Panel Session:

From Ecosystems to Natural Disasters: Health, Economic, Security and Resource Implications

American Public Health Association

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Nevada System of Higher Education

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DRI—Environmental Research Campus of the Nevada System of Higher Education

Research Divisions:

- Atmospheric Sciences
- Earth and Ecosystem Sciences
- Hydrologic Sciences

Integrated Science Centers:

- Center for Advanced Visualization, Computation, & Modeling (CAVCaM)
- Rogers Center for Environmental Remediation and Monitoring (CERM)
- Watersheds and Environmental Sustainability (CWES)
- Clean Technologies and Renewable Energy Center (CTREC)

Unique Aspects:

- A non-profit organization. Faculty do not have tenure. Salaries are raised through grants and contracts.
- Over $37M in sponsored research in FY2010 with 66 percent for US federal agencies, 21 percent for local and state governments, and 14 percent for private and foreign sources.

Strategic Directions in DRI's Environmental Research Mission

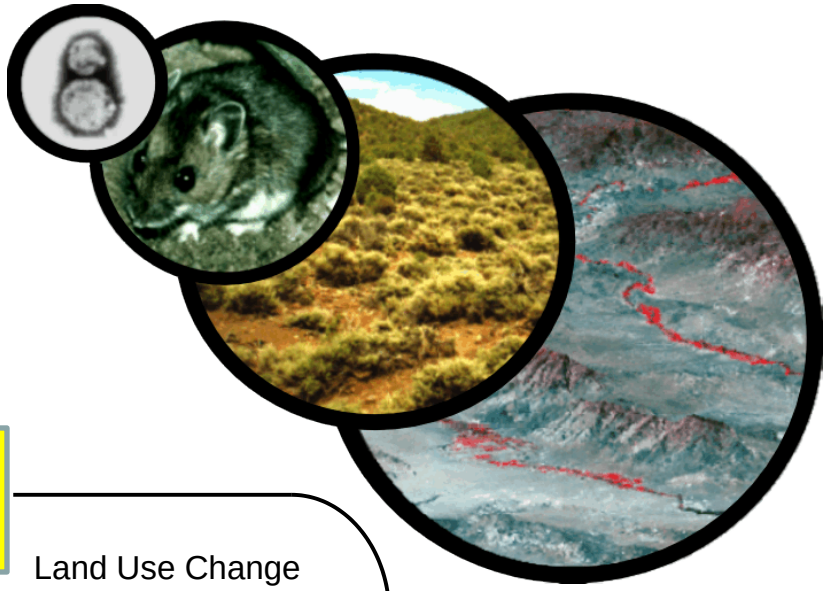
- DRI will make significant, measurable enhancements to basic & applied environmental research mission – expansion of core research:
  - Impact of climate change on earth's hydrologic, physical, biological, and human systems.
  - Environmental change and human health
  - Modeling & visualization
  - Environmental informatics
  - Clean energy systems & applied technology
  - Improved resource management.

  - ***Examples of research pertinent to public health by examining systems--***


Along the edge of Greenland's vast ice sheet

Landscape Epidemiology of the Hanta Virus

Knowledge of the environmental conditions necessary for maintenance of a pathogen in nature should allow one to identify spatial and temporal distribution of disease risk.



