

EPSCoR

iUtah EPSCoR: Building Scientific and Human Infrastructure to Sustain Utah's Water Resources

iUTAH

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WHAT WE KNOW

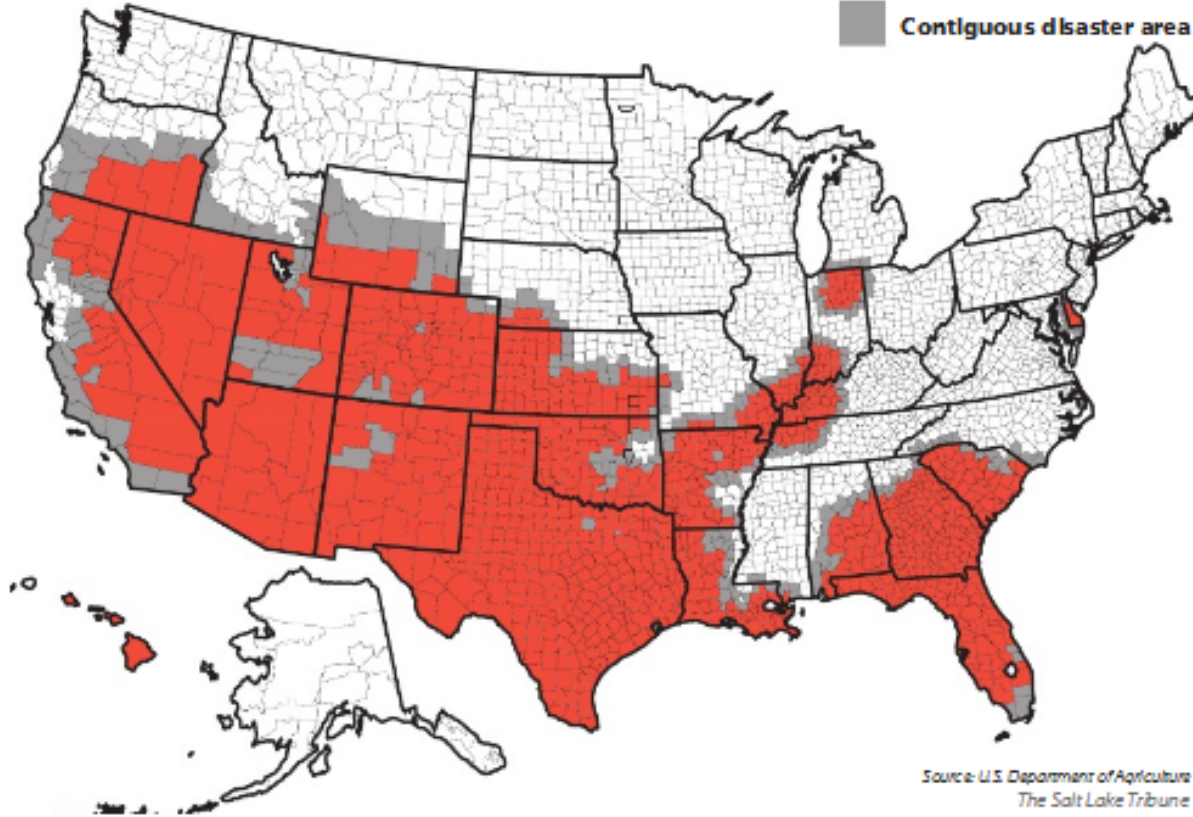


Utah is the 2nd driest state in the nation and the situation is getting worse

Disaster areas

The U.S. Department of Agriculture has declared Utah and 25 other drought-stricken states as natural disaster areas—the largest declaration ever.

