Urban development, social relationships, and water policy as drivers of wetland change in the Tampa Bay Region

An introduction to USF's "ULTRA-Ex" project

David B. Lewis
Fenda A. Akiwumi
Susan S. Bell
Thomas L. Crisman
Sharon J. Feit
Shawn M. Landry
Kenneth A. Nilsson
Mark C. Rains
Paul E. Thurman
Carl C. Trettin[‡]
Raymond L. Vinson
Rebecca K. Zarger

University of South Florida &
[‡]U.S. Forest Service

Northern Tampa Bay Local Technical Peer Review Group Meeting, Southwest Florida Water Management District, Tampa, FL
19 May 2010

What is “ULTRA-Ex?”

Urban Long-Term Research Area-Exploratory Award

Supported by the National Science Foundation and the U.S. Forest Service

Image: http://georgiainfo.galileo.usg.edu/us-night.gif

NSF

USF
UNIVERSITY OF
SOUTH FLORIDA

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

What is “ULTRA-Ex?”

Urban Long-Term Research Area-Exploratory Award

Supported by the National Science Foundation and the U.S. Forest Service

- “…to enable interdisciplinary teams of scientists and practitioners to conduct research on the dynamic interactions between people and natural ecosystems in urban settings in ways that will advance both fundamental and applied knowledge.”

- “Because of the highly integrated character of the coupled human and natural ecosystems that will be studied, these teams will require the involvement of researchers from the social and behavioral, ecological, and technical sciences.”

Urban Long-Term Research Area-Exploratory Award

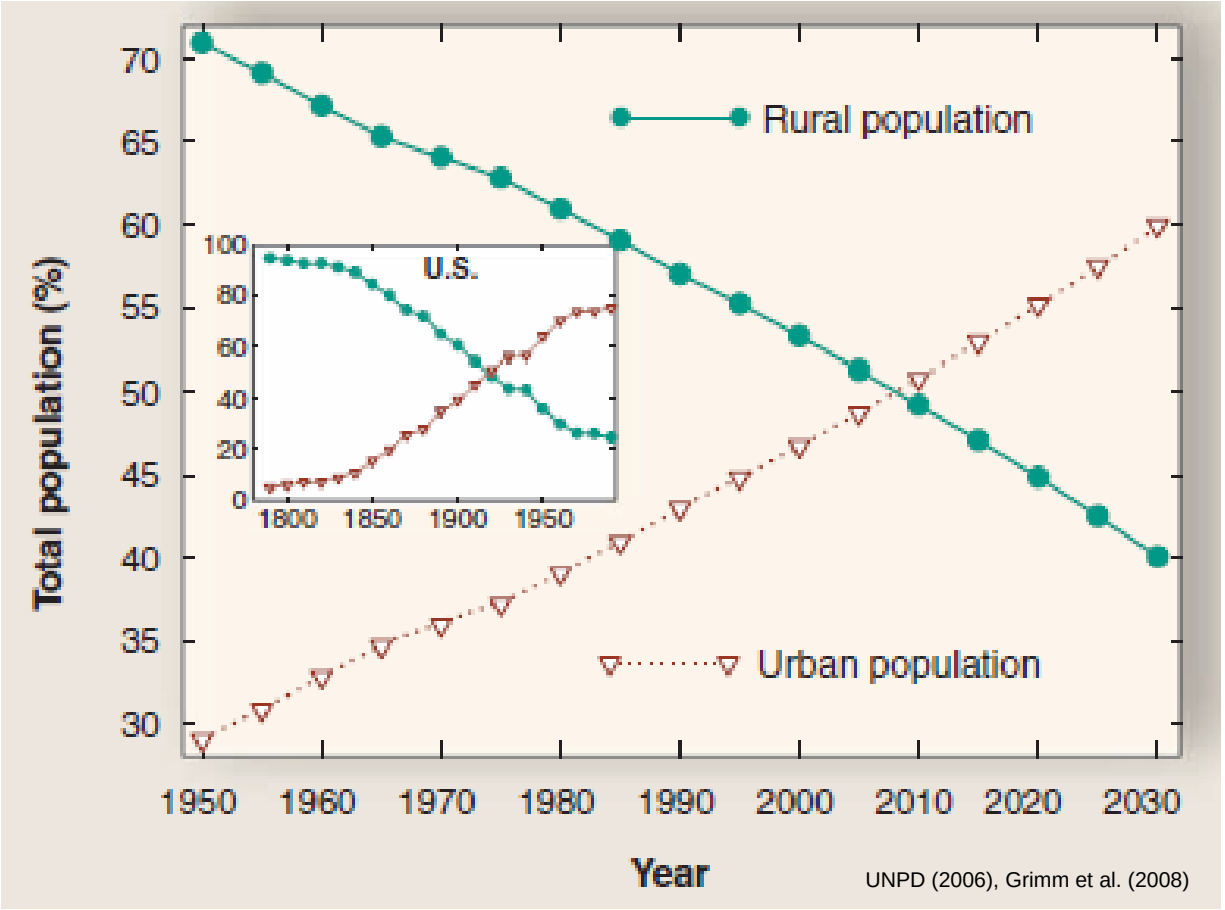
What is our charge?

- "include considerable local participation, including city or metropolitan planning offices and organizations related to management of natural resources."

- "integrate the efforts of different jurisdictions to address local and regional environmental issues."