Remote Sensing / GIS

Field Studies

Laboratory

LANDSCAPE

Distribution
Connectivity
Dispersal

Land Use Change
Human Exposure
Climate

HABITAT

Diet
Species / Genotype
Shelter Type
Home Range

Presence / Absence
Predation / Competition
Forage Yield

RODENT

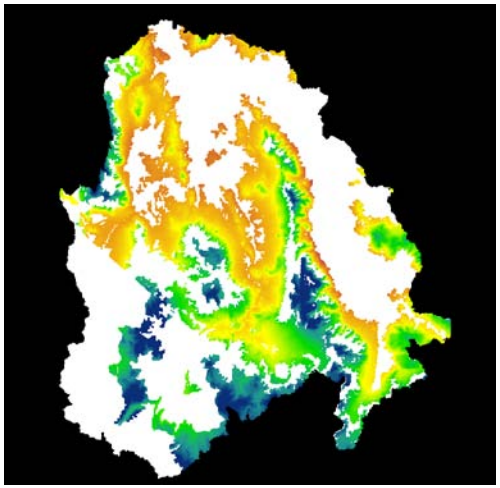
Infection
Transmission

Population Density
Reproduction Rate

VIRUS

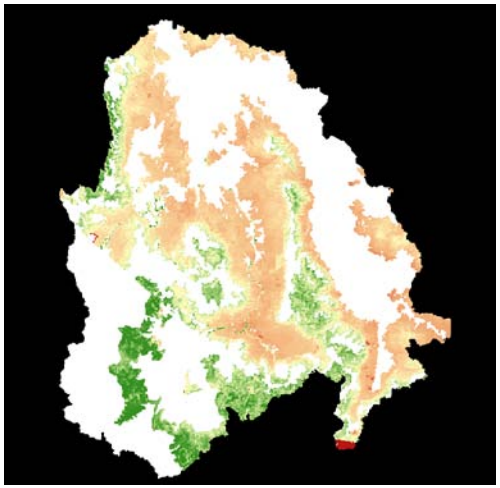
Dr. Ken McGwire
Division of Earth & Ecosystem Sciences

Elevation



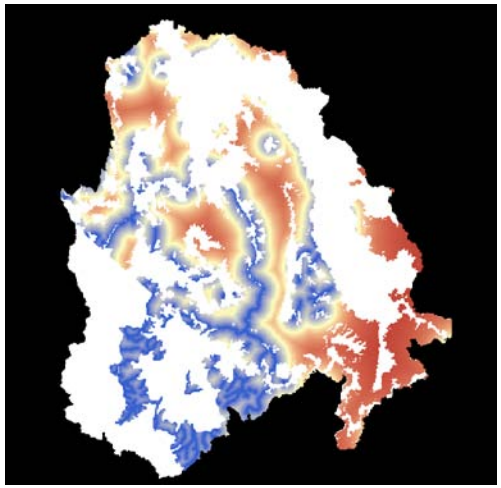
Low High

NDVI



Low High

Distance from Streams



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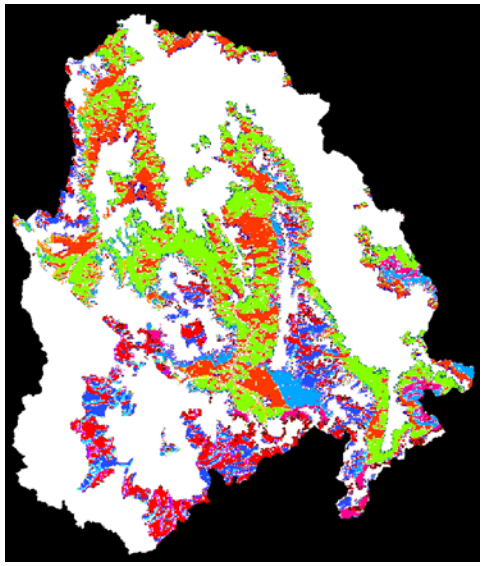
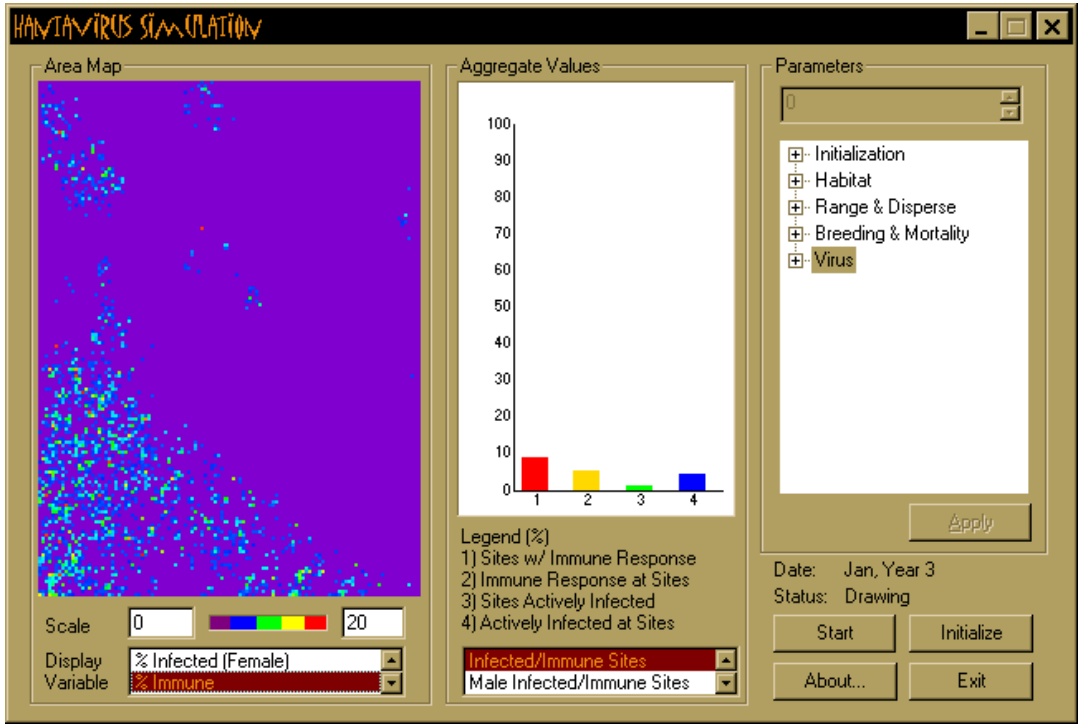


