

iUTAH GAMUT

EYE ON UTAH'S STREAMS

A key component of iUTAH's science infrastructure is an environmental observatory called GAMUT or 'Gradients Along Mountain to Urban Transitions.' iUTAH is a university-community collaboration integrating research, training and education to strengthen science for Utah's water future. The project, now in its fifth year, is funded in cooperation with the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR) The purpose of iUTAH is to lay a foundation for addressing water, population growth, and climate change issues in Utah.

WHAT IS GAMUT?

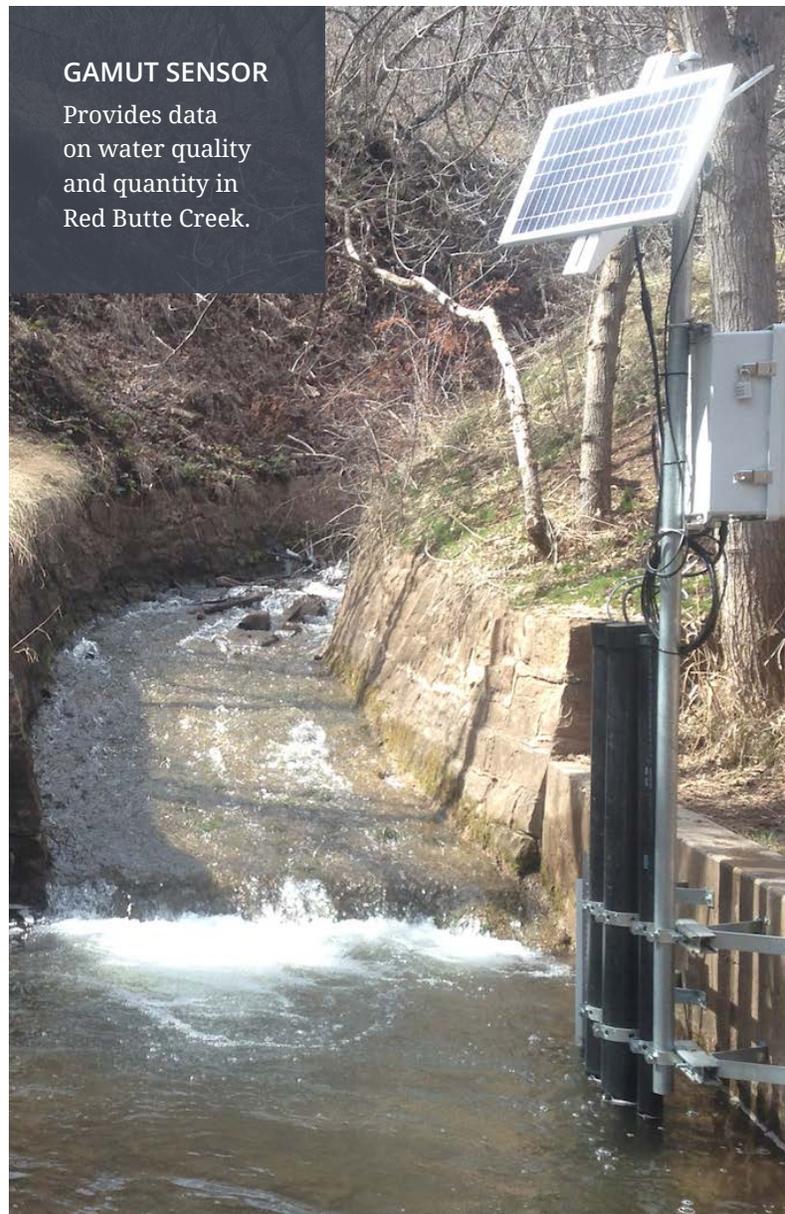
Our scientists and technicians, with input from municipal, state, and federal stakeholders, designed and installed a network of aquatic and climate sensor stations along the Wasatch Front. Built to study water, the GAMUT network has 38 sites measuring climate, hydrology, and water quality in three watersheds: Red Butte Creek, Logan River, and Provo River. Although alike in their primary source of water—winter snow—these three watersheds are very different in terms of human use of the surrounding land. GAMUT provides data to inform research about a wide range of issues related to water quality and quantity.

WHY IS IT IMPORTANT?

