Incubating Interdisciplinary Sustainability Science Research at UNH

- Sustainability Research Collaboratory (SRC)
  Lead by Sustainability Academy, EOS, Carsey, ERG
  PIs: Dibb, Gardner, Grimm, Jacobs, Kelly, Spence, Wake
- SRC facilitates transdisciplinary *sustainability science* research among faculty, staff, & students across campus
- Goal is to “skate to where the puck is going to be” in terms of:
  - interdisciplinary research
  - federal agency research funding
  - addressing grand challenges
  - Internal (UNH strategic plan) and external (NSF SEES) movement
- UNH Research Leveraging $100K; Matching funds $54K
Sustainability Science

“... brings together scholarship and practice, global and local perspectives, and disciplines across the natural and social sciences, engineering, and medicine... it can be usefully thought of as neither “basic” nor “applied” research but as a field defined by the problems it addresses rather than by the disciplines it employs; it serves the need for advancing both knowledge and action by creating a dynamic bridge between the two.”

Clark 2007. Sustainability Science: A room of its own. PNAS 104: 1737-1738
Main objective: Raise capacity for sustainability science research at UNH through development and support of Researcher Learning Communities

Three program elements
1. Spring Workshops (next one May 17-18)
2. Faculty Fellows and Roundtable Discussions
3. Proposal Development and Submission

Plus strategic hire – Dr. Paul Kirshen (EOS & Civil Engineering)
UNH Sustainability Research Collaboratory (SRC)

Spring Workshops

• SRC sponsored Spring 2011 Workshop (May 24-26)
  “Gulf of Maine and Grand Challenges: Incubating Sustainability Science Research at UNH”
• 55 people: UNH faculty & staff, external partners
• Created time for focused discussions
• Heard from NSF and White House Office of S&T
• Agreed on sustainability science focus
  “Sustainable Piscataqua – Sustainable Coasts”
  food - water - health

• Next Workshop May 17-18, 2012 (this one!)
Faculty Fellows AY 2011 – 2012
Semra Aytur  Health Management & Policy, CHHS
Steve Jones  NREN, COLSA
Julia Peterson  Cooperative Extension
Alison Watts  Civil Engineering, CEPS and ERG

Roundtables
RT 1: Paradigm Shifts: What is interdisciplinary research?  
   Guest Lecture by Dr. Jennifer Kushner
RT 2: Faculty presentation of interdisciplinary methods
RT 3: Discussion on food systems research
RT 4: Topic focused on adaptive management.
RT 5: Establishing Key Topics/Priorities for Spring 2012 Workshp

What worked and what didn’t? (Discussion topic)
2012 Workshop Objectives

Develop and Launch SRC Working Groups
- build upon existing expertise and infrastructure
- key research questions for future proposals
- key methods
- existing expertise and infrastructure that can be leveraged
- identify (and fill?) gaps (people, methods, skills, etc.)
  - e.g., opportunity and strategic hires; collaboration
  - submit several proposals to specific funding opportunities

Discuss SRC support for Working Groups
- Faculty Fellows
- Space
- Roundtables
## SRC Proposals AY 2011 – 2012

