A vertical strip on the left side of the slide shows a topographic map of a mountain range, with contour lines and peaks. A white circle with a crosshair is positioned on the map, and a white arrow points from it towards the right, passing through the word 'Prospects' in the title.

# Integration of Geosciences and Social Science within the LTER Program: Progress and Prospects

Nancy B. Grimm  
Central Arizona-Phoenix LTER  
Arizona State University

# Rationale

“Clear opportunities exist for interaction with physical/earth scientists, with environmental engineers, and with social and economic scientists that would greatly expand the range of application of LTER research”

- LTER White Paper

- This interaction is increasingly necessary for understanding the structure and function of most ecosystems, and for addressing today's complex environmental problems.

# CONSTRAINT

## •Geophysical template

[Climate, hydrology,  
geology/geomorphology,  
disturbance regime]



## STRUCTURE

- Populations
- Biodiversity
- Organic matter
- Nutrients
- Human component

## FUNCTION

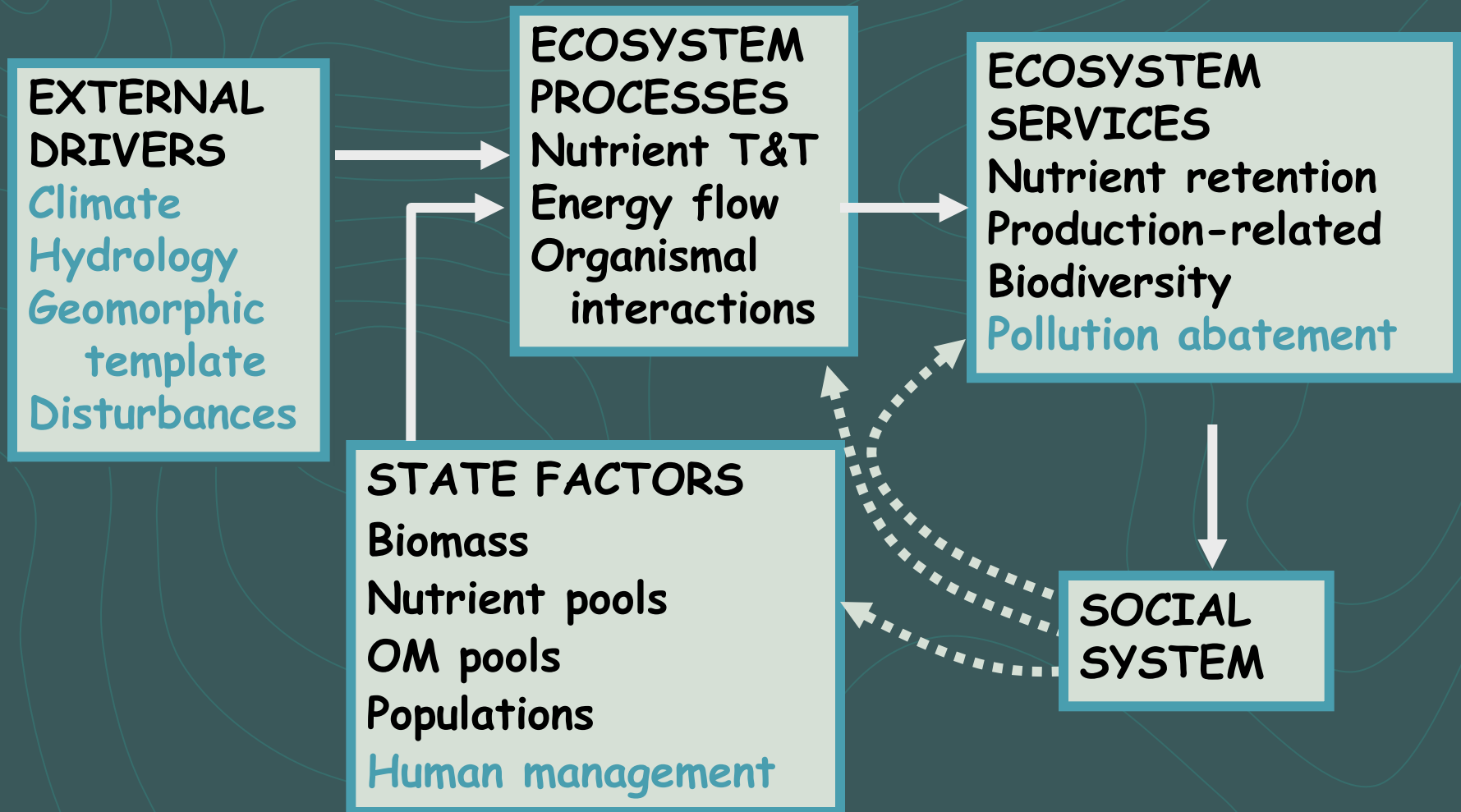
- Primary production
- Organic matter decomp
- Nutrient processing
- Human component