Sagebrush Sampling Strata

Distance from Roads

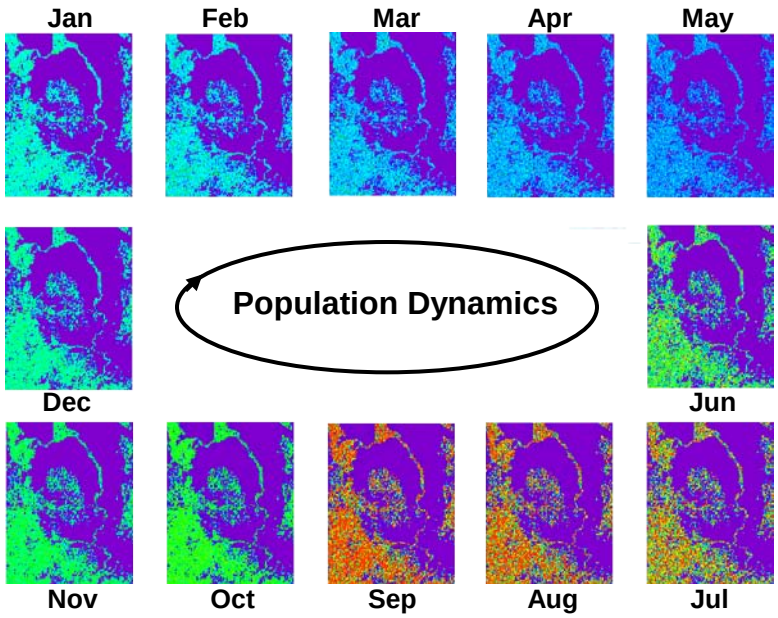
Field Sampling Strategy based on Remote Sensing & GIS

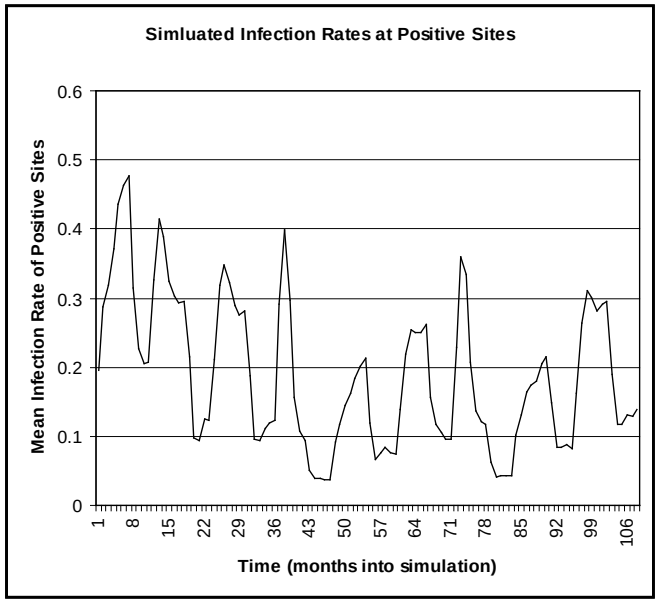
- capture environmental variability
- avoid bias in where deer mice (the carrier) are collected.
- increase efficiency (time/cost) of collecting animals to test for the virus.



