Center for
Water-Efficient
Landscaping

annual report

july 2020 - december 2021

2021

UtahState University

This document was designed to be read digitally as a **two-page spread.** In your pdf reader, go to View in the top tab menu and select Page Display, set to Two Page View.

Center for Water-Efficient Landscaping
UtahStateUniversity.

Extension
UtahStateUniversity

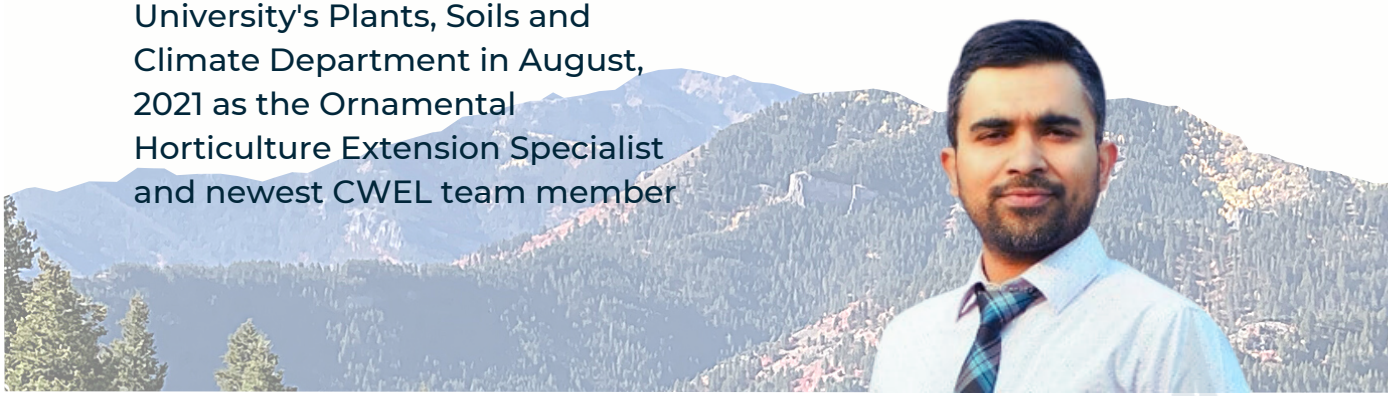
S.J. & JESSIE E. QUINNEY
COLLEGE of
NATURAL RESOURCES

PEOPLE

The Center for Water-Efficient Landscaping's team is a small multidiciplinary group of faculty, staff, and graduate students dedicated to finding ways to reduce water use in the landscape without compromising the environment, lifestyle, or economics.

WELCOME!

Dr. Shital Poudyal joined Utah State University's Plants, Soils and Climate Department in August, 2021 as the Ornamental Horticulture Extension Specialist and newest CWEL team member



Dr. Poudyal's research focuses on developing sustainable management practices for landscape and nursery plants with an emphasis on water conservation.

He aims to evaluate and understand physiological, morphological, and biochemical responses of various ornamental plants subjected to irrigation with unconventional water sources and develop effective techniques to protect surface and groundwater resources by reducing agrochemical runoff.

Research areas will include:

- increasing production sustainability in the nursery and landscape industry
- developing stress tolerance mechanisms in ornamental plants
- using alternate water sources for irrigation of ornamental crops
- identifying new ornamental cultivars for xeriscaping and regional climate

In his role as a USU Extension Specialist, Dr. Poudyal will be closely involved with the Qualified Water Efficient Landscaper (QWEL), USU Master Gardeners programs, USU county Extension faculty, Utah Water districts, nursery, landscape growers and associations, the Utah Department of Natural Resources, as well as USDA-NRCS programs.