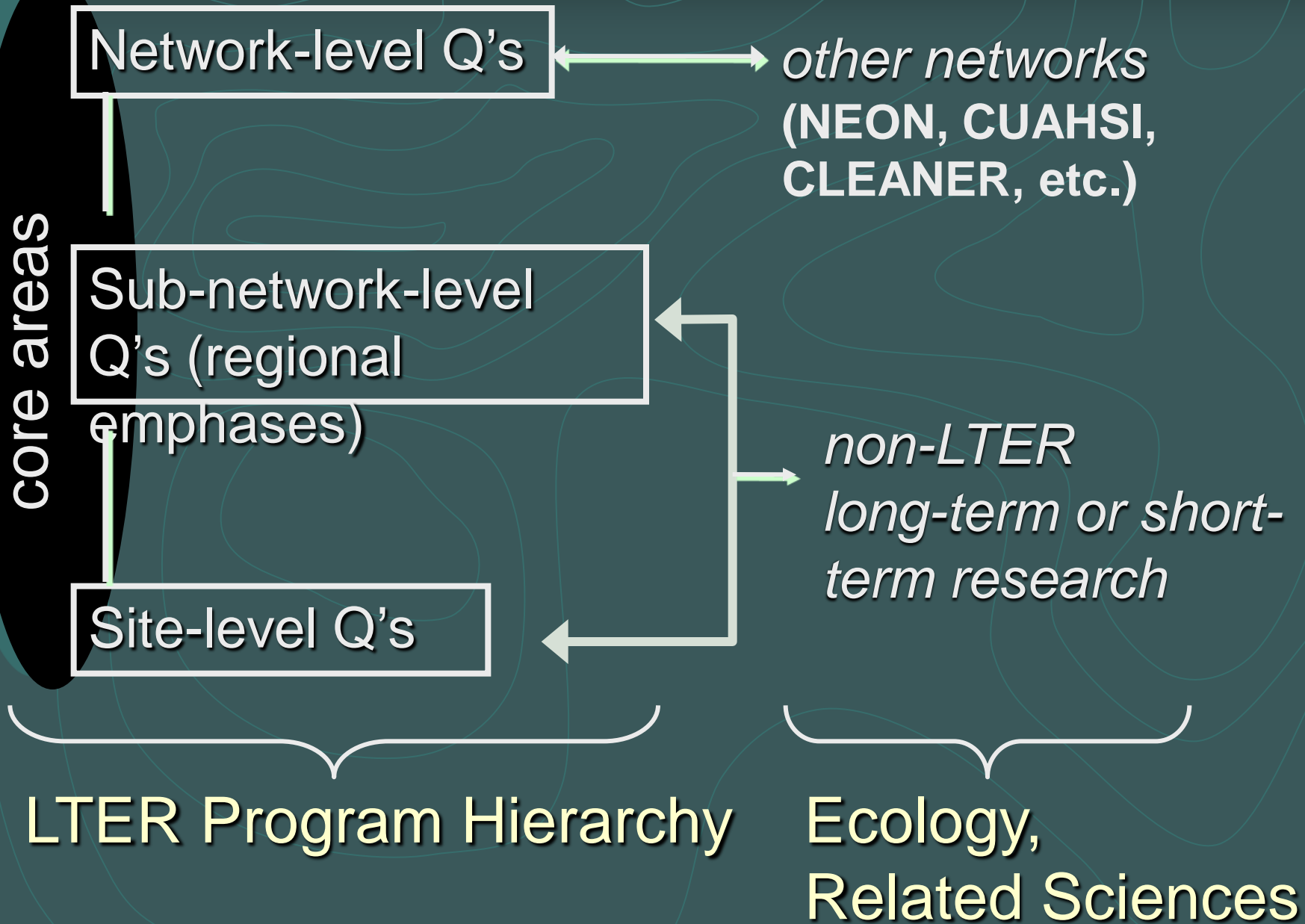
# MECHANISM



# Fit of geosciences, social sciences, and engineering into ecosystem science



After Groffman et al. in review





# CAP 2: Ecological, Economic, Social, and Political Aspects of Urban Water Systems

- **Spatiotemporal variability**
- **Consideration of supply, risk, & ecosystem services associated with water systems**
- **Restoration & preservation**
- **Vulnerability & sustainability**
- **Human perception**
- **Management/institutions**



# Sub-network questions: Regional water availability, quality, and sustainability

How can water delivery, retention, and quality be assured for growing populations in “sunbelt” regions of the Southwest?