- No designation
- Primary disaster area
- Contiguous disaster area



In 2012, over 20 Utah counties were declared drought disaster areas

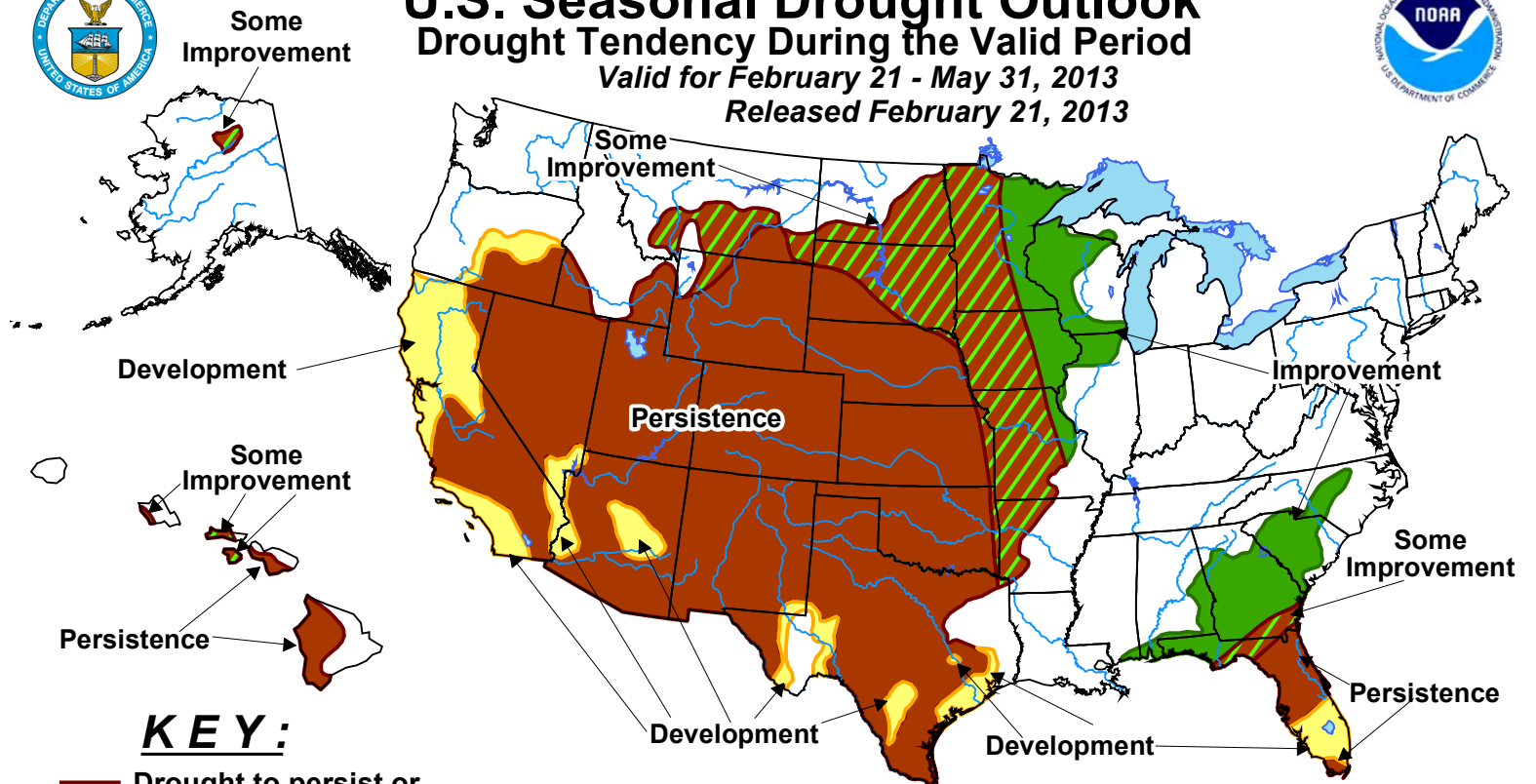


U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for February 21 - May 31, 2013

Released February 21, 2013



KEY:

- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely

No Drought Posted/Predicted

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

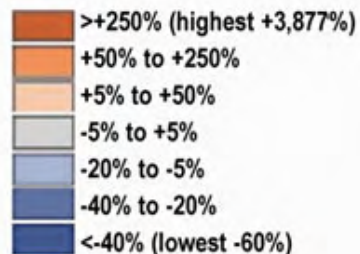




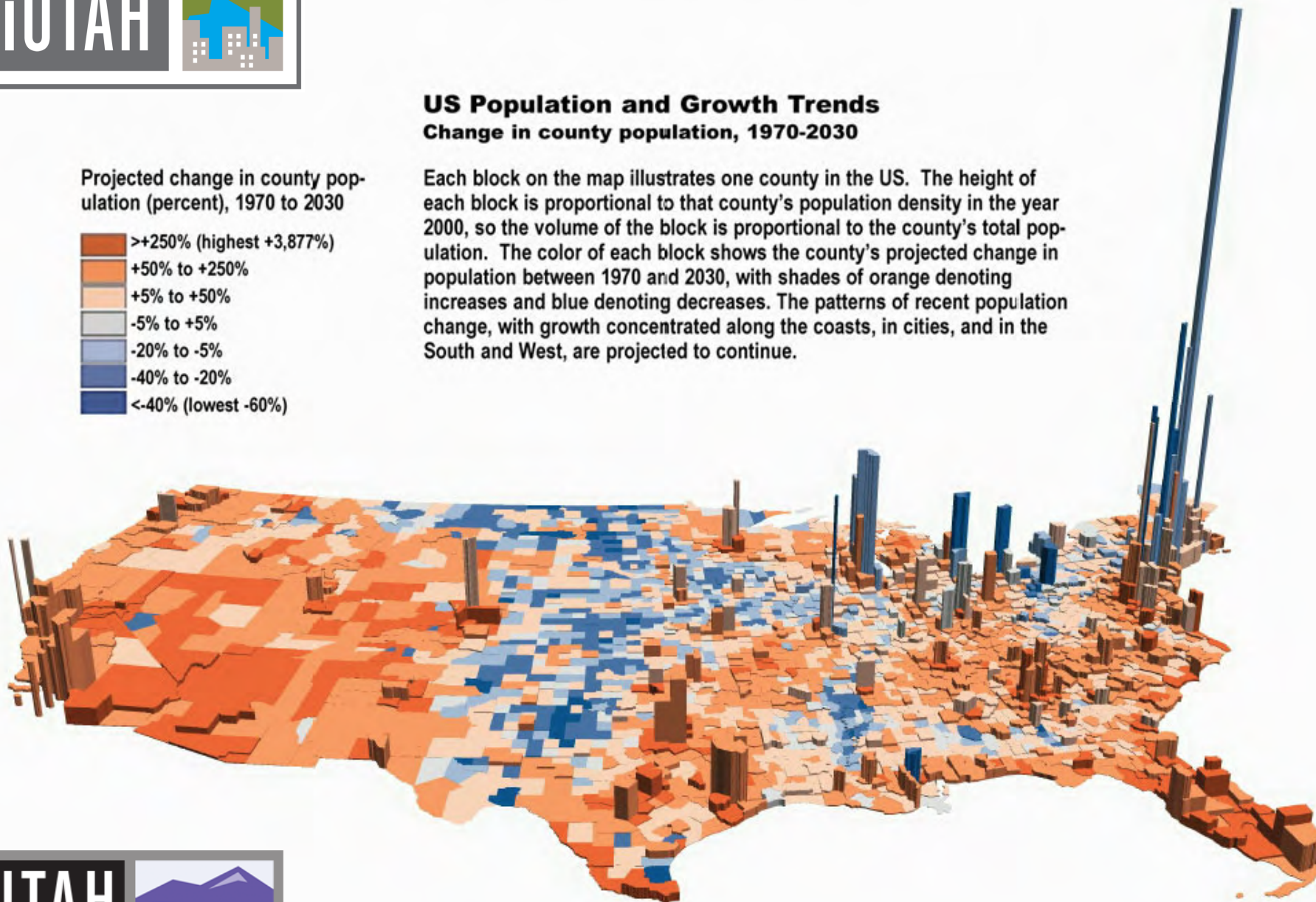
US Population and Growth Trends

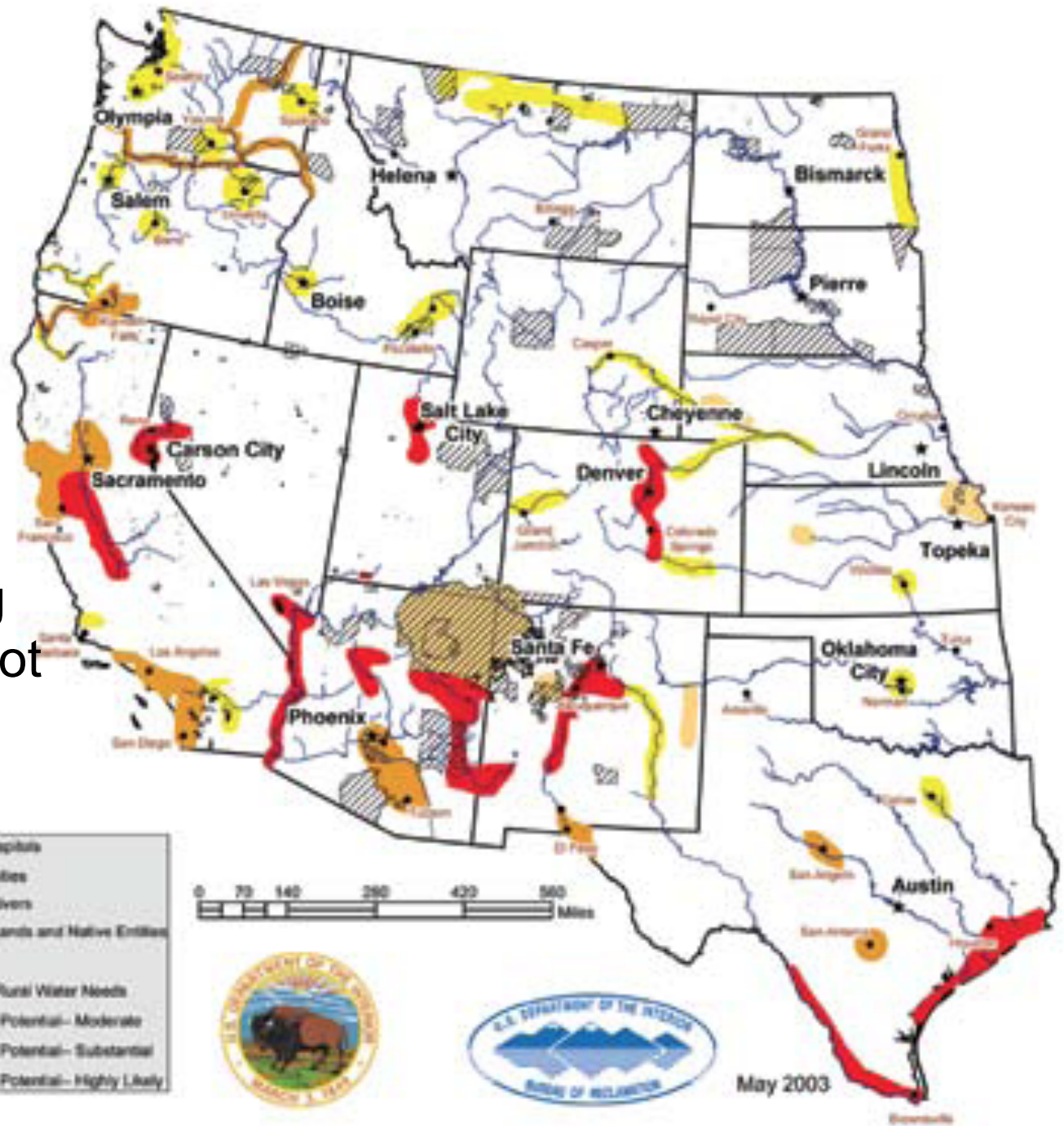
Change in county population, 1970-2030

Projected change in county population (percent), 1970 to 2030



Each block on the map illustrates one county in the US. The height of each block is proportional to that county's population density in the year 2000, so the volume of the block is proportional to the county's total population. The color of each block shows the county's projected change in population between 1970 and 2030, with shades of orange denoting increases and blue denoting decreases. The patterns of recent population change, with growth concentrated along the coasts, in cities, and in the South and West, are projected to continue.





Areas where existing Water supplies are not Adequate (red=severe)

- ★ State Capitals
- Major Cities
- Major Rivers
- ▨ Indian Lands and Native Entities
- States
- Light Orange Unmet Rural Water Needs
- Yellow Conflict Potential— Moderate
- Orange Conflict Potential— Substantial
- Red Conflict Potential— Highly Likely



May 2003



Utah in a Nutshell:

- Utah is growing.
 - 5 million people by 2040.
- Utah has limited water.
 - 2nd driest state in the nation.
- Utah's climate is changing.
- Snowmelt and water quality are decreasing





Utah's Sustainable Future





WHAT WE NEED

1. Better downscaled climate models to predict local and regional precipitation
2. Better snowmelt to surface water quality and quantity Models
3. Better understanding of the 'urban' hydrosystem
4. Understanding of valley form transformations, decisions, and policies on water quality
5. Better communication of science and data





Focus Area 1:

