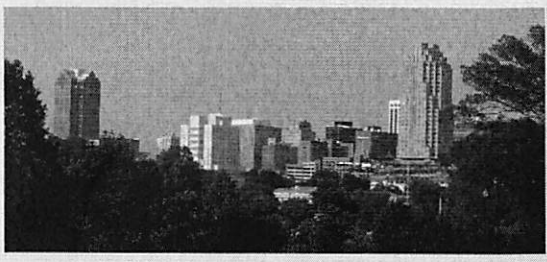
Instructor Copy, notes on back page.




FROM CONCRETE JUNGLES TO SAVANNAS:

LONG TERM SOCIO-ECOLOGICAL RESEARCH PROGRAMS IN THE US AND ABROAD

WHAT IS URBAN ECOLOGY? (TO YOU?)

- What "box" would you put yourself in (right now)? (i.e. engineer, bio-mathematician, ecologist, community organizer, activist, educator, parent)
- Do you think urban ecology is relevant to you? If so, how?

WHAT URBAN ECOLOGY MEANS TO ME HAS EVOLVED OVER TIME…..

- Childhood: environmental activist. Urbanization must stop – people are destroying the planet.
- College: Naturalist. Explored the complex relationships among humans and nature over time – struggled with the human / nature dichotomy.
- Post-College: Organic Farmer. Lived a life that was both urban and rural. (you can't run from urban)
- Community Forester: How do we make urban better?
- Ecologist: Its going to take more than trees…..
- Urban Ecologist: Urbanization is a process – key to achieving global sustainability. Integrated social-ecological analyses.

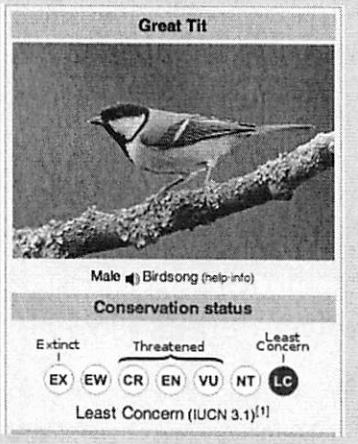
THE URBAN ECOLOGY LAB

- To utilize the **Triangle region** of NC as a study system where we analyze policy relevant socio-ecological patterns and processes that can inform regional management and planning.
- To elevate the Triangle's representation in **national studies** that enhance a comparative framework for understanding the sustainability and resilience of cities.
- To contribute to the advancement of urban ecological theory **internationally** through development of the IMAGINE Program in South Africa.

NC STATE UNIVERSITY

ECOLOGY IN THE CITY

- Basic ecological studies
- Interaction between biotic and abiotic
- How do populations respond to the urban environment?



Slabbekoorn, Hans; Margriet Peet (2003). "Birds sing at a higher pitch in urban noise". *Nature* ***424 (6946): 267.*** doi:10.1038/424267a. PMID 12867967.

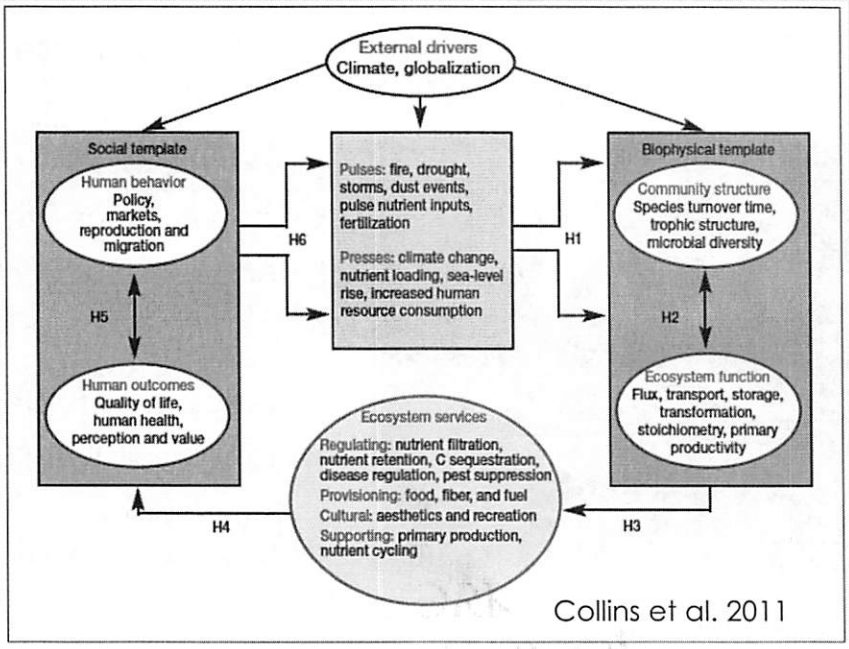
ECOLOGY OF THE CITY

- Urban Metabolism, nutrient cycling, ecosystem level assessments
- Cities as ecosystems
- People are part of the ecosystem
- Inter and trans-disciplinary studies
- High Resolution Studies
- Account for heterogeneity at fine scales

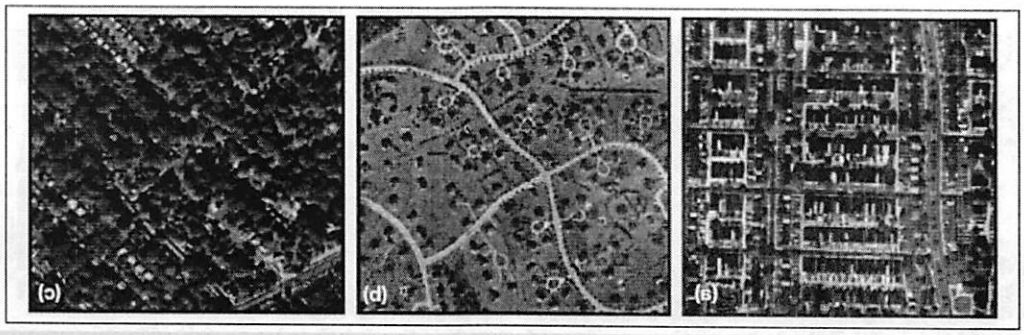
LONG TERM ECOLOGICAL RESEARCH (LTER) SITES - NSF

- McDonnell and Pickett 1990
- Pickett et al. 1992
- Baltimore and Phoenix Urban LTERs (1997)
- ULTRA-ex sites (2009)

A FRAMEWORK FOR SOCIO-ECOLOGICAL RESEARCH



Collins et al. 2011



WHAT ARE THE DRIVERS OF URBAN TREE COVER?

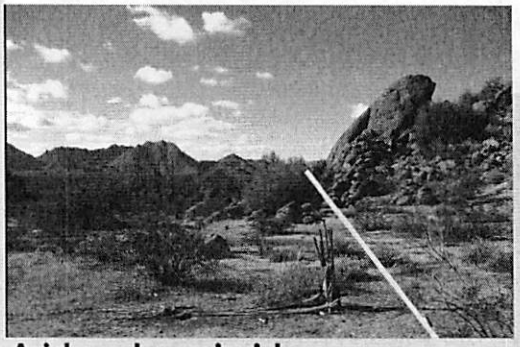
KEVIN BIGSBY (MCHALE, HESS, NELSON)

WHAT ARE THE *DRIVERS* OF URBAN FOREST COVER?

Drivers –

the variables that have the most influence on the amount of tree cover in cities

URBAN ECOSYSTEM CONVERGENCE?