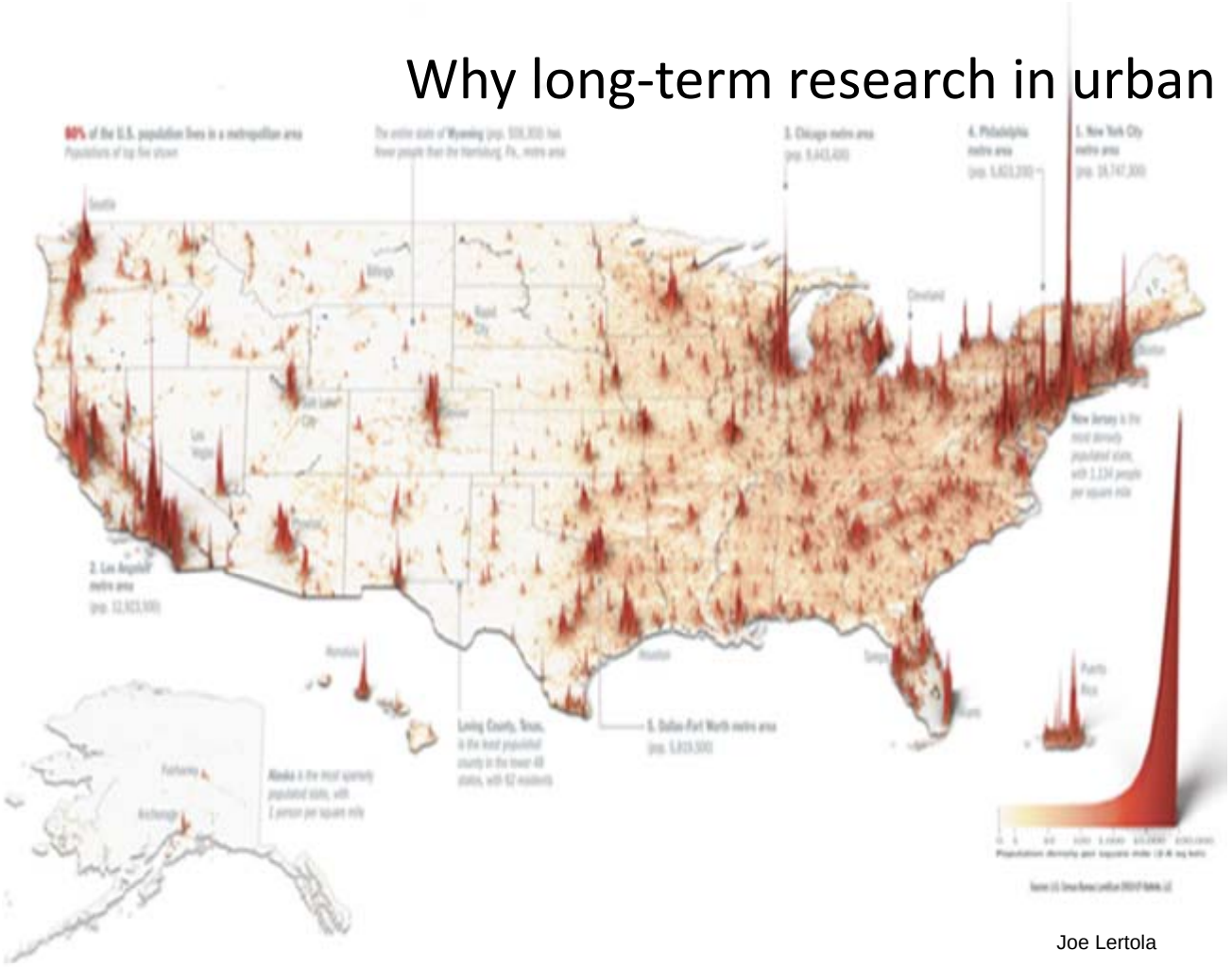
- "generate knowledge about human-natural system interactions that can be used by individuals, groups, governments, and other organizations for maintenance and enhancement of environmental quality, including the development of management and planning tools."

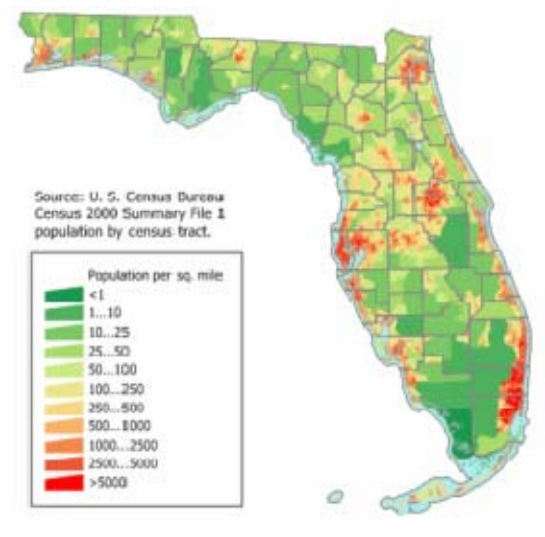
Why long-term research in urban areas?



UNPD (2006), Grimm et al. (2008)

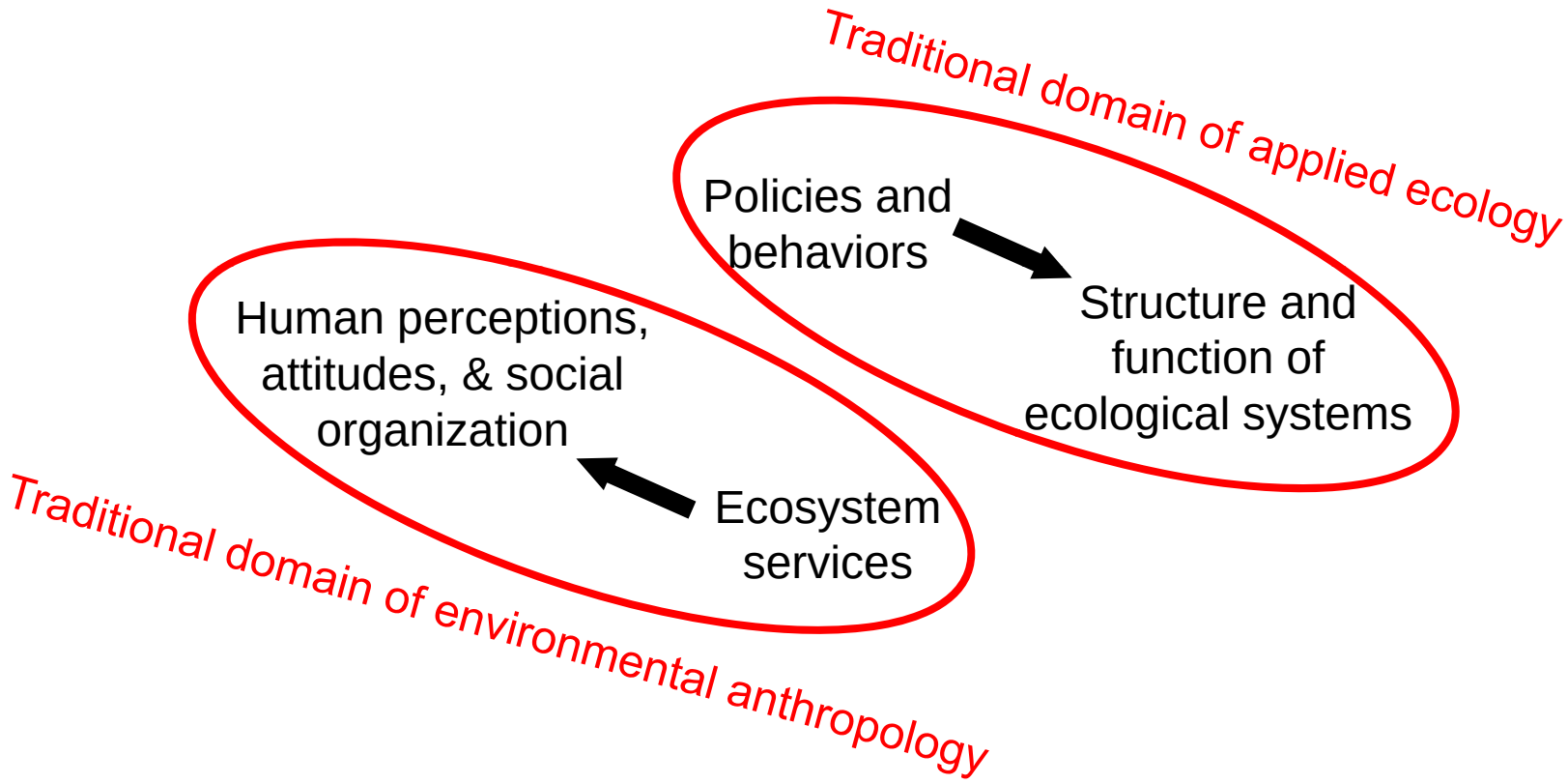
Why long-term research in urban areas?





