

Urban Natural Resources

Urban Ecological Systems: Linking Terrestrial, Ecological, Physical, and Socioeconomic Components of Metropolitan Areas



• Pickett et al. *Annu. Rev. Ecol. Syst.* 2001, 32: 127-157

Terrestrial urban ecology

- Purpose
 - “to review the status of ecological knowledge of the terrestrial components of urban areas”
 - “to present a framework for continued ecological research and integration with social and economic understanding”
- Data and method
 - literature review

Urban Ecological Systems: Linking Terrestrial, Ecological, Physical, and Socioeconomic Components of Metropolitan Areas

- Introduction
- Biogeophysical approaches
- Urban ecology as a planning approach
- An integrated framework for urban ecological studies
- Conclusions

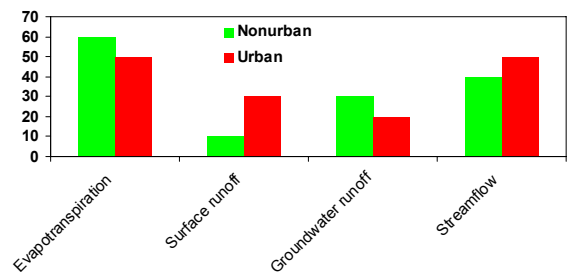
Introduction

- Components of urban ecosystems
 - Suburban areas, exurbs, sparsely settled villages, hinterlands
- Two distinct meanings of urban ecology
 - Scientific definition
 - Urban planning

Biogeophysical processes

- Ecology in the city
 - urban physical environment, urban soils, vegetation and flora in cities, animals and wildlife

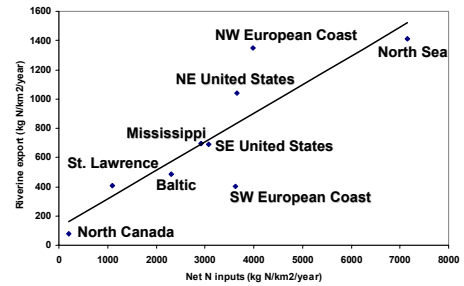
Example: urban hydrology



Biogeophysical processes

- Ecology in the city
 - urban physical environment, urban soils, vegetation and flora in cities, animals and wildlife
- Ecology of the city
 - feedbacks and dynamics of the ecological linkages
 - relates patterns and dynamics of systems to the characteristics of the city

Example: biogeophysical budget



Source: Howarth et al. 2002 *Ambio* 31: 88-96

Toward integration of ecosystem pattern and process

- More *inclusive* assumptions about *ecosystem function*: dynamic, connected, open system
- Ecosystem budgets: multiple processes and spatial heterogeneity
- Breadth of key theories: based on actual mechanisms for interaction

Urban ecology as a planning approach

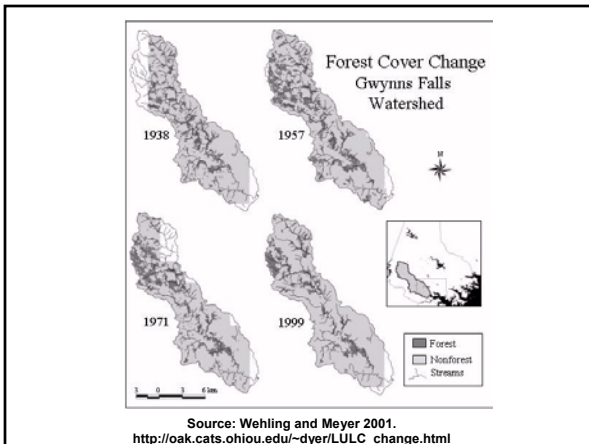
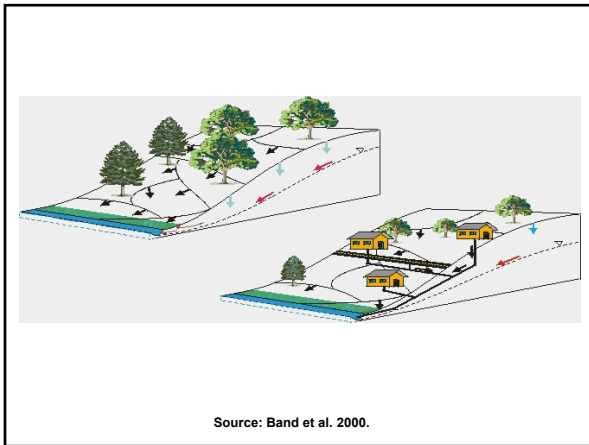
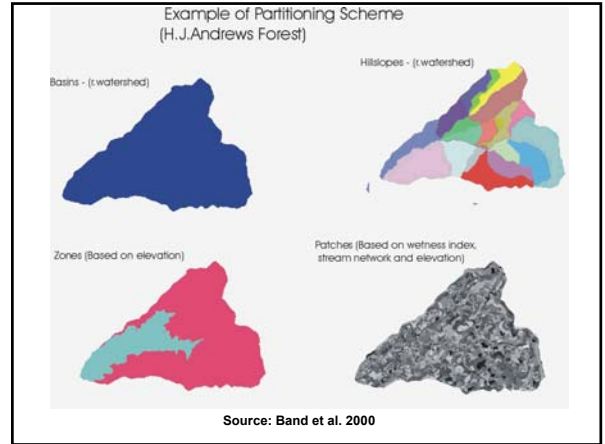
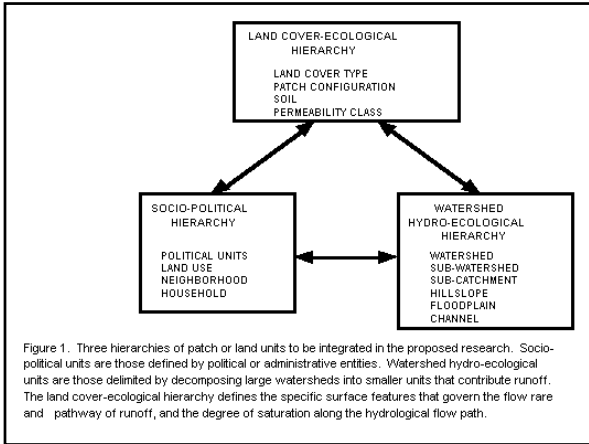
- Natural processes embedded in cities
- Spatial planning
- Not based on ecological function?

Integrated framework for urban ecological studies

- Equally deal with social and biogeophysical processes
- Spatial structure of biogeochemical systems
- Hierarchy theory

Social ecology and social differentiation

- Social ecology
 - life science focusing on the ecology of various social species
 - stochastic, historic, and hierarchical
- Social differentiation
 - social identity, social hierarchy
 - affects the allocation of critical resources
 - has a spatial dimension: territoriality, heterogeneity
 - scale issue



Human ecosystem framework and urban ecological systems

- Primary drivers: biophysical and social
- No single determining driver of anthropogenic ecosystems
- The relative significance of drivers changes over time
- Components need to be examined simultaneously in relationship to each other
- How biological and social allocation mechanisms affect the distribution of critical resources