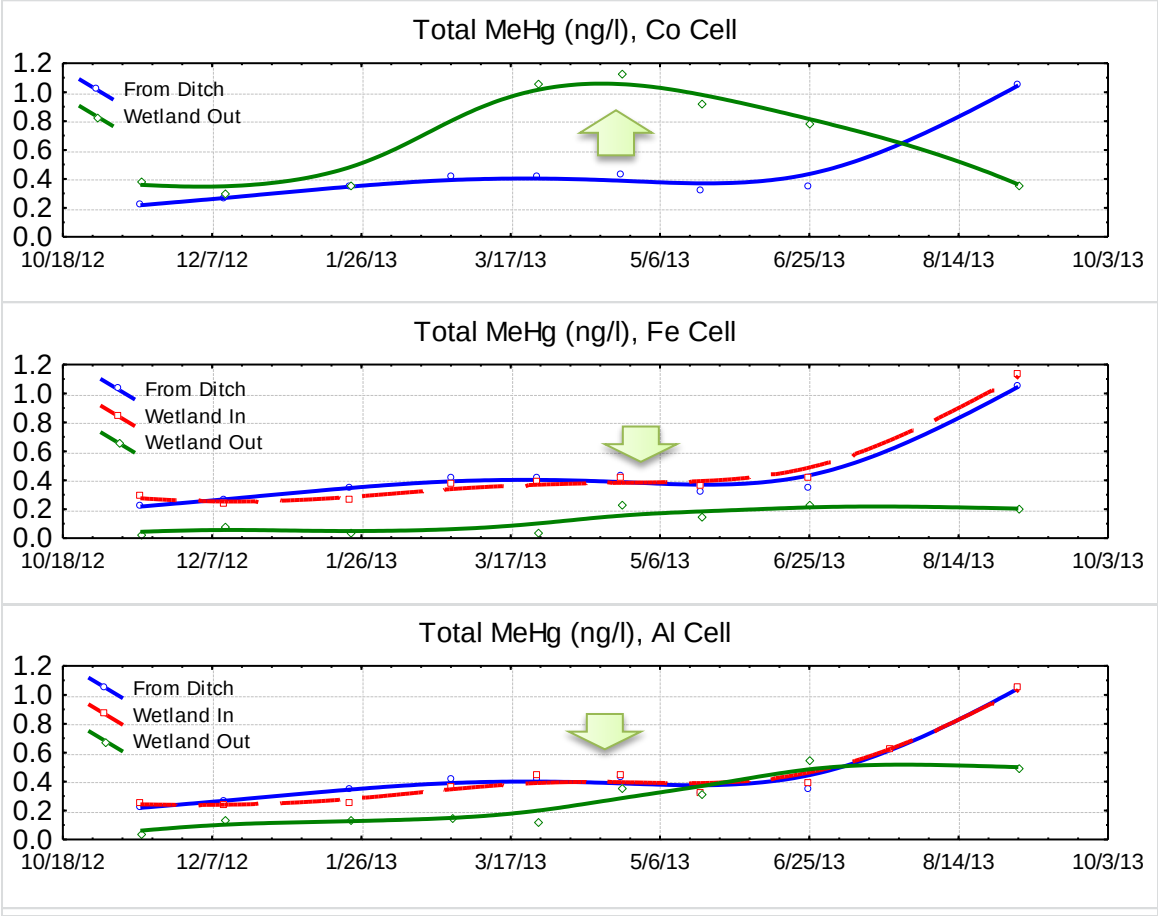
Production

Sequestration

