EFFECTS OF LIMEROCK AND NON-FARMED MUCK SUBSTRATES ON STORMWATER TREATMENT AREA PERFORMANCE

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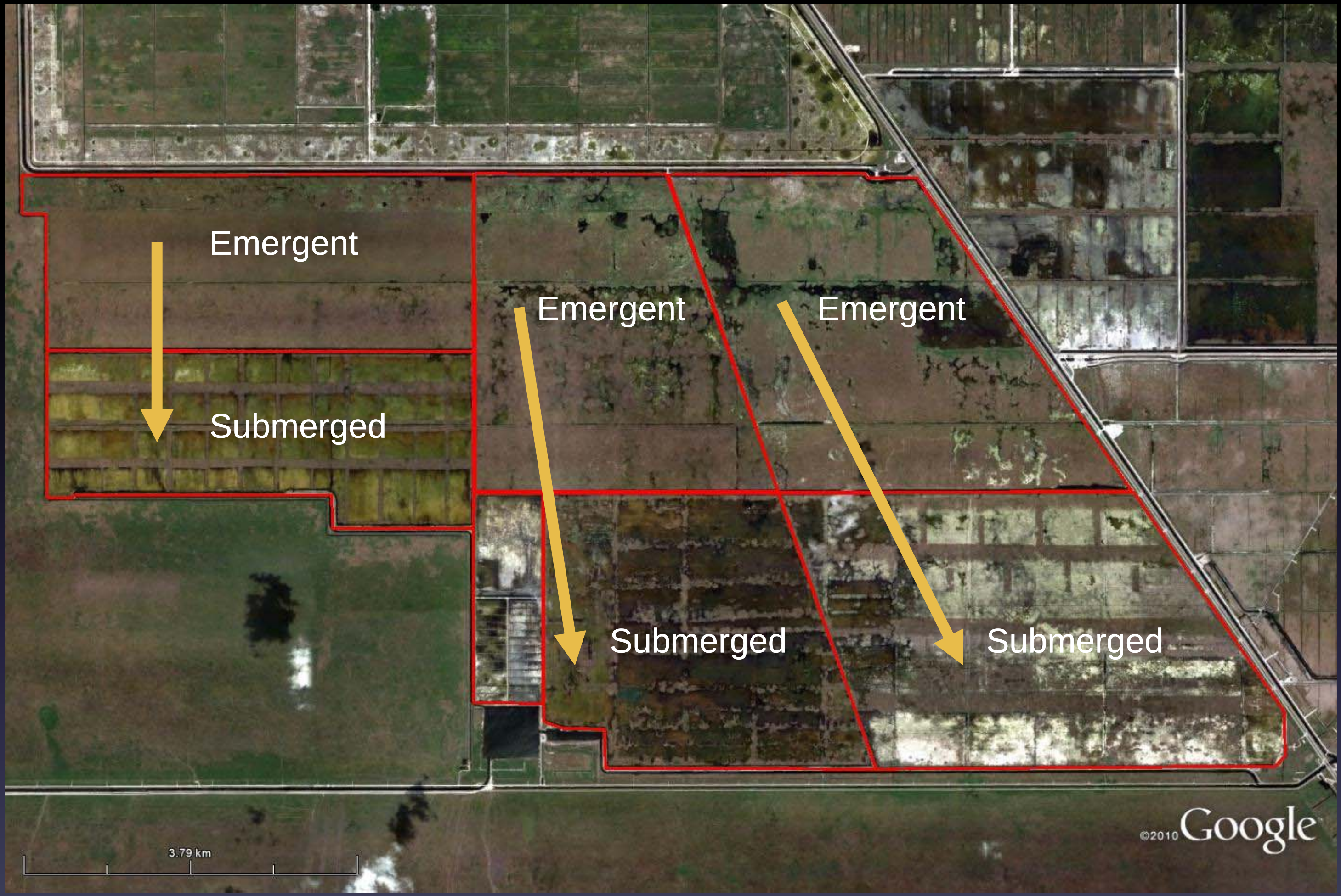
April 22, 2015

Vegetation communities characteristic of STA flow paths

For Everglades STAs, several early studies demonstrated that SAV communities offer the greatest promise for achieving low outflow [TP]

