Urban Water Innovation Network

Transitioning toward sustainable urban water systems

National Science Foundation
WHERE DISCOVERIES BEGIN

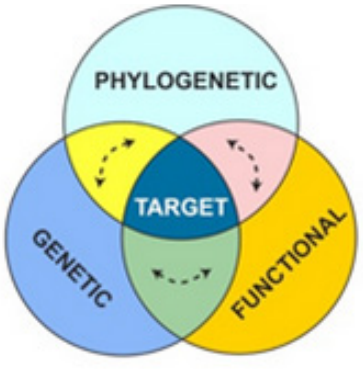
Project A3-1
Urban Vegetation Biodiversity and Ecosystem Functioning

PROJECT OUTCOMES

Our work will help develop assessments of vegetation distributions to improve human well-being in the context of urban warming and drought.

We will look toward identifying plant communities that maximize water use efficiency in supplying urban ecosystem services. People will benefit through better assessments of the water use by vegetation and the services provided by vegetation to better manage their landscapes. This project plans to produce the following:

- Estimates of plant water use and benefits
- Quantification of biodiversity and ecosystem functioning
- Improved modeling approaches that include biodiversity
- Management blueprint for species selection, and landscaping



This project looks to better understand how plants and vegetation influence the trade-off between provisioning of ecosystem services and use of water resources.

We explore components of plant density and diversity as key components of the vegetation-hydrology nexus. Key ecosystem services we look to evaluate are climate cooling and well-being of urban residents.

We are using combinations of field surveys, embedded environmental sensors, and remotely sensed imagery of the urban environment. In a recent example of this work we linked field measurements of evaporation with a tower mounted on a trailer with satellite based imagery of vegetation to generate a whole-city map of evaporation.

Research Questions

How do urban plant communities differ phylogenetically?

How do phylogenetic relationships influence plant functional diversity?

Do different urban vegetation communities lead to different ecosystem service and hydrologic relationships?

How do GI vegetation and ecosystem functioning vary within and among cities?

Our project will generate new data that quantify both distributions of urban vegetation and the microclimate influence of vegetation across the UWIN network of cities.

Picture left: Infrared gas analyzer and 3D sonic anemometer mounted to tower and moved throughout the landscape to measure the evaporative fraction lost to develop a relationship between satellite derived greenness (NDVI) and evaporative fraction. Pictured right: examples of air temperature sensors, called iButtons, that will be deployed throughout eight US metropolitan areas.

ENVIRONMENTAL SENSORS

In 2017 and 2018, we will be deploying more than 300 air temperature sensors throughout eight metropolitan areas that represent the breadth of different climates within the United States.

On the ground, we are surveying the biodiversity of green infrastructure throughout the United States to compare both types of green infrastructure and regions. This work is looking to assess how biodiversity influences the functioning and sustainability of green infrastructure projects.

Together these tools will help evaluate how outdoor water use contributes to urban sustainability and resilience to environmental changes. We are exploring both vegetation writ-large within the urban environment and green infrastructure in particular.

PROJECT KEYWORDS

- Urban Biodiversity
- Ecosystem Services
- Remote Sensing
- Environmental Sensors
- Green Infrastructure

PROJECT CONTACT

Darrel Jenerette
Associate Professor
University of California - Riverside
(951) 827-7113
darrel.jenerette@ucr.edu
https://erams.com/UWIN/a3-1/