The biophysical ecohydrologic system

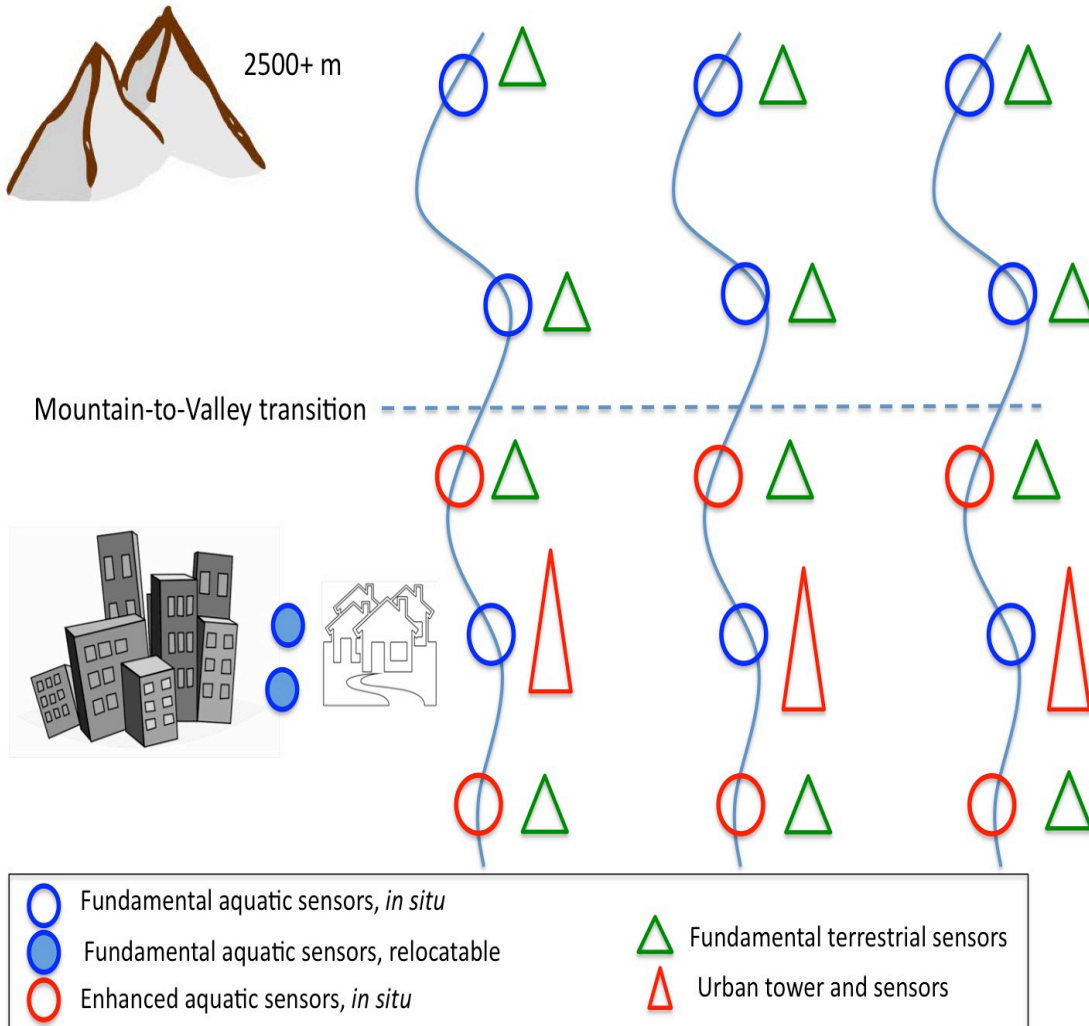
Builds on existing strengths in water science, engineering and montane ecology

Provides conceptual and empirical platform for interdisciplinary, inter-institutional collaboration

Q1: What is the water balance of forested, urban, exurban and agricultural land cover?

Q2: What determines the water quality of montane surface and groundwater resources?

Q3: How will availability of and demand for montane water resources change as a result of climate and land use change?



Schematic of iUTAH GAMUT (**G**radients **A**long **M**ountain to **U**rban **T**ransitions). All sensors are connected to the internet via one of several options. Note that the network is a mix of fixed in situ sensors and several deployable or relocatable sensors.



Table 1. Parameters to be measured by the iUTAH Climate and Ecohydrology Sensor Network.

	Fundamental Suite	Enhanced/Urban Suite
Terrestrial Sensors	Barometric pressure Wind speed and direction Air temperature Relative humidity Precipitation Snow depth Soil temperature, moisture, conductivity Solar radiation (net radiation and PAR)	Barometric pressure Wind speed and direction Air temperature Relative humidity Precipitation Snow depth Soil temperature, moisture, conductivity Solar radiation (net radiation and PAR)
Aquatic Sensors	Stream stage Temperature Electrical Conductivity pH Dissolved oxygen Turbidity	Stream stage Temperature Electrical Conductivity pH Dissolved oxygen Turbidity Total algae (chlorophyll a + phycocyanin) fDOM Nitrate



Focus Area 2:

The social and engineered ecohydrologic system

Builds on existing strengths in water science and urban ecology and planning

Develops capacity in social sciences as an integrator for complex, coupled-natural-human systems

- this is the area of NSF's newest and largest investment area, SEES

Q1: What are the current structures and drivers of water and land-use management in the region and how are they changing?