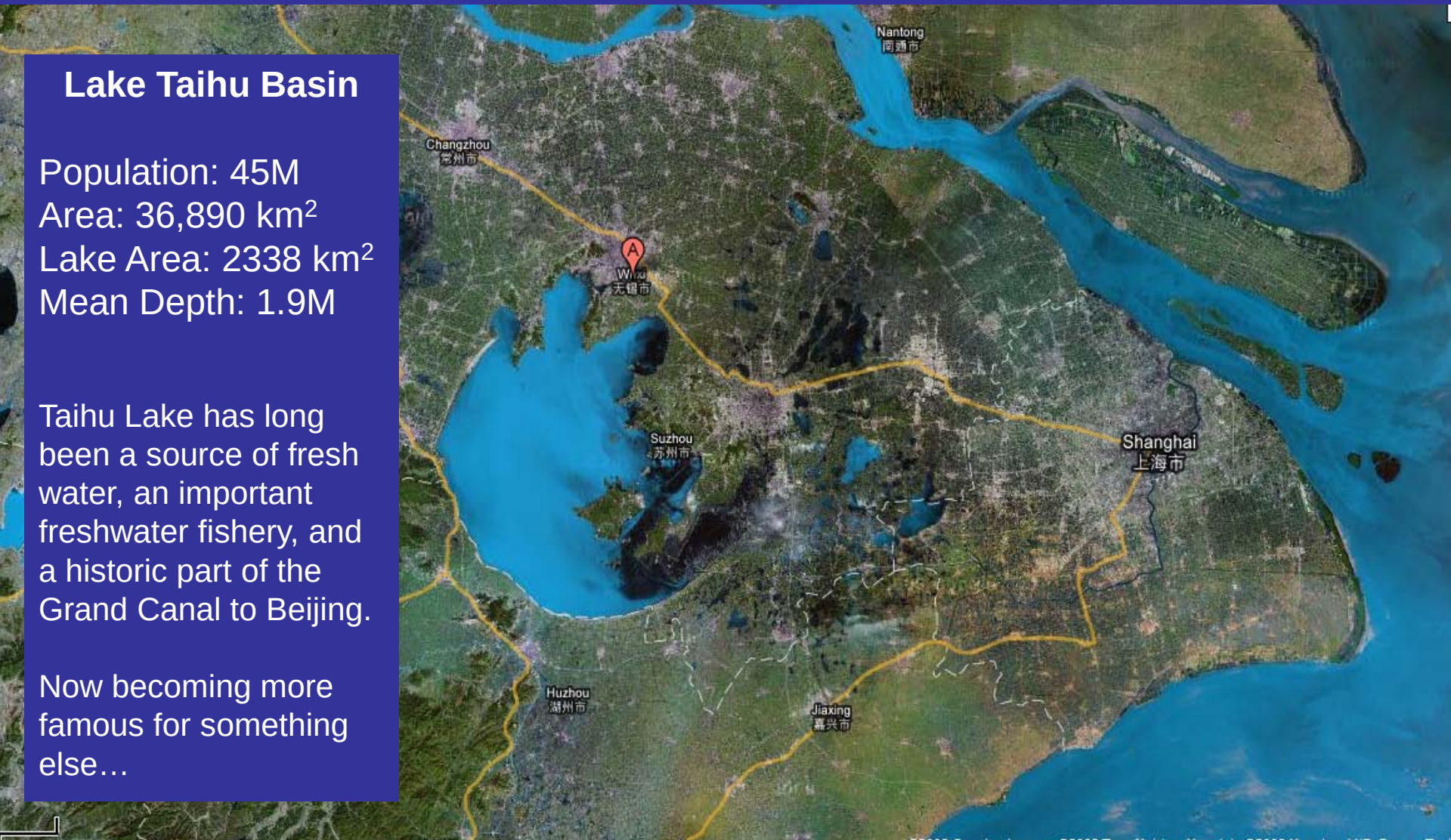
Modeling Population Dynamics and the Infectious Processes

- GIS-based habitat map
- Population responds to climate
- Simulates dispersal
- Tracks number, age distribution, and infection status of deer mice.





Taihu Lake, China—
Urbanization and Environmental Degradation at a *Dizzying* Pace