FACULTY

JOANNA ENDTER-WADA

Professor of Natural Resource Policy and Social Science
Department of Environment and Society
Quinney College of Natural Resources

- social science and policy aspects of urban landscape water use and conservation
- human dimensions of drought and climate change

SHITAL POUDYAL

Assistant Professor and Ornamental Horticulture Extension Specialist
Department of Plants, Soils and Climate
College of Agriculture and Applied Sciences

- develop sustainable management practices for landscape and nursery plants
- irrigation with unconventional water sources
- develop techniques to protect surface and groundwater by reducing agrochemicals runoff

PAUL JOHNSON

Department Head and Professor of Turfgrass Science
Department of Plants, Soils and Climate
College of Agriculture and Applied Sciences

- develop bluegrass species with increased drought and salt tolerance for better adaptation to Intermountain West environments

CANDACE SCHAIBLE

Professional Practice Extension Associate Professor Horticulture and Water Conservation
Iron County, Utah State University Extension

- horticulture emphasis
- educate homeowners on best practices for water conservation in the landscape

KELLY KOPP: *DIRECTOR*

Professor/Extension Water Conservation and Turfgrass Specialist, Director
Department of Plants, Soils and Climate
College of Agriculture and Applied Sciences

- improve efficiency of landscape irrigation with projects that include plant water-use efficiency evaluations, appropriate irrigation system design, and smart water application technologies

YOUPING SUN

Assistant Professor of Landscape Horticulture
Department of Plants, Soils and Climate
College of Agriculture and Applied Sciences

- understand whole-plant responses to natural or managed water stress
- promote use of native plants for water-efficient landscapes

STAFF

SUSAN BUFFLER

Coordinator of Programs
Center for Water-Efficient Landscaping

- coordinates CWEL programs
- landscape design
- Master of Professional Studies in Horticulture (MPSH) coordinator
- social media outreach coordinator

CHRIS GARRARD

Programmer / Analyst
Remote Sensing / GIS Laboratory College of Natural Resources / Center for Water-Efficient Landscaping

- software programmer for the WaterMAPS™ project
- teaches courses on Python scripting for GIS

PAUL HARRIS

Research Technician
Center for Water-Efficient Landscaping

- research in turfgrass drought tolerance
- promoting landscape water conservation
- recently completed a master of science degree in plant science

MICHAEL KILCREASE

Research Technician & Grounds Manager
USU Botanical Center / Center for Water-Efficient Landscaping

- assists with a variety of research projects for CWEL at the USU Botanical Center

MELANIE ROBINSON

Undergraduate Extension Outreach Assistant
(through 2020)
Center for Water-Efficient Landscaping / Department of Plants, Soils and Climate

- website management
- CWEL social media outreach
- video production

COVID-19 STATEMENT

Images in this document used to illustrate research and activities were taken between July 2020 and December 2021 during the Coronavirus (COVID-19) pandemic. For the purposes of this document, Utah State University COVID-19 health and safety protocols were followed.

GRADUATE STUDENTS

PAIGE BOYLE

PhD Ecology
Undergraduate Degree: Environmental, Soil & Water Science, University of Arkansas

Master's Degree: Horticulture, University of Arkansas
Dissertation Project: Clover Inclusion for Value-Added Turf

Committee chair - Kelly Kopp

JI-JHONG (JJ) CHEN

PhD Plant Science
Undergraduate Degree: Horticultural Science, National Chung Hsing University (Taiwan)

Master's Degree: MS, Plant Science, Utah State University
Dissertation Project: How do low water-use ornamental plants respond to restricted water availability?

Committee chair - Youping Sun

MORIAH JACKSON

MPSH - Master of Professional Studies in Horticulture
Undergraduate Degree: Psychology, B.S., minor: Chemistry & Nutrition, The University of Utah
Capstone Project: TBD

Faculty advisor - Kelly Kopp

CHRISTOPHER M. MCGINTY

PhD Ecology
Undergraduate Degree: Management and Human Resources, Utah State University

Dissertation Project: Development of a classification and monitoring approach to identify and assess disturbance in semi-arid ecosystems using multi-scale and multi-temporal remotely sensed imagery: Development of protocols for land managers

Committee chair – Joanna Endter-Wada

ASMITA PAUDEL

PhD Plant Science
Undergraduate Degree: Agricultural Science, Tribhuvan University (Nepal)

Master's Degree: MS Plant Science, Utah State University
Dissertation Project: Salinity Stress Responses and Adaptive Mechanisms in Landscape Plants

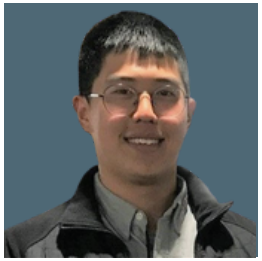
Committee chair - Youping Sun

LI-TING (MILA) YEN

PhD Soil Science

Committee chair - Astrid Jacobsen

GRADUATE DEGREES AWARDED



JI-JHONG (JJ) CHEN

MS Plant Science

Undergraduate Degree: Horticultural Science, National Chung Hsing University (Taiwan)
Thesis Project: Nodulation and growth of *Shepherdia × utahensis* 'Torrey'