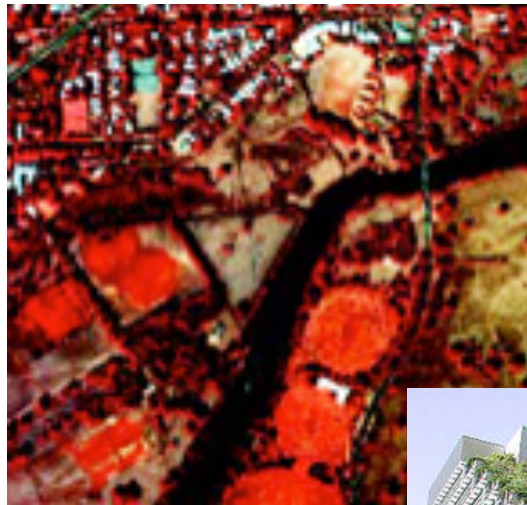
Q2: How does urban form interact with water availability?

Q3: How can we design our built system to enhance sustainability?



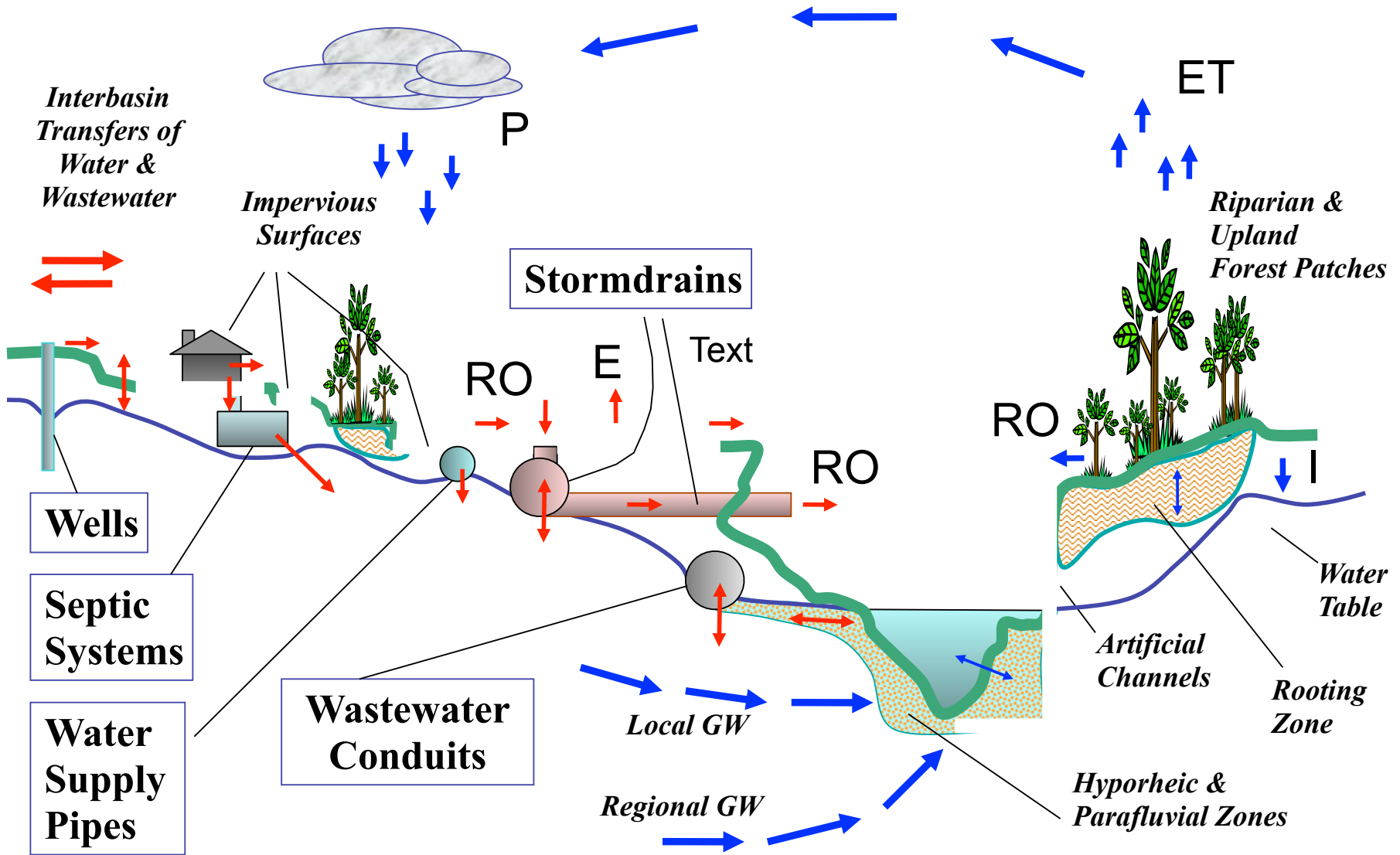
Environmental-Social Monitoring Network

