

Use of Soil Inversion to Control Phosphorus Flux in the Everglades Stormwater Treatment Areas

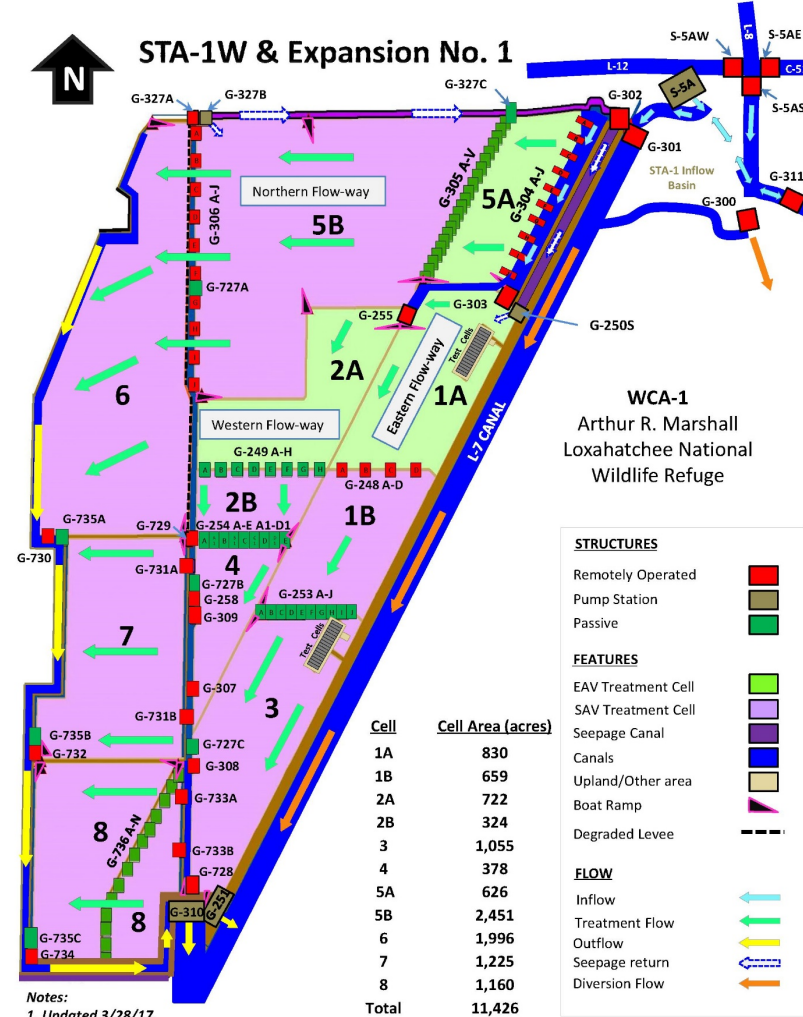
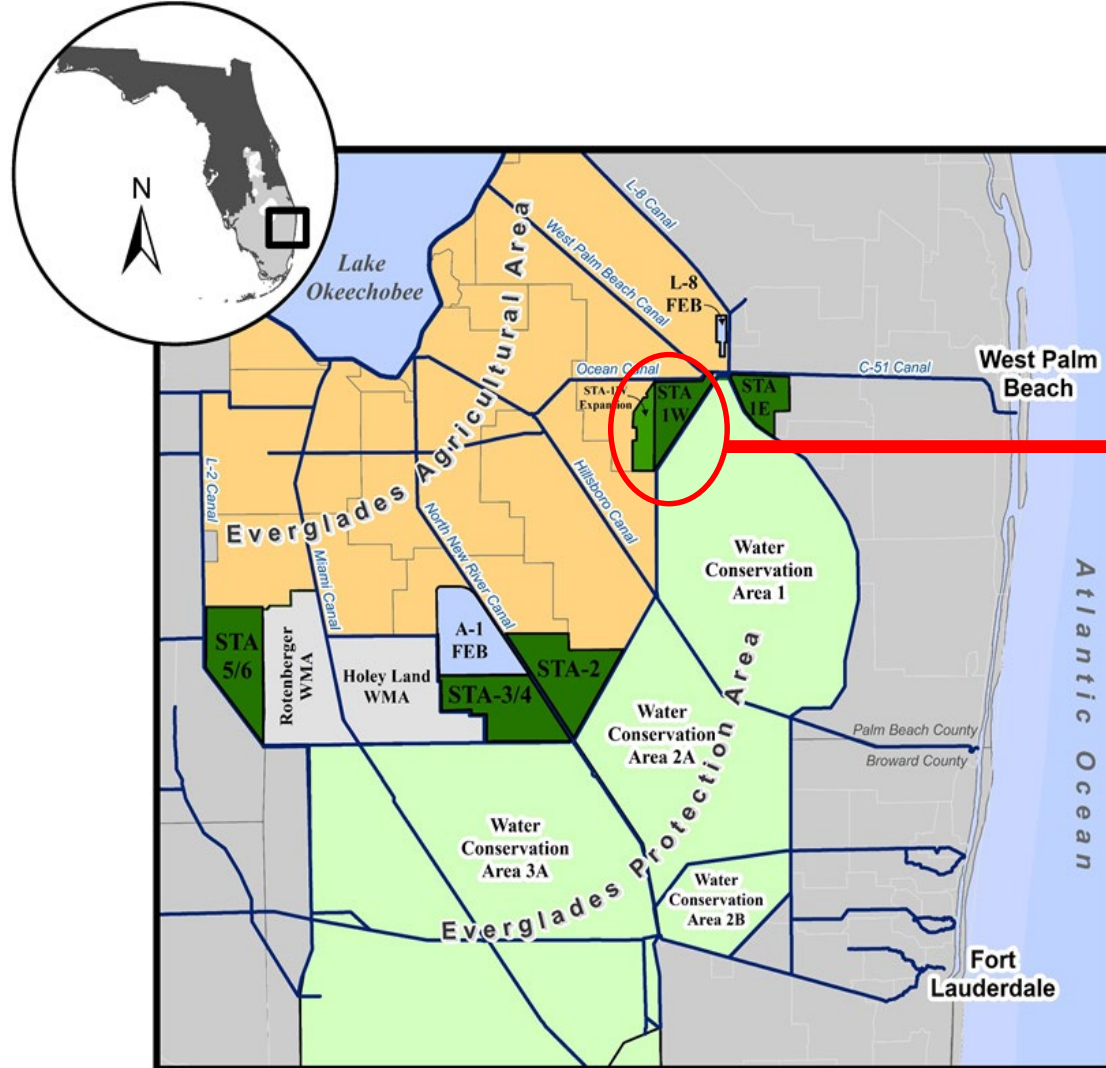