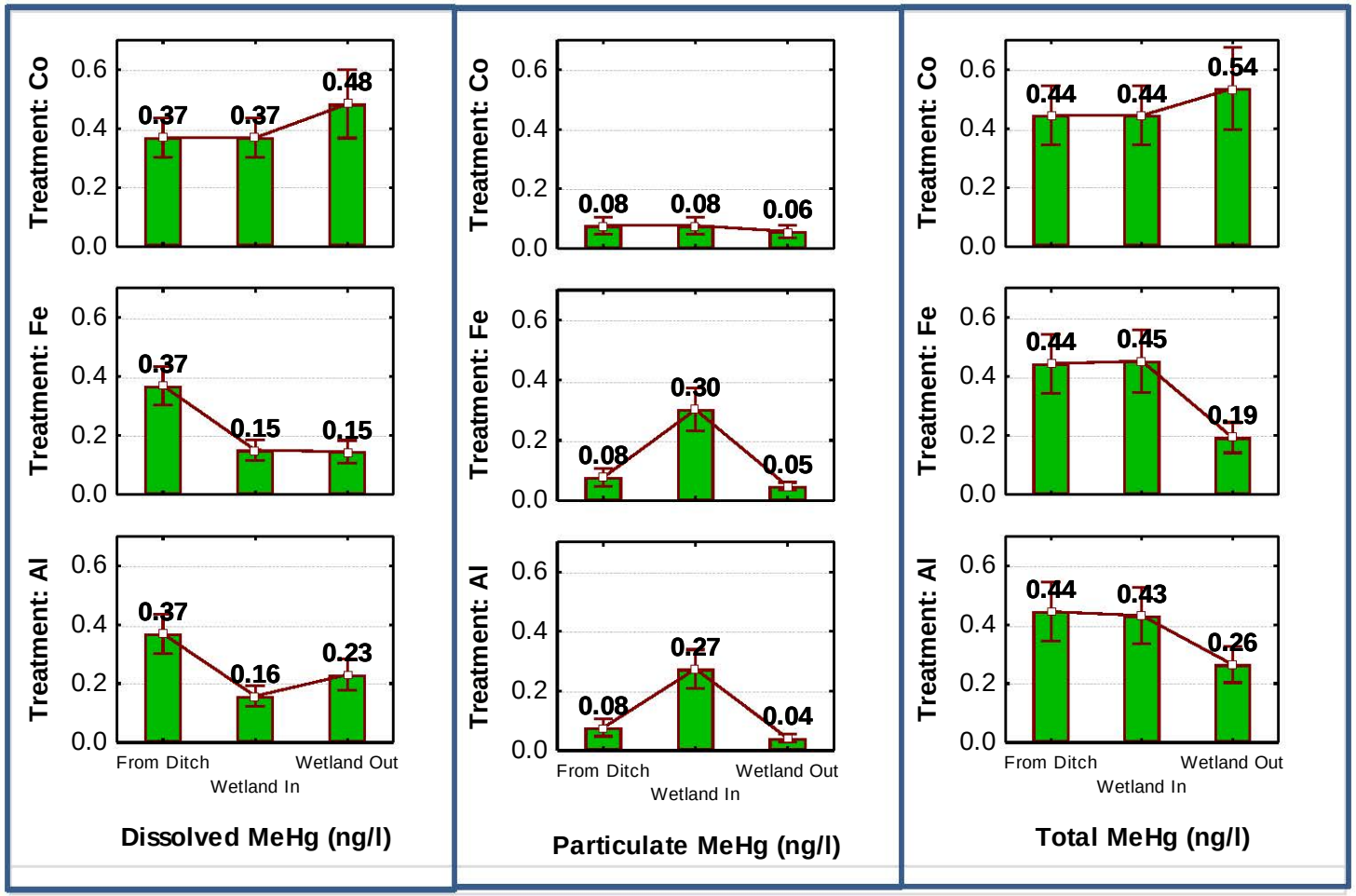
Disinfection **B**y**p**roduct **P**recursors are also removed