Arid and semiarid ecosystems

↑ NPP and carbon storage

Human modification and management (fertilizers and water)

Tropical and temperate ecosystems

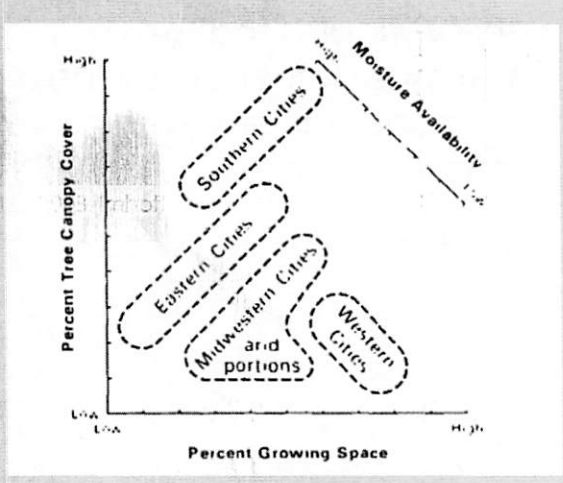
↓ NPP and carbon storage

Reduced forest cover

(Davies et al. 2013, Golubiewski 2006, Grimm et al 2008, Imhoff et al. 2004, Kaye et al. 2006, Pouyat et al. 2006, Raciti et al 2013)

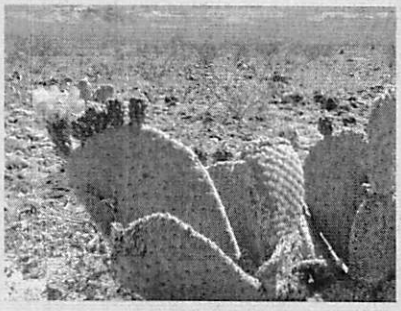
CONCEPTUAL FRAMEWORK: SANDERS 1984

- Natural factors
- Vegetation management systems
- Urban morphology



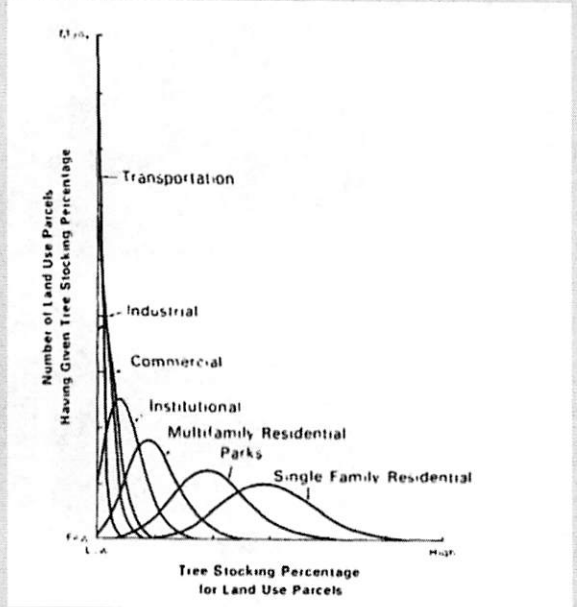
NATURAL FACTORS

- Forested 34.4 %
- Grassland 17.8 %
- Desert 9.3 %
  (Nowak and Crane 2002)



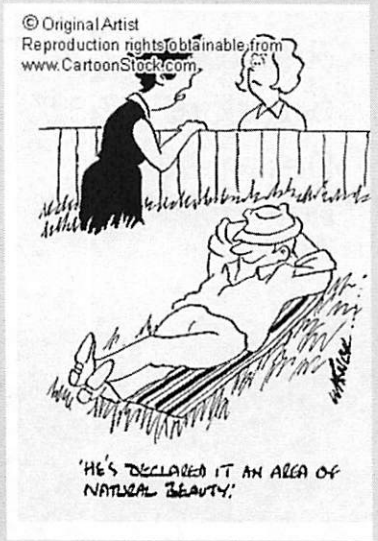
URBAN MORPHOLOGY

- Zoning ordinances and land use
- Parcel characteristics and population density



VEGETATION MANAGEMENT SYSTEMS

- The Luxury Effect
- The Ecology of Prestige



THE LUXURY EFFECT – SOCIO-ECONOMIC STATUS

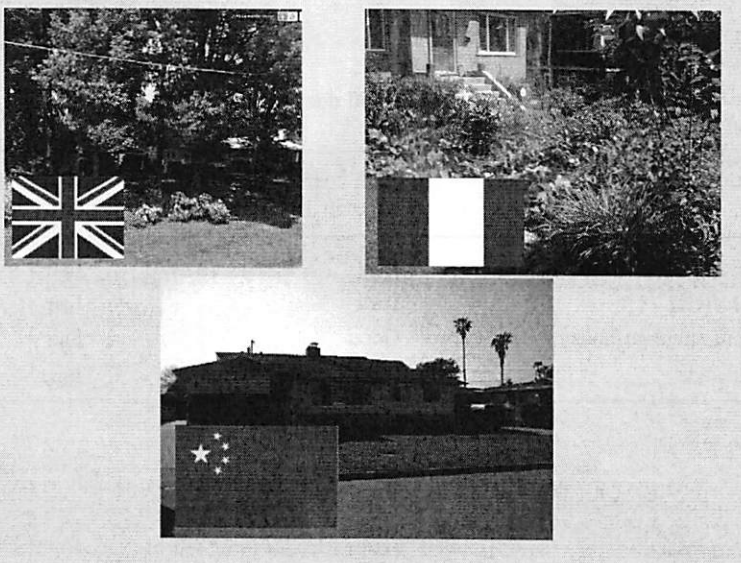
Phoenix

Chicago

Low High

(Martin et al. 2004)

SOCIO-ECONOMIC STATUS AND CULTURE



Fraser and Kenny (2000)

THE ECOLOGY OF PRESTIGE

Predicting Opportunities for Greening and Patterns of Vegetation on Private Urban Lands

Austin R. Troy · J. Morgan Grove · Jarlath P. M. O'Neil-Dunne · Steward T. A. Pickett · Mary L. Cadenasso

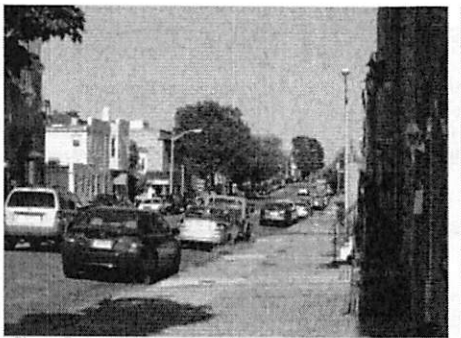


Figure 7: A sample streetscape in a neighborhood classified with the "Bohemian Mix" PRIZM Group in Baltimore (photograph by Jennifer Jenkins)

Figure 8: A sample streetscape in a neighborhood classified with the "Money and Brains" PRIZM Group in Baltimore (photograph by Austin Troy)

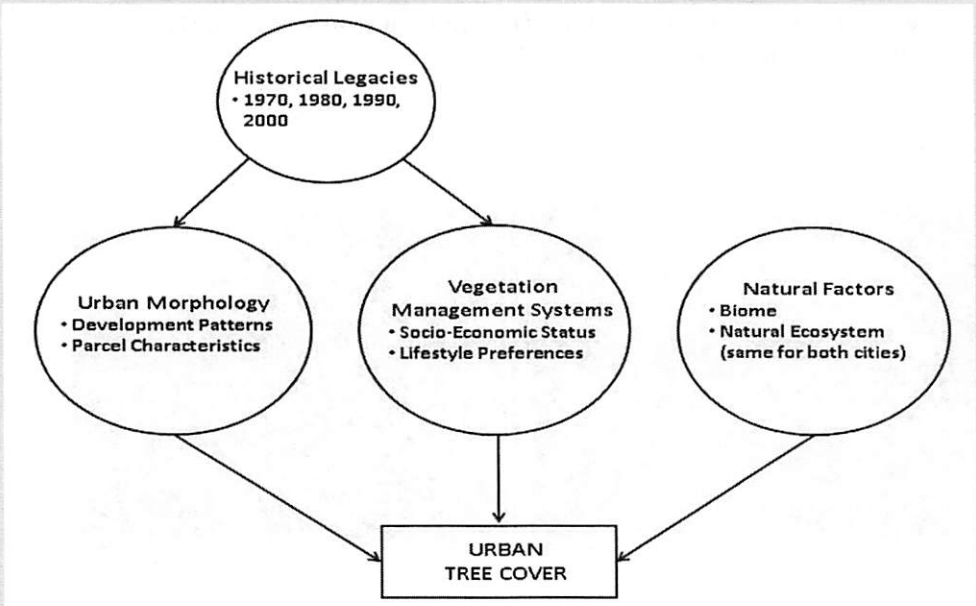
HISTORICAL LEGACIES

Table 4 Strength of associations between 1960 and 2000 demographics/housing and lifestyle with patches of high coarse and high fine vegetation in 1999

