



Social & Engineered Systems

Research Focus Area 2

Approach

- Focus on social and engineered aspects of water systems in urbanizing and urban environments
- Collaborate with Focus Areas 1 and 3 and Cyberinfrastructure to:
 - Co-locate instrumentation/monitoring/data collection
 - Develop models for coupled system dynamics
- Work closely with Education, Outreach, & Diversity and Focus Areas to:
 - Engage in collaborative discussions with water stakeholders and decision-makers
 - Train the next generation of water scientists

Team

Faculty/Researchers

D. Bedford (WSU), M. Buehert (UU), S. Burian (UU), R. Dupont (USU), J. Endter-Wada (USU), S. Hinnert (UU), D. Jackson-Smith (USU), S. Li (USU), C. Licon (USU), Z. Ma (USU), C. Pomeroy (UU), C. Sims (USU), C. Trentelman (WSU), B. Yang (USU)

Graduate Students

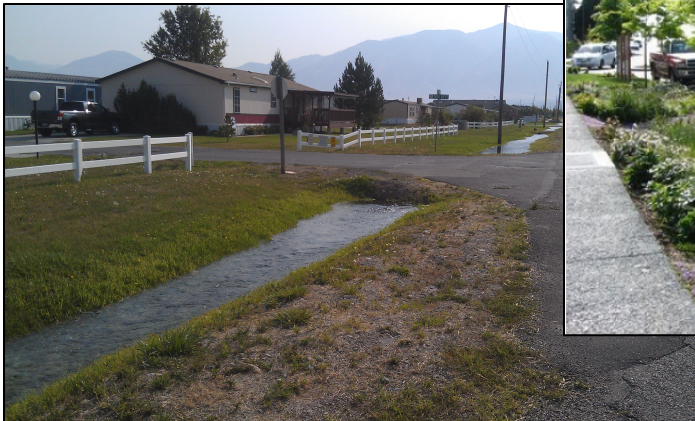
A. Armstrong (USU), M. Burnham (USU), D. Houdeshel (UU), E. Li (USU), A. Odame (USU), K. Sandoval (UU), P. Stoker (UU), T. Walsh (UU)

Overarching Goals

- Improve capacity of Utah's science community to gather and analyze social and engineering system data on coupled water systems
- Understand the interactions between urban form, environmental change, built water infrastructure, and water use and decision-making

Overarching Goals, cont.

- Model the impact of alternative infrastructure designs and policy options on water use behaviors, the water cycle, water quality, and interconnected social and environmental systems



Guiding Research Questions

- What are the current drivers of water and land use management in the region?
- How does urban form interact with water availability?
- How can we design our built systems to enhance water sustainability?



Goal 1: Ensure our research activities are relevant to decision-makers

Objective 1.1: Initiate collaborations with water stakeholders

- Coordinate with Focus Area 3 and Education, Outreach, & Diversity teams to organize stakeholder interactions
- Hold 2 collaborative meetings with larger iUTAH team*
- Conduct 3-5 focus groups year 1*
- Establish formal partnerships with 2-5 local water system managers in each of the study sites*



Goal 2: Improve capacity to study human dimensions of water systems

- **Objective 2.1: Train graduate and undergraduate students**
 - *Fund average of 3-4 graduate fellows each year*
 - *Engage 4-8 undergraduates in research each year*
- **Objective 2.2: Facilitate cross-disciplinary and cross-campus collaborations**
 - Support meetings and networking among social scientists, planners, and engineers (*2-4 mtgs first year*)
 - Coordinate with ecohydrology team to develop integrated research plans (*weekly co-PI phone calls, 2 full group mtgs/yr; work on 1 new collaborative proposal*)

Goal 3: Ensure social and engineering data can answer research questions

- ◉ **Objective 3.1: Identify urban sites for intensive data collection**
 - ◉ Inventory and analyze spatial data for WRMA
 - ◉ Identify clusters of similar urban form types
 - ◉ *Coordinate with RFA 1 to pick common locations to instrument and monitor*
- ◉ **Objective 3.2: Assess existing social and engineering data in selected study sites**
 - ◉ *Build archive of social/eng.data for each location*
 - ◉ *Develop partnerships with local water system managers to coordinate data monitoring plan*