Mean±0.95 Conf. Interval

Temporal changes in Total MeHg under different dosing regimes

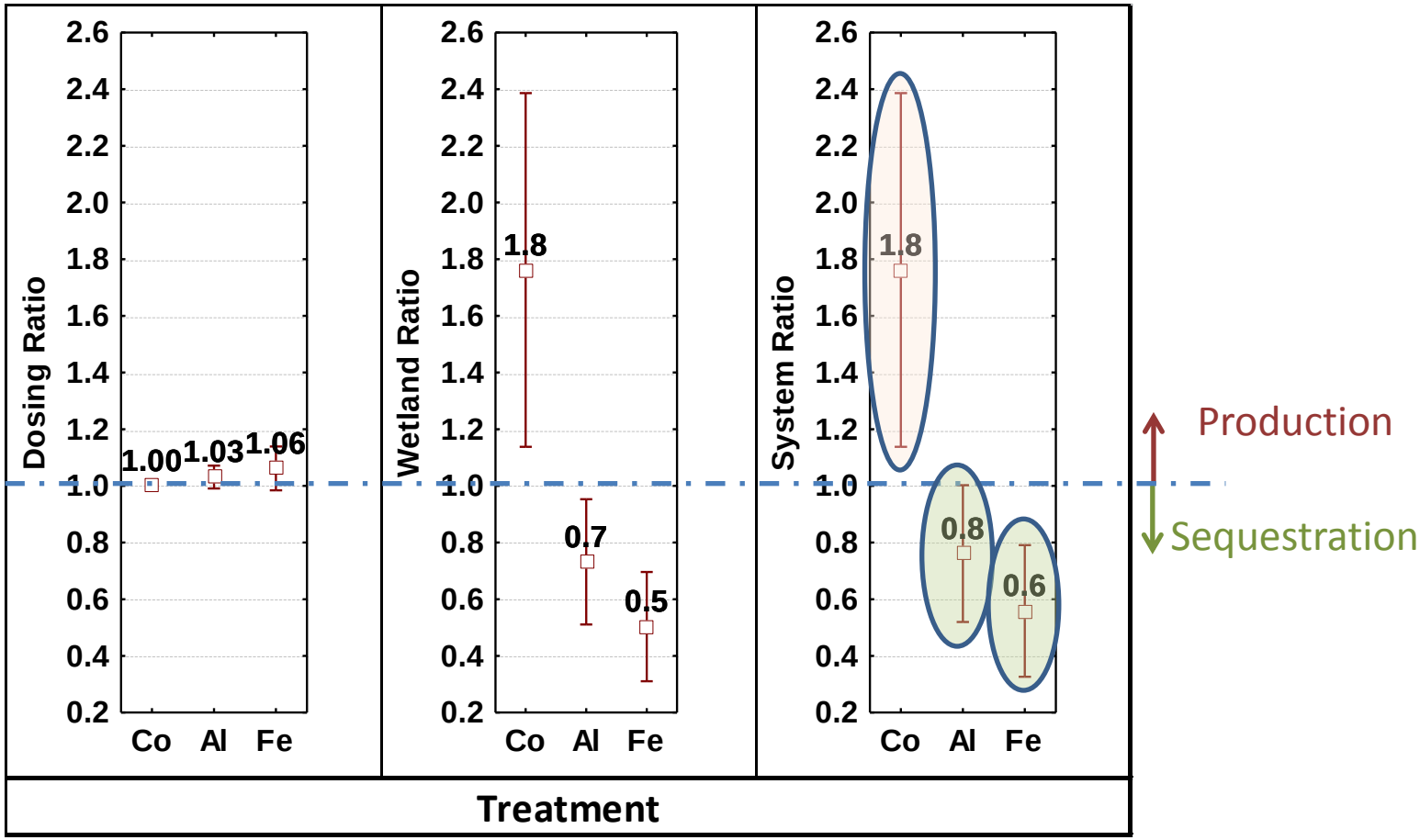


Effect of Treatment on MeHg Concentrations



Mean±0.95 Conf. Interval

Production and Sequestration of Total MeHg



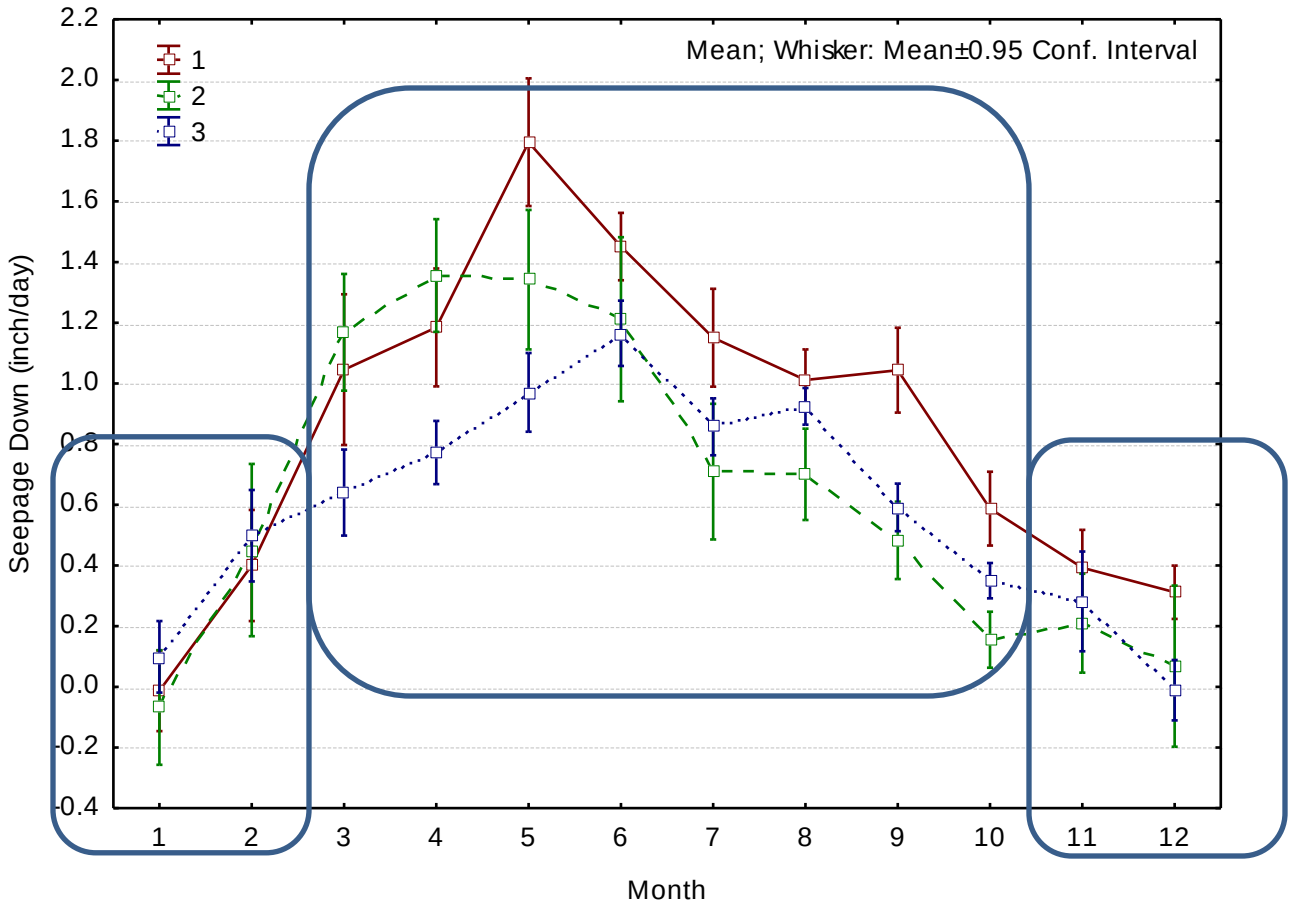