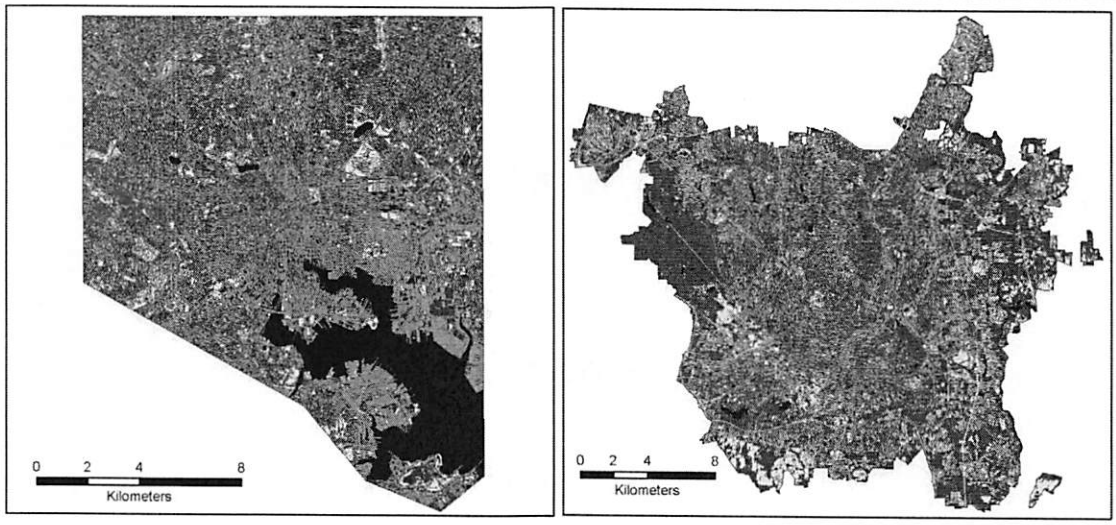
	Independent variable group	High coarse vegetation cover in 1999 (Trees)	High fine vegetation cover in 1999 (Grass)
1960	Demographics/housing	Best	Poor
	Lifestyle	Poor	Fair
2000	Demographics/housing	Good	Fair
	Lifestyle	Poor	Best

Boone et al. 2010

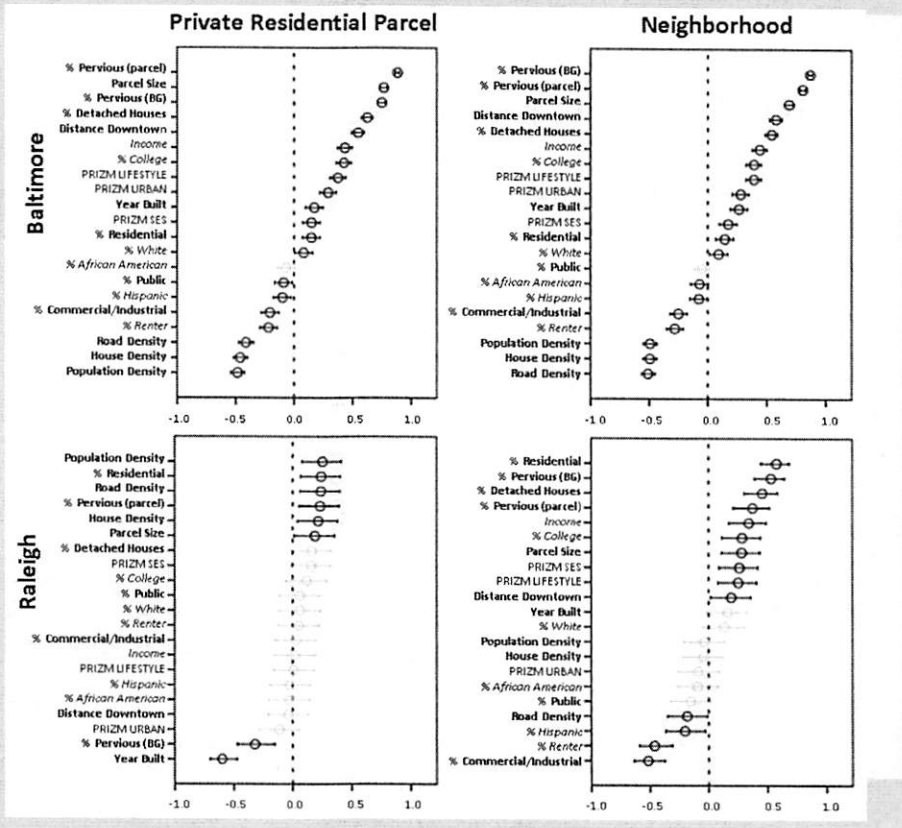
MODIFIED CONCEPTUAL FRAMEWORK



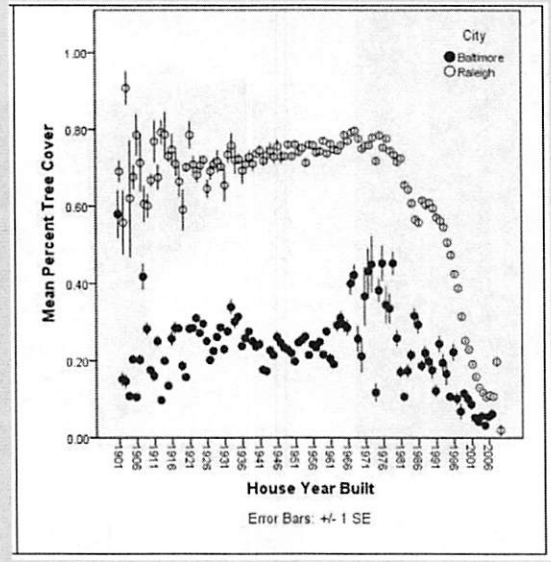
HIGH RESOLUTION LAND COVER CLASSIFICATION- BALTIMORE AND RALEIGH



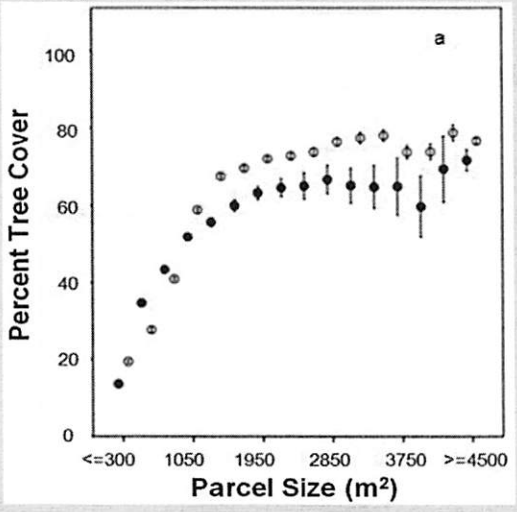
BIVARIATE MODELS

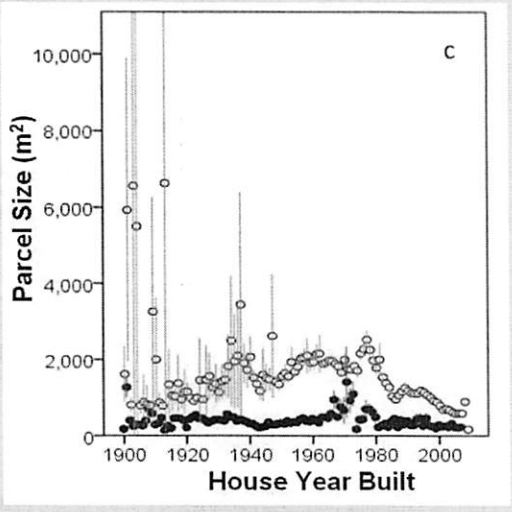


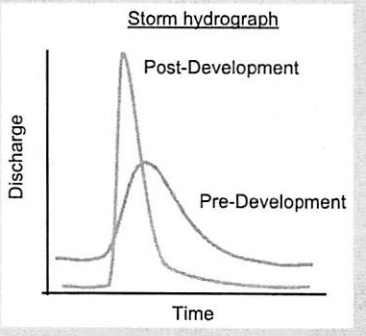
URBAN ECOSYSTEM CONVERGENCE?

