Nutrient Attenuation Using Industrial Residues as Reactive Substrate in Constructed Wetlands

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Hybrid constructed wetland systems

Concept:
1. FWS wetland planted with reeds to filter TSS from influent & mineralize N (organic N → NH₄⁻-N)
2. 2 x intermittently-saturated VF wetlands to promote nitrification (NH₄⁻-N → NO₃⁻-N)
3. HF wetland to promote denitrification (NO₃⁻-N → N₂(g))

Residues with high P attenuation capacity incorporated into all wetlands

Poyang Lake

China’s largest freshwater lake with average surface area of >3580 km²
- 13-m difference in water height between wet/dry seasons
- ~44 million people live within 162,200 km² watershed (97% Jiangxi Province)
- Land use primarily agricultural; 68% rural population

Substrate composition

- 50% (w/w) locally-sourced coarse sand
- 30% pebbles (4-8 mm)
- 10% Ti mineral processing residue
- 3% Blast furnace slag
- 3% Steel slag
- 4% Wood chips

For details of material characterisation see poster #1314, Wetland Soils II poster session, Wednesday 18 Nov. 2-4:30 PM
System performance – effluent pH

- Effluent pH potential concern due to alkalinity of iron- & steel-making slags.

System performance – N & P attenuation

- 55% attenuation of total inorganic N in influent wastewater
- Effective P attenuation (81% PO₄-P removal)
- Acceptable effluent pH <9.0
- Low concentrations of dissolved metals in effluent
- Additional longer-term monitoring required
  - Varying climatic conditions
  - Optimize HRT?

System performance – hardness, DO, COD

Summary

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