Committee chair - Youping Sun

ASMITA PAUDEL

MS Plant Science

Undergraduate Degree: Agricultural Science, Tribhuvan University (Nepal)
Thesis Project: Propagation and Production of Utah Native Plants

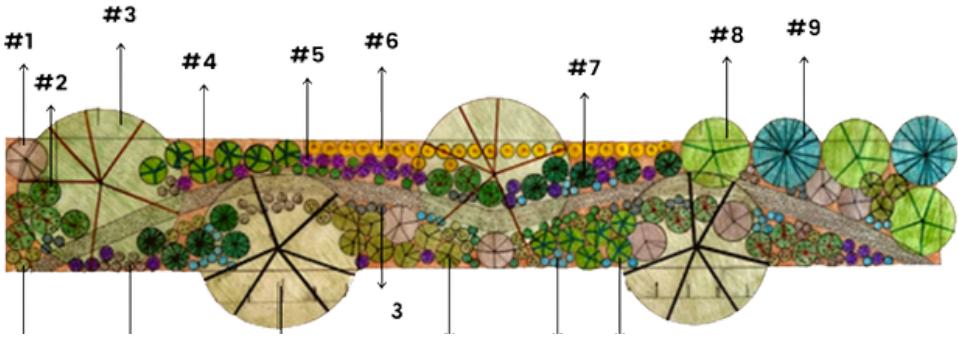
Committee chair - Youping Sun

NYSSE WILSON

MPSH - Master of Professional Studies in Horticulture

Undergraduate Degree: Individualized Studies / Socio-Cultrual Anthropology / B.A.
Northern Michigan University
Capstone Project: 16 Drought Tolerant Edible Landscape Plants

Faculty Advisor - Kelly Kopp



RESEARCH

Research demonstrates that the amount of water applied to landscapes can be reduced substantially without affecting landscape quality or consumer lifestyles. Water use could be reduced even further if alternative landscape designs and management programs were practiced.

CWEL conducts research in three main areas:

- Human Dimensions
- Turf Management
- Ornamental & Landscape Horticulture

CWEL PhD student JJ Chen uses a CIRAS-3 Portable Photosynthesis System with a PLC3 Conifer Leaf Cuvette, to record gas exchange data of plants with narrow leaves

Turf Management

- Water requirements of turfgrass
- Effects of short-term drought
- Development of drought-tolerant and other potentially useful turf species

Research Projects

2021 Drought response at the
Greenville Research Farm

Turfgrass Projects

Drought Tolerance

- Evaluation of infrequent irrigation on Kentucky bluegrass
- Nitrogen fertilization for drought tolerance in Kentucky bluegrass

National Turf Evaluation Program (NTEP) Studies

- Creeping bentgrass putting green trial
- Fine fescue quality and adaptation
- Perennial ryegrass quality attributes and stress performance (reduced irrigation)
- Kentucky bluegrass drought performance
- Tall fescue quality attributes and drought tolerance

Persistence of Turfgrass / Legume Mixtures

- Clover inclusion for value added turf

Highlights

2021 Drought response at the Greenville Research Farm

The drone photos at right illustrate water conservation steps CWEL researchers at the Utah Agricultural Experiment Station's (UAES) Greenville Research Farm took during the summer of 2021 in response to severe drought conditions.

Throughout the summer only active research was irrigated. The rest was allowed to go dormant.

The image at the top shows irrigated active research plots in mid-summer with surrounding dormant areas.

The image at the bottom illustrates the recovery when temperatures cooled in the fall and we received precipitation.

Researchers also had a contingency plan to prioritize research in the event we were asked to reduce irrigation even further.

Drought recovery / survival of turfgrass

LOCATION
UAES Greenville Farm

STUDY 1:
Evaluation of infrequent irrigation on Kentucky bluegrass

WHY: What is the bare minimum amount of water needed for turfgrass to recover from drought dormancy?