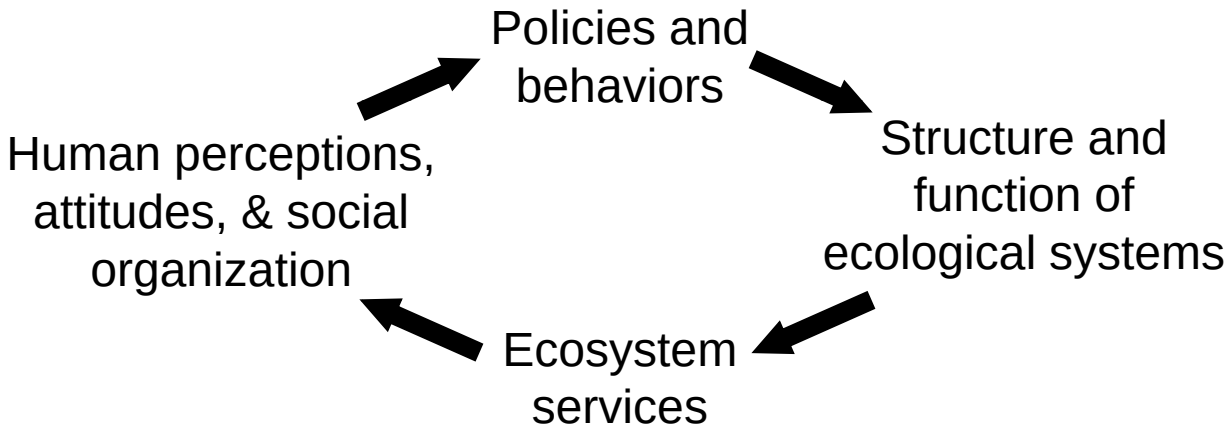
Joe Lertola

Why ***interdisciplinary*** long-term research in urban areas?



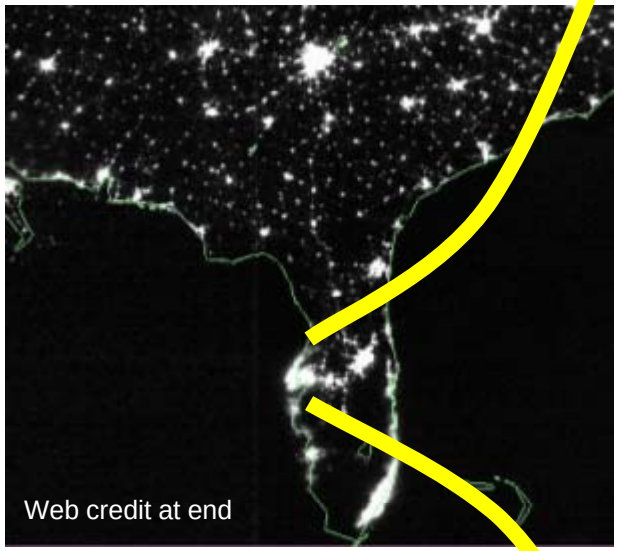
Why ***interdisciplinary*** long-term research in urban areas?

Domain of socioecology and its application to the development of planning and management tools



ULTRA-Ex in West-Central Florida

Tampa Bay Region Socioecosystem



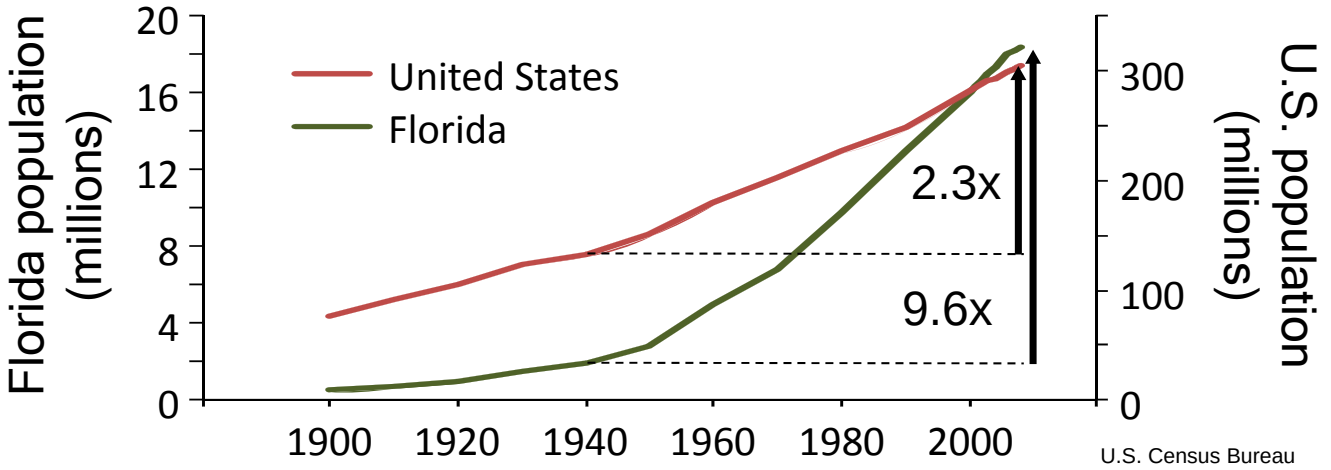
Downtown Tampa, looking north from Davis Island