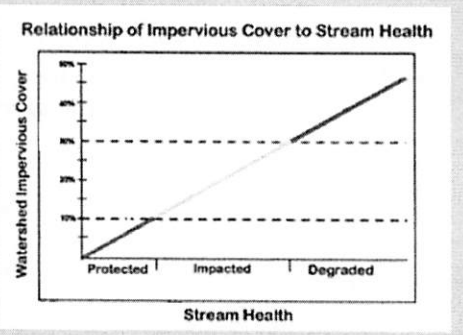


URBAN ECOSYSTEM CONVERGENCE?



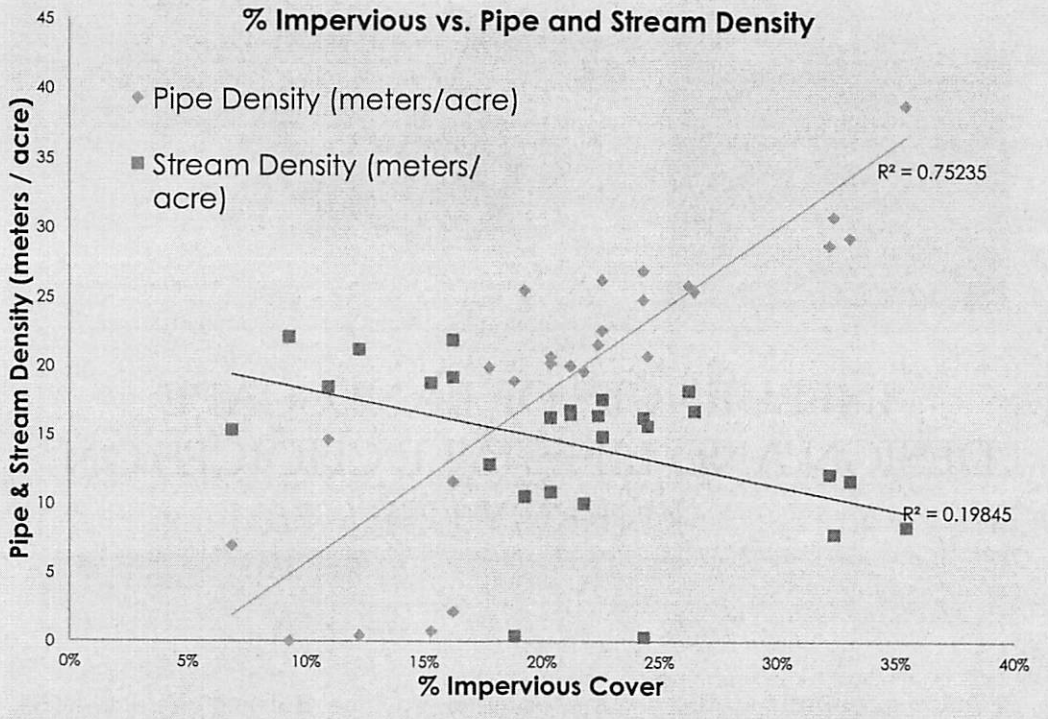




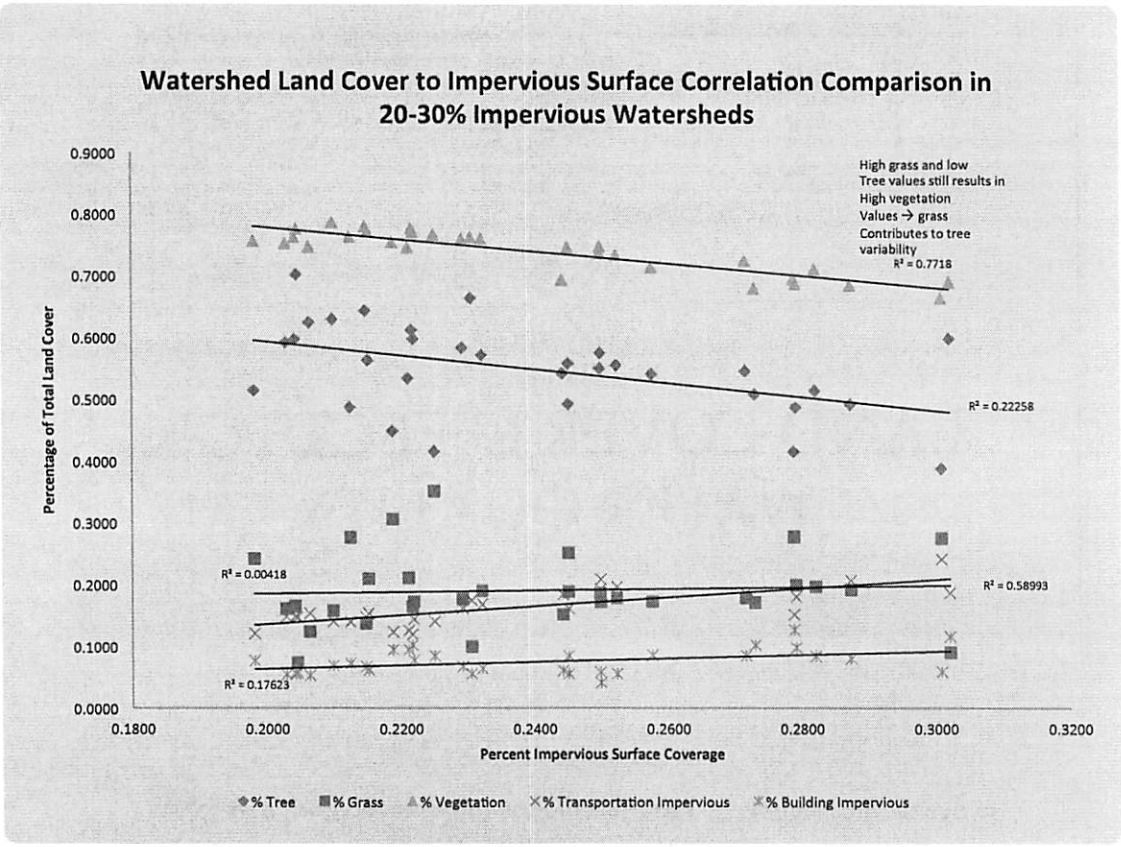


LAND COVER EFFECTS ON WATER QUALITY

SCOTT BECK (MCHALE, HESS, SOMERS, BERNHARDT)



- Increase in Pipes = "more riparian zones"



INFLUENCES OF LANDSCAPE DESIGN AND LIFESTYLE CHOICES ON ENERGY USE

CARA NELSON (MCHALE, PETERSON)

4 Socio-economic status groups, Home energy use, Building characteristics, Air conditioner type and efficiency, Occupant(s) behaviors, Environmental attitudes, Demographics

STANDARDIZED ENERGY RESULTS

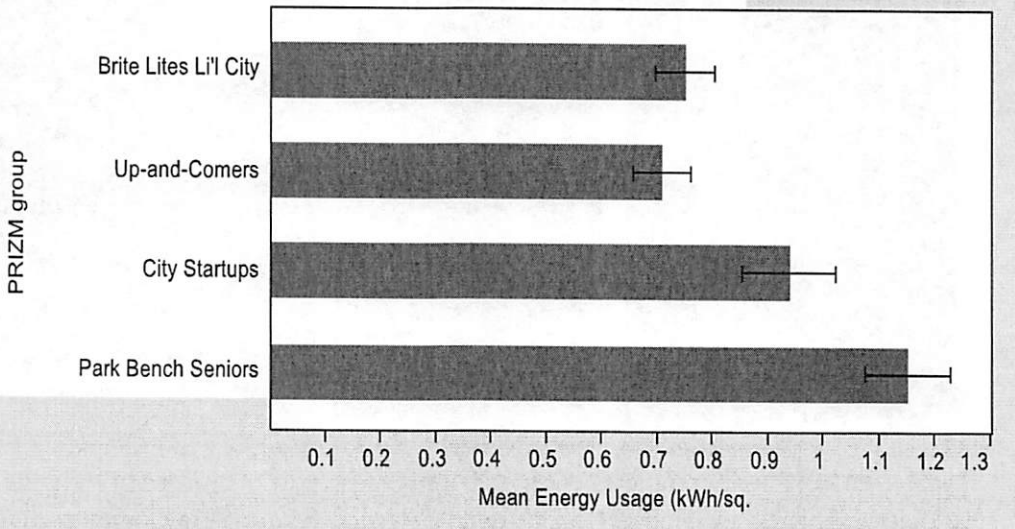
Table 4: Stepwise regression results for standardized energy use (energy use per square foot) in order of increasing R-square value (α=0.10). Dependent variable= kWh/month/sq. ft. This model explains 42.25% of the total variation. Percent tree cover within 18 m of the home was not significant in the model.

