



Assessing Tree-to-grass Water-use Ratios: Significance to Urban Water Conservation

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The effects of climate change and the increase of extended droughts make meeting water demands in the arid West a challenge. Because of these factors and rapidly growing populations, understanding water use in urban environments is critical for water conservations efforts. In particular, being able to estimate the amount of water used

specifically for landscaping is crucial for understanding urban water use. “Urban landscapes in Las Vegas use approximately 40 percent of the total water used annually,” says Dr. Dale Devitt, the principal investigator for the project that also includes graduate researcher Tamara Wynne. “Although turfgrass has been demonstrated to be a high water user, many trees can also

RFPs

If you have questions about submitting a NWRRRI proposal, e-mail Amy Russell (Amy.Russell@dri.edu).

For current RFP information, visit the NWRRRI website (www.dri.edu/nwrrri).



The Acacia Demonstration Gardens in Henderson, Nevada, shows examples of water-efficient landscaping combinations for the arid Nevada climate.

(Project Spotlight continued)

use significant amounts of water. In fact, trees use larger amounts under more favorable conditions, such as irrigated landscapes.”

Quantifying tree and turfgrass water-use rates for landscaping in urban environments is vital for conserving Nevada’s precious water resources. All plants require water, but it’s important to know the water usage of different landscaping covers to make sure that water resources are being allocated correctly. Even xeric landscape designs can use more water as the trees mature, and therefore their water-saving benefits could decrease over time. The researchers of this project will evaluate the water-use rates of mature landscape trees growing in an arid environment, the water-use rates of these trees relative to the morphological parameters to scale the data to other locations, the trade-offs between different tree species, tree-to-grass water-use ratio estimates for younger and mature trees, water-use rates under experimental and field conditions, and the effects of water use by trees on turfgrass.

This project will quantify tree-to-grass water-use rates to show the trade-offs between using turfgrass and trees. “Natural



The water-use rates of trees can change as they mature, so it is important to understand those changes to create the most water-efficient tree and grass landscape combinations.

trade-offs exist between vegetation types in terms of water use,” explains Devitt. “Low-water-use landscapes can be comprised of a mix of grass and tree species, such as high-water-use turfgrass and low-water-use trees or low-water-use turfgrass and high-water-use trees.” Understanding the water-use rates of turfgrass and maturing trees will provide insight into these trade-offs that landscape architects, golf course and park superintendents, homeowners, horticulturalists, and water managers can then use to design and maintain water-efficient landscapes. “We will

use a hydrologic balance approach by estimating soil water storage using soil moisture sensors and irrigation based on evapotranspiration feedback to minimize drainage,” continues Devitt. “Simultaneously, we will also use Granier’s thermal dissipation probes to assess transpiration velocity within the trees by relying on a dye injection system to assess the conductive tissue.”

An experimental plot of landscape trees planted in 1998 at the Center for Urban Horticulture and Water Conservation at the University of Nevada, Las Vegas, will be

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(Project Spotlight continued)

used to assess the water-use rates of mature tree species that are commonly planted in the arid Southwest. The researchers have also planted turfgrass in nonweighing lysimeters to estimate the water-use rates of commonly planted turfgrass

species. “We selected ten urban landscape tree species and four turfgrass species,” says Devitt. “This will allow us to make 40 different tree-to-grass water-use comparisons over the two-year experimental period.” The results of this study will benefit

Nevada and other arid regions in the Southwest by providing solutions for beautiful, water-saving landscape combinations that use diverse plant species. ■

PI Spotlight: Dr. Dale Devitt



Dr. Dale Devitt’s career at University of Nevada, Las Vegas, has given him an in-depth understanding of the critical water issues that affect southern Nevada. “I have been at the university for over 30 years and have watched the population in the Las Vegas community increase fourfold,” says Devitt. “We are 90 percent dependent on

the Colorado River and many models suggest that flow reductions associated with climate change may be significant over the next 20 to 30 years.”

Because a significant amount of the water used in the Las Vegas metropolitan area is used outdoors to irrigate urban landscapes, finding solutions for water-efficient landscaping is important for conserving valuable water resources and meeting increasing water demands over the long term. It is the fact that water resources research is directly applicable to daily life, especially in arid and semiarid environments such as Nevada, that Devitt appreciates most about his work for NIWR. “The research I’m doing for NIWR has real applied significance that can be easily translated into water savings in the urban landscape,” he

explains, “and the results directly benefit end users.”

In addition to his NIWR research, Devitt is also researching the effects of climate change, such as the hydrologic and ecological connectivity in mountain valley systems, the response of phreatophytes (deep-rooted shrubs) to groundwater oscillations, the environmental impacts of large utility-scale solar facilities on desert ecosystems, and the use of treated sewage effluent as an alternative irrigation source.