STA-3/4



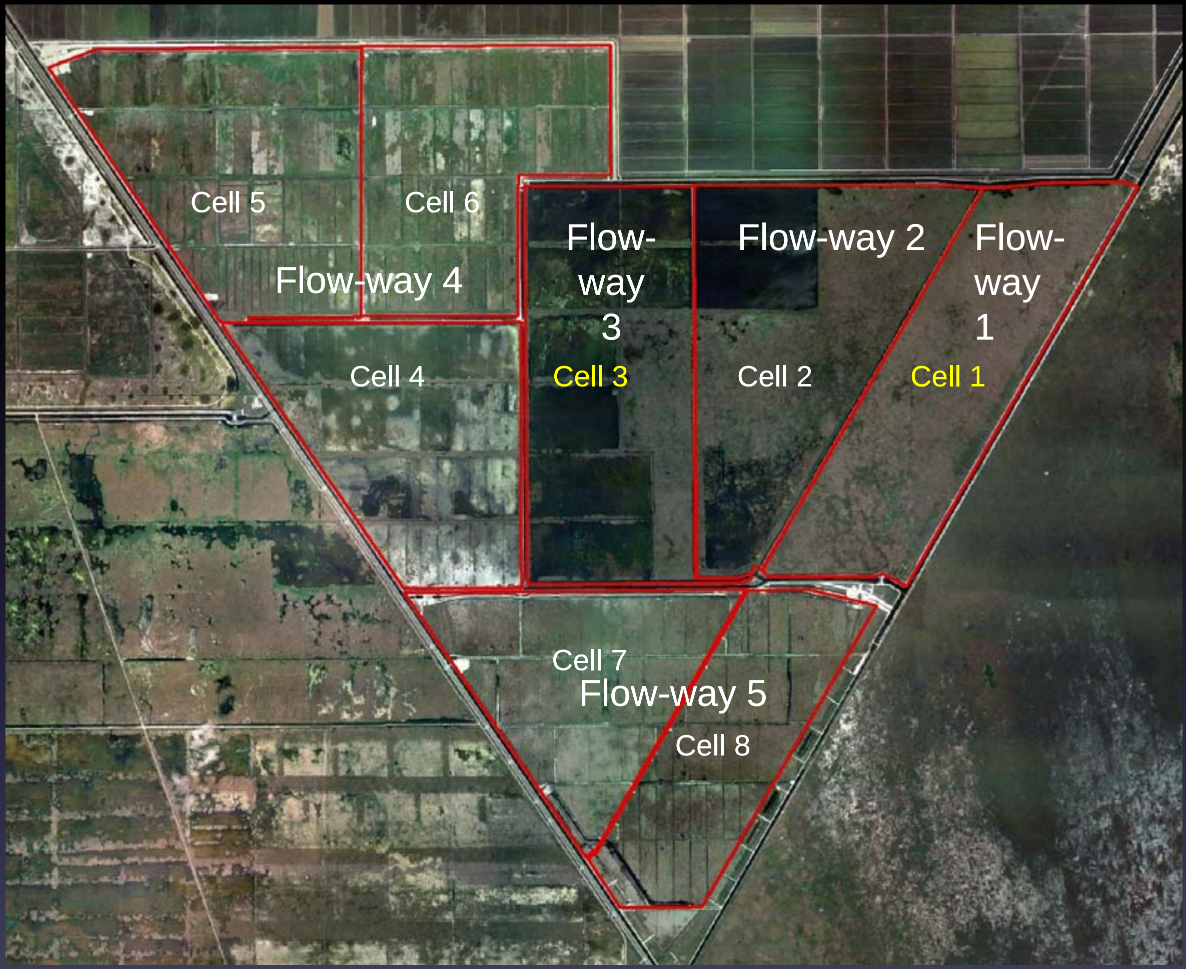
Typical STA configuration- wetland communities developed on previously farmed soils: emergent vegetation (EAV) front end, submerged vegetation (SAV) back end

STA-2

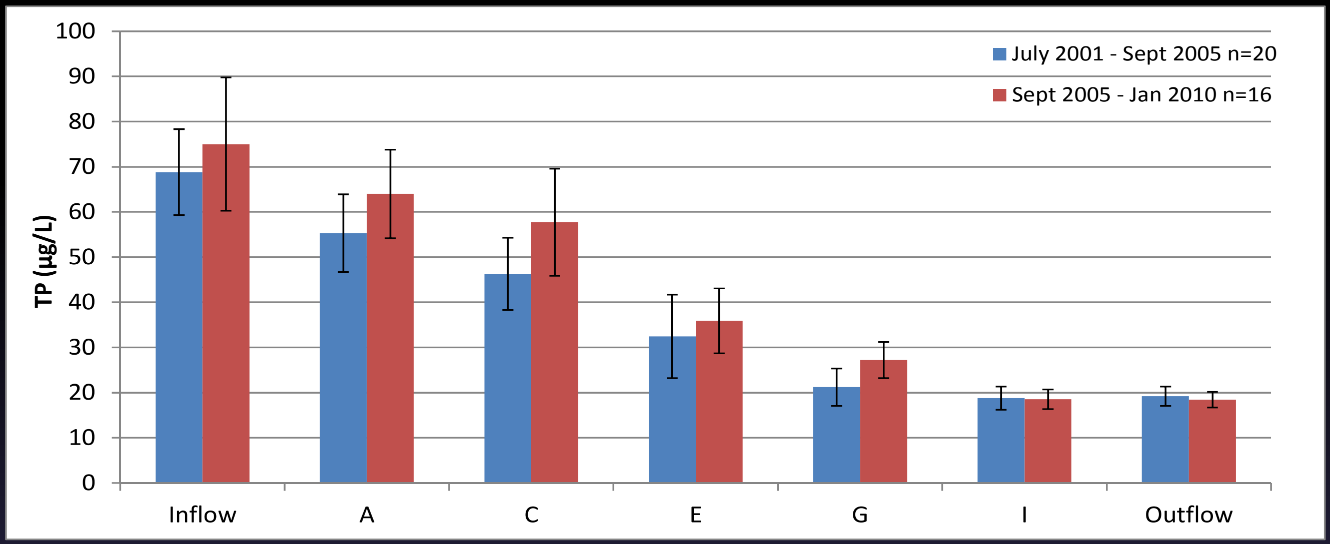
There exist two unique flow paths in STA-2:

