



# BREE Social Systems Team Overview

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2 post docs & 1 GRA

# Main Research Question for Social Systems:

- *How do governance networks, institutional rules, macro-economic indices and resource allocation decisions respond to extreme events and how can this knowledge be used to design public policies and governance networks that enhance resilience across the Lake Champlain Basin?*
- The Stockholm Resilience Centre has laid out two grand challenges for the study of adaptive governance:
  - What are the important multiscale processes in Social Ecological Systems governance that lead to more or less resilient outcomes on the ground?
  - What are the tradeoffs between management priorities and Social Ecological Systems for long-term sustainable futures and how do these play out over different scales?

# Social Systems Key Concepts:

## Building Blocks:

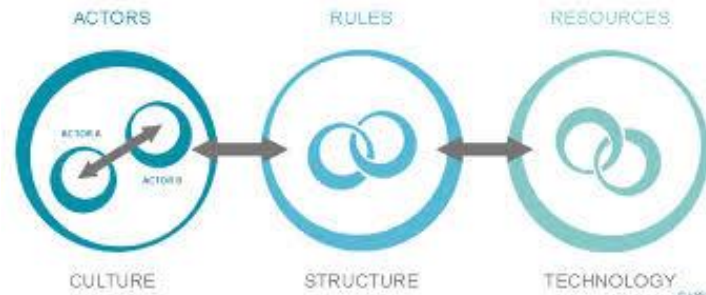
- **Agents** (farmers, urban residents, rural/forest land owners, town managers, watershed managers, policy makers, governments, nonprofits, firms) (consumers, citizens, owners...)
- Agent **behaviors** (rational, boundedly rational, non-rational)
- Agent **ties** (to each other, to the land, to markets, etc.)

## Methods:

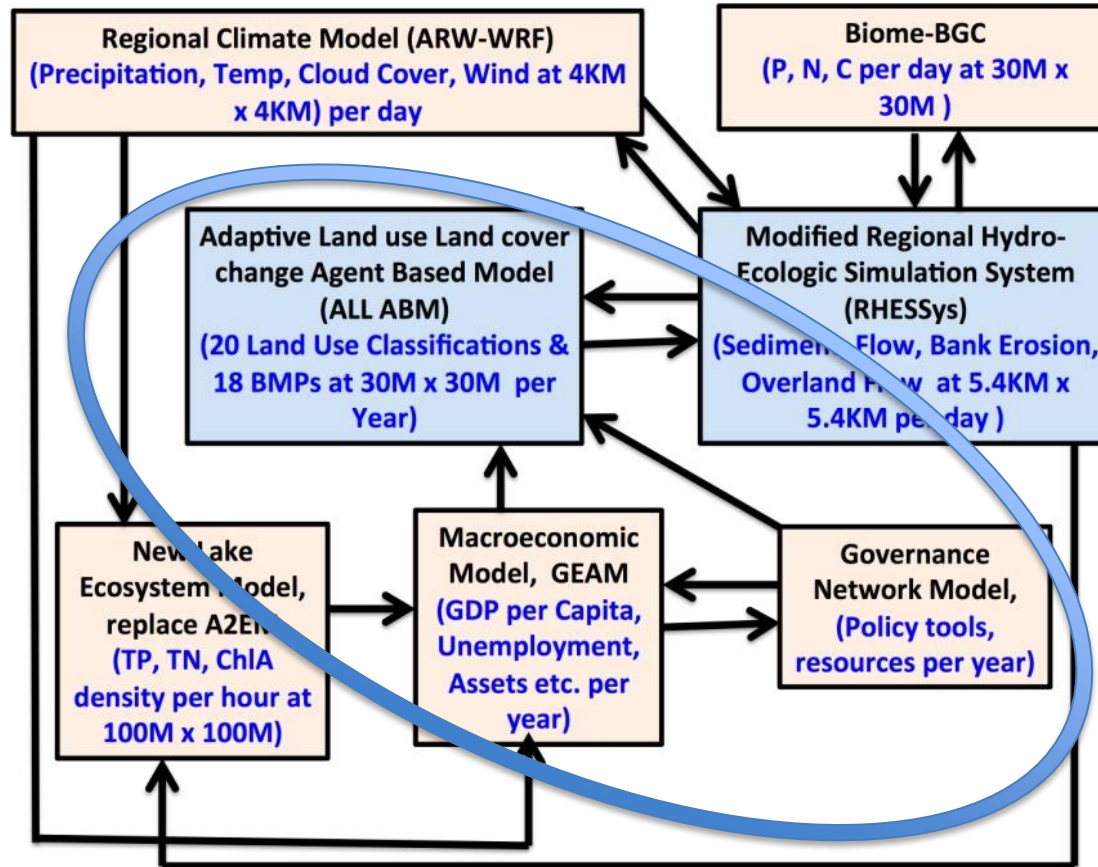
- **Surveys** (Governance Network configurations and functions; agent decision heuristics)
- **Focus Groups** (Governance Network configurations and functions; Scenario planning; Model validation)
- **Network Analysis**
- **Agent-based modeling**