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Introduction





Objectives

- Assess effect of soil inversion on P release to water column
- Evaluate effect of soil inversion on soil P content



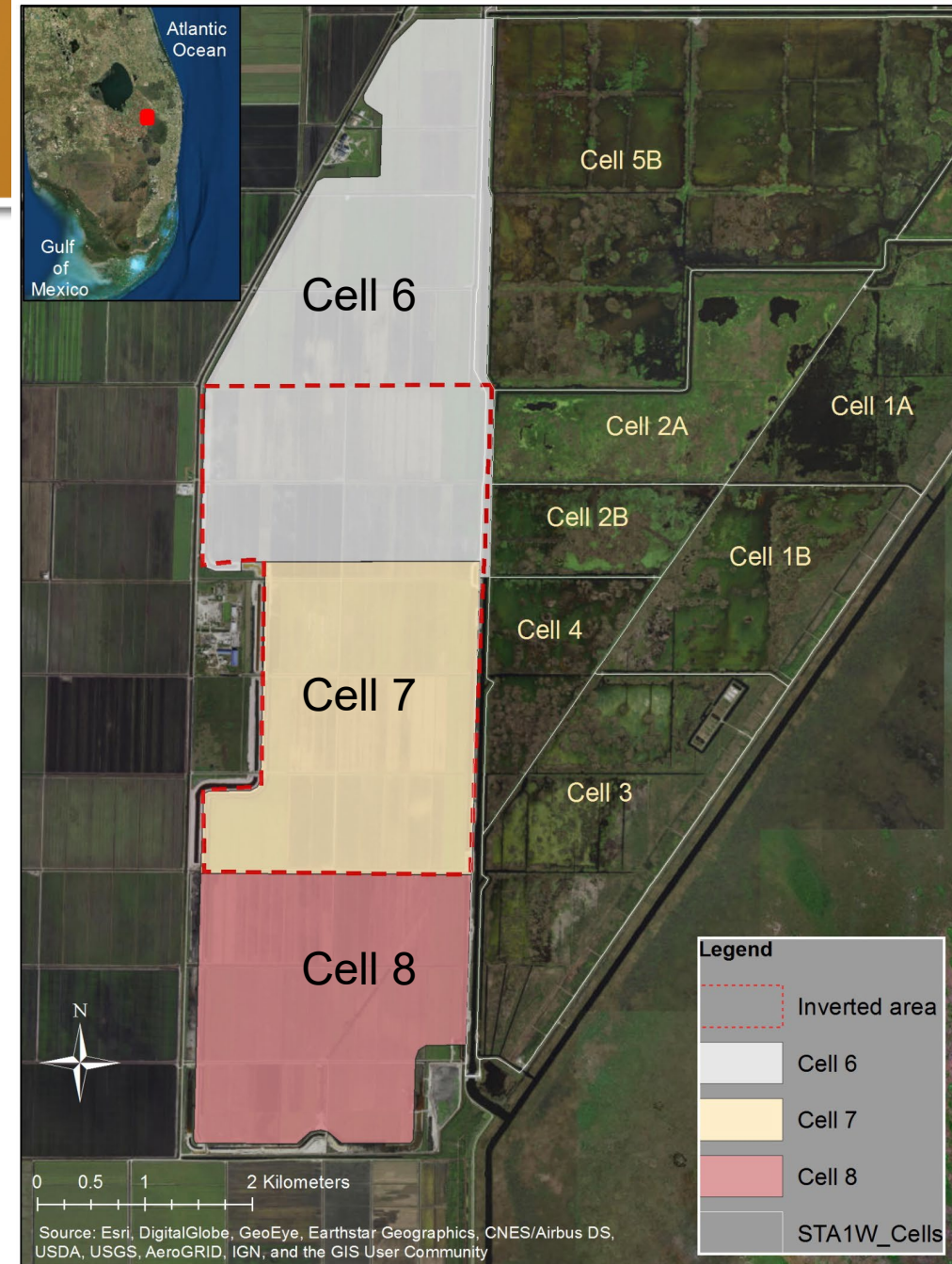
Study Site & Approach

■ STA1-W Expansion 1

- Cell 6 (~ 807 ha)
- Cell 7 (~ 495 ha)
- Cell 8 (~ 470 ha)

