The Coupled Human-Natural System

Research Area Focus 3

Overarching Goals

- Study the water system as a whole, including the linkages between biophysical and social dynamics, using results from Focus Areas 1 and 2

- Facilitate interactions with stakeholders and linkages among disparate datasets and models to improve our capacity to study the complexity of local water issues

Team & Disciplines

- **Component Faculty/Researchers:** Diane Pataki (UU), Doug Jackson-Smith (USU), Reid Ewing (UU), Sarah Hinners (UU), Jeff Horsburgh (USU), Ryan Jensen (BYU), Chris Nelson (UU), Sara Null (USU), David Rosenberg (USU), Bo Yang (USU)

- **Component Disciplines:** Ecology, sociology, urban planning, hydrology, landscape architecture, engineering, climate science

Goal 1

- Integrate results from Focus Areas 1 and 2 to better understand the water system as a whole

Guiding Socio-Ecohydrology Framework
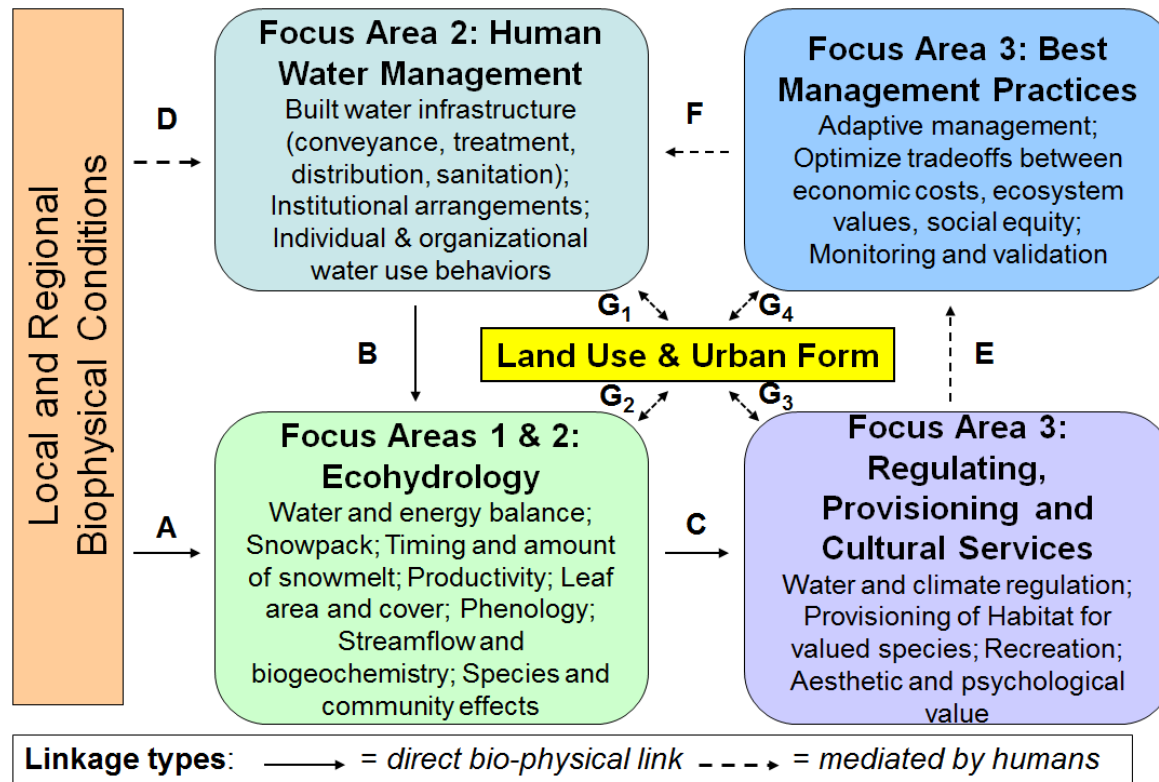
Goal 1 Objectives & Activities