1940

Hillsborough Co. Public Library

2009

Jack Winter, Panoramio



U.S. Census Bureau

Objectives of the TBRS

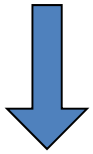
- Conduct empirical research to improve our conceptual model
- Exercise an interdisciplinary socioecological research team
- Instill an interdisciplinary perspective in social and natural science graduate students
- Develop cooperative relationships with, and provide usable information to, organizations involved in regional water resource management.

Conceptual framework of the TBRS

Borrow basic concepts from Ecosystem Ecology

Eutrophic Ecosystem

Production > Respiration



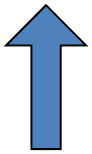
Net export of
organic matter

Examples

- Salt marsh
- Lake receiving nutrient runoff
- Aggrading forest

Heterotrophic Ecosystem

Production < Respiration



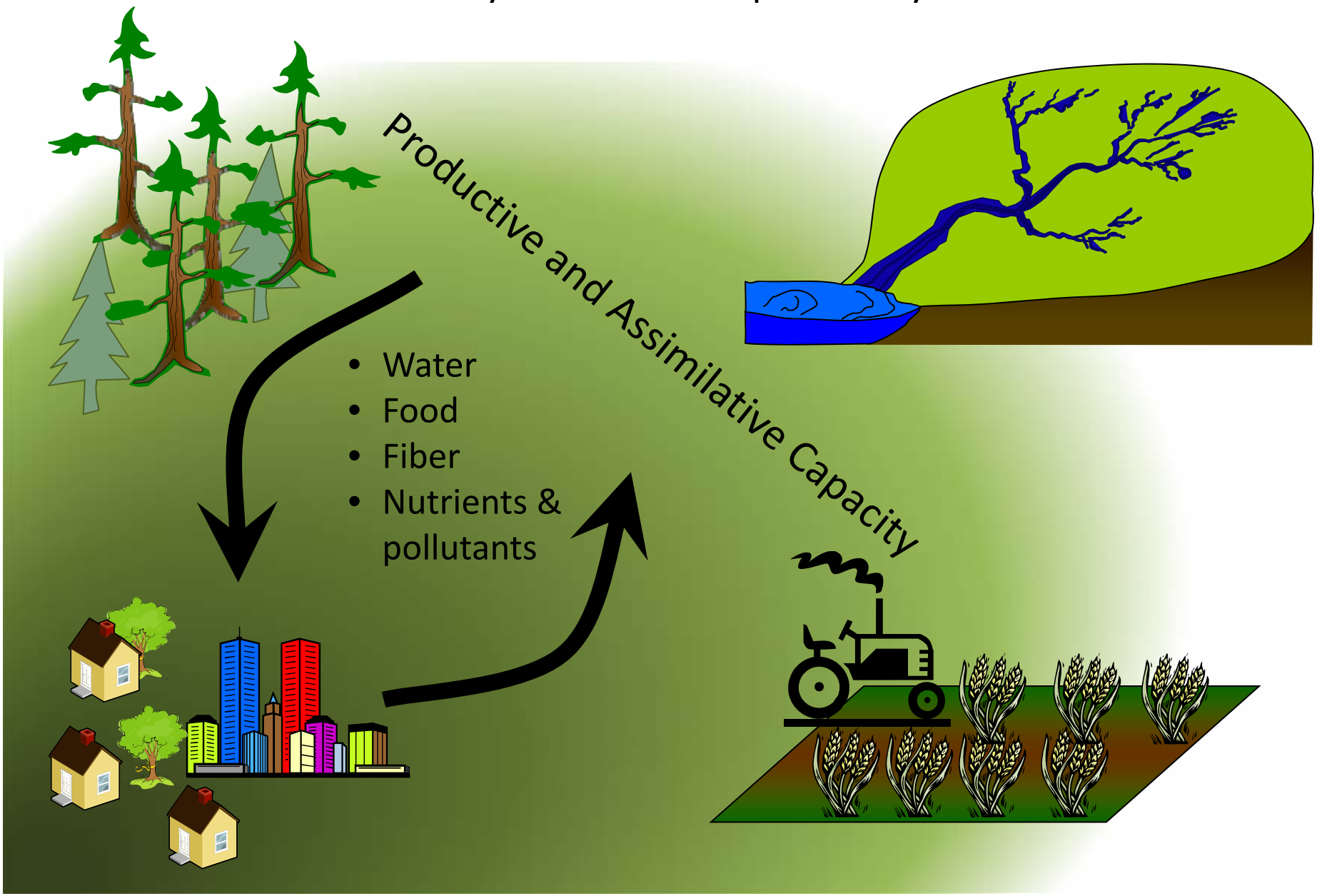
Net import of
organic matter

Examples

- Shaded forest stream
- Farm in the Great Plains
- ***City!***