Mean±0.95 Conf. Interval

Some lessons learned from the Twitchell Island LICD project

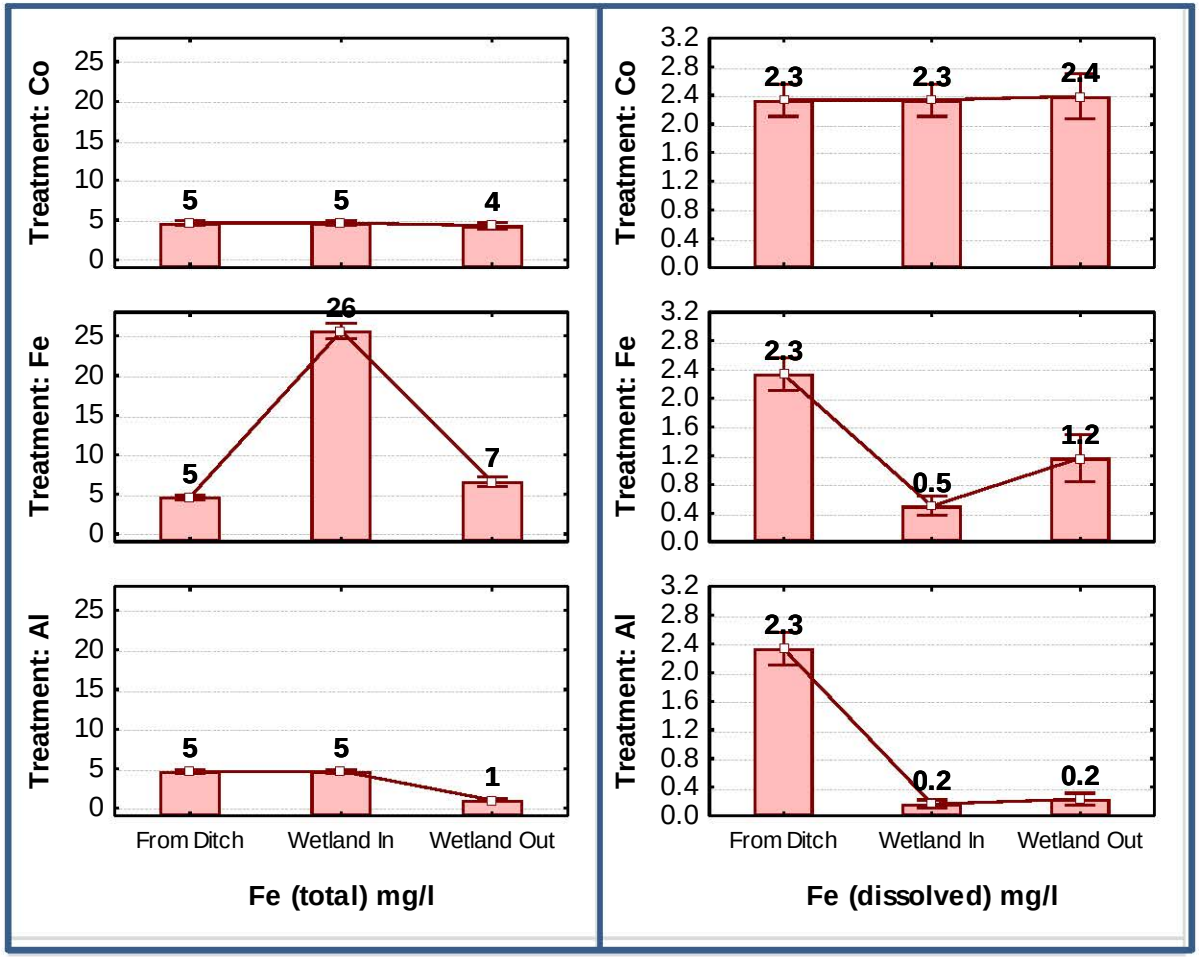
- A coagulation system can be operated in the field, with changing water quality.
- Both Fe and Al coagulants reduced DOC and MeHg concentrations and resulted in sequestration within the wetlands.
- The “slow mixing” step could be improved for the Fe coagulant. Better floc formation would enhance settling and reduce particulates at the outflow.
- … and more that we don’t have time for today