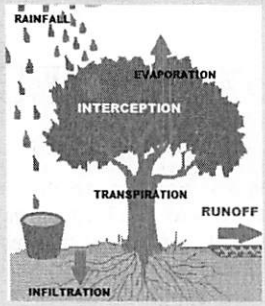
Explanatory Variables	Coefficient	S.E.[a]	R-square	p-value
Intercept	2.648	0.585	---	<0.0001
Education level	-0.065	0.037	0.1608	<0.0001
Inside temperature	-0.024	0.007	0.2162	0.0006
Home size	-0.0002	0.00004	0.2843	<.0001
Type AC unit	0.417	0.106	0.3054	0.0238
Number AC units	0.147	0.058	0.3433	0.0020
Home age	-0.003	0.001	0.3596	0.0400
Home 18+ hours	0.157	0.062	0.3741	0.0499
Race	0.153	0.090	0.3870	0.0624
Comfort level	-0.138	0.067	0.4011	0.0500
Number trees NW[b]	-0.031	0.015	0.4284	0.0834
Percent cover 18 m	---	---	---	>0.1500
Model R-square 0.4225				

[a] S.E. =Standard Error

[b] Trees taller than 6 m and within 18 m of the home

ENVIRONMENTAL JUSTICE ISSUES?

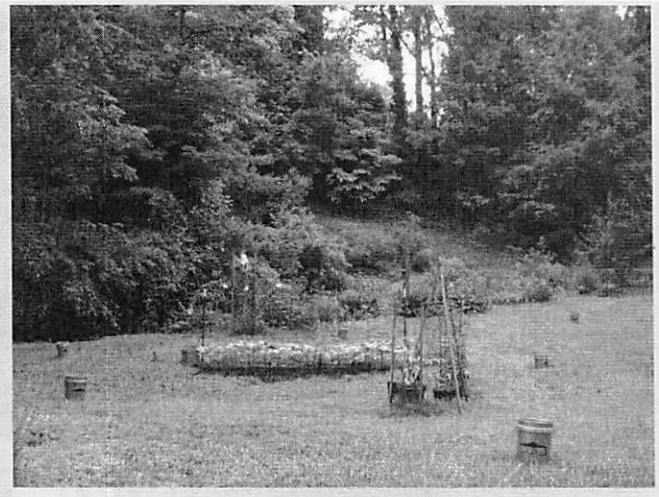




RAINFALL INTERCEPTION BY TREES IN RESIDENTIAL NEIGHBORHOODS

ELINA INKILAINEN (MCHALE, JAMES, BLANK)

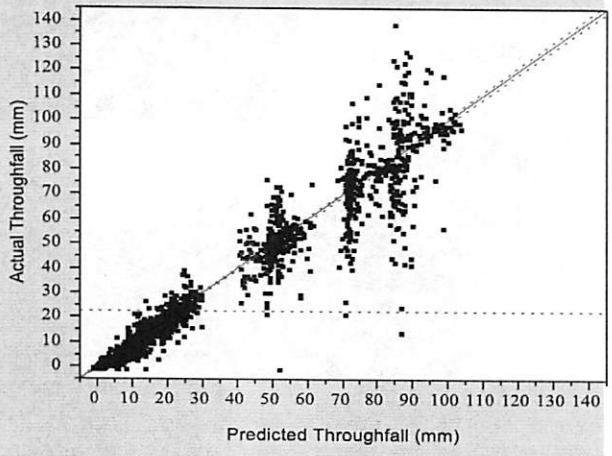
A NEIGHBORHOOD COVERED IN BUCKETS



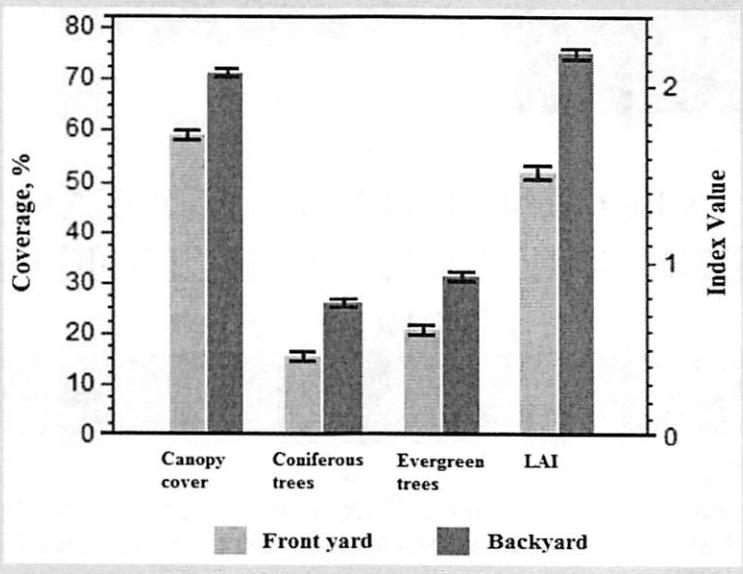
"Finally, one backyard has a dog that pees in my buckets - I love urban ecology. What is the average volume of pee a large dog produces in one day? Can you estimate the ratio of pee vs. rainwater from the color of the water??"

RESULTS

- In this Urban Forest (66% tree cover) rainfall interception parallels that of rural forests
- Canopy cover and percent evergreen were the most important predictors (LAI failed)

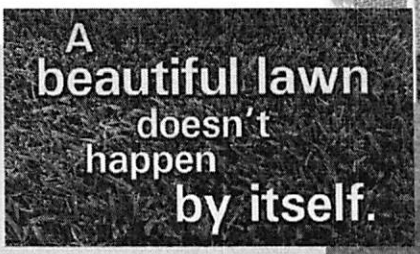


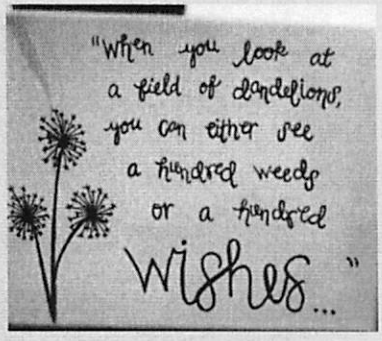
AGAIN PEOPLE MATTER....