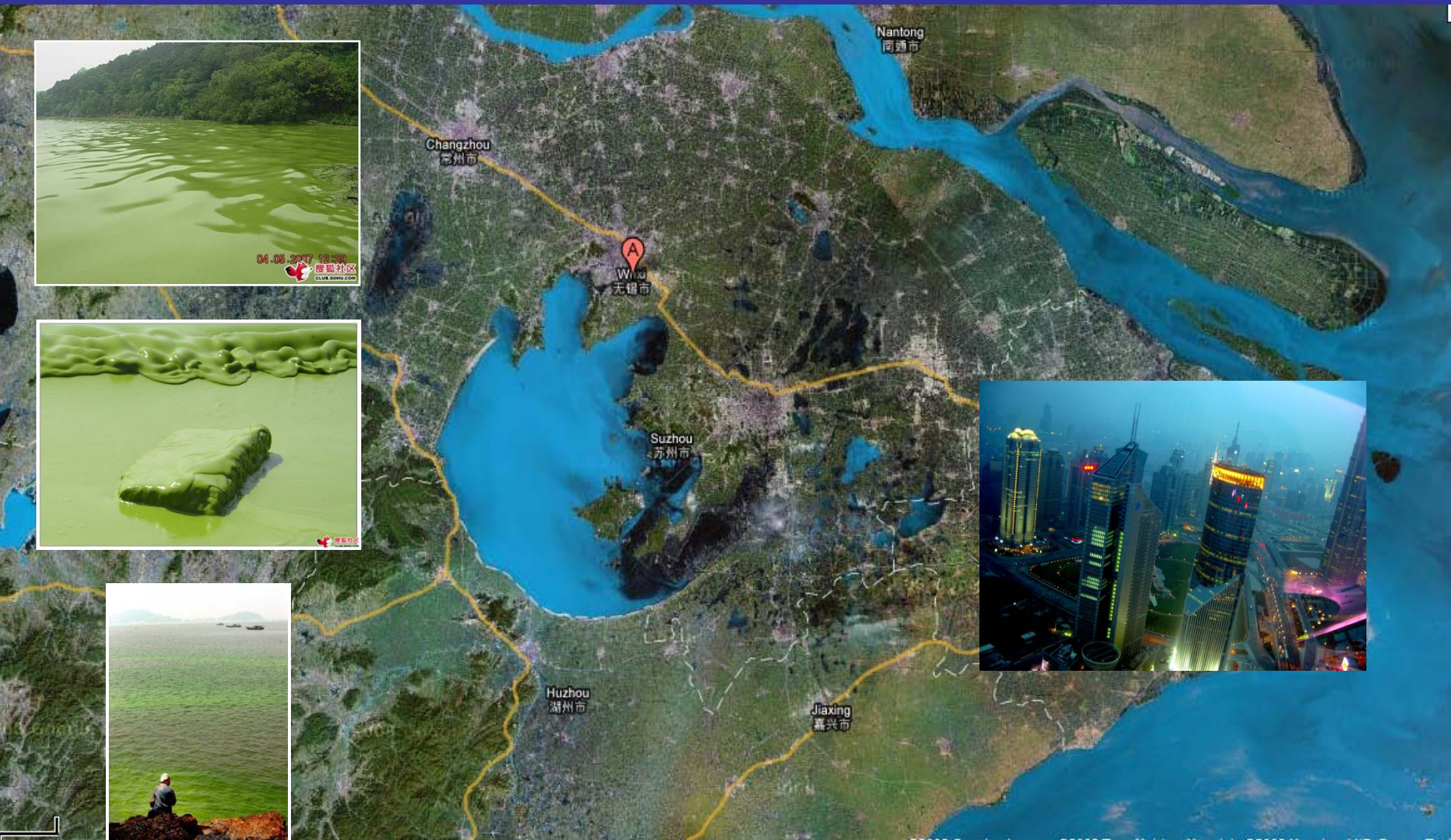
Lake Taihu Basin

Population: 45M
Area: 36,890 km^2
Lake Area: 2338 km^2
Mean Depth: 1.9M

Taihu Lake has long been a source of fresh water, an important freshwater fishery, and a historic part of the Grand Canal to Beijing.

Now becoming more famous for something else…

Taihu Lake, China—
Lake Eutrophication from Point and Nonpoint Source Pollution.
Shanghai and other cities forced to look at other sources for water.



Taihu Lake, China
Restoration of Lake and Protection of Public Health
—Where Does One Begin?

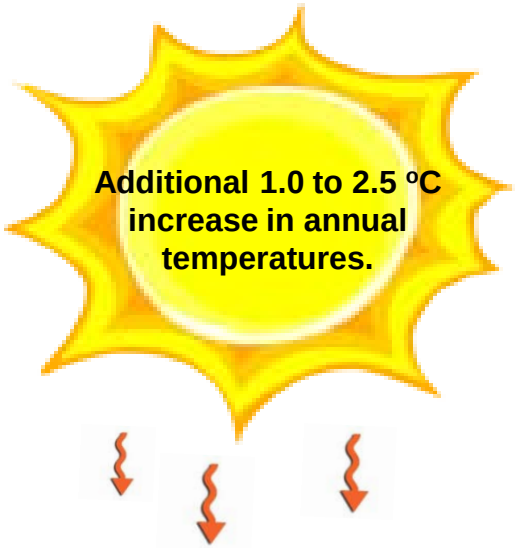
Dr. Kumud Acharya
Division of Hydrologic Sciences

Spatial and Temporal Trends in Eutrophication- Examining the System

--Algal blooms most significant in northern bays.
--Particular tributaries account for vast majority of pollutants to the lake.
--Algal blooms most common in the wet season when stream flow is highest.
--Atmospheric deposition may account for 30% of the N loading.