- Integrated environmental-social monitoring network - from mountain top to city center
- Land use patterns
- Green infrastructure facility

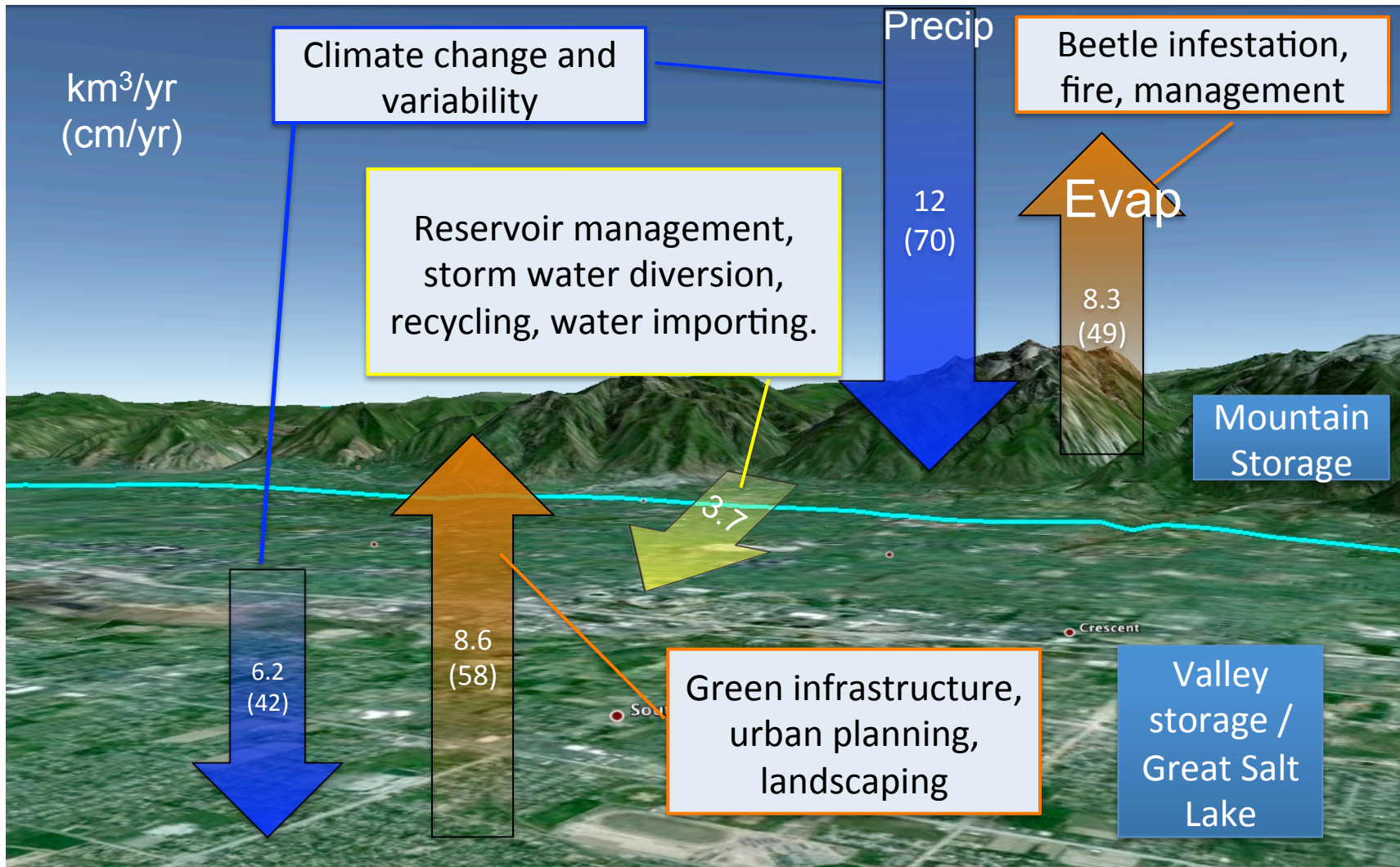




The Urban Hydrologic System: infrastructure driven pathways



Some of the iUTAH factors influencing these terms ...