## Critical elements:

- **Governance & policy design** ( $H_1$  : Governance failure)
- **Agent cognition & learning** ( $H_2$ :Risk perception)
- **Stakeholder engagement for Adaptive Management**

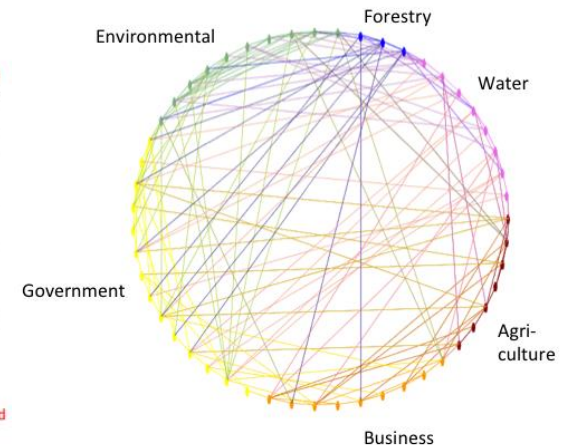
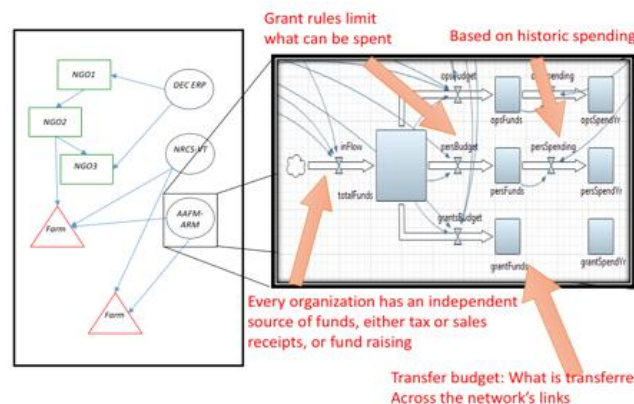
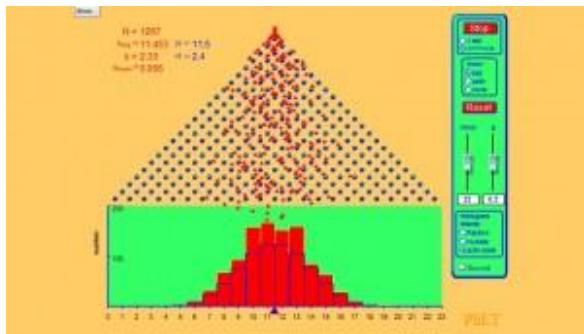


# Social Systems Models



# Governance Network Model (GovABM)

- Purpose: To ascertain how financial resources flow through the technical assistance, financial aid and regulatory system, and how these systems are influenced by economic and environmental changes.
- ABM is useful here because we can model observed network ties and institutional rule structures.
- Use of longitudinal network survey data, focus groups, databases to further design and calibrate model.
- Focus on:
  - Major action arenas: LCBP TAC; Tactical Basin Planning; Regional Planning, VT Climate Cabinet, etc.
  - Outputting financial resources available for reg. and BMPs into ALL ABM.
  - Inputting economic forecasts from GEAM.
  - Decision criteria of action arenas to build in learning capacity.



# General Equilibrium Analysis Model (GEAM)

- Purpose: Include the assessment of economic impacts (i.e. tourism, lake front property prices, and drinking water supply) of water quality for response to extreme events.
- GEAM's attempt to explain interactions of supply and demand of many goods and services leading to "general equilibrium.
- Extreme Events, presumably, perturb regional economies and markets.

## GEAM: Economic Impact of Extreme Weather Events

- Tourism, **lake-front** property prices
- Impact of *run-off* on **algae blooms**
- Data from *USDA Economic Research Service* and commercial sources
- Blend of computable general equilibrium with **agent-based elements**



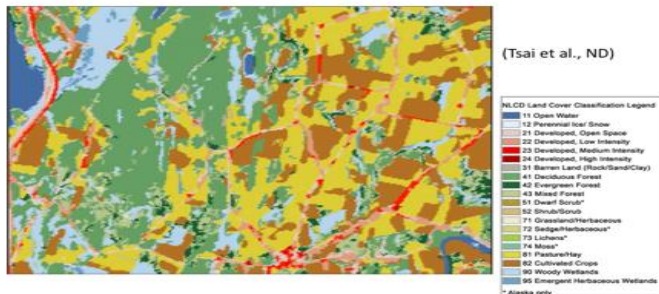
- Focus: **behavioral spatial heterogeneity of response to extreme events**