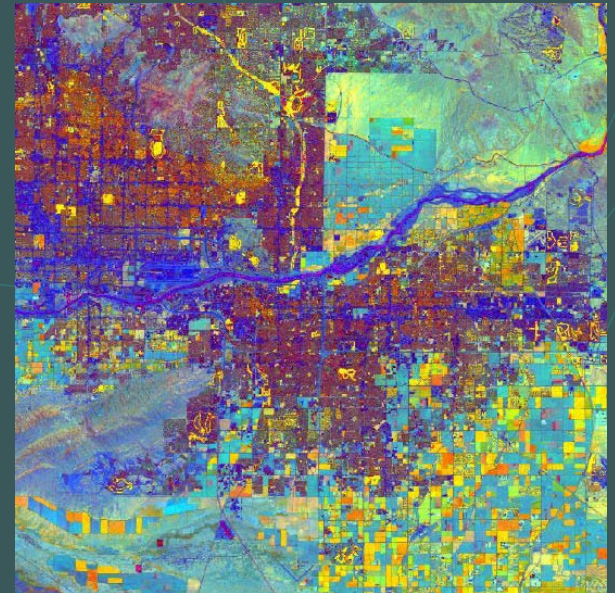
Network-level question: How does human modification of hydrology alter ecosystem structure and processes in different regions?





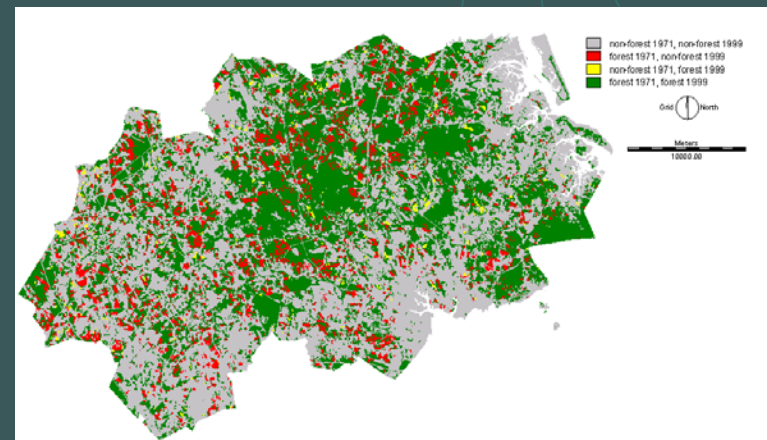
# Geosciences Research in the LTER Network

- Hydrology
- Climate
- Atmospheric chemistry
- Geologic remote sensing
- Geochemistry
- Geomorphology



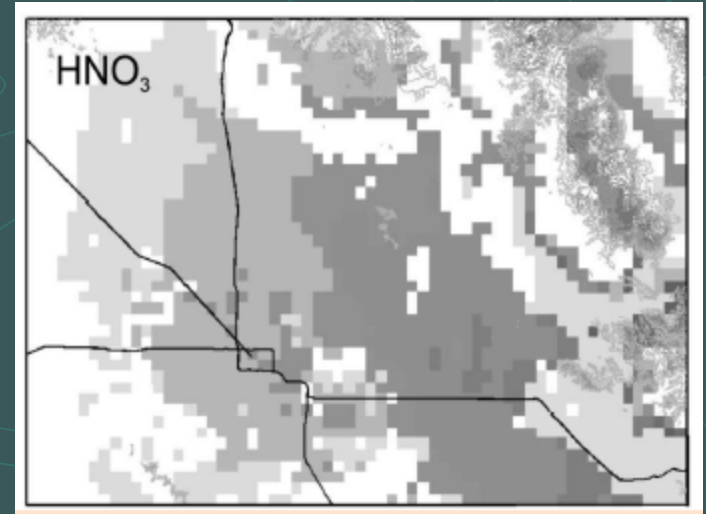
# Social Sciences Research in the LTER Network

- Land-use and land-cover change
- Land-use legacies, historical ecology
- Economic analyses of ecosystem services
- Socioeconomic drivers of land-use and land-cover change