- Objective 1.1: Identify, categorize, and centralize relevant datasets and models
  - Define and scope the coupled water system
  - Create data inventory
  - Create model inventory

- Objective 1.2: Link disparate models and datasets
  - Link data to models
  - Improve model coupling

Goal 1 Outputs

- Detailed conceptual framework (manuscript)
- Web-based data inventory and archive
- Documentation of iUtah models with their domains, inputs and outputs, and platforms
- Enhanced capability of existing models to utilize new datasets
- Coupling of existing models that represent different aspects of the water system (e.g., climate, hydrologic, and agent-based models)

Goal 2

- Goal 2: Enhance capacity for interdisciplinary research and training

Goal 2 Objectives and Activities

- Objective 2.1: Link researchers, teachers, students, and stakeholders interested in water sustainability
  - Build collaborative relationships across campuses
  - Scenario scoping
  - Evaluate water system change
- Objective 2.2 :Enhance data/model visualization capacity
  - Scope and build the Environment Situation Rooms

Goal 2 Outputs

- Meetings, workshops, and teleconferences
- Interdisciplinary working group to establish common scenarios
- Modeled scenarios of water system change
- Environment Situation Rooms constructed at UU and USU

Possible Challenges

- The campus and disciplinary silo problem
- Relevant datasets are held by different agencies with varying degrees of public access
- Disparate model inputs, outputs, spatiotemporal domains, and platforms
- Need for more interdisciplinary training programs (IGERTs are pending)
- Lack of funding for personnel

Anticipated Outcomes or Impacts

- **Short-term:** Increased communication and collaboration across disciplines and campuses

- **Mid-term:** Identified and centralized datasets and models relevant to studying the natural-human water system

- **Long-term:** Improved understanding of the complex, coupled human-natural water system

RFA 3 Logic Model

EPSCoR
iUTAH

INPUTS	ACTIVITIES	OUTPUTS	OUTCOMES	IMPACT

INFRASTRUCTURE
Cyberinfrastructure
Datasets, models, and off campus partnerships in individual research groups

Student and faculty interests and expertise in bridging social, natural, and engineering sciences

ENGAGEMENT
Water agencies
Governments
Private industry
NGOs
Museums
Schools

FUNDING
iUtah student and post-doc fellowships, faculty

iUtah and EPSCoR Track II cyberinfrastructure

iUtah EOD funding

ESR investment

INFRASTRUCTURE
Scope existing datasets, models, and off campus partnerships

Develop student funding programs

RESEARCH
Create working groups to refine the conceptual model, develop common modeling scenarios, and build collaborations with stakeholders

Link existing models that simulate components of the coupled human-water system

Write proposals for new collaborative research

Integration – EOD
Scope Environmental Situation Rooms

Translate results for public and K-12

INFRASTRUCTURE
Centralized datasets and models relevant to studying the natural-human water system

Student fellowships in coupled dynamics

RESEARCH
Refined conceptual framework of the coupled human-water system

Common scenarios of water system change developed with stakeholders

Linkages between previously separate models and datasets

Foundation for an iUtah water model

Integration – EOD
Environmental Situation Rooms

Web and museum-based dissemination of scenarios and results

INFRASTRUCTURE
Improved coupled modeling and analytical capacity

Stronger funding base to support coupled human-water research

RESEARCH
Institutional programs to facilitate collaborative research and training across social, natural, and engineering sciences

Visibility and impact of Utah's research products and expertise

Capacity to build an iUtah water model

Integration – EOD
Collaborations between stakeholders and researchers

Public and K-12 education and outreach on water issues

Stronger capacity and competitiveness in coupled human-natural research

Advancements in the science of coupled human-water dynamics

Decision-making and management of the local water system based on an improved understanding of coupled-natural processes

Integration of water issues into local sustainability planning

Economic development through increased funding, off-campus and private partnerships, and better educated and experienced STEM workforce