Conceptual framework of the TBRS

The city as a heterotrophic ecosystem



G. M. Lewis

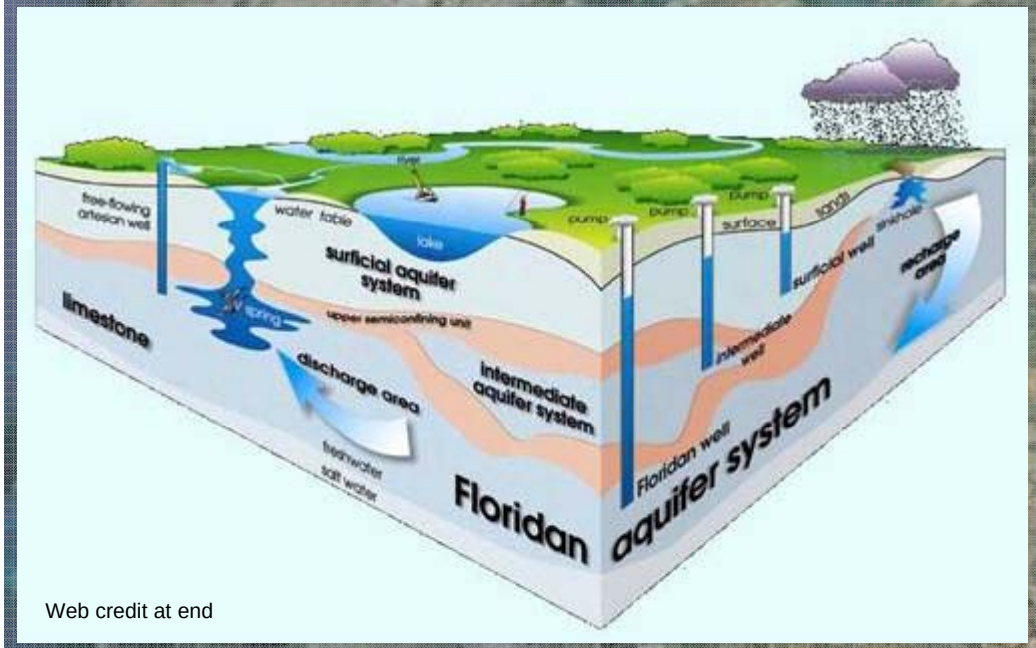
D. B. Lewis

Web credit at end

Web credit at end

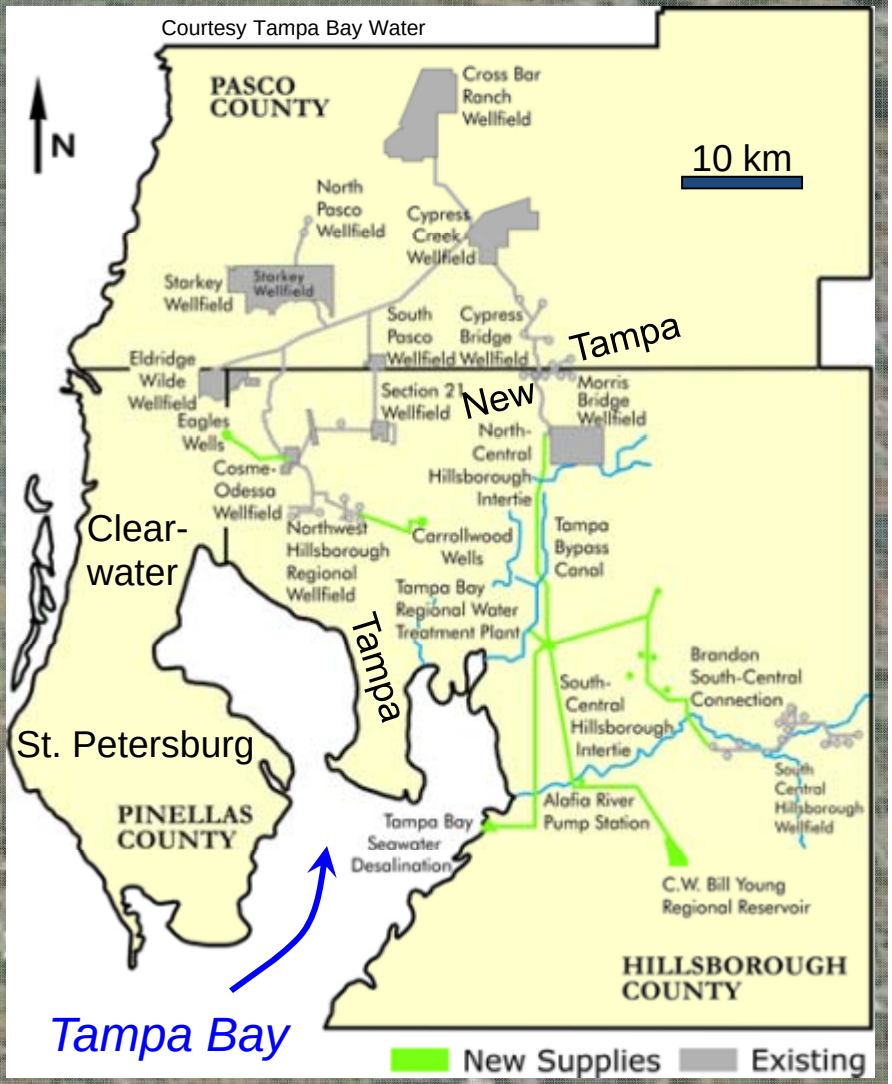
A watery blue pervades daily life here. Greater Fort Lauderdale berths an estimated 42,000 resident yachts (plus countless more that come to visit). At twilight, gondolas glide along the city's waterways, carrying couples enjoying the romantic ambience. Adventure seekers kayak through the mangrove forests of the Wilderness Waterway in Everglades National Park. The waterway stretches 99 miles around countless islands, and visitors can spend the night in the park on raised-platform campsites accessible only by water.

~Continental Airlines inflight magazine, 2006



Web credit at end

Courtesy Tampa Bay Water



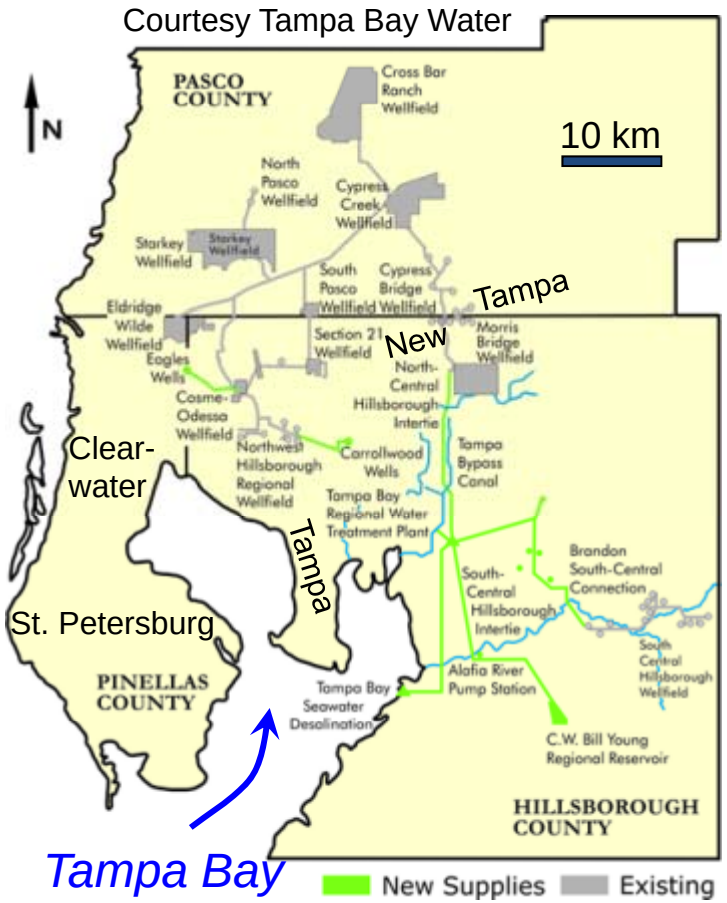

D. B. Lewis


D. B. Lewis

Cities use more natural resources than they produce → they rely on external inputs