Conceptual Design of Social/Engineering Observatory in GAMUT

River

Mountain-to-Valley Transition

NEIGHBORHOOD TYPE A

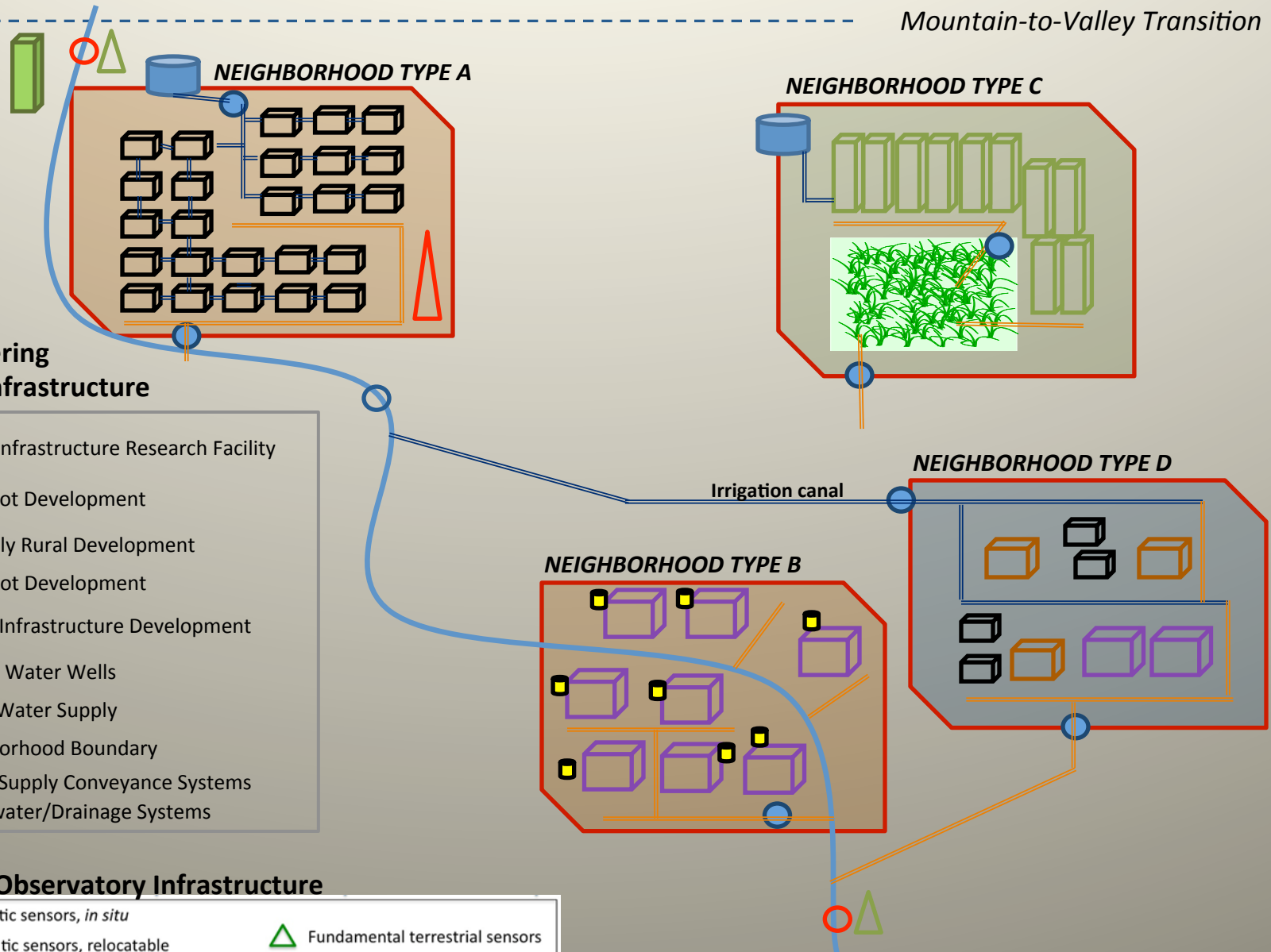
NEIGHBORHOOD TYPE C

Social/Engineering Observatory Infrastructure

- Green Infrastructure Research Facility
- Small Lot Development
- Formerly Rural Development
- Large Lot Development
- Green-Infrastructure Development
- Private Water Wells
- Public Water Supply
- Neighborhood Boundary
- Water Supply Conveyance Systems
- Stormwater/Drainage Systems

Ecohydrology Observatory Infrastructure

- Fundamental aquatic sensors, *in situ*
- Fundamental aquatic sensors, relocatable
- Enhanced aquatic sensors, *in situ*
- Fundamental terrestrial sensors
- Urban tower and sensors