■ Soil Inversion

■ Soil Core Incubation Study





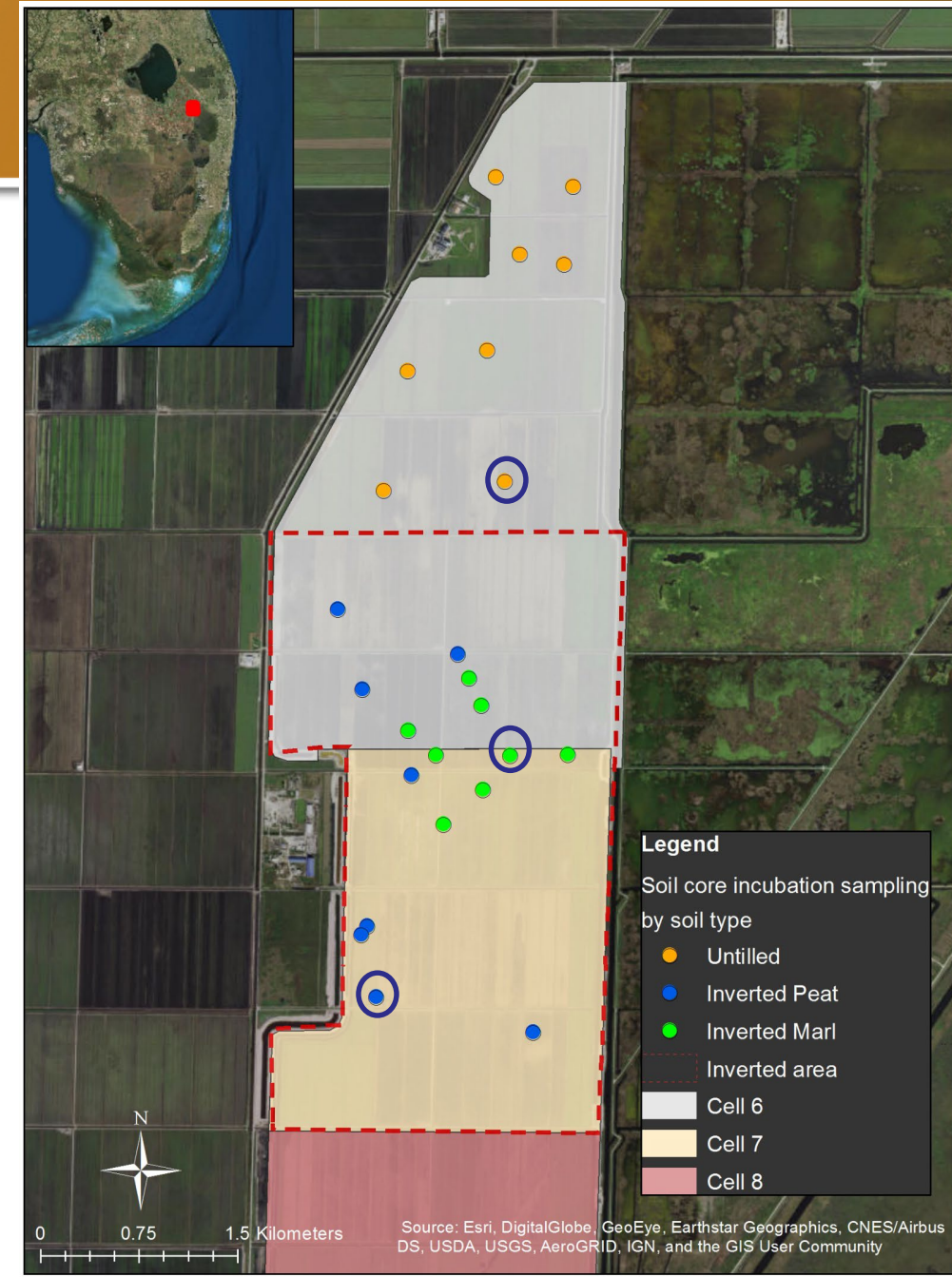
Soil Inversion Equipment





P Flux Measurements

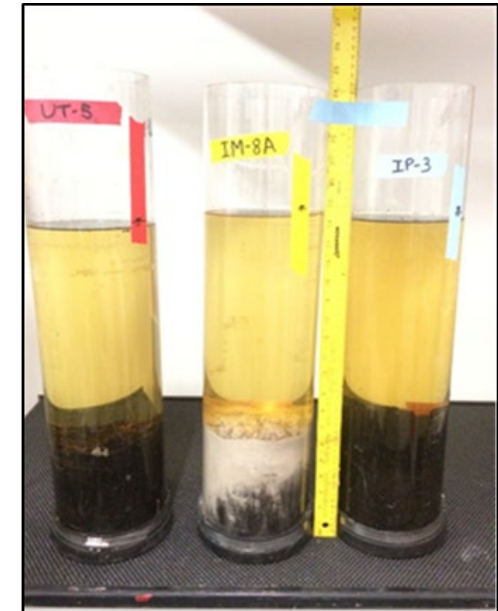
- Collected soil cores from three areas:
 - Untilled
 - Predominantly peat, Inverted-Peat
 - Predominantly marl, Inverted-Marl
- Core: 15-cm diameter, 15-20 cm depth
- 8 cores from each area
- Triplicate cores (○) at one site for each area





Laboratory Incubation

Incubation Cycle	Parameter		
	SRP Water Sampling (day)	TP Water Sampling (day)	Soil Sampling
Cycle 1	0, 3, 7, and 14	0 and 14	Not applicable
Cycle 2	0, 3, 7, and 14	0 and 14	Not applicable
Cycle 3	0, 3, 7, and 14 for triplicates cores <u>0 & 14 rest of the cores</u>	0 and 14	TP and plant available P (after third cycle)



- Post-incubation soil cores were analyzed for:
 - Total P **0-5**, & **5-15** cm
 - Plant available P **0-5** cm (0.5 M NaHCO₃, Olsen et al. 1954)



