Contrasting Urban and Natural Wetlands in South-central New York

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Introduction

- Urbanization increasing globally
- Contrast urban wetlands with natural wetlands
- Urban wetlands expected to have higher nitrogen levels and fewer plant species in comparison to natural wetlands
Design

- 26 wetlands were surveyed over the summers of 2010 and 2011
- 18 natural wetlands comprised of three categories: Emergent, Scrub/Shrub, and Forested
- 8 urban wetlands
- Collected vegetation, soil chemistry, and water chemistry data
Vegetation

- Stratified random sampling locations
- Herbaceous cover
  - 1 m\(^2\) quadrats
- Shrub cover
  - 10 m\(^2\) quadrats
- Species count and estimate percentage cover for herbaceous plants and shrubs
- Trees every three sampling locations
  - 100 m\(^2\) quadrats
  - Species and circumference at breast height were recorded
Water and Soil

- Three water and soil samples
- Taken at each end and middle of wetland
- Water: grab sample
- Soil: top 5 cm
Results
Total Extractable Soil Nitrogen

Soil Nitrogen (mg N/kg soil)

Emergent

Scrub/Shrub

Forested

Urban

Not significant

Bars ± 1 SE
Soil Nitrogen Mineralization and Nitrification

Rate (mg N • kg soil⁻¹ • day⁻¹)

<table>
<thead>
<tr>
<th></th>
<th>Emergent</th>
<th>Scrub/Shrub</th>
<th>Forested</th>
<th>Urban</th>
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</thead>
<tbody>
<tr>
<td>Net N Mineralization</td>
<td></td>
<td>a</td>
<td>a</td>
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<tr>
<td>Net Nitrification</td>
<td>a</td>
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</tbody>
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Bars ± 1 SE

p = .003

n.s.
Soil pH and Conductivity

Soil pH and Conductivity (μS/cm)

Bars ± 1 SE

Emergent  Scrub/Shrub  Forested  Urban

pH

Conductivity

p < .001

Bars ± 1 SE
Wetland Indicator Status and Total Species Richness

Bars ± 1 SE
Reduced Species Richness

- Is it correlated to...
  - Presence of dominate species?
  - Biogeochemical conditions?
Total Species Richness vs. Invasive Cover

\[ y = -0.43x + 55 \]

\[ R^2 = 0.22 \]

\[ p = .015 \]
Total Species Richness vs. Concentration of Dominance

y = -0.51x + 76
R² = 0.26
p = .0078

Species Richness vs. Concentration of Dominance

Emergent
Scrub Shrub
Forest
Urban
Total Species Richness vs. Soil pH and Conductivity

- **Soil pH**
  - Equation: \( y = -9.4x + 104 \)
  - \( R^2 = 0.23 \)
  - \( p = .014 \)

- **Conductivity (μS/cm)**
  - Equation: \( y = -0.12x + 58 \)
  - \( R^2 = 0.24 \)
  - \( p = .014 \)
Total Species Richness vs. Nitrogen Mineralization

$y = 13x + 43$

$R^2 = 0.24$

$p = 0.011$

Species Richness vs. Nitrogen Mineralization Rate (mg N \cdot kg soil^{-1} \cdot day^{-1})
Conclusions

- Urban wetlands differed from natural wetlands
- Biogeochemistry
  - Greater pH, higher conductivity, lower N-mineralization
- Vegetation
  - Reduced species richness
    - Significant negative correlation with invasive cover, concentration of dominance, soil conductivity, and soil pH
    - Significant positive correlation with N mineralization
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