

The SES Synergy Project

Faculty: Timothy Waring

Graduate Students: Abigail Sullivan, Julia McGuire, & Sandra Goff

Undergraduate Students: Dylan Moore

High School Students: Sam Chase & Olivia Hecker

A multi-faceted approach to the study of socio-ecological systems

Team

Graduate student research team as of summer 2012.



Research Team, Summer 2012. From left: Tim Waring (assistant professor, social-ecological systems dynamics, School of Economics, Sustainability Solutions Initiative), Sandra Goff (EES PhD), Abigail Sullivan (EES Masters), Julia McGuire (EES PhD).

SSI's Modeling Self-Assessment

How does the SSI use SES models in research?

- SSI Report on SES modeling, Sandra Goff and Tim Waring, spring 2012

SEE: Report on SES modeling across the SSI:
timwaring.files.wordpress.com/2012/03/esssynergyreport_v5.pdf

Synergies and Recommendations

- **Theme-based S-E Linkages workshops:** With so much overlapping interest in specific areas, targeted workshops built around SSI theme areas may be valuable.
- **Model Discussions:** Modeling discussions held in the spring of 2012 were too broad ranging to be useful to individual teams. As a result, SES Synergy will explore the modeling-as-service outreach framework in the spring of 2013.
- **Model Needs Forum:** Create an opportunity for teams to workshop model needs that would allow formal models to become more prevalent in the SSI by helping teams eager to implement a formal model but lacking modeling expertise.
- **Participatory Modeling Workshop:** Plans have begun for a participatory modeling workshop to be conducted in the fall of 2012. Participatory modeling expert Dr. Alexey Voinov has provisionally accepted the invitation to lead a participatory modeling workshop for the SSI.
- **S-E Systems Theory:** The Synergy team has begun to develop a new set of SES dynamics theory using agent based models to explore the evolution of SE systems over time, with the intent to facilitate a greater exchange between theory and practice in sustainability science.

SEE: Graduate student **Sandra Goff's** poster on the agent-based SES simulations.

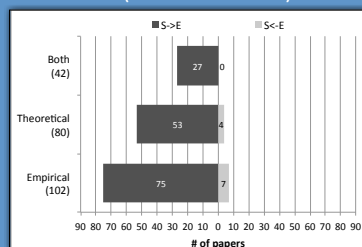
- **S-E Systems Comparisons:** There is a growing body of research on S-E systems from which the SSI might well be able to extract even more nuanced guidance in the quest to deliver sustainable solutions. To that end, the S-E Synergy team has completed a literature review of coupled human-natural systems research.

SEE: Graduate student **Abigail Sullivan's** poster on the SES literature review.

SES Literature Meta-Analysis

How are SESs being studied outside the SSI?

- Graduate student Abigail Sullivan reviews the current state of SES research (*to be submitted*).



A Key Finding: Social-ecological systems research is heavily skewed towards S-E forces over E-S forces.

Abstract

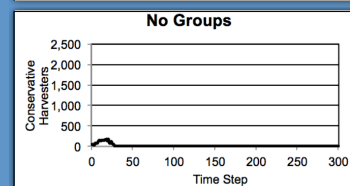
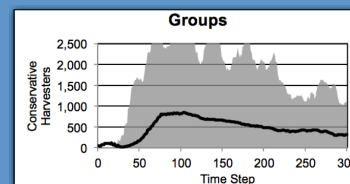
We conducted a review and meta-analysis of 224 peer-reviewed articles pertaining to social-ecological systems (SES). The review uncovered a much greater emphasis on social-to-ecological than on ecological-to-social feedbacks. Results also reveal several weaknesses in current SES research, including an apparent geographic bias in case study selection, a lack of quantification of social-ecological feedbacks, and a dearth of research generating or testing theoretical predictions. These challenges complicate the sharing of SES research between researchers, especially across disciplines, slow the accumulation of a core body of generalized social-ecological knowledge within the field, and hinder accurate analysis of SESs. We argue that the young field suffers from the lack of a common theoretical framework. We propose a greater emphasis on generating and testing key theoretical predictions, and quantitative measurement of social-ecological feedbacks. We conclude with a possible agenda for future research.

SEE: Graduate student **Abigail Sullivan's** poster on the extensive review of social-ecological systems research literature.

Modeling & Simulation

How do agent-based social-ecological systems evolve?

- Preliminary agent-based model results suggest that sustainable SES management may evolve via the differential selection of groups in certain scenarios.



A Key Finding: Preliminary agent-based simulations demonstrate the evolution of resource conservation via multilevel selection. Mean of 400 runs (ECS model parameters: 100 agents, living.cost=20, reprod.cost=40, rMax=0.5, K=200, conserve.harvest=30, aggressive.harvest=60).

SEE: Graduate student **Sandra Goff's** poster on the agent-based simulation of the evolution of social-ecological systems.

Sustainability Experiments

What insights can we glean from economic experiments?

- SSI Games Analysis (2011) - as part of the Diverse Portfolio project, Dylan Moore helped to lead high school students Sam Chase and Olivia Hecker to collect a quantitative measurement of cooperation between SSI, UMaine faculty and Bangor residents.

Contribution from:	Contribution to:		
	SSI	UMaine	Bangor
SSI (N=41)	7.3	7.0	6.2
UMaine (N=81)	7.3	6.7	6.4
Bangor (N=78)	6.5	6.9	7.0

A Key Finding: Average patterns of cooperation between and within groups. Regression models also show that SSI faculty members cooperate strongly with other SSI members, and less well with Bangor residents.

- The UMaine Experimental Economics Laboratory (Spring '13)
xecon.umaine.edu
(under construction)

SEE: UMaine's Experimental Economics Laboratory website (in beta):
xecon-dev.umaine.edu

Upcoming:

- CCAREER Grant application complete, Waring, summer 2012
- Sustainability Experiment #1 - Social-ecological boundary effect - spring 2013
- Modeling as service framework: connecting with SSI teams, testing framework, exploring CNH proposal possibilities, spring 2013
- SEES Fellow application, Dec 2012

SSI maine's sustainability solutions initiative



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