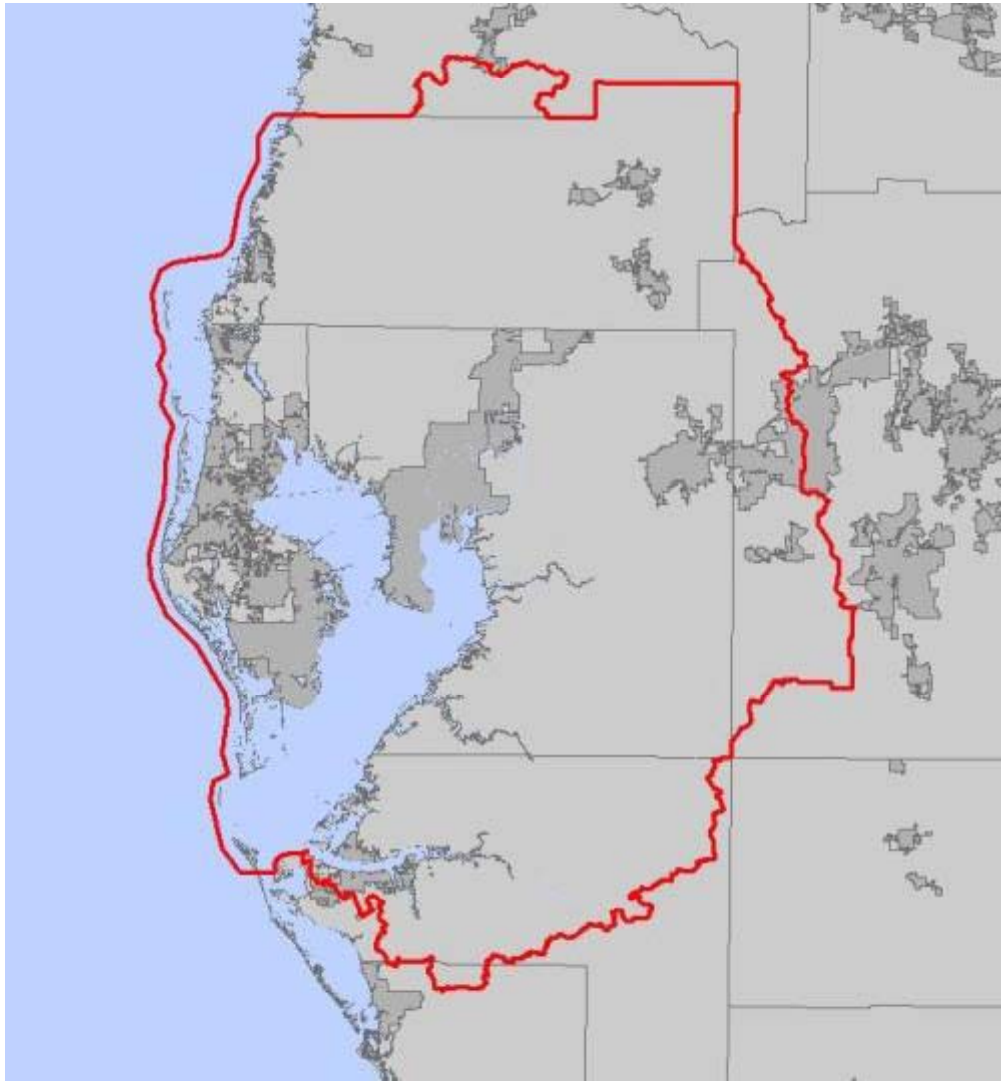
- What relationships among people and institutions facilitate the transfer of natural resources from rural areas to cities?
- How do the social and ecological systems of urban and rural areas change as a consequence?

