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Loyola Marymount University

From Sustainability to Resilience: Re-imagining the Role of the Healthy City in International Research Collaborations

National Academies: Government-University-Industry Research Roundtable

1. Urban Ecology?
2. Nature of Cities
3. *to* Collaboration

Today's Goal – To provide a deeper understanding of the field of urban ecology as it frames a context for trans-border collaborations.

What do we mean when we say Urban?

According to the research scientists at the Baltimore Ecosystem Study…

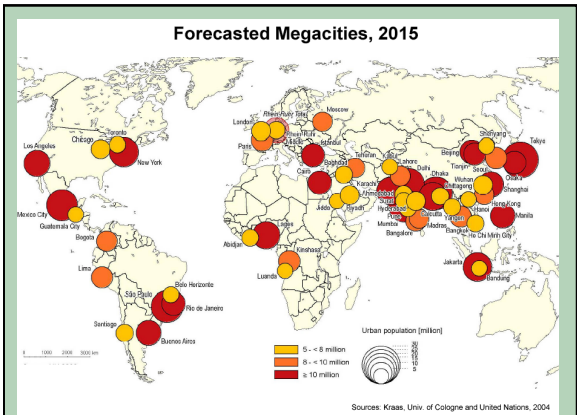
The Broad Meaning of Urban. The broad sense takes urban to be the whole range of habitats and environments within the scope of a petroleum-based commuting network. Some call this an "urban mosaic," referring to the great variety of kinds of areas included.

The Narrow Meaning of Urban. Urban, in the strict sense, refers to the densest built and paved components of the settled mosaic.

What is Urban Ecology?

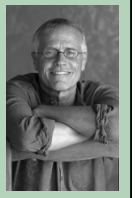
- Emerging and interdisciplinary science, uses tools of natural and physical sciences and social sciences to studies cities – to understand resiliency
- Urbanization is a dominant demographic trend and the most important component of land-transformation processes
  - Large populations of underrepresented population live in urban areas
  - Wonderful opportunity to revision the approach to teaching science, engaging stakeholders and reimagining the boundaries of collaboration

Another density plot for the United States.
Any guess as to which which metric?
Thanks to Arsalan Modjbafan & Rachel Vermeulen from BIOL398, (AggData, Stephen Von Worley)



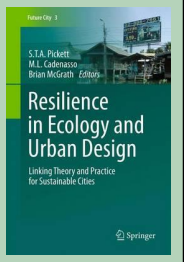
Brundtland Report –
Sustainable developments are those that "meet present needs without compromising the ability of future generations to meet their needs"
(World Comm Econ Dev, 1987)

Paul Hawken from *Blessed Unrest - Sustainability is about stabilizing the currently disruptive relationship between earth's two most complex systems- human culture and the living world.*



The Resilient Generation for Urban Ecology

- Are Cities Ecosystems?
  - Clear ecological structure/function
  - Tansley (1950's) – human/natural
- The roots: Ecology ***in*** Cities
  - Familiar comparisons
  - Parks as analogues of forests
  - Vacant lots as analogues of fields
- The present: Ecology ***of*** Cities
  - Functional consequences of heterogeneity
  - Baltimore (BES) & Phoenix (CAP)



Guiding Principles for Urban Ecology

adapted from Grove, MG (2009), Principles of Ecosystem Stewardship

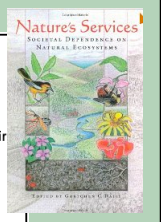
- *Cities are open, multi-scale systems*
  - Wide range and size of habitats in a mosaic
- *Cities are heterogeneous ecosystem composites*
  - Patchy, microclimates, hydrology, economics
- *Cities are complex adaptive systems*
  - Biophysical and social legacies as feedback
- *Cities are functional socio-ecological systems*
  - Idea of ecosystem services
  - Environmental Justice

Final ecosystem services are components of nature, directly enjoyed, consumed, or used to yield human well-being.

Boyd & Banzhaf (2007), Ecological Economics 63:616-626

Daily's List of Ecosystem Services (Partial)

- purification of air and water
- mitigation of droughts and floods
- generation and preservation of soils and renewal of their fertility
- detoxification and decomposition of wastes
- pollination of crops and natural vegetation
- dispersal of seeds
- cycling and movement of nutrients
- control of the vast majority of potential agricultural pests



Daily, GC, Ed. 1997. *Nature's Services: Societal Dependence on Natural Ecosystems, Island Press, Washington, DC.*

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Human Development Within the Planetary Boundaries

Mitigation and Adaptation to **Global environmental change**

Ecological Resilience and the capacity to persist, adapt and transform in the face of shocks

Biological Diversity

Ecological functions and **Ecosystem services**

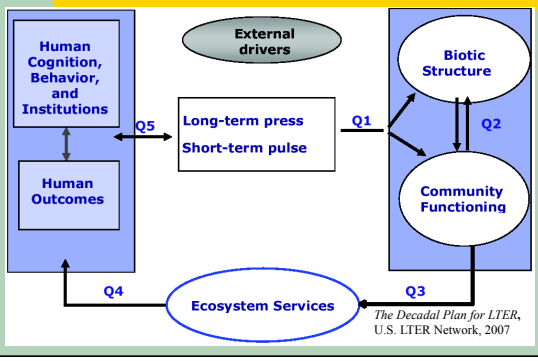
Planting Day & Biodiversity Assesment; Ballona Creek, Los Angeles 2011

A New Guild of Urban Meso-Predators: The Very Essence of a "Wicked Problem"

Understanding Outdoor Cat Movement and Behavior using Remote Sensing Cameras and Radio Telemetry.