# Engineering Research in the LTER Network

- Air pollution modeling
- Urban infrastructure
- Water systems and water treatment
- Large-scale restoration by hydrologic manipulation



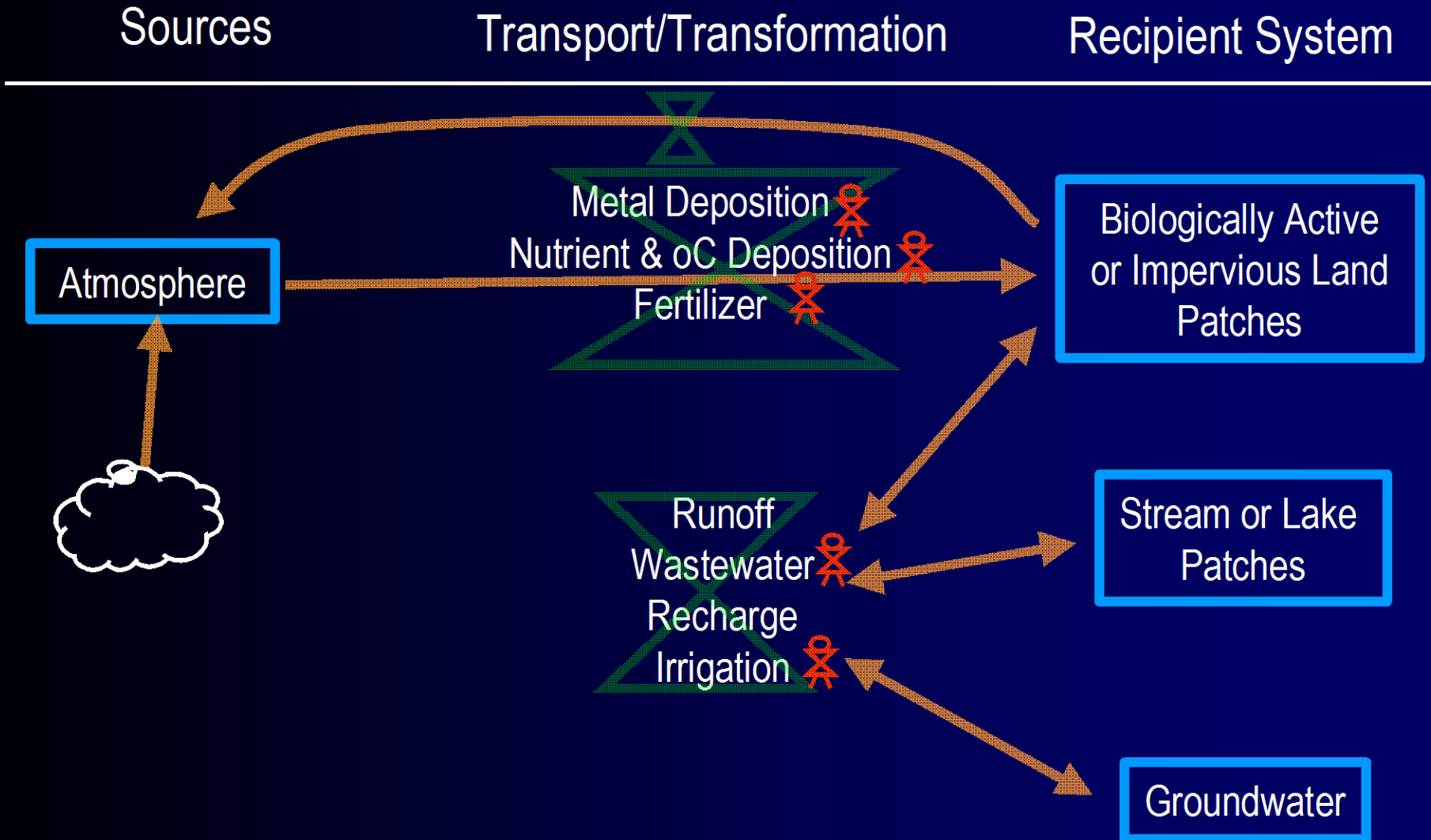


# New Ecological Theory?

To what extent and in what ways do patterns and processes in human-dominated systems require *qualitative* changes to ecological theory as it has developed until now?



# CAP2: Air-Land-Water-Groundwater Linkages in Biogeochemistry



# Future of the LTER

LTER synthesis science should adopt and make systemic the components of 21<sup>st</sup> century biology, including the investigation of complex ecological phenomena using cross-domain approaches and interdisciplinary, collaborative teams.



LTER 20-Year Review, NSF 2002