Water Conservation Area 1- A Case Study of Hydrology, Nutrient and Mineral Influences on Biogeochemical Processes

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Greatest Carbon Storage

Source: Scheidt and Kalla. 2007. USEPA

Source: Newman et al., in prep.
Environmental Gradients

Source: EDEN

Source: Newman et al. in prep.
Mineral Enrichment in Surface Soils 2003

Osborne et al. unpublished data

Source: Corstanje et al. 2006. JEQ
Hydrologic and Mineral Changes in the Everglades (McCormick Mon)

Phosphorus Effects within WCA1
  • Influence on C and nutrient cycling

Mineral Effects on Biogeochemistry
  • Influence on C cycling and P availability.
Phosphorus Effects in WCA1

Source: Rutchey et al. Unpublished data
Effect of P is a Function of Load and Duration - Mesocosm Studies

- Floc TP concentration (mg/kg)
- Year (1996-2008)
- P dose g/m²/y

Phosphorus Effects on Decomposition

Phosphorus Effects – N Cycling

Phosphorus Enrichment- Mineral Release

Ca concentration (mg/L)

Year


0

3.2


P dosing stopped
Western Soil TP Boundary Increased from 1991-2003

Change in TP concentration

mg/kg

Mineral Enrichment Effects in WCA1

Source: Hagerthey et al. Unpublished data
Mineral Influences on Decomposition

**Graph A:**
Distance East of L-7 Perimeter Canal (km)

Mass Loss after 12 months (%)

- **LOX8**
- **LOX9**
- **LOX10**
- **A111**
- **A112**
- **A113**
- **A114**
- **LOX7**
- **LOX6**
- **LOX5**

**Graph B:**
Litter Source Site

Mass Loss after 12 months (%)

- **LOX9**
- **A113**
- **LOX10**
- **A112**

Mineral Enrichment Influences on Decomposition

Solid Bars litter packs deployed in WCA1, hatched bars packs deployed in interior WCA2A. Litter Material Collected from WCA1.

Source: Newman et al., unpublished data
Potential Mechanisms Controlling Mineral Enrichment Effects on Decomposition

- Quality of Substrate
  - Limited literature to suggest Ca poor plant material has lower substrate quality

- Effect on Microbial Community
  - Ca-P binding making P more limited
  - Ca-Organic Matter Binding Alleviating Enzyme Inactivation
  - Divalent Cations Required for Optimum Hydrolysis
Phosphorus Storage in Benthic Floc - Similar Across Nutrient & Mineral Gradient.

Enzyme Activity - Decreased P limitation

Phosphatase Activity

Diesterase Activity

Decomposition Duration

Source: Unpublished data from McCormick et al. WCA1 mineral dosing mesocosms
Summary and Conclusions

- Biogeochemical cycles in WCA1 are driven by hydrologic, nutrient and mineral gradients.
- The P enrichment boundary expanded during the last decade.
- Mineral enrichment will significantly alter C cycling in WCA1.
- Natural biogeochemical cycles in WCA1 require low P & low mineral waters.