Developing core policy through National Study Group

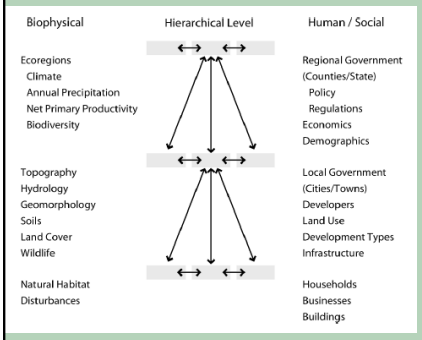
An integrative conceptual framework for socio-ecological research in human-dominated landscapes.



The Decadal Plan for LTER, U.S. LTER Network, 2007

Overlay from previous slide

Hierarchal Organization of Human & Ecological Relationships



Urban landscapes are organized hierarchically. Higher levels operate on a larger spatio-temporal scale and define the boundary conditions in which the system functions, while the lower operating conditions exhibit much faster processes in space and time and act as initiating conditions.

Alberti, Marina, 2010. *Advances in Urban Ecology: Integrating Humans and Ecological Processes in Urban Ecosystems*. Springer Science Media

New Opportunities in Europe

- Mission: *to foster and develop new knowledge of urban ecology worldwide*
- Strategy: *strengthening contacts and dialog among researchers and practitioners – bringing the academic resources to the wider international community*
- SURE Summer School "Urban Development and Urban Ecosystem Services - European approaches and Shanghai experiences" 2013 in Shanghai
- http://www.society-urban-ecology.org

Boston Metropolitan Area ULTRA: *Exploring past, current and future socio-ecological dynamics in a founding city*

BostonMetro ULTRA-Ex

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CLARK

Urban Ecology Institute

Roger Williams University

NSF

LTER

A. How have historical and social processes led to regional and local land cover transformations, producing current patterns of ecosystem state and structure?

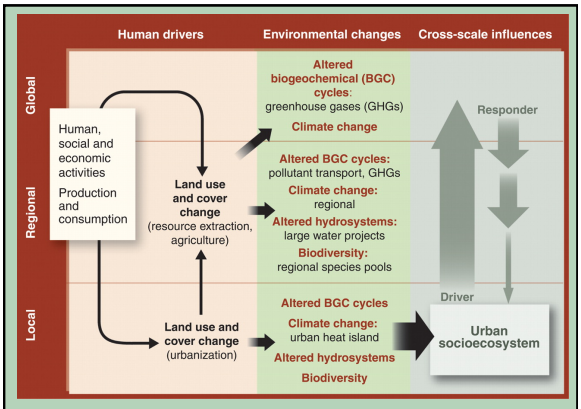
B. Which social drivers and intervening biophysical processes link most strongly to particular social, ecological and health outcomes?

C. What is the future of the Boston Metropolitan Area under different landscape change scenarios?

Ecology of Cities Provides Novel Scales of Analysis & Collaboration

- Watersheds
- Riparian Zones
- Wildlife Refugia
- Migratory Corridors

Sepulveda Basin, Los Angeles, California
An Anthropogenic addition to the LA River Watershed with a unique suite of ecosystem services…



Grimm, et al. 2008, Science, 319:756-760

Beyond Urban Legends: An Emerging Framework of Urban Ecology, as Illustrated by the Baltimore Ecosystem Study

STEWARD T. A. PICKETT, MARY L. CADENASSO, J. MORGAN GROVE, PETER M. GROFFMAN, LAWRENCE E. BAND, CHRISTOPHER G. BOONE, WILLIAM R. BURCH JR., C. SUSAN B. GRIMMOND, JOHN HOM, JENNIFER C. JENKINS, NEELY L. LAW, CHARLES H. NILON, RICHARD V. POUYAT, KATALIN SZLAVECZ, PAIGE S. WARREN, AND MATTHEW A. WILSON

Cary Institute of Ecosystem Studies
(the science behind environmental solutions)

Finding	Assumption	Finding from BES
Social		
Social status and environmental concern	Different across groups	Similar across groups
Environmental inequity	Affects minority groups	Affects all economically disadvantaged groups
Biophysical		
Biodiversity	Low in city	High in city, with valuable elements
Riparian function	Sink function in urban environments	No sink function, or acts as source
Stream nitrogen loading (spatial distribution)	Lower in city than in suburbs	Lower in suburbs than in city
Representing urban heterogeneity	Standard methods adequate	Requires new classification system
Urban soil heterogeneity	Uniformly artificial or disturbed	Mosaic with some unmodified or little modified profiles
Carbon sequestration	Source only	Some sink functions exist
Integrative		
Social-biophysical linkages	Instantaneous	Lagged
Lawns and biogeochemistry	Only nutrient sources; only socially contentious	Nutrient sink; social value
Urban ecosystem retention	Only anthropogenic control	Both anthropogenic and natural controls
Social-biophysical feedbacks	Minor	Pronounced