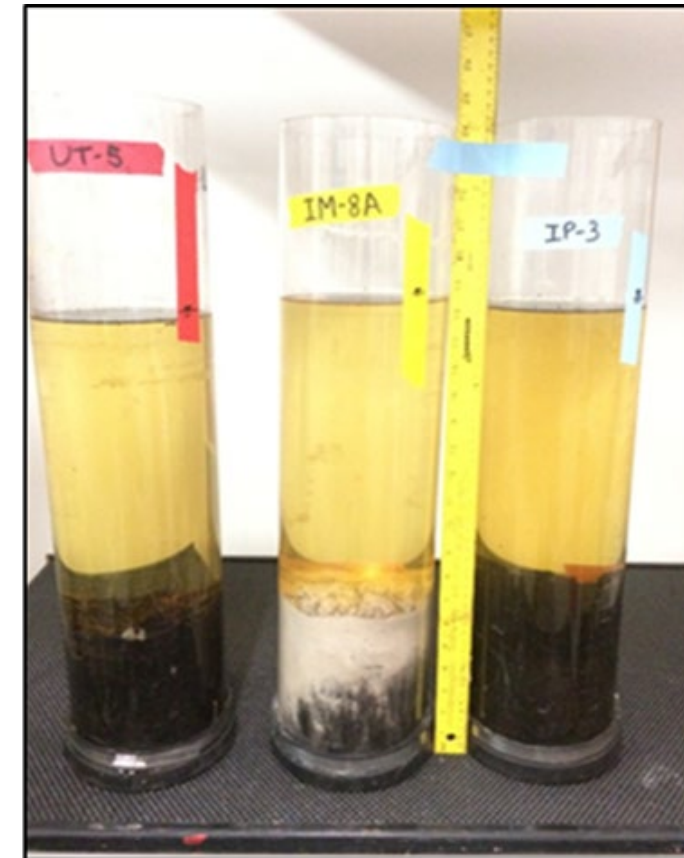
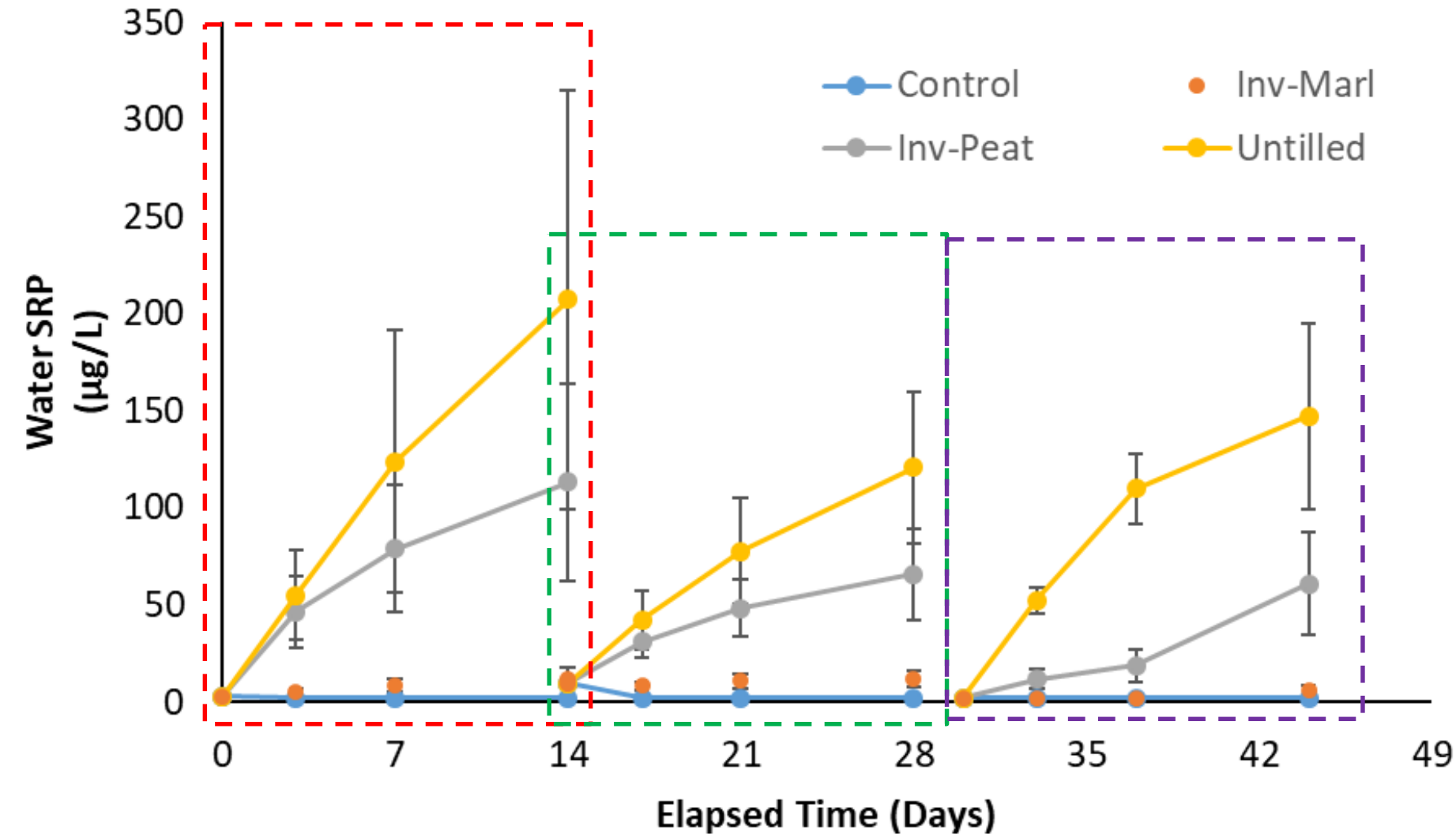
Data Analysis Approach