Cell 3, primarily SAV, with most of the footprint situated on prior farm land and

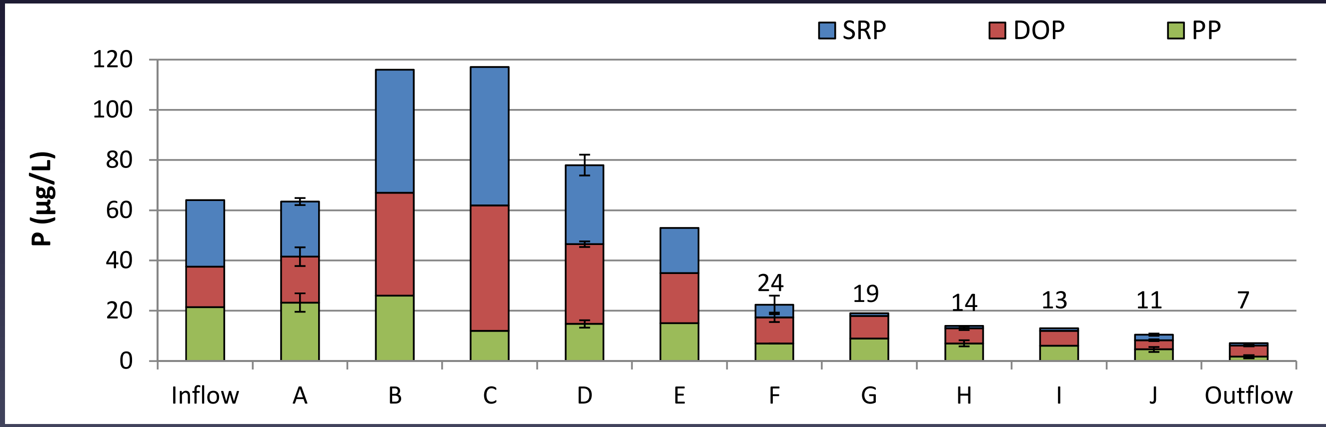
Cell 1, primarily EAV, developed on a relic marsh parcel that was not previously farmed (NPF)



Total P Concentrations in the Water Column Along the Flow-Ways of STA-2 Cells 1 and 3