LAWN EFFECTS

- Irrigation
- Fertilizers
- Herbicides
- Pesticides
- Mowing
- Lack of wildlife habitat





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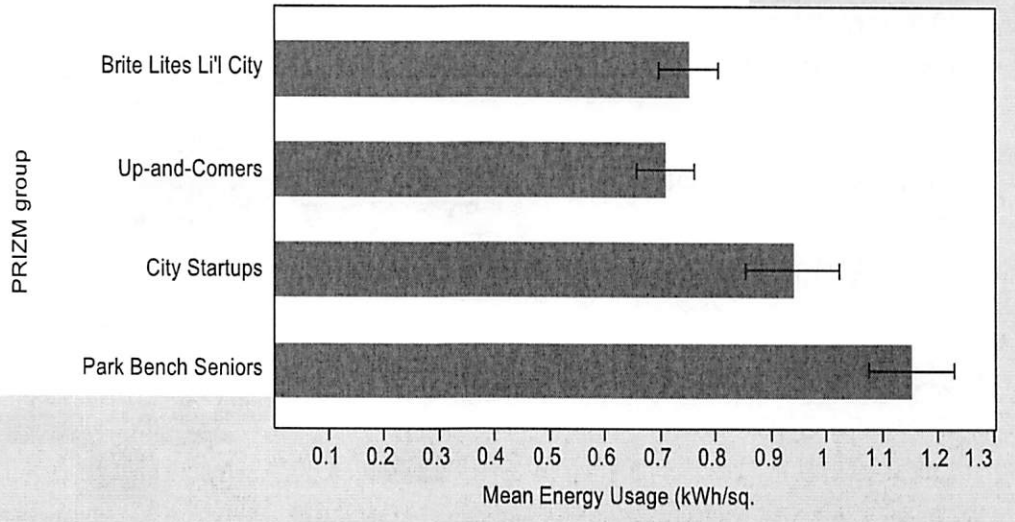
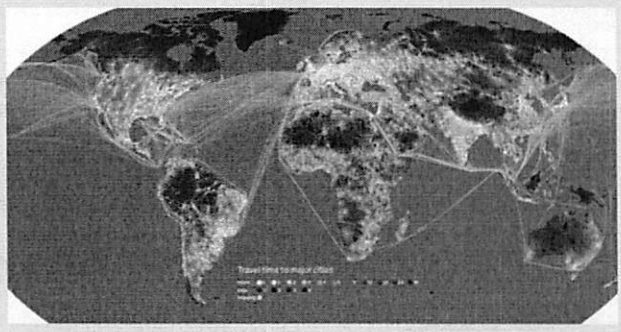


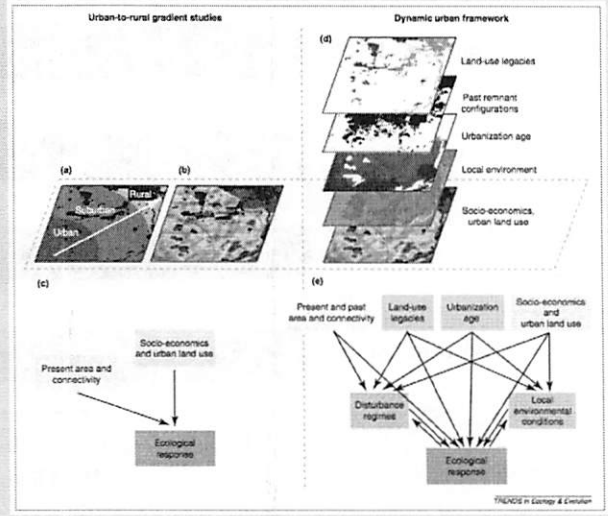


URBAN ECOLOGY IN A DEVELOPING WORLD

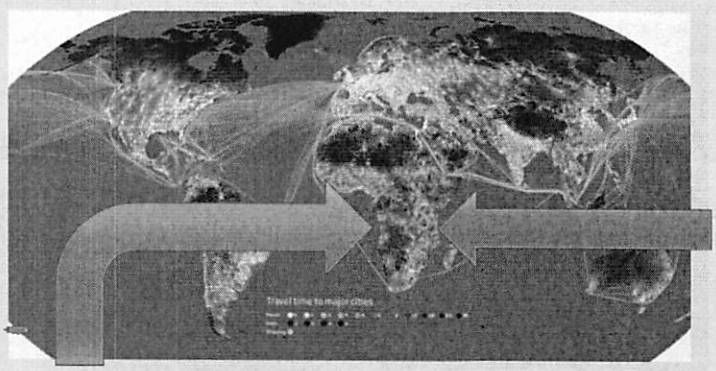
MCHALE, PICKETT, BUNN, TWINE

URBANIZATION IS A PROCESS

- Drivers of Urbanization
- "The City" as the climax condition – western idea
- Study the urbanization process



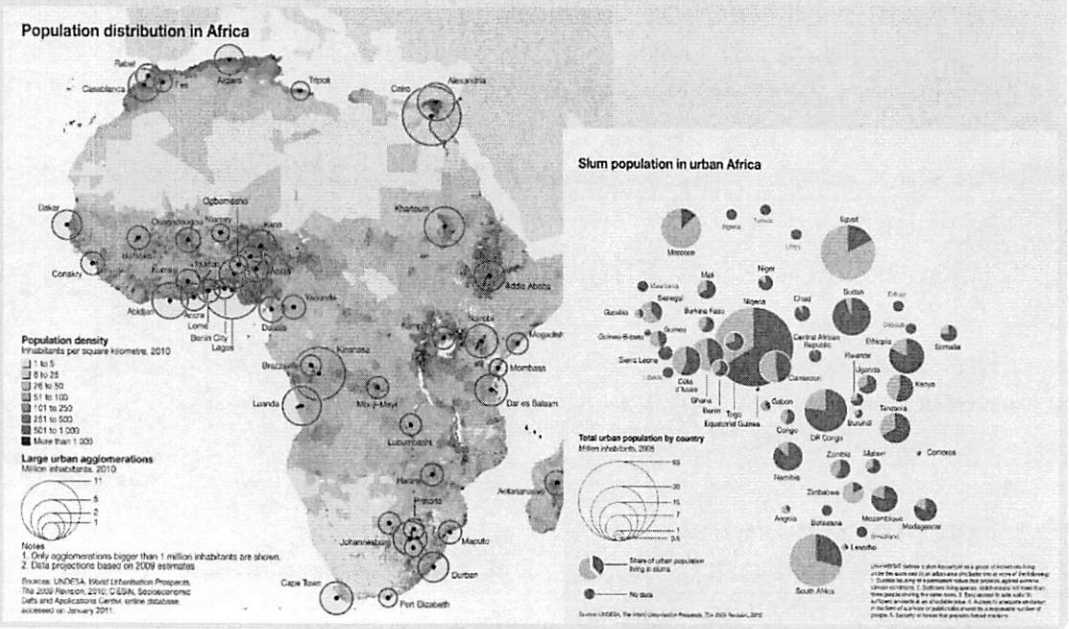
URBANIZATION IN SUB-SAHARAN AFRICA



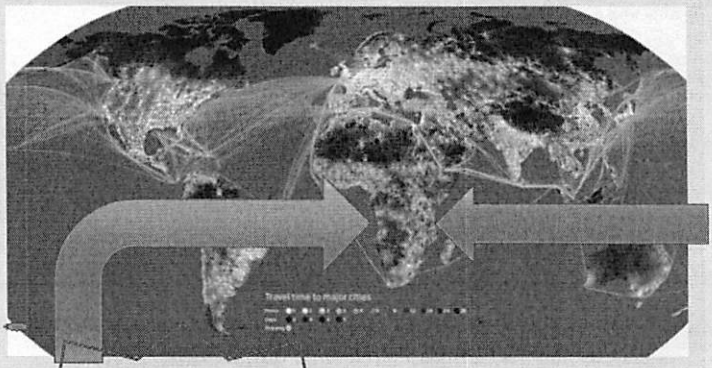
By 2030 770 million Africans living in cities – more than the total # of city dwellers in the western hemisphere today

12-Fold Increase in Urban Land Cover by 2050

IS OUR CURRENT UNDERSTANDING OF URBANIZATION RELEVANT HERE?