Questions

Seepage By Month



Effect of Treatment on Iron Concentrations



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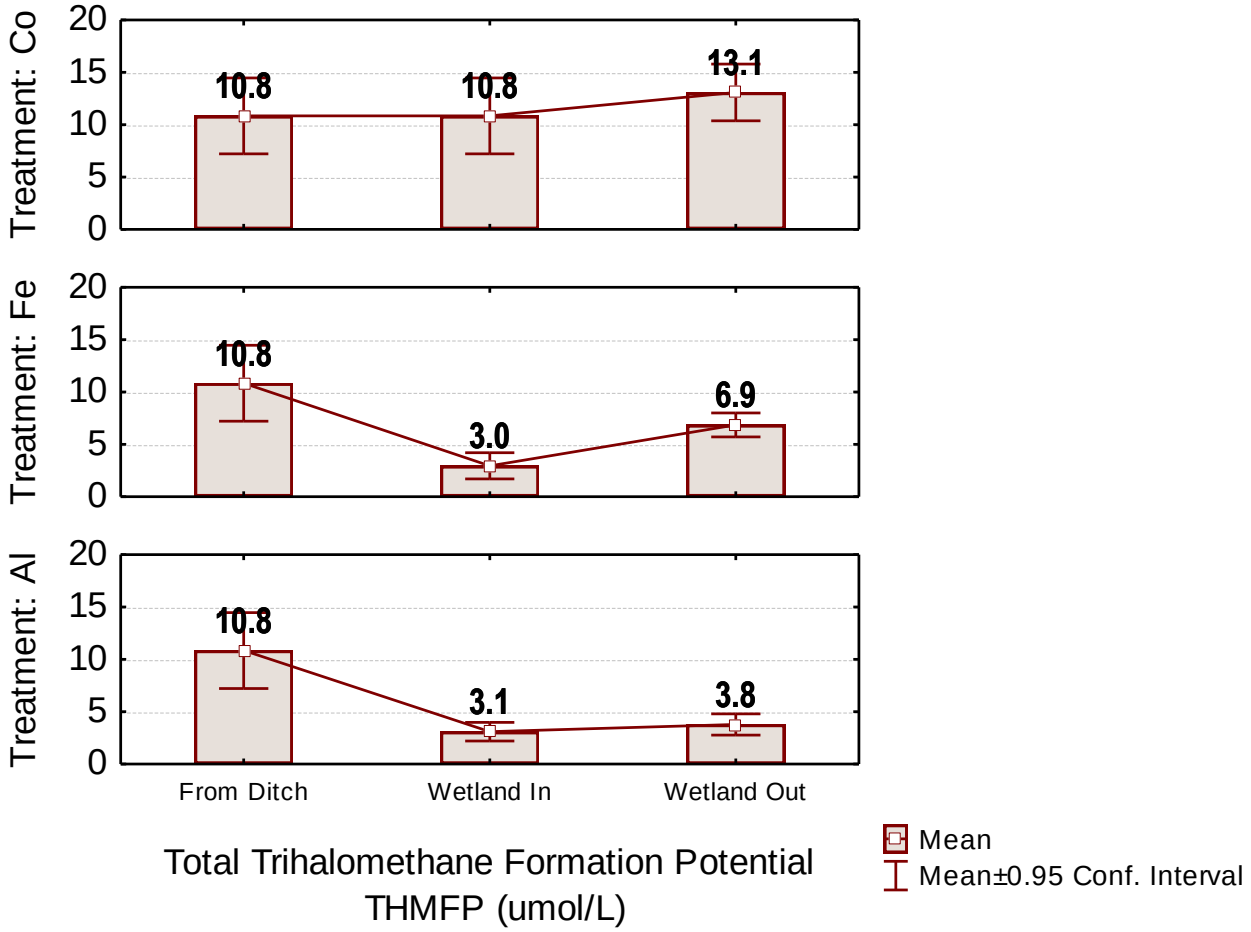
The Potential to for Disinfection Byproduct formation is reduced by coagulation