- Looked at amounts of irrigation applied infrequently to see how turf recovered from prolonged drought
- Grasses were either irrigated 0.25", 0.5" or 1.0" once per month (June, July, August)

TAKEAWAY:

- Even with small amounts of irrigation turf will recover much faster than with zero irrigation
- You can tell from the drone images that the unirrigated borders are recovering much slower

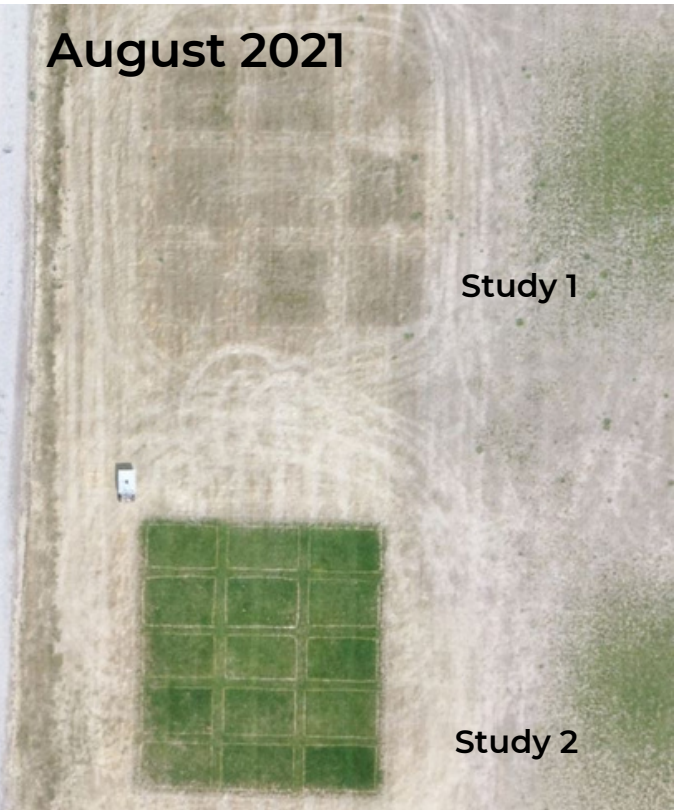
STUDY 2:
Nitrogen fertilization for drought tolerance in Kentucky bluegrass

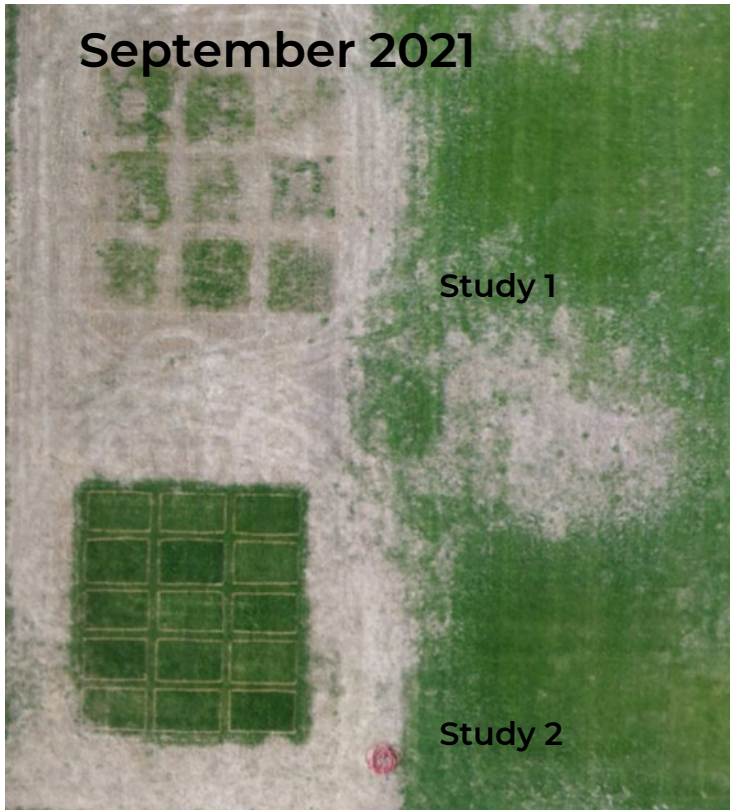
WHY: Do different amounts of nitrogen fertilizer help turf tolerate drought conditions better?