URBANIZATION IN SUB-SAHARAN AFRICA



12-Fold Increase in Urban Land Cover by 2050

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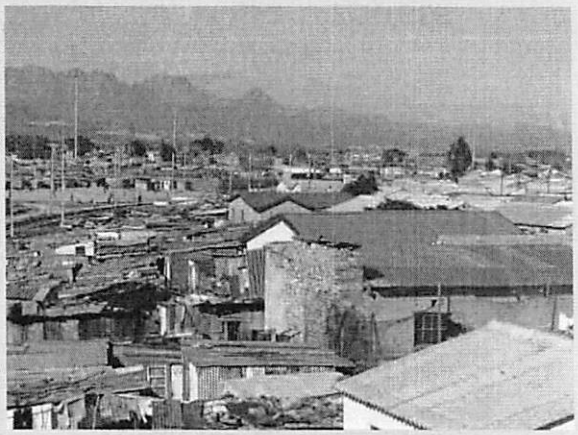
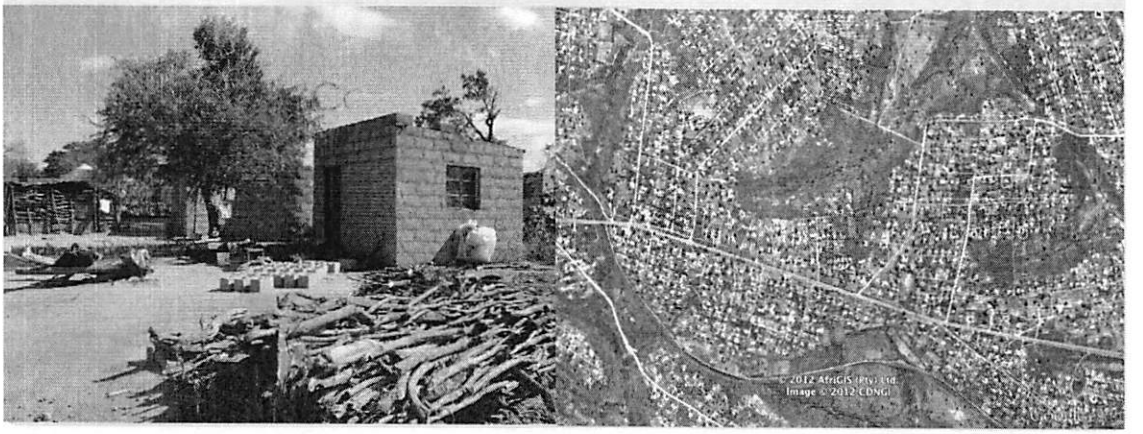
URBAN GROWTH IN AFRICA?

- Permanent migration to cities is decreasing
  (Ferguson 2007, Potts 2009)
- Urban population growth = high birth rates
  (Cohen 2004, Potts 2010)
- Urbanization = Reclassification of rural settlements (Potts 2012)
- Rural migration toward smaller towns and cities (Collinson et al. 2007)



RURAL IS THE NEW URBAN

Low resource availability, poor services, little manufacturing, dependent on local natural areas, bustling centers of activity, informal economic production, high density of people



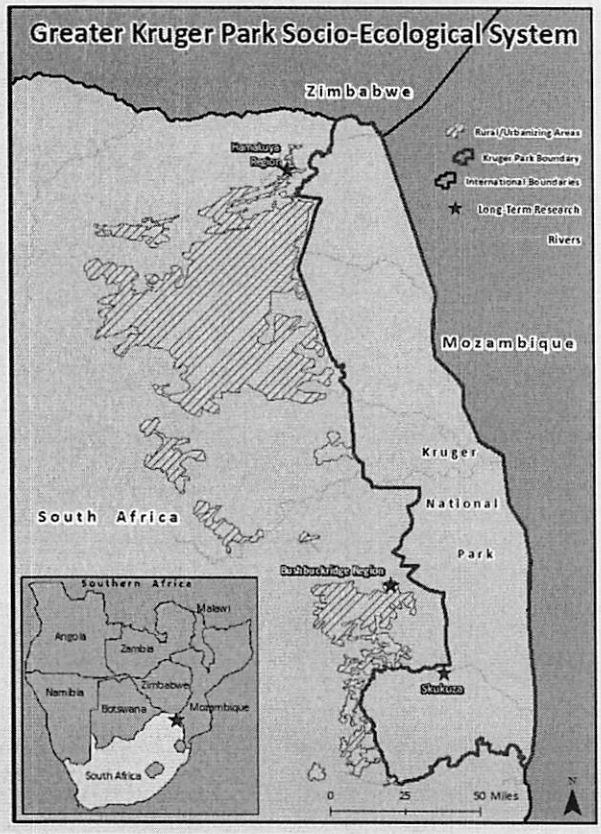
THE URBAN GRADIENT / CONTINUUM

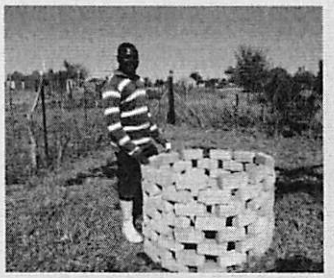
Urban/Rural "Connectivity" – Spatial or Temporal or Economic or ?

- Family and Kin relations
- Migration patterns

SOUTH AFRICA – ENVIRONMENTAL JUSTICE AND CONSERVATION

- Challenges- Unemployment, Extreme rural poverty, Political corruption, Xenophobic violence, HIV/aids, post apartheid legacies
- Advantages – large economy, progressive constitution, heterogeneous and diverse, kruger national park, urbanizing populations



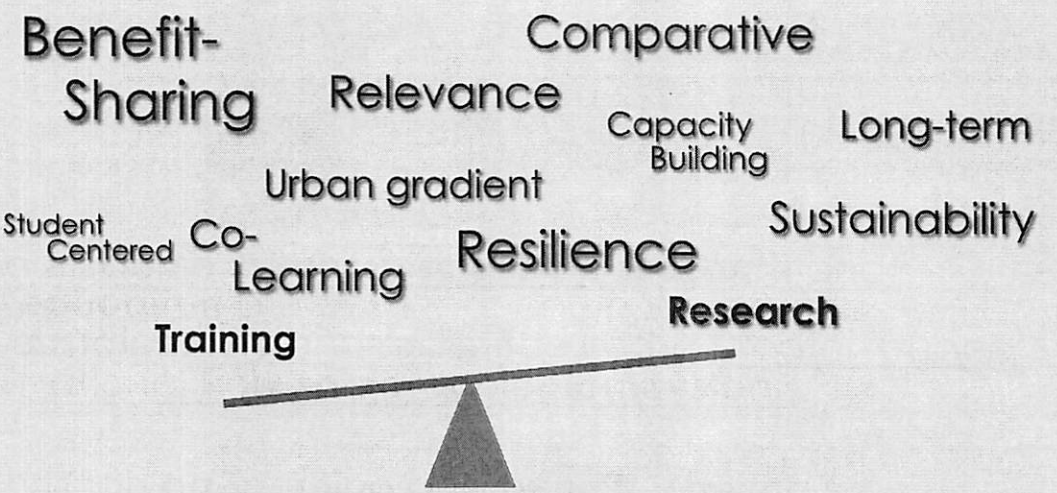


THE IMAGINE PROGRAM

DEVELOPING SCIENCE FOR THE WELL-BEING OF COMMUNITIES IN-NEED

http://urbanecologylab.wikispaces.com/IMAGINE

INTERNATIONAL GRADUATE TRAINING AND LONG-TERM SOCIO-ECOLOGICAL RESEARCH?

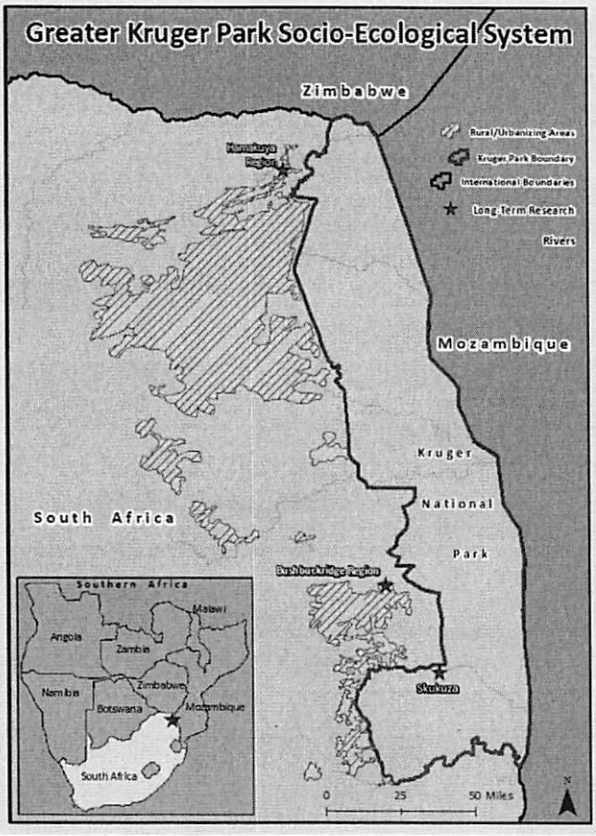


IMAGINE – OUR MISSION FOR A LTSER PROGRAM

To establish a **trans-disciplinary research** and **education** program that contributes to the **sustainability** and **resilience** of the greater Kruger National Park **socio-ecological system**.