# Adaptive Landuse and Land Cover Transition Model (ALL ABM)

- Purpose: Simulation of land user behavior lies at the center of the IAM.
- Model calibrated using household and municipal surveys and farmer panel data; high resolution sub-meter panchromatic image satellite photography of the 10 population centers of over 6,000 to monitor BMP adoption
- Builds on existing LUT ABM by:
  - Expanding to Winooski watershed
  - Integrating agent learning
  - Expanding model to “urban” stormwater BMPs
  - Build capacity to run “green infrastructure” scenarios

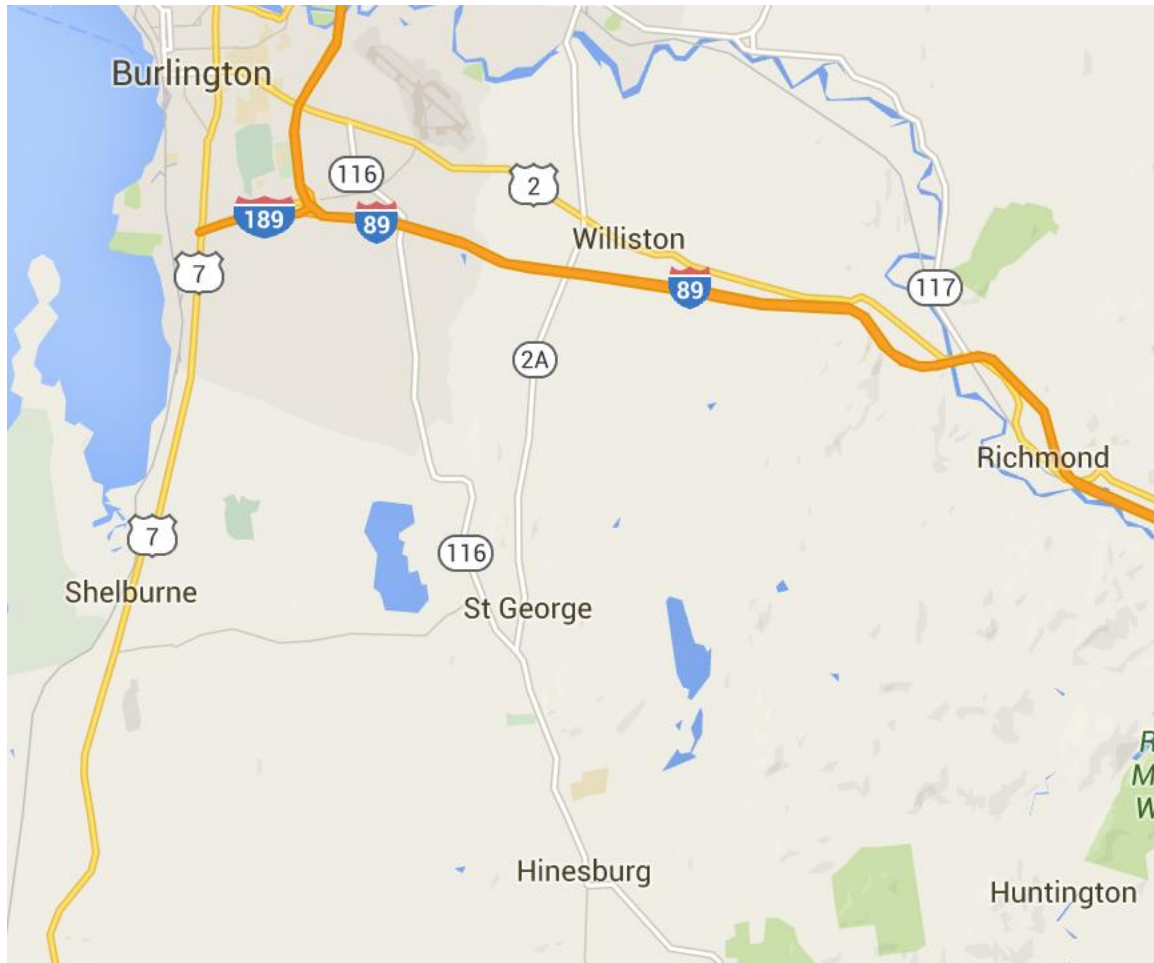
Preliminary Simulation  
with Zoning



q22h\_v1 Would you be willing to pay \$90 annually for your town to make green stormwater infrastructure improvements

	Frequency	Percent
Yes	93	16.1
No	154	26.7
Total	247	42.7

# Consideration of smaller scale ALL ABM's tied to BREE's small fresh water lake research sites?



Focus on land use planning/zoning in these local jurisdictions?



# Stakeholder engagement