### UNH Sustainability Research Collaboratory Proposal: AY 2011-2012

<table>
<thead>
<tr>
<th>No</th>
<th>PI</th>
<th>Co-PI(s)</th>
<th>Agency</th>
<th>Program</th>
<th>Title</th>
<th>Total $$</th>
<th>UNH $$</th>
<th>Status</th>
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<tbody>
<tr>
<td>1</td>
<td>Aytur</td>
<td>Asbjornsen, French, Jones</td>
<td>NSF</td>
<td>CHN-RCN</td>
<td>Building A Network for A Resilient Food System in New Hampshire and S. Maine</td>
<td>$499,932</td>
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<td>2</td>
<td>Wake</td>
<td>Gardner, Hart (UMaine), Merrill(USM)</td>
<td>NSF</td>
<td>SRN</td>
<td>Enhancing Resilience in the Gulf of Maine Watershed</td>
<td>Prelim</td>
<td>Prelim</td>
<td>not invited</td>
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<td>3</td>
<td>Kirshen</td>
<td>Aytur, Roseen, Burdick, Jones, Wake</td>
<td>NOAA</td>
<td>NERRS Sc Collab</td>
<td>Collaborative Planning for Climate Change Adaptation (Exeter, NH)</td>
<td>$655,963</td>
<td>$655,963</td>
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<td>4</td>
<td>Roseen</td>
<td>Houle, Ballestero, Bubier, LaBrance, Watts</td>
<td>NOAA</td>
<td>NERRS Sc Collab</td>
<td>Green Infrastructure for Sustainable Coastal Communities</td>
<td>$452,430</td>
<td>$452,430</td>
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<td>5</td>
<td>Wolheim</td>
<td>Jacobs, Watts</td>
<td>NSF</td>
<td>WSC</td>
<td>Sustaining Water for People and Nature in the Suburban Northeastern US</td>
<td>$4,950,000</td>
<td>$1,515,907</td>
<td>pending</td>
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<td>6</td>
<td>Kinner</td>
<td>Aytur, Kirshen, Thomas, Valcourt</td>
<td>NSF</td>
<td>CI4TSL</td>
<td>Solutions for Coupled Natural Human Systems Problems</td>
<td>$570,819</td>
<td>$570,819</td>
<td>pending</td>
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<td>7</td>
<td>Merrill (USM)</td>
<td>Sowers(PREP), Bohlen (CBEP), Kirshen, Cooper</td>
<td>EPA</td>
<td>CRE</td>
<td>Sea Level Rise and Storm Surge Adaptation Analysis via COAST</td>
<td>$75,000</td>
<td>?</td>
<td>funded</td>
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<tr>
<td>8</td>
<td>Susskind (MIT)</td>
<td>Many including Kirshen, Wake</td>
<td>NOAA</td>
<td>NERRS Sc Collab</td>
<td>Building the Capacity of Coastal Communities in New England to Address Climate Change Risks Through the Use of Role-Play Simulations</td>
<td>$600,000</td>
<td>$25,000</td>
<td>pending</td>
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<td>9</td>
<td>Jacobs</td>
<td>Daniel, Hayhoe(TTU), Kartez(USM), Kirshen</td>
<td>NSF</td>
<td>SEES</td>
<td>Engineering Research Collaboratory for Sustainable Infrastructure in a Changing Climate</td>
<td>$749,779</td>
<td>$749,779</td>
<td>recommended for funding</td>
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<td>10</td>
<td>Diers (Nashua RPC)</td>
<td>Many including Mallory, Wake, Rubin</td>
<td>HUD</td>
<td>SCI</td>
<td>New Hampshire Sustainable Community Initiative</td>
<td>$4,565,039</td>
<td>$110,761</td>
<td>funded</td>
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<td>11</td>
<td>Aytur</td>
<td>Jones, Kirshen</td>
<td>NIH</td>
<td>R21</td>
<td>Behavioral &amp; Social Science Research on Understanding &amp; Reducing Health Disparities</td>
<td>TBD</td>
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</table>
Through evaluations of participants in the first 4 Roundtables, the SRC sought to understand:

• What are the perceived benefits of doing interdisciplinary research (IDR) at UNH?
• What are the perceived barriers?
• How can the SRC help to connect researchers across disciplines?
Respondents by College

<table>
<thead>
<tr>
<th>College</th>
<th>Freq</th>
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</thead>
<tbody>
<tr>
<td>COLSA</td>
<td>15</td>
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<tr>
<td>CEPS</td>
<td>11</td>
</tr>
<tr>
<td>NRESS</td>
<td>8</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
</tr>
<tr>
<td>EOS</td>
<td>3</td>
</tr>
<tr>
<td>CHHS</td>
<td>1</td>
</tr>
<tr>
<td>WSBE</td>
<td>1</td>
</tr>
<tr>
<td>COLA</td>
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</table>

*N=47; Totals include responses from individuals who attended multiple roundtables*
Who Responded?

Affiliation

<table>
<thead>
<tr>
<th>Affiliation</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grad Student (NRESS)</td>
<td>14</td>
</tr>
<tr>
<td>Research Faculty</td>
<td>12</td>
</tr>
<tr>
<td>Tenured Faculty</td>
<td>12</td>
</tr>
<tr>
<td>Staff</td>
<td>7</td>
</tr>
<tr>
<td>Grad Student (Other)</td>
<td>5</td>
</tr>
<tr>
<td>Tenure-Track Faculty</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td>Post Doc</td>
<td>2</td>
</tr>
<tr>
<td>Clinical Faculty</td>
<td>1</td>
</tr>
</tbody>
</table>

*Graph: E Troisi*

*Totals include responses from individuals who attended multiple roundtables*
What are the perceived benefits of IDR? Are people interested in IDR?