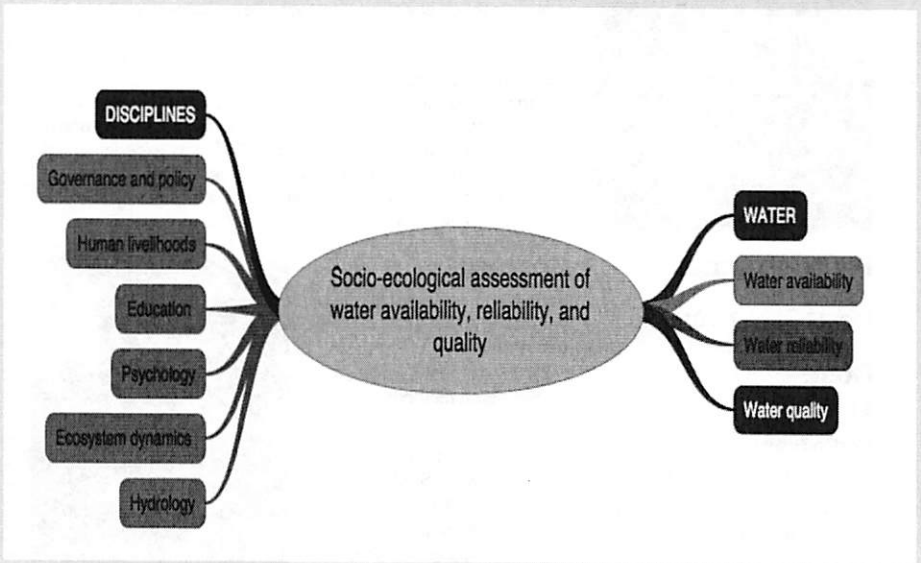
Through **co-learning** and **benefit- sharing** we will develop research that enhances the **well-being** of people living in the region.

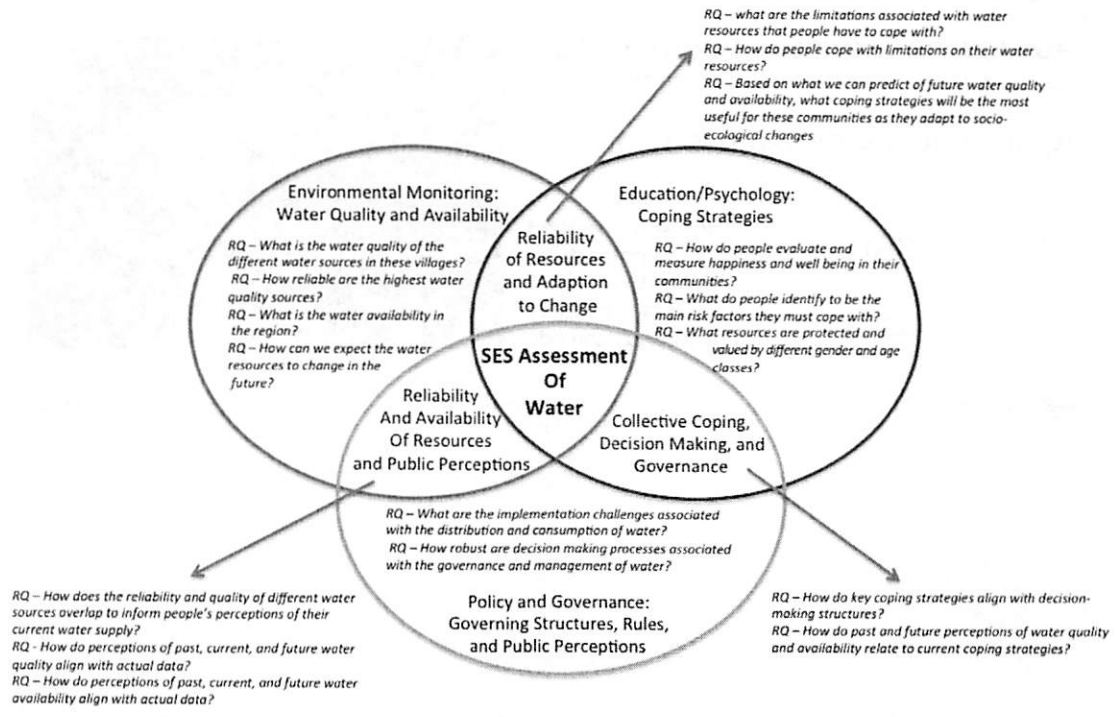
Our **collaborative** research network will expand **comparative** understanding of complex socio-ecological systems located along a **rural-urban** gradient.



2012 IMAGINE RESEARCH TEAM

INTERDISCIPLINARY APPROACH





NC STATE UNIVERSITY

SOUTH AFRICA Summer 2015

Water Woes: People, Parks, and Pollution

Designed for undergraduate and graduate students interested in sustainability, environmental technology, conservation, public health, environmental justice, policy, planning, and urbanization - participants will explore and gain a more nuanced understanding of how conservation areas and communities struggle to find balance in maintaining ecosystem health and integrity with human health and well-being. In one of the world's most biodiverse areas, Kuger National Park, this experience will allow participants to engage with the wonders of the savanna in a meaningful way while developing the expertise needed to become successful sustainability scientists and practitioners.

Program Dates:

May 17 - June 7, 2015

Cost:

$4,100

Cost includes: non-refundable application charge, tuition, housing & meals, intl health insurance, field work & park entrance fees.

Airfare *not* included.

Courses:

Participants will enroll in one of the following courses for a total of 6 credits.

- NR 595 Socio-Ecological Research Methods
- ET 495
- ADN 495 Art and Design International Studio: Documentary Digital Film
- LAR 565 International Landscape Architecture Design Studio

Application Deadline: February 15

Applications will be reviewed on a rolling basis.

Apply at studyabroad.ncsu.edu

STUDY ABROAD

make the world your classroom

The University reserves the right to alter the program format and/or costs in case of conditions beyond its control. See Study Abroad Office policies.

Program Contact Information:
Dr. Melissa McHale
Dept of Forestry
mrmchale@ncsu.edu

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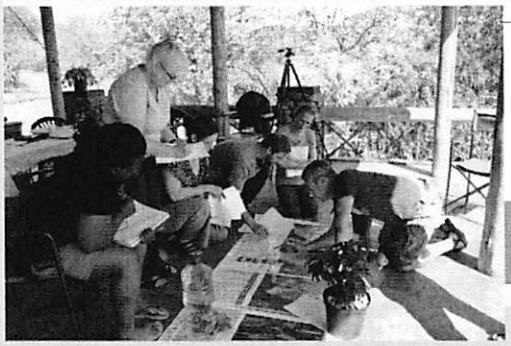

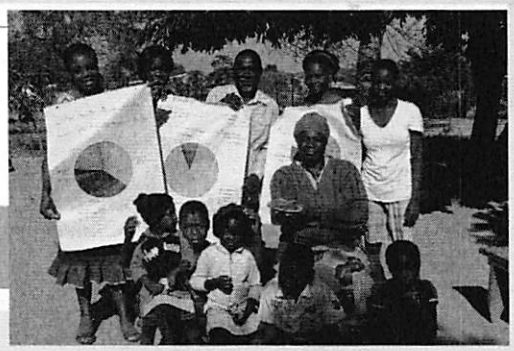

QUESTIONS?

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