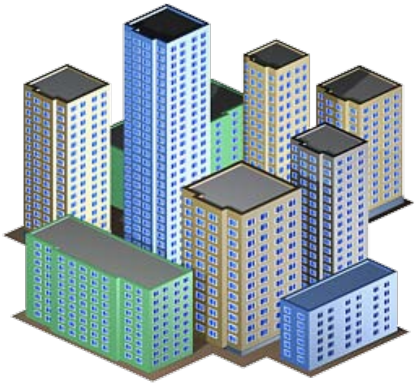
Alternatives to Taihu Lake as a water source?: groundwater. However, levels are dropping and salt water intrusion is occurring.

Projected Climate Change in the Southwest U.S.
The Next 50 Years



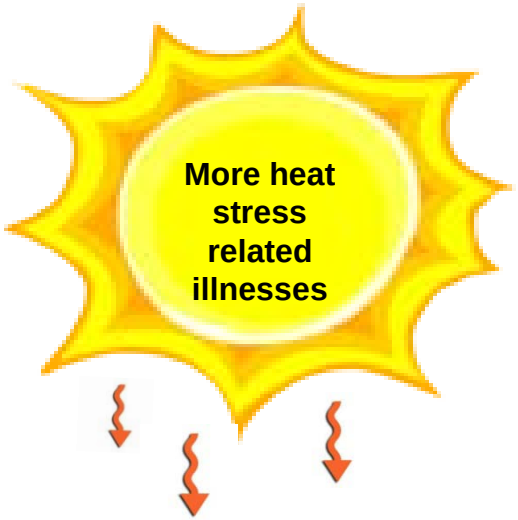
Reservoir

Reservoir



Projected Climate Change in the Southwest U.S.
Implications for Public Health

Winter snowpack is a less reliable source of base flow for rivers, affecting water supply.

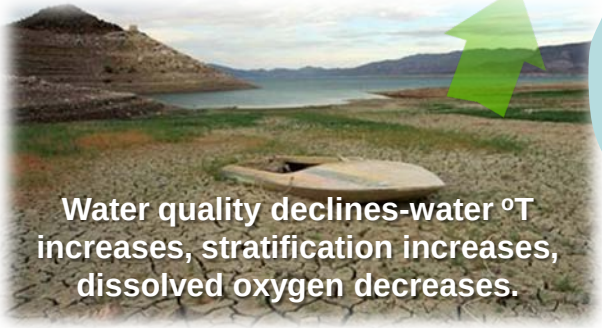


Contaminant pulses into streams and lakes.

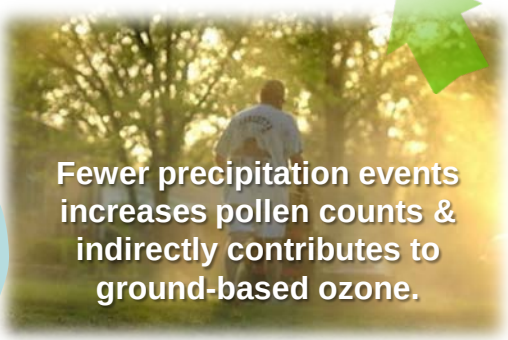
Reservoir or Lake

Reservoir

Higher PM_{10} emissions off burned & disturbed land; respiratory health consequences.



Water quality declines-water ^{o}T increases, stratification increases, dissolved oxygen decreases.



Fewer precipitation events increases pollen counts & indirectly contributes to ground-based ozone.

OVER FIFTY YEARS OF ENVIRONMENTAL RESEARCH CHANGING LIVES

- **Interdisciplinary approaches lead to more comprehensive understanding of environmental systems and system changes that affect public health.**
- **More than half the population of the word now lives in urban/built environments. Research must increasingly examine intersection of natural and built environment for successful solutions.**
- **Infrastructure for water, food, and other resources built around particular patterns of environmental processes. If patterns are changing, so must the infrastructure or the way we use the infrastructure.**
- **Risk of the welfare of urban environment coming at expense of the broader environment & the people who still live in rural areas.**

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