Courtesy Tampa Bay Water



Water policy and distribution in the Tampa Bay Region Socioecosystem

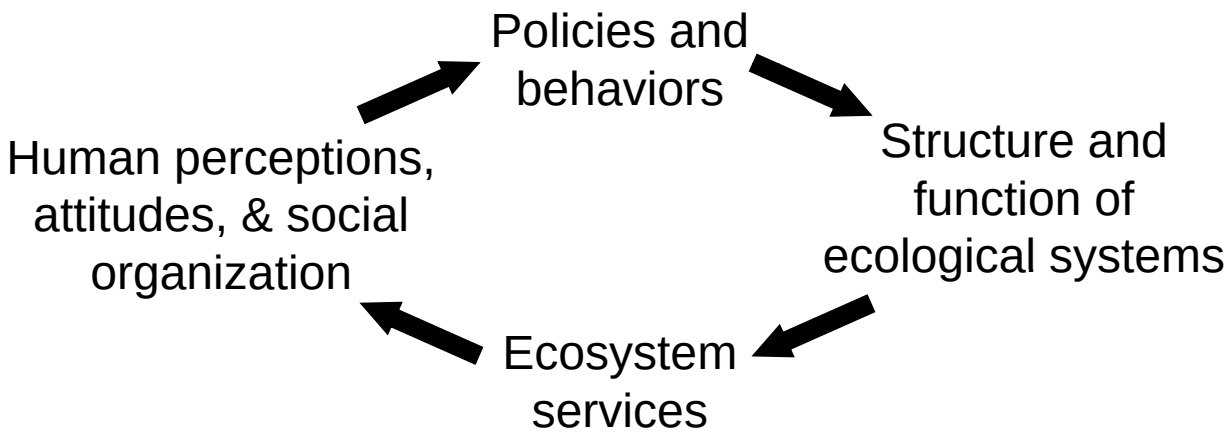
Study-area boundaries of the TBRS



Graphic: Shawn Landry

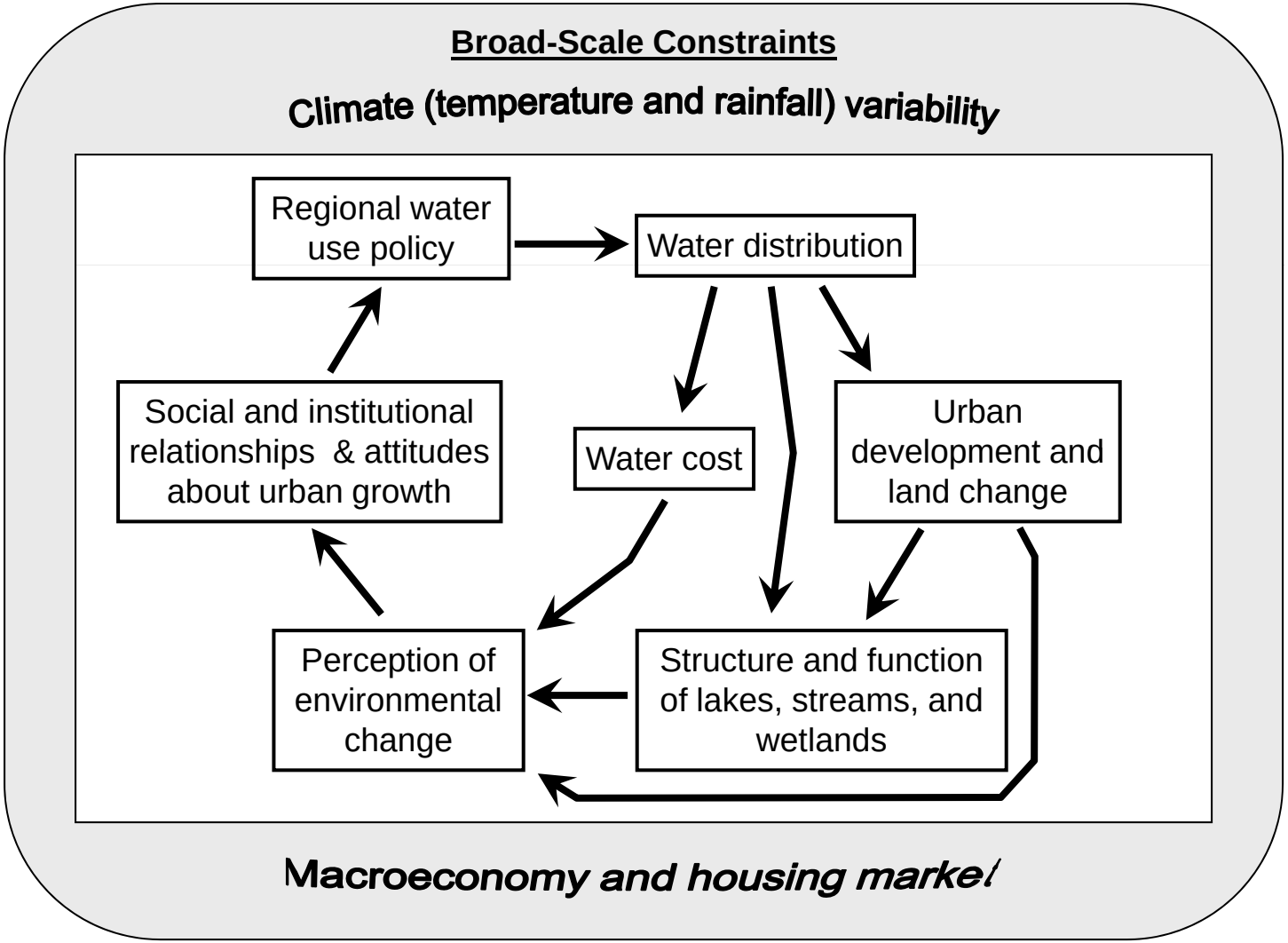
Water policy and distribution in the Tampa Bay Region Socioecosystem

Conceptual model



Water policy and distribution in the Tampa Bay Region Socioecosystem

Conceptual model

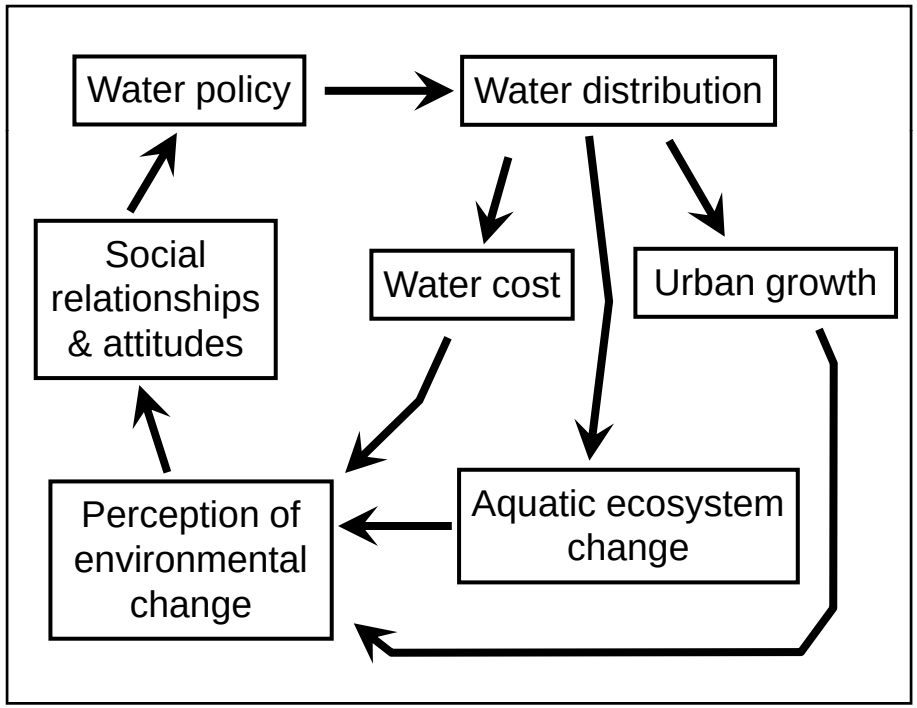


Water policy and distribution in the Tampa Bay Region Socioecosystem

Research Questions

Research Questions

1. How do perceptions and values of change in freshwater habitats vary across the urban-rural gradient?
2. How do relationships among jurisdictions and stakeholders result in particular water policies?
3. How do forested wetlands respond to water policies (e.g., groundwater withdrawal) and the urban growth that those policies facilitates?