- **Evaluation questions inquired about:**
  - Research respondents “dream of doing”
  - Benefits of working “collaboratively” with scientists in other fields as well as intended users
  - The value-added to their current primary discipline
Major Themes

• “Information ExchangeCollaboration”
• “New areas of investigation”
• “Informing Decision Making”
• “More relevant research”
• “Ecosystem-Based Management or a Systems Approach”
• “Sustainability Research”
• “Holistic”
• “Fun and challenging”
Themes surrounding the research people “dream of doing”

<table>
<thead>
<tr>
<th>“Information Exchange or Collaboration”</th>
<th>“Informing decision-making”</th>
<th>“Ecosystem-Based Management or a ‘Systems’ approach”</th>
<th>“Sustainability Research”</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I want to bridge the gap between knowledge exchange... and infrastructure (facilities) development...”</td>
<td>“Applied research which will support informed community decisions”</td>
<td>“ecosystem-based governance:”</td>
<td>“business and the natural environment embedded sustainability”</td>
</tr>
<tr>
<td>“a mix of fundamental and applied research on water resources that has a two-way knowledge flow...”</td>
<td>“… to solve a real world problem through providing information relevant to decision makers”</td>
<td>“systems approach to increasing food production...”</td>
<td>“combining sustainability performance indicators to solve a real world problem...”</td>
</tr>
<tr>
<td>“data collaboration”</td>
<td>“linking coastal ecosystem science and management”</td>
<td>“understanding the whole”</td>
<td>“community based research related to measurement of sustainability along a broad spectrum...”</td>
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<tr>
<td>“solve socially important problems using methods from my area and collaboration”</td>
<td>“linking environmental science and decision-making”</td>
<td>“working to build capacity...communities to be better adapted to think about ecosystem based management approaches.”</td>
<td>“…to recover a sustainable, locally harvestable, economically useful entity”</td>
</tr>
<tr>
<td>“policy advising...”</td>
<td>“using research outcomes to advise policy making”</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“research on water resources that has a two-way knowledge flow with managers and policy makers”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Barriers to Interdisciplinary Research (IDR)

- **Evaluation questions inquired about:**
  - Barriers to doing interdisciplinary research at UNH
  - The “hardest thing” about doing interdisciplinary research
Barriers: Major Themes

“Culture”

- “Silos/different paradigms”
- “Funding and resources”
- “Time”
- “Communication/interaction”
- “Rewards/incentives”
<table>
<thead>
<tr>
<th>“Funding and resources”</th>
<th>“Time”</th>
<th>“Communication and interaction”</th>
<th>“Silos/Culture”</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Funding”</td>
<td>“time and effort...”</td>
<td>“communication between departments”</td>
<td>“get out of silos”</td>
</tr>
<tr>
<td>“...funding challenges”</td>
<td>“time and other demands ...”</td>
<td>“communication between disciplines”</td>
<td>“competing priorities and mixed messages about what is values by one’s department, college, and university”</td>
</tr>
<tr>
<td>“more funding...”</td>
<td>“time, busy schedules ...”</td>
<td>“hard to hear about talks and current research of other faculty”</td>
<td>“traditional disciplinary boundaries”</td>
</tr>
<tr>
<td>“funding”</td>
<td>“time (everyone is already busy)”</td>
<td>“we don’t speak the same language”</td>
<td>“academic silos”</td>
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<tr>
<td>“funding”</td>
<td>“time really”</td>
<td>“lack of communication between departments”</td>
<td>“academic/scholarly framework doesn’t reward collaborative/interdisciplinary research”</td>
</tr>
<tr>
<td>“money”</td>
<td>“time”</td>
<td>“lack of communication of key expertise”</td>
<td>“culture of various disciplines”</td>
</tr>
<tr>
<td>“support and money”</td>
<td>“time”</td>
<td>“difficulty developing relationships with other disciplines”</td>
<td>“disciplinary Balkanization”</td>
</tr>
<tr>
<td>“...resources need to be shared to provide incentive”</td>
<td>“inability to interact”</td>
<td>“division into different departments, old traditional mindsets, linear thinking”</td>
<td></td>
</tr>
<tr>
<td>“funding”</td>
<td>“identifying suitable people to develop research programs with”</td>
<td>“incentives for faculty and students to favor specialization...”</td>
<td></td>
</tr>
<tr>
<td>“lack of supportive resources”</td>
<td>“engaging other faculty/students to come to lectures in other departments”</td>
<td>“institutional barriers...disciplinary practice engraved in minds”</td>
<td></td>
</tr>
<tr>
<td>“lack of core resources to bring researchers together...”</td>
<td>“connecting with researchers that have similar goals and interests”</td>
<td>“Embedded nature of disciplinarily”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“tenure criteria”</td>
<td>“tenure habits”</td>
<td>“tenure tract”</td>
</tr>
</tbody>
</table>