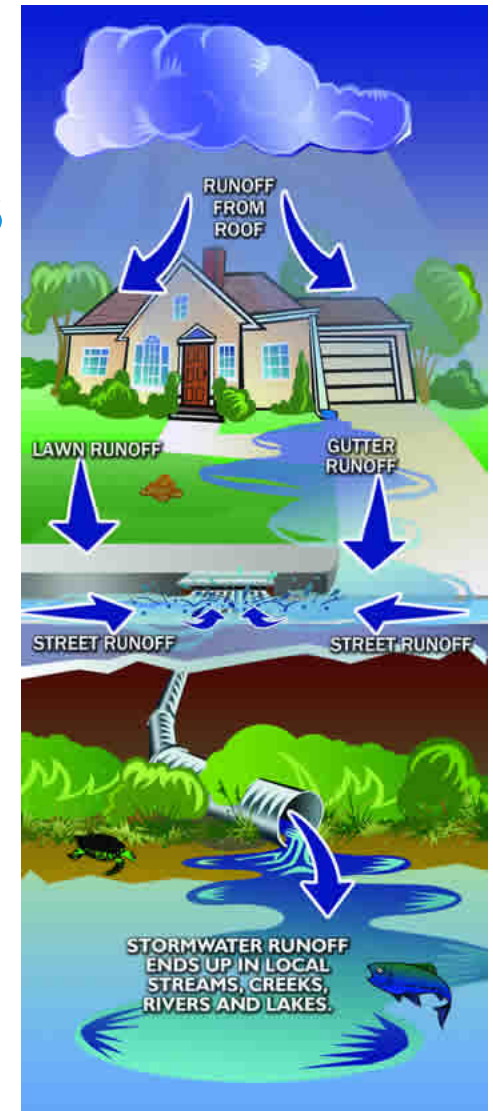


Goal 4: Improve our capacity to collect data about water use and decision-making

- **Objective 4.1: Develop appropriate methods and instruments to document drivers of variation in water use behaviors**
 - Inventory existing data on water use
 - *Develop relationships with local water system managers to share data and address local water mgt challenges*
 - Develop methods, instruments, and produce specific research plans/protocols for use in Years 2-5
 - *Hold 2-4 methods workgroup meetings*
 - *Approve collaborative research plans/protocols*

Goal 5: Improve our knowledge of the built water infrastructure in our study sites

- **Objective 5.1: Begin inventory of built infrastructure in Red Butte Creek and Logan River sites**
 - *Collect and archive baseline data on water infrastructure*
 - *Find examples of green infrastructure to track pre- and post-implementation*

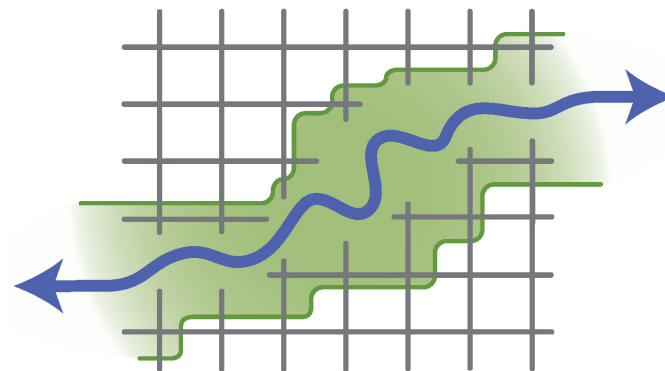


Goal 6: Improve our capacity to use information about built infrastructure to model water system outcomes

- ◉ **Objective 6.1: Develop methods to assess sustainability of current built infrastructure**
 - ◉ *Define sustainability outcome metrics*
 - ◉ *Inventory range of infrastructure practices and regulations in region*
 - ◉ *Evaluate alternative modeling approaches for simulating impacts of built infrastructure*
 - ◉ *Train 1-3 graduate students in water system modeling*

Goal 6, cont.

- **Objective 6.2: Design and prepare to construct Facility 2 (GIRF) on U.U. campus**
 - *Refine design plans, prepare to order equipment*
 - *Develop methodological approach to incorporate distributed network of GI sites with work at GIRF facility*
 - *Initiate discussions with Education, Outreach, and Diversity team to use facility for education and outreach work*



Green Infrastructure Center

Anticipated Outputs

- Summary report from focus groups
- Map of WRMA neighborhoods showing distribution of different types of “urban forms”
- Creation of common spatial database archive on social and engineered variables for full WRMA
- Approve research protocols to collect social and engineering data in Years 2-5

Anticipated Outputs, cont.

- Detailed inventory and archive of built water infrastructure and social and engineering data in selected RBC and LR sites
- Selection of modeling approaches for simulating impacts of infrastructure, water behaviors, and policies
- Complete GIRF design plan
- 3-6 student presentations at spring runoff conference and participation of 4 graduate fellows in Summer Institute

Possible Challenges

- Availability of data on water infrastructure and water use
- Coordination with ecohydrology observatory network when selecting and instrumenting study sites
 - Some interesting urban neighborhoods may not be proximate to instrumented river reaches
 - Location of in-stream monitoring stations to best capture urban effects may be constrained by access to good sites

Possible Challenges, cont.

- Balancing desires to cultivate collaborative networks, build new data and observational infrastructure, and start doing “real research”



Anticipated Outcomes (year 1)

- Better data availability and sharing for Utah science community
- New collaborative relationships among scientists and students across campuses
- New collaborative relationships between scientists and water stakeholders
- Better trained undergraduate and graduate students in social and engineering sciences
- Clear planning guidelines for work to be done in Years 2-5

Anticipated Long-Run Impacts

- Improved data to enhance understanding of human aspects of coupled water systems
- Improved economic development through increased funded research and a better educated and experienced workforce
- Improved science-based water management decisions

RFA 2 Logic Model