- Water SRP and TP concentrations during each incubation cycle averaged for each soil type

- Soluble reactive P Flux (mg P/m²/day) = $(C_t - C_0) \times V / A$
 - C_t = SRP concentration in water column at day 14
 - C_0 = SRP concentration in water column at day 0
 - V = Volume of water in core (5.3 L)
 - A = surface area of core (0.0176 m²)

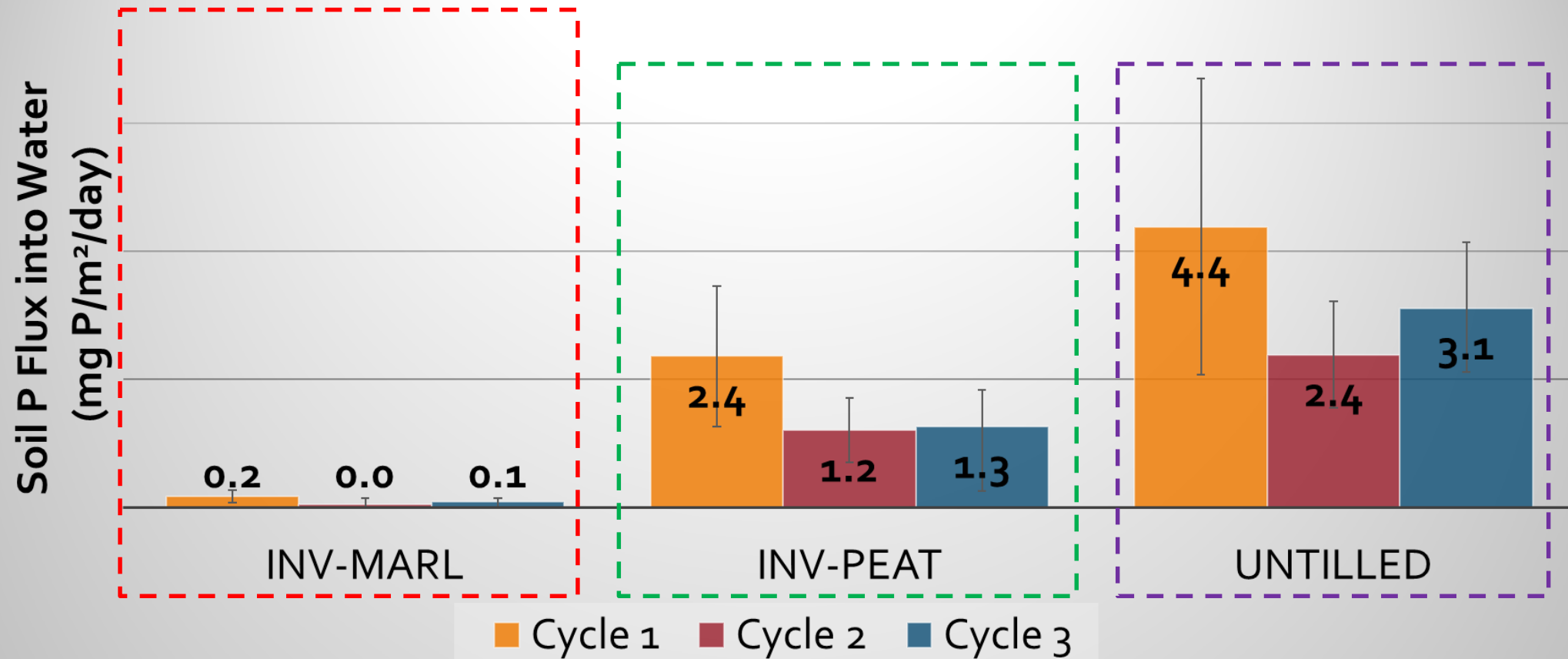


Soil Core Incubation: Water Column SRP



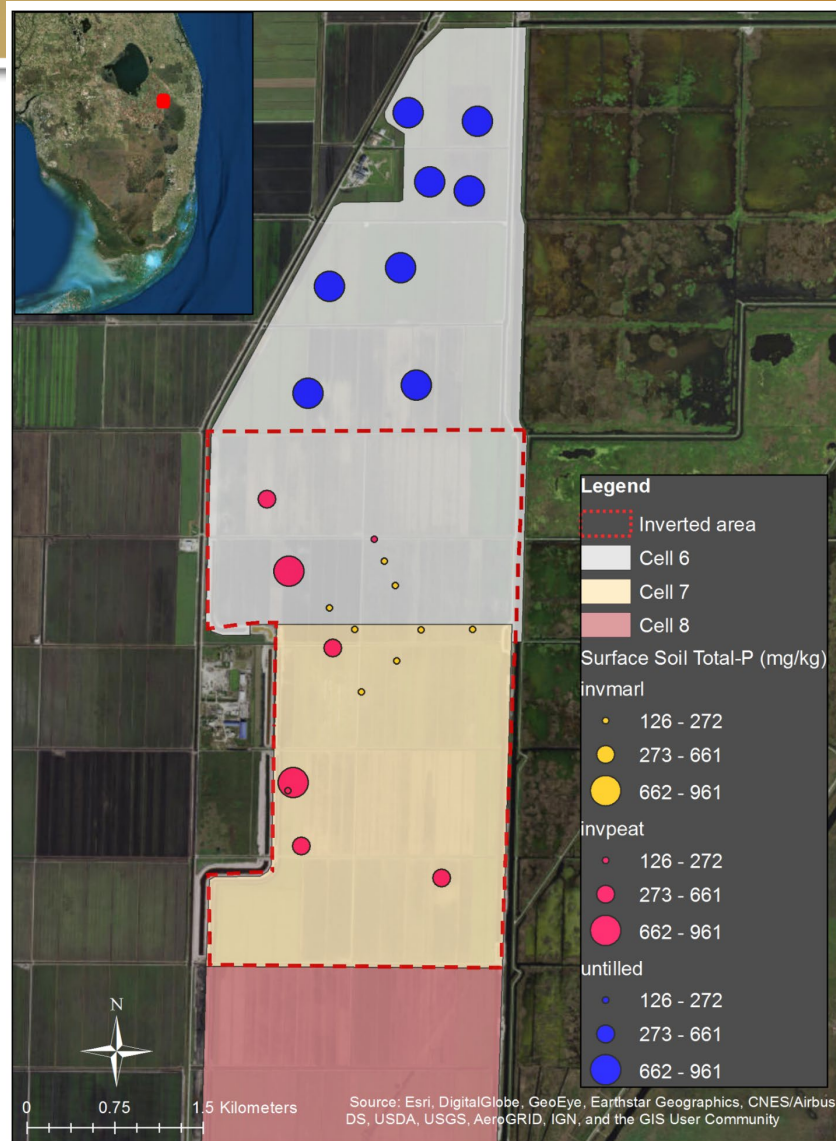


Soil Core Incubation: SRP Flux Rate

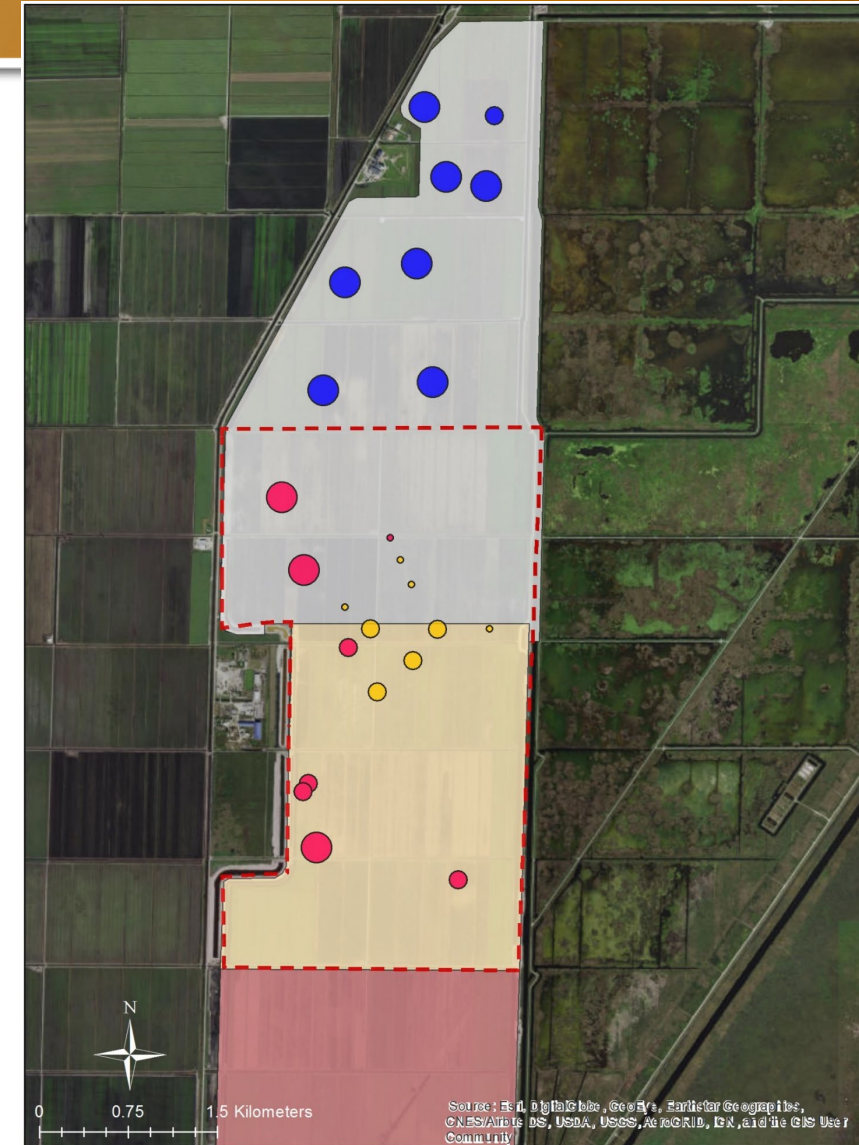




Spatial Distribution of Core Soil TP



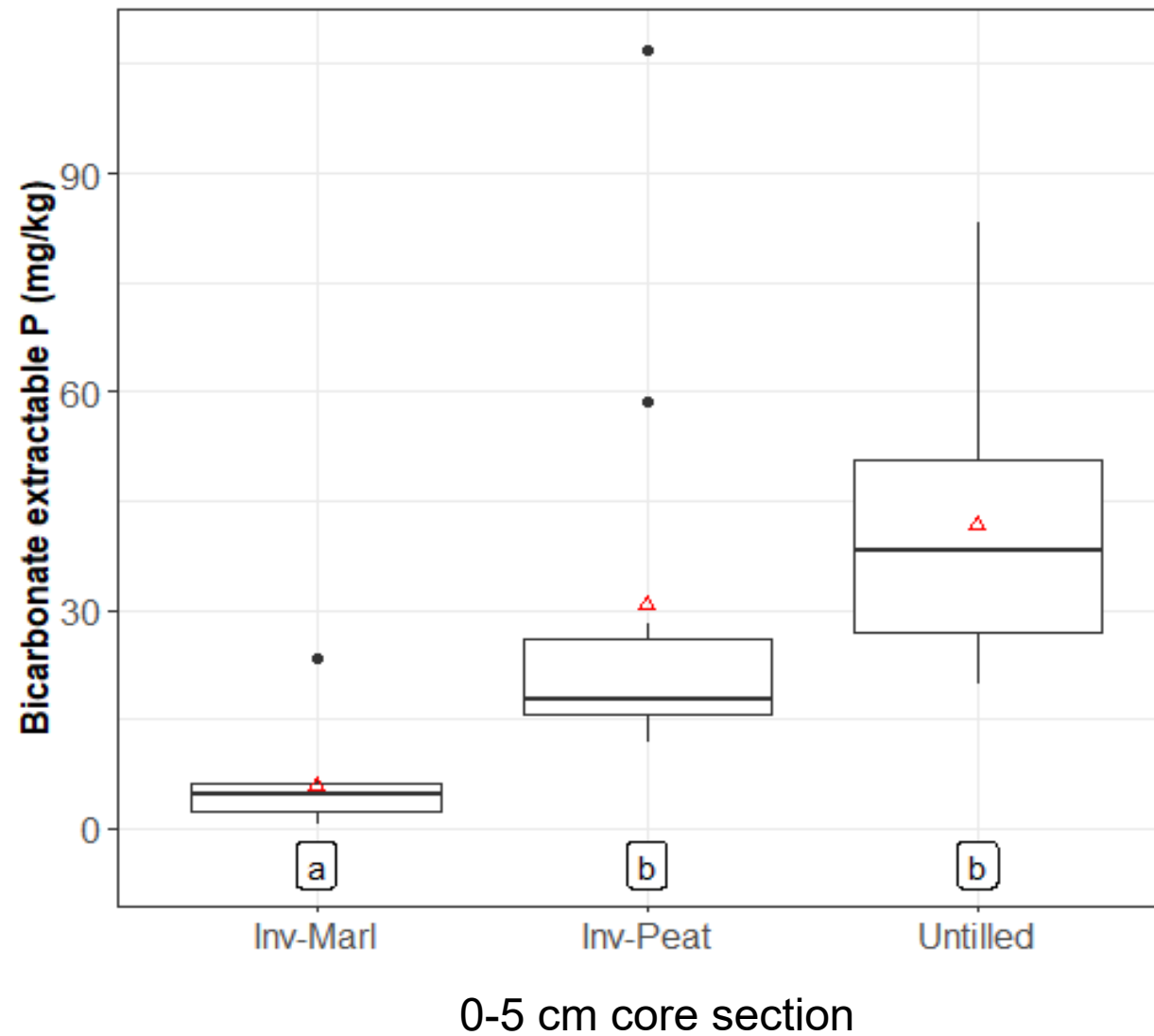
0-5 cm core section



5-15 cm core section



Distribution of Core Olsen-P





Summary

- Soil inversion reduced surficial TP
- Cores with inverted marl released lowest SRP
- Remaining Cell 6 soils were inverted based on soil incubation study
- Longer-term field scale evaluation of soil inversion benefits is planned through Restoration Strategies Science Plan





Questions?