Cell 3



Cell 1

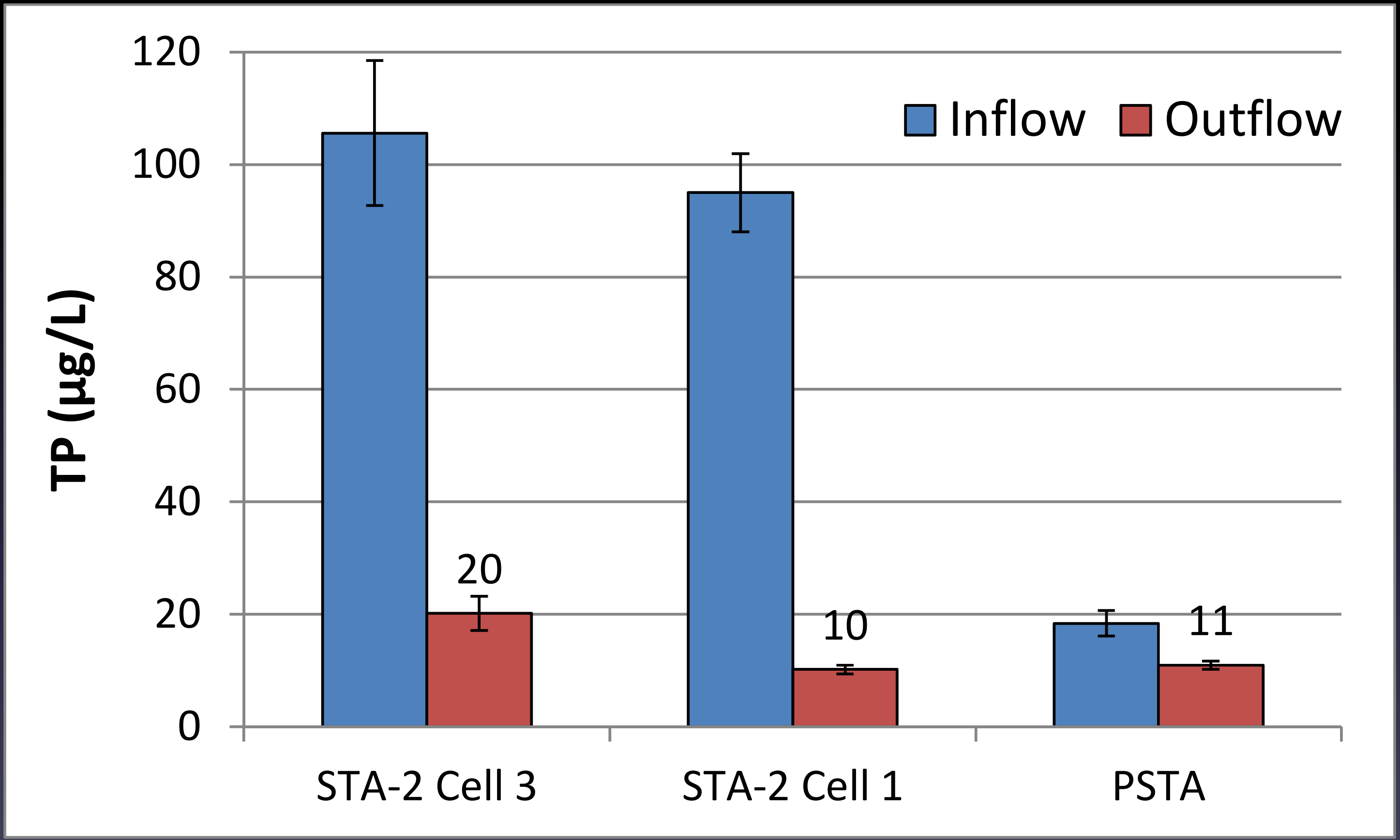
2/25/14

Limerock substrates also are under investigation in a configuration termed “Periphyton STAs” (PSTA)

- The PSTA concept generally refers to:
  - Treatment wetland with a lime rock (LR) substrate, achieved either through muck removal or LR cover placed over muck
  - Deployed as a “back end” STA community
- The lime rock provides a stable substrate, and therefore minimizes potential sediment P contribution to water column via diffusive flux, bioturbation and/or macrophyte mining
- Vegetation that develops/persists is adapted to low P conditions, and can support microbial communities that contribute to removal of relatively recalcitrant P forms (e.g., dissolved organic P [DOP])

Aerial photo of STA-3/4 PSTA Cell

Mean inflow and outflow [TP] for STA-2 Cells 1 & 3, and the STA-3/4 PSTA Cell



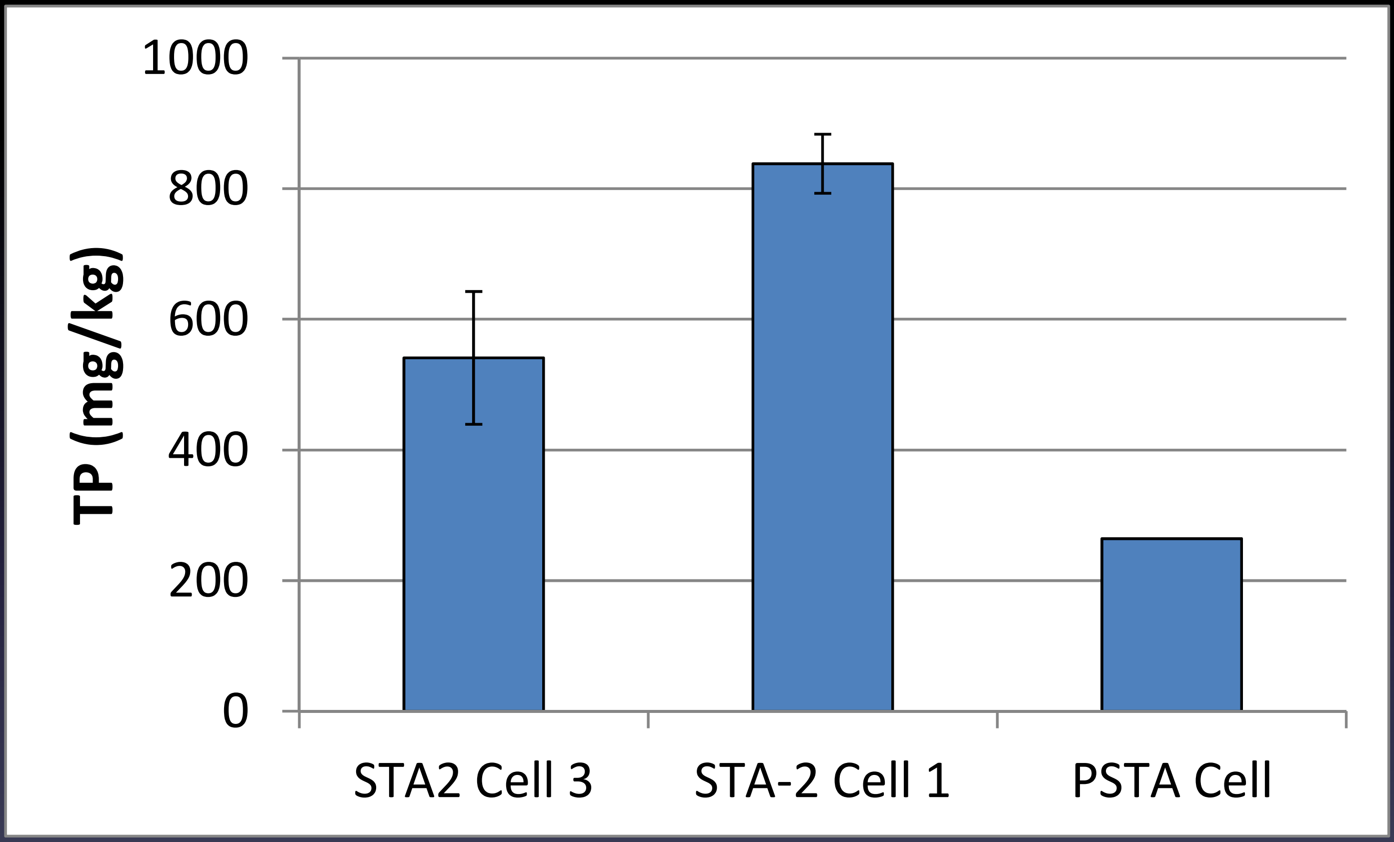
Average of annual means from
May 2007 – April 2013,
excluding WY 2010