Over the past three decades Utah has been one of the fastest-growing states in the U.S. It's also the second driest state. Factors such as rapid population growth coupled with a predicted shift in precipitation from snow to rain will result in less available water. This means that water issues will gain even greater importance in the coming years. With access to data from GAMUT, research scientists, water managers, and state agencies will be able to better understand and prepare for the growing demands on Utah's water supply in the near and distant future.

GAMUT SENSOR

Provides data on water quality and quantity in Red Butte Creek.





GAMUT OBSERVATORY IN RED BUTTE WATERSHED

Towers and sensors form the backbone of the GAMUT network, which measures climate, hydrology, and water quality.

HOW DOES GAMUT WORK?

GAMUT's environmental observatory consists of instrumented platforms on land and in water that are capable of sensing key variables from local sources and moving the data in near-real time to web-accessible databases. Spatially, the network spans the Wasatch Front encompassing three montane-to-urban watersheds, where terrestrial and aquatic stations collect information ranging from air pressure, temperature, and humidity on land to pH, dissolved oxygen, turbidity, algae, and nitrate sensors in the water. GAMUT's ecological sensors log, transmit, and share data via the iUTAH Modeling and Data Federation, a highly developed cyberinfrastructure, at 15-minute time intervals. Data can be downloaded and visualized online.

A key component of the iUTAH GAMUT network is its cyberinfrastructure, which includes computing systems, data storage systems, a data repository, and visualization environments. The human component of this network involves technically trained individuals who are skilled at linking software and high-performance computing networks to improve research productivity. The web application available for visualizing, summarizing, and exporting time series data includes active U.S. Geological Survey sites in overlapping basins. Using standardized protocols and an open data policy, GAMUT communicates essential data for scientific understanding and theory development needed to manage Utah's hydro-ecological challenges.

GAMUT in Action

SHARING DATA AND RESEARCH RESULTS

The iUTAH Data Repository was established as a digital data library. It stores, manages, and distributes scientific data collected by the GAMUT sensors and our researchers. The repository includes archival, file-based results for each site in the GAMUT network. It is an open-access resource with datasets available for public viewing and long-term use.

INTEGRATED SOCIO-ENVIRONMENTAL OBSERVATORY

GAMUT's environmental measurements raise interesting questions that need to be answered with a human viewpoint in mind. Social scientists and students at institutions across the state are involving stakeholders and the public in this process through surveys, interviews, and participatory modeling exercises. The results provide useful information about how residents use water and feel about related issues. GAMUT data provide important context that allows for linking social and environmental sciences, which may result in directing decision makers toward socially acceptable solutions to our water challenges.

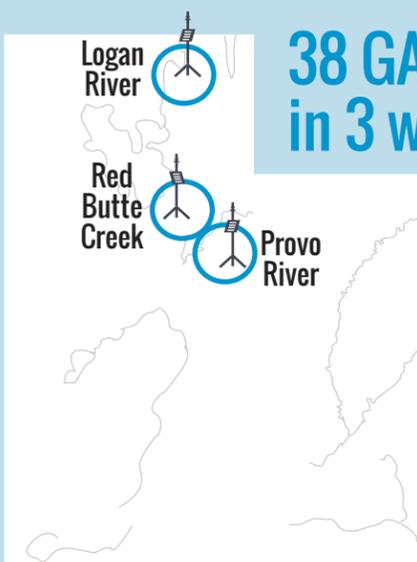
STORMWATER/GREEN INFRASTRUCTURE

As land in Utah is converted to buildings, roads, and parking lots, GAMUT is providing data on streams in cities and towns, where most of Utah's population growth is occurring. Engineers and city/environmental planners are using this data to explore new approaches to stormwater management and green infrastructure development in hopes of reducing water runoff carrying pollutants into our streams and waterways.