When asked what he would want to have with him if he was stranded on a desert island, Devitt answered that he’d want to have a telescope and a surfboard. And when it comes to dessert, if he had to pick between cake or pie, his choice would be: “Loganberry pie straight from the oven with a scoop of vanilla ice cream.” ■

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Grad Student Interview: Tamara Wynne

We asked graduate student Tamara Wynne about her current studies and her plans for the future. Here's what she had to say:

1) What field are you currently studying and what sparked your interest in that field?

I am currently studying botany. I've always loved nature and the outdoors. I took a botany class in high school here in Las Vegas, and that's what sparked my interest. I graduated from Cornell University in New York with my bachelor's degree in plant science, which is what fueled my passion for plants.

2) What research project are you currently working on and what research are you doing?

I am currently working on the project "Assessing Tree-to-grass Water-use Ratios: Significance to Urban Water Conservation." Professor Dale Devitt of the University of Nevada, Las Vegas, and I are studying the amount of water that is used by landscape trees versus landscape grasses. We have ten different species of trees and four different species of grasses that I carefully monitor. Fortunately, we were able to purchase Granier probes to measure the amount of sap flow in the trunk of the trees and a three-foot-long moisture probe to

measure the soil moisture at six depths.

3) What have you learned from working on this project?

I am continually learning something new as I work on this project. Currently, we are studying how the xylem tissue exhibits active and inactive functions that are intermingled in the wood of the tree. Measuring the soil moisture around the trees has taught me about the relationship between evapotranspiration and soil water content. I have also observed interesting water-use trends by studying the grasses. So far, I have seen how some grasses, such as fescue, use much more water than Bermuda grass.

4) What have you enjoyed most about working on this project?

My dad volunteers at the orchard where I do my research, so it's great being able to work



with him almost every day. I really value our time together learning about the trees, and life. I also enjoy working with Dr. Devitt, particularly because of his kindness and what he teaches me about the value of research and hard work. And lastly, I love being outside working with plants, so that's another great aspect of working on this project.

5) What are your goals for the next step in your career?

I hope to continue teaching and researching. I love the idea of doing experiments and leading

"Caring for the environment and working to conserve our natural resources ranks very high on my priority list." – Tamara Wynne

(Grad Student Interview continued)

classes, especially because I enjoy doing both. Also, caring for the environment and working to conserve our natural resources ranks very high on my priority list.

6) If you could go on vacation anywhere in the world, where would you want to go, why would you want to go there,

and what would you want to do there?

A vacation to Israel would be so cool! Israel has so many cool things related with water resources research, such as desert soil research and desert fruit orchards. It's also the Holy Land, so there would be a lot of neat places to see. I would love to

collaborate with the scientists there and see all the landmarks.

7) Cake or Pie?

Pie, especially my mom's apple pie. ■

Upcoming Events

AGU Chapman Conference: Extreme Climate Event Impacts on Aquatic Biogeochemical Cycles and Fluxes
January 22-27, 2017
San Juan, Puerto Rico
chapman.agu.org/extremeclimate/

Water Rights in Nevada Workshops
February 13-14, 2017
Reno, NV
www.nvwra.org/2017-water-rights-seminar

2017 Mine Water Management Symposium
February 13-14, 2017
Reno, NV
www.nvwra.org/2017-symposium

2017 NWRRA Annual Conference
February 14-16, 2017
Reno, NV
www.nvwra.org/2017-annual-conference-program

Geotechnical Frontiers
March 12-15, 2017
Orlando, FL
geotechnicalfrontiers.com

2017 AWRA Spring Specialty Conference
Connecting the Dots: The Emerging Science of Aquatic System Connectivity
April 30-May 3, 2017
Snowbird, UT
www.awra.org/meetings/Snowbird2017/

2017 GSA Cordilleran Section: 113th Annual Meeting
May 23-25, 2017
Honolulu, Hawai'i
www.geosociety.org/Sections/cord/2017mtg/

3rd North American Symposium on Landslides
June 4-8, 2017
Roanoke, VA
www.aegweb.org/mpage/nasl17m

2017 AWRA Summer Specialty Conference
Climate Change Solutions: Collaborative Science, Policy, and Management for Sustainable Water Management
June 25-28, 2017
Tysons, VA
www.awra.org/meetings/Tysons2017/

GSA 2017
October 22-25
Seattle, WA
www.geosociety.org/meetings/2017/

2017 Annual AWRA Conference
November 5-9, 2017
Portland, OR
www.awra.org/meetings/Portland2017/

NWRRI - Desert Research Institute

Success and the dedication to quality research have established the Division of Hydrologic Sciences (DHS) as the Nevada Water Resources Research Institute (NWRRI) under the Water Resources Research Act of 1984 (as amended). As the NWRRI, the continuing goals of DHS are to develop the water sciences knowledge and expertise that support Nevada's water needs, encourage our nation to manage water more responsibly, and train students to become productive professionals.

Desert Research Institute, the nonprofit research campus of the Nevada System of Higher Education, strives to be the world leader in environmental sciences through the application of knowledge and technologies to improve people's lives throughout Nevada and the world.

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www.dri.edu/nwrri

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