Understanding and Adaptive Management in Urban Ecosystems

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The Four Watersheds of Baltimore City
Stream Flow Gaging Sites

- Small Watershed (Suburban)
- Small Watershed (Agric)
- Subwatershed (Suburban)
- Gwynns Falls (Urban)

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External Drivers

Socio-Cultural-Economic Template

Human Behavior
- Riparian Revegetation

Human Outcomes
- Riparian Management Strategy

Events

Pulses
- Flooding

Presses
- Urban Watershed Land Cover

Geophysical and Infrastructural Template

Community Structure
- Riparian Structure

Ecosystem Function
- Denitrification

Ecosystem Services

Expected Nitrate Retention

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Riparian disconnection 1

- Urban stream incision
A. Natural Channel

B. Incised Channel Due to Increased Runoff
Riparian disconnection 2

- Water table depth
Riparian disconnection 3

• Tree composition
Number of tree species in riparian habitats

- Gwynns Falls (urban)
- Piedmont (non-urban)

Bottomland Species

Upland Species
Riparian disconnection 4

• Denitrification
Ecosystem services

• Stream chemistry
Reference stream . . . .
Ag > Suburban > Forested.
Suburban > Urban

- Suburban (sewered, GL)
- Urban (CP)

NO$_3^-$ (mg N L$^{-1}$)

9/12/98 1/25/00 6/8/01 10/21/02 3/4/04
Riparian obliteration
Management options

• Beyond the riparian
• Increasing urban canopy
• Alter infiltration
Increase tree canopy
Baltimore City Urban Forest
Data: Physical
Data: Biological
Data: Social
Analysis

Prioritization of Planting Locations

Placing Index
(PD x 40) + (TS x 30) + (TP x 30)

- 63-98 (High Priority)
- 60-62
- 57-59
- 53-56
- 50-52
- 15-49 (Low Priority)

The Planting Index was developed by D.J. Nowak et al. (unpublished) of the USDA Forest Service Northeastern Research Station. The criteria used to create the index were:
- Population density (PD), the greater the population density, the greater the priority for tree planting.
- Tree stocking level (TS), the lower the tree stocking level, the greater the percent of available green space that is occupied by tree canopies, the greater the priority for tree planting.
- Tree cover per capita (TPC), the lower the amount of tree canopy cover per capita, the greater the priority for tree planting.

Analysis and map production:
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Urban Design: Watershed 263
Storm Drain
Watershed 263
Franklin Square ES
Children’s Reading Circle
Conclusions

- Basic ecology applies to cities;
- Integrate biological, physical, and social;
- Apply the Integrated Science for Society and Environment feedback;
- Failure of urban riparian nitrate retention;
- Management to compensate;
- Open cycle of ecological urban design.
See Ya Later Bye, Hon

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