Themes surrounding barriers to doing IDR at UNH
What people learned from the Roundtables....

Addressing the *Communication/Interaction* Barrier

- Meeting people from different disciplines
- Being exposed to new methods or new ways of thinking
- Importance of community buy-in or involving citizens
- Importance of policy-relevant research
- Learning about others research, and general sustainability research at UNH
Lessons Learned

• Strong desire to pursue interdisciplinary research
• The SRC made significant progress in bringing natural scientists and social scientists together
• Some disciplines (e.g., humanities) will require more intensive efforts to connect with, due in part to different cultures and incentive structures
• Researcher Learning Communities work; proposals and relationships
• Continued efforts to build interdisciplinary research capacity will require continued investment and institutional support to overcome other key barriers
  o Culture, time, resources
Enhancing Resilience in the Gulf of Maine Watershed

NSF - Sustainability Research Networks

PI: C Wake; Team Leaders: UNH: Semra Aytur, Kevin Gardner Paul Kirshen
UMaine: Kathleen Bell, David Hart, Laura Lindenfeld’s
USM: Charlie Colgan, Jack Karteiz Samuel Merril

Focus on four interdependent Grand Challenges that require integration of interdisciplinary research and knowledge: food security, energy development, water for the future, and societal metabolism in a resource-constrained world.

Multiple and complex relationships and tradeoffs between food production, ecological services, food insecurity and obesity across many scales

Digital Commons and Social Networks

Understand/strengthen links between scientific knowledge and societal actions (K↔A)

Social network analysis will be used to evaluate the entire SRN

Conceptual framework for building resilience and adaptive capacity and connecting scientific knowledge and societal action will be evaluated

Educational efforts integrated across many scales
Figure 1. Conceptual Framework for Sustainability that will be tested and adapted by the Gulf of Maine SRN. Description of Boxes #3-11: 

3. Vulnerability - Conditions that result from stressors that accumulate over time and at various scales. 

4a. Sensitivity - Affects the response to a stressor or exposure; Risk regulators – Mediate between stressors (2c) and sensitivity (4a) to exposures. Examples: Green infrastructure, growth management policies, sustainable energy sources; 

4b. Exposures – (negative) - toxins, poor air quality, obesogenic environments; (positive): clean water, availability/affordability of healthy food; 

Coping (5b), Resilience (5a), Adaptation (6b), and Capacity (6a)- The process of building capacity to adapt to stressors. Examples: K↔A dissemination, local food production in tribally owned farms; 

7a,c. Place Based Human/Environmental Conditions – e.g., socioeconomic inequities, obesity, increasing food insecurity, land use/land cover change, increasing magnitude and frequency of coastal and inland flooding; loss of farmland and forestland; diminished fish and shellfish stocks; 

7b. Grand Challenges and Collaboratively Defined Research Focus Areas – e.g., Food Security, Energy Development, Water for the Future, Societal Metabolism; 

8. Social Networks and Bridging Social Capital – e.g., social ties, trust, reciprocity, and co-creation of knowledge to support resilience and adaptive capacity; 

9a-9b. Adaptive management, transition management (TM), adaptive governance- Example: TM assesses mutual stakeholder adaptation against a set of collectively defined goals. SRN activities are expected to support more inclusive, participatory, and accountable management and governance structures that create and sustain social justice. 

10. Place Based Impacts – e.g., maintenance of ecosystem services; 

11. External Impacts – e.g., use of knowledge and processes generated by the SRN to increase resilience in national and global contexts.
OK – Now Read the Reviews