What are the current, projected, and physically possible variations in the size of these budget terms, and what are the implications for water quantity and quality?



Focus Area 3: The coupled human-natural system

Builds on existing strengths in disciplinary modeling, urban ecology and planning, new CI capacity coupled atmospheric-hydrologic models

Develops capacity in interdisciplinary data compilation and interdisciplinary scenarios and participatory modeling

Provides a powerful tool to ENGAGE students, scientists, teachers, stakeholders and policy makers

Q1: What are the major social and biophysical processes that control the flows of water and material into and out of the Wasatch Front?

Q2: How can specific models representing hydrology, ecology, and human systems be coupled and executed to ensure efficient exchange of inputs and outputs?

Q3: How can we communicate through visualization technologies our model and data products to enhance communication among faculty, students and stakeholders?



iUTAH Research Teams

PI: Todd Crowl, USU
Co-PI: Diane Pataki, UU
Co-PI: Jim Ehleringer, UU

Co-PI: Doug Jackson Smith, USU
Co-PI: Michelle Baker, USU

Focus Area 1: Biophysical ecohydrologic system

Facility 1
GAMUT network

Focus Area 2: Social and engineered ecohydrologic system

Facility 2
Green Infrastructure (GRIF)

Focus Area 3: Coupled human-natural system

Facility 3
tbd

Cyberinfrastructure
Co-Leads:
Jeff Horsburgh, USU
Steve Corbato, UU
James Stewart, UEN
Dave Tarboton, USU

Major Education and Research Infrastructure: Jim Ehleringer, UU



Workforce Development Team

K-16 Co-leads: Tami Goetz (UVU), Paul Spruell (SUU)

- **Undergraduate Research Experiences**

- PUI students summer research experiences
- RFA mentors, projects at watersheds (or iUTAH facilities)
- Coordinators: Paul Spruell (SUU) and Brian Avery (Westminster)

- **iUTAH Summer Institute**

- K12 students, teachers, undergrads, grads, faculty
- Research experiences at watersheds (or facilities)
- Curriculum development afterwards
- ***July 15 to 18, 2013***
- Coordinators: Louisa Stark (UU)



- **iUTAH Internships**

- Partnering with industry, state agencies, universities, etc.
- Coordinators: Chris Keleher (UDNR) and Bob Ramsey (Canyon Concepts)



Workforce Development Team

Graduate through Faculty: Todd Crowl (USU)

- **Graduate Research Fellows**

- USU, UU, BYU

- **Postdoctoral Fellows**

- RFA1, RFA2, RFA3

- **Research Catalyst Grants**

- Research opportunities for faculty at Primarily Undergraduate Institutions (PUIs)
- Coordinators: Dan Bedford (WSU), Suzanne Walther (UVU)





External Engagement Team

Co-leads: Madlyn Runburg (NHMU), Chris Keleher (UDNR)

- **Museum Partnerships**

- Taking Learning Outdoors
- Engage students, teachers and diverse populations in museum activities
- Coordinators: Madlyn Runburg and Lorie Millward (NHMU)
- Expand to additional partners

- **Citizen Science**

- Statewide program to involve students and the general public in watershed research
- Coordinators: Nancy Mesner and Brian Greene (USU)

- **Stakeholder Engagement**

- Reach out to water resource managers across Utah
- Coordinators: Chris Keleher (UDNR)

- **Communications Strategies**





Diversity Enhancement Team

Co-leads: Janet Ross (FCS), Nancy Huntly (USU)

- **Cultural awareness conference**
 - Spring 2013 in Southern Utah
- **Create cultural awareness manual**
 - Best practices
- **Diversity training workshop**
 - Train the trainer
- **Hispanic 'schoolyard' curriculum**
 - Coordinator : Omar Perez-Reyes
- **Recruit and retain diverse populations in iUTAH opportunities**
 - K12 students, teachers, undergraduates, graduates, postdocs, faculty
- **Increase diversity of iUTAH participants**



Source: Four Corners School