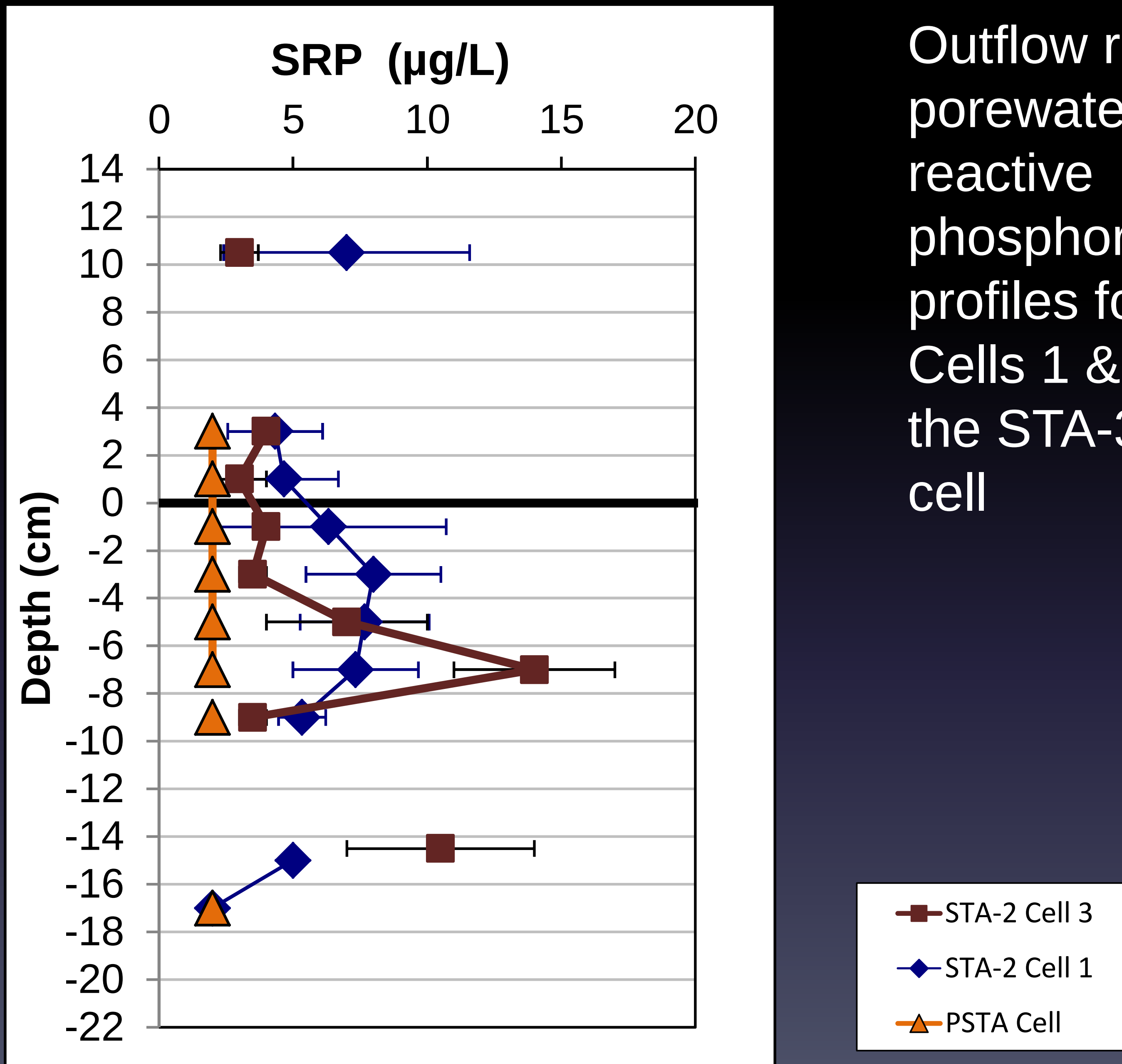
Source:
2013 SFER, 2014 SFER and 2015 SFER