EDUCATION AND OUTREACH

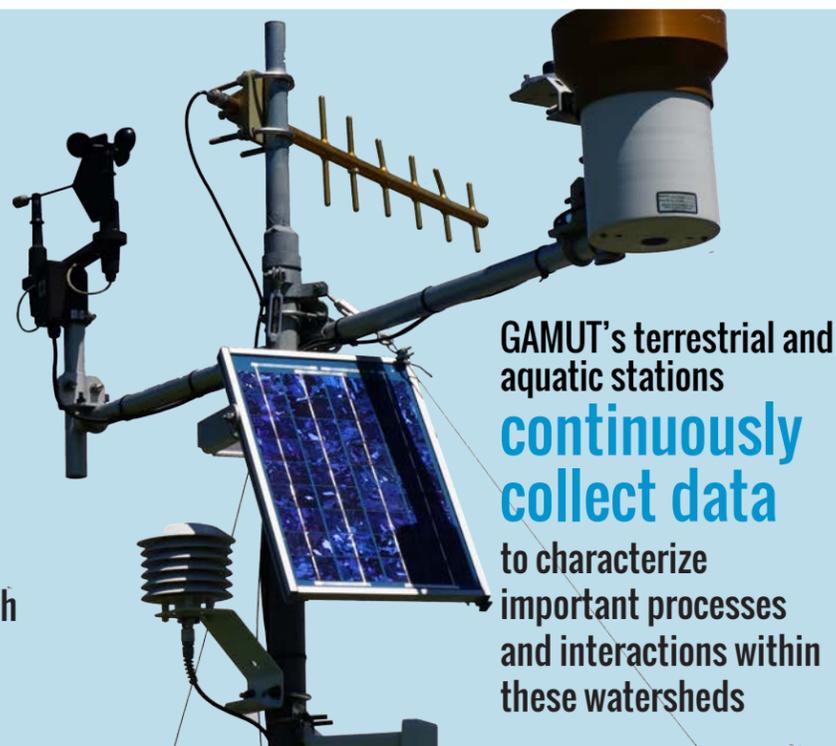
GAMUT technology and data are being used to train Utah's next generation STEM workforce. Programs such as iUTAH's Summer Institute, iFellows undergraduate research experience, and WaterGirls introduce students K-20 to the GAMUT network to help them learn about science-focused water issues facing the state. The iUTAH traineeship program provides opportunities for undergraduate students at Utah universities to acquire skills in sensor maintenance, management, and data processing that are highly sought after in a competitive job market. Through a collaboratively developed interactive display, visitors to the Natural History Museum of Utah can learn about streams and view live GAMUT data from the Red Butte watershed.

How GAMUT Works



38 GAMUT sites in 3 watersheds

Each watershed has a common water source (snow), but differences in how people use and interact with available water



GAMUT's terrestrial and aquatic stations **continuously collect data** to characterize important processes and interactions within these watersheds

Results of GAMUT

GAMUT has made it possible for scientists, engineers, city officials, and the public to access data that can effect change for a better water future

1

DATA REPOSITORY

All collected data are accessible to everyone online

2

EXPLORE, EXTEND & ENHANCE WATER SUSTAINABILITY

“The comprehensive data being measured, in collaboration with iUTAH scientists, will enable the Salt Lake City Department of Public Utilities to gain a better understanding of the water quantity and water quality of the Red Butte Creek System”

*Tracie Kirkham
Water Resources Scientist
Salt Lake City Department of Public Utilities*

“One of the weaknesses that we as a city face is having good quality data to evaluate water quality impacts. The advantage of collaborating with iUTAH is that they provide us with a data management source for collecting data, including quality control. Then they store and warehouse it, so that it is not just available to Logan City, but also to all of the irrigation and canal companies, state agencies, the EPA, and researchers who are concerned about water quality.”

*Lance Houser
Assistant City Engineer
City of Logan*

WHO DOES IT HELP?

Researchers and scientists, including biologists, engineers, and social scientists, are using the information that GAMUT sensors collect on weather, energy balance, snow accumulation, soil moisture, surface water flow, and surface water quality.

These measurements are entered into a uniform database and used to strengthen collaboration between researchers statewide as each seeks to better understand the impact of these variables on the state’s water resources. The data help users answer a wide variety of scientific questions about how natural processes and human activities affect water in Utah, and how that water in turn affects environmental quality and human well-being.

Municipalities and state agencies, such as the Utah Division of Water Quality, City of Logan, and Salt Lake City Department of Public Utilities use GAMUT data to gain important knowledge that can inform the decisions they make.

GAMUT is part of the larger collaborative cyberinfrastructure developed by iUTAH, which integrates hardware and software to support the large volumes of data being collected. iUTAH brings scientists and engineers together to explore, extend, and enhance Utah’s water sustainability now and in the future.

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