Water policy and distribution in the Tampa Bay Region Socioecosystem

Sample questions for empirical research

Photo: D. B. Lewis

Water policy and distribution in the Tampa Bay Region Socioecosystem

Research Questions

Citizen Interviews

1. How do perceptions and values of change in freshwater habitats vary across the urban-rural gradient?

    a) How does knowledge of the water distribution system, length of residence, or other demographic variables affect perceptions of environmental change?

    b) Do residents value particular freshwater habitats and landscape types over others; how does this vary across social groups and the urban-rural gradient?

    c) Do perceptions of hydroecological change correlate with certain behaviors, such as participation in public consultations about water distribution?

Water policy and distribution in the Tampa Bay Region Socioecosystem

Research Questions

Key-informant Interviews

2. How do relationships among jurisdictions and stakeholders result in particular water policies?

    a) Who are key stakeholders in the decision-making process with regards to water distribution and how does organizational structure affect policy outcomes?

    b) In what ways does the public influence key stakeholders and regulatory decision-making (e.g., are certain social groups more engaged in public hearings)? Which social groups appear to have the greatest influence, and are any groups marginalized from the decision-making process?

Ranking of possible solutions for Southwest, US, water shortages (Casagrande et al. *2007* Human Organization)

Solution	Managers' Ranking	Public Ranking
Desert landscaping	1	1
Water banking and trading of water rights	2	11
Public education	3	9
Waste water reclamation	4	4
Pricing	5	3
Household efficiency (e.g., improved appliance efficiency)	6	8
Enforced water conservation measures	7	10
Diversion of more water from northern states (e.g., secure more Colorado River water or divert rivers from Washington state to flow to Phoenix)	8	7
Desalination	9	6
Limit population growth and development	10	2
Infrastructural efficiency (e.g., cover delivery canals to prevent evaporation)	11	5

Water policy and distribution in the Tampa Bay Region Socioecosystem

Research Questions

Wetland research with new and existing hydro-ecology data

3. How do forested wetlands respond to water policies (e.g., groundwater withdrawal) and the urban growth that those policies facilitates??

    a) What is the spatial distribution of wetlands within the TBRS, and how do wetland type and canopy closure vary with landscape context (surrounding land use and proximity to high groundwater production volumes)?

    b) How does the connection of wetlands to the underlying aquifer vary with landscape context?

    c) How do plant species composition and soil organic matter storage of cypress wetlands vary with landscape context and connection to the aquifer system?

Success of the Tampa Bay Region Socioecosystem research project

From ULTRA-Ex to ULTRA

- Peer-review publications
  - enhancing fundamental theory with respect to human-natural system interactions
- Local problem-solving
  - generate knowledge useful for maintaining and enhancing environmental quality, and for developing management and planning tools.

Photo: D. B. Lewis

Water policy and distribution in the Tampa Bay Region Socioecosystem

Collaboration and Exchange

- Key unknowns
- Surveys
- Key informant interviews
- Hydrology and wetland ecology information

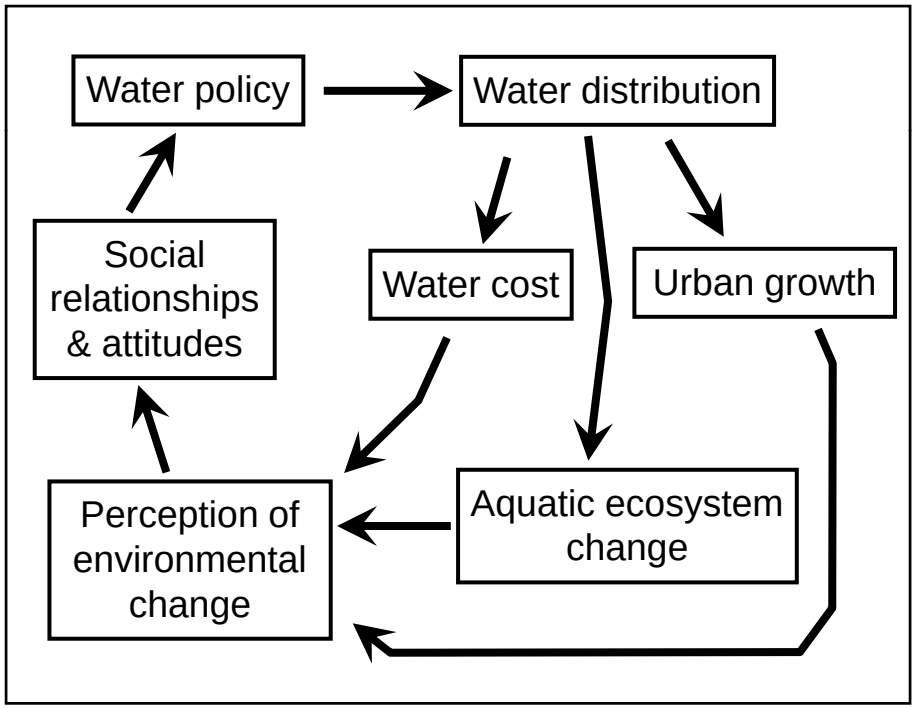
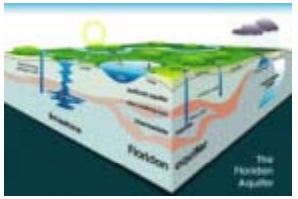


Photo: D. B. Lewis

Additional photo web credits

http://www.wec.ufl.edu/extension/gc/harmony/images/east_us_night_lg.gif
From NOAA, East Coast US at Night, 01 February 1994
NGDC DMSP Data Archive, OLS-Smooth, Visible Band

Google Earth



http://www.wec.ufl.edu/extension/gc/harmony/images/aquifer.gif

Photograph courtesy of Ted Rochow.

http://digital.hcplc.org/burgert/archive01/341.jpg

Jack Winter
http://static.panoramio.com/photos/original/2429230.jpg

http://api.ning.com/files/oypKfed1sLx2Sv2tQ3lyufsNGu-TEnDl59YkrUarxt0_/TampaSkyline.jpg

http://blogsouthflorida.com/wp-content/uploads/2007/09/north-view-ft-lauderdale-beach.jpg