Comparison of soils that accrete in PSTA and SAV wetlands

PSTA   Cell 2B-SAV   Cell 3B-SAV

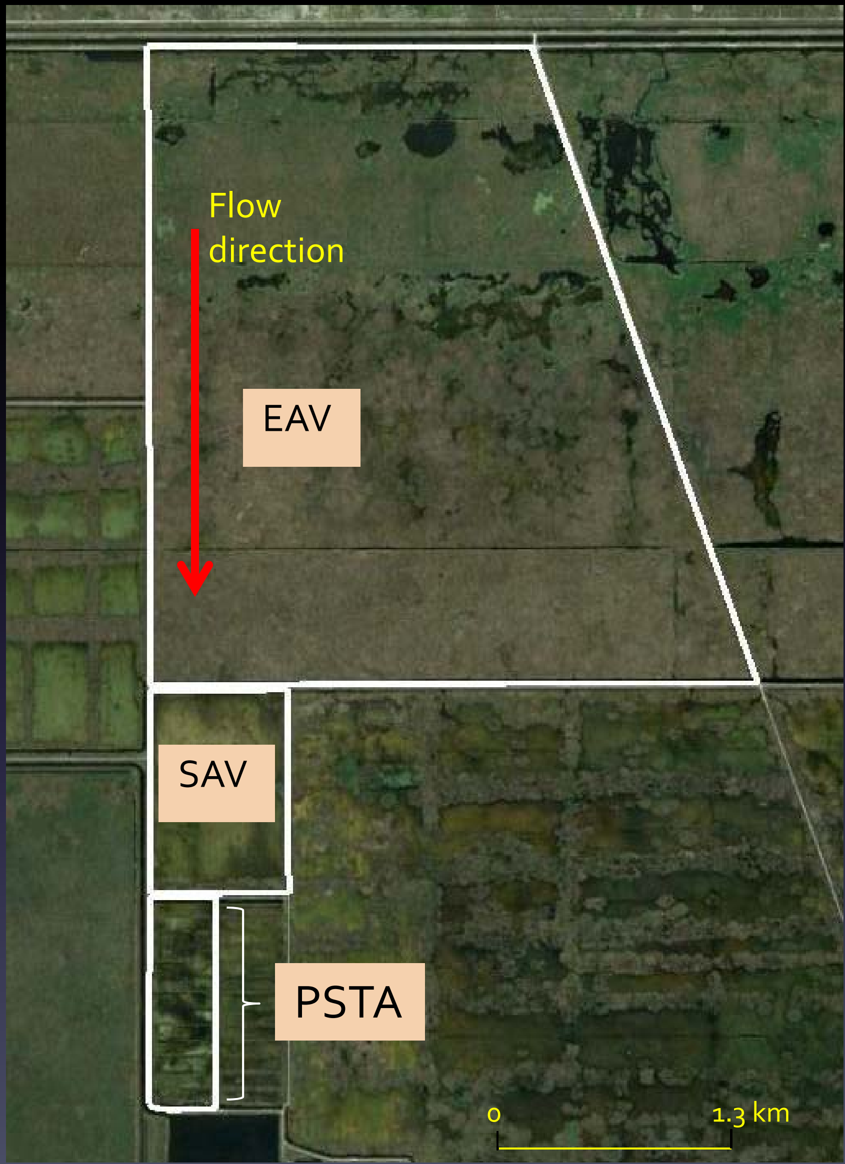
TP content of surficial soils in outflow regions of the wetlands