Cell 6 Soil Inversion in Progress, Facing NW, 08/17/2018.
Credits: N. Ralph

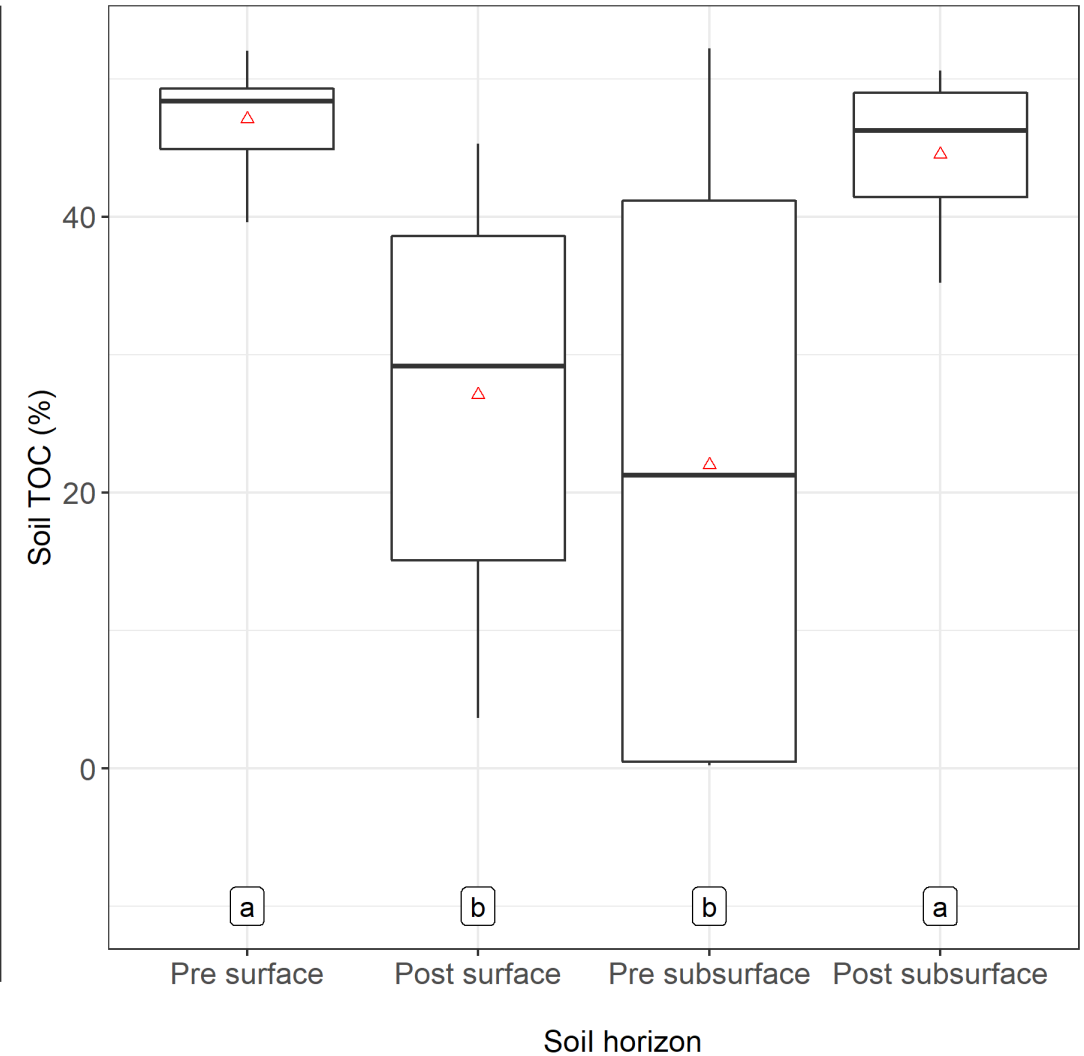
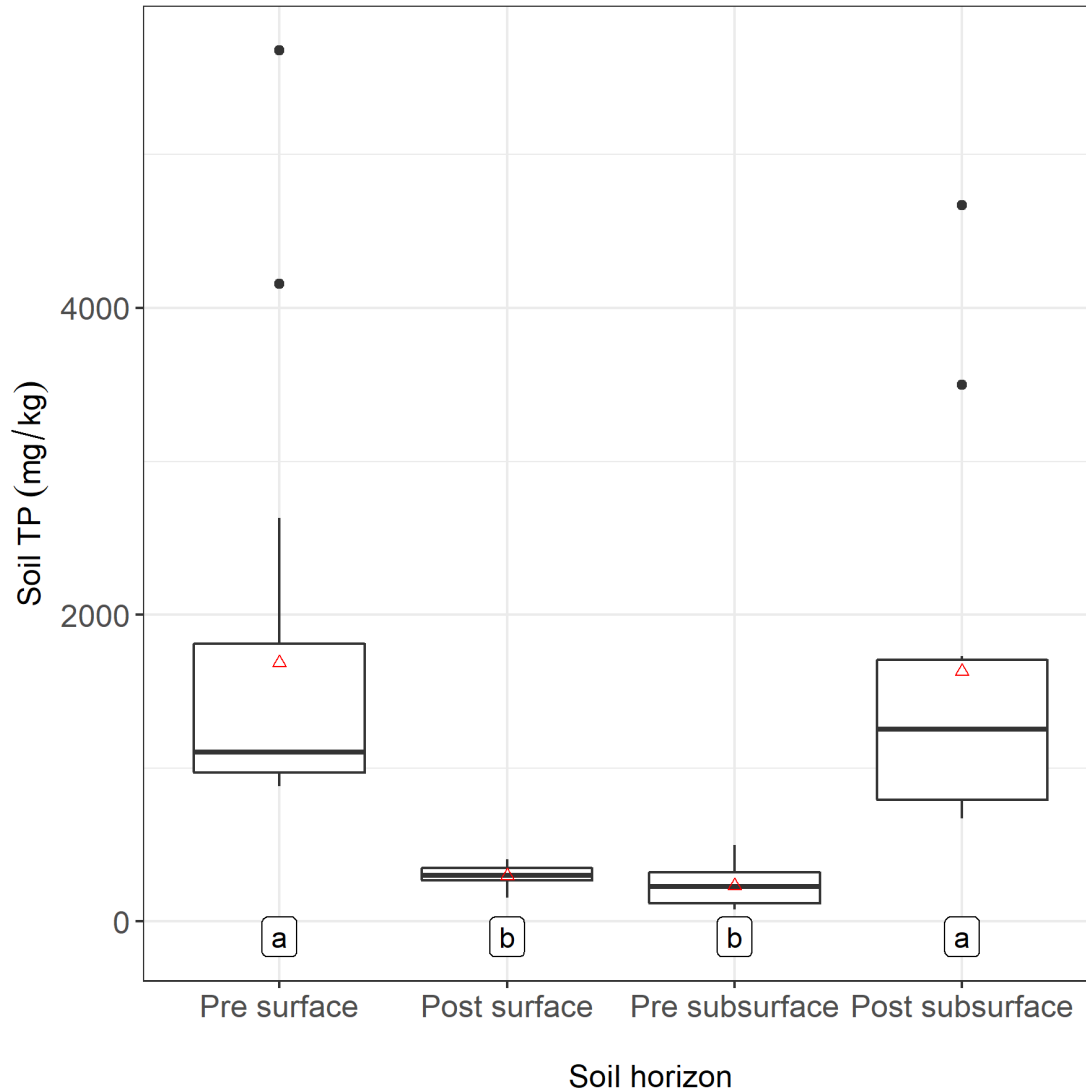
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- DB Environmental Laboratories Inc. for soil core incubation experiment and associated analyses
- AECOM Inc., for Cell 7 Pilot Study logistics





Cell 7 Soil Inversion Pilot Study: Soil TP and TOC





Cell 7 Soil Inversion Pilot Study

- Pre-inversion soil sampling (3/4/2015)
- Post-inversion soil sampling (3/12/2015)
- One sample per acre in the 20-acre pilot P area (AECOM, 2018)
- Parameters measured:
 - Total-P
 - Total organic carbon
 - Soil pH



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNR
USDA, USGS, AeroGRID, IGN, and the GIS User Community