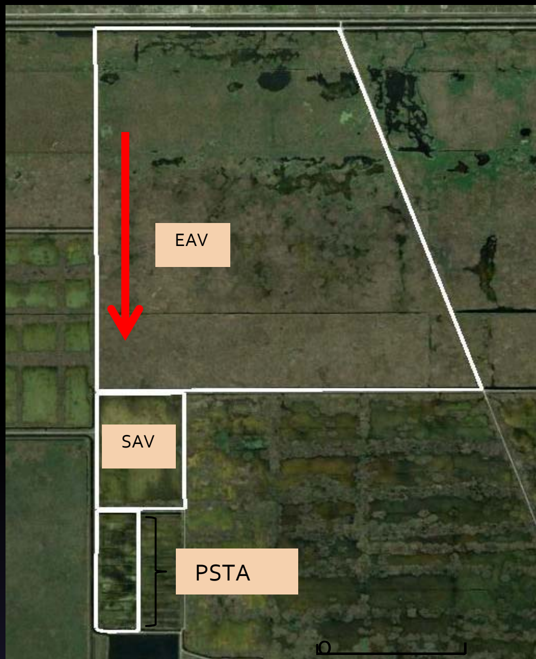




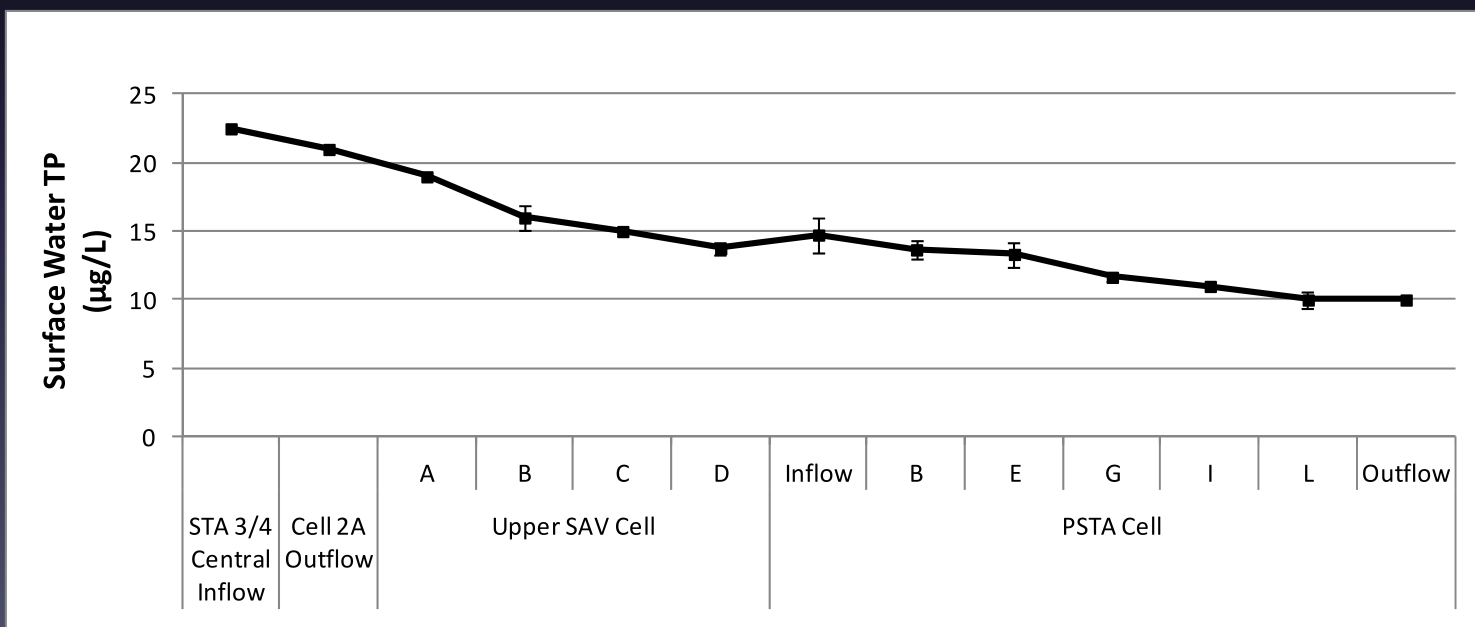
Outflow region soil porewater soluble reactive phosphorus (SRP) profiles for STA-2 Cells 1 & 3; and for the STA-3/4 PSTA cell

The EAV – SAV – PSTA flow path in the STA-3/4 central flow-way

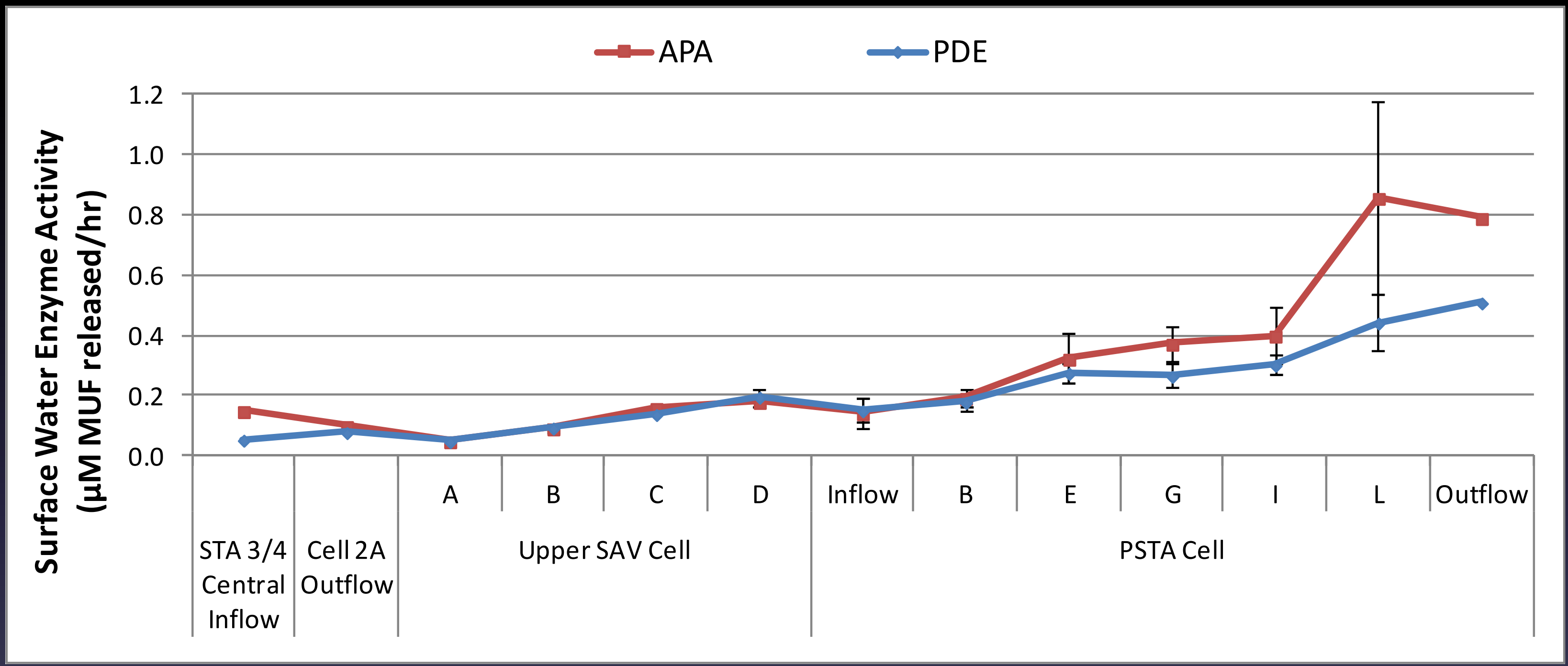




Surface water [TP] along the central STA-3/4 EAV, SAV and PSTA flow path in June 2014



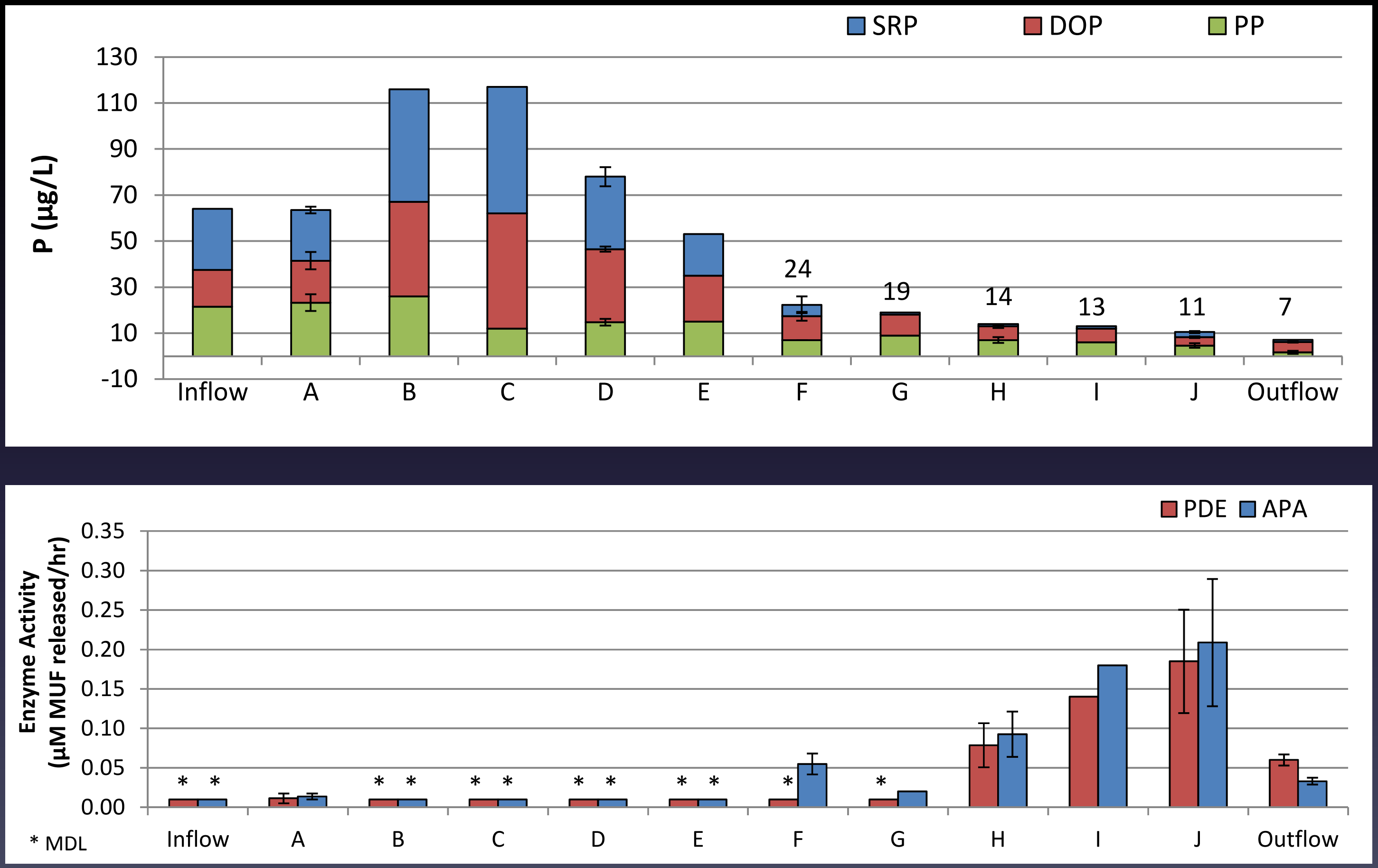
Surface water phosphatase enzyme activity along the central STA-3/4 EAV, SAV and PSTA flow path in June 2014



APA- alkaline phosphatase activity

PDE – phosphodiesterase activity

Production of phosphatase enzymes also may account for the low outflow TP levels achieved by Cell 1



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Summary

- Wetlands that are lime rock based, and those developed on NPF lands, can provide slightly lower outflow TP concentrations than those constructed on farmed muck soils
- Neither soil TP content nor porewater [SRP] appear to correlate well with outflow P concentrations for these systems
- Both lime rock based, and NPF wetlands, exhibit elevated outflow region phosphatase enzyme activity
- Additional investigations are underway on phosphatase enzyme activity and soil chemical parameters in these flow paths

This research was jointly funded by the Everglades Agricultural Area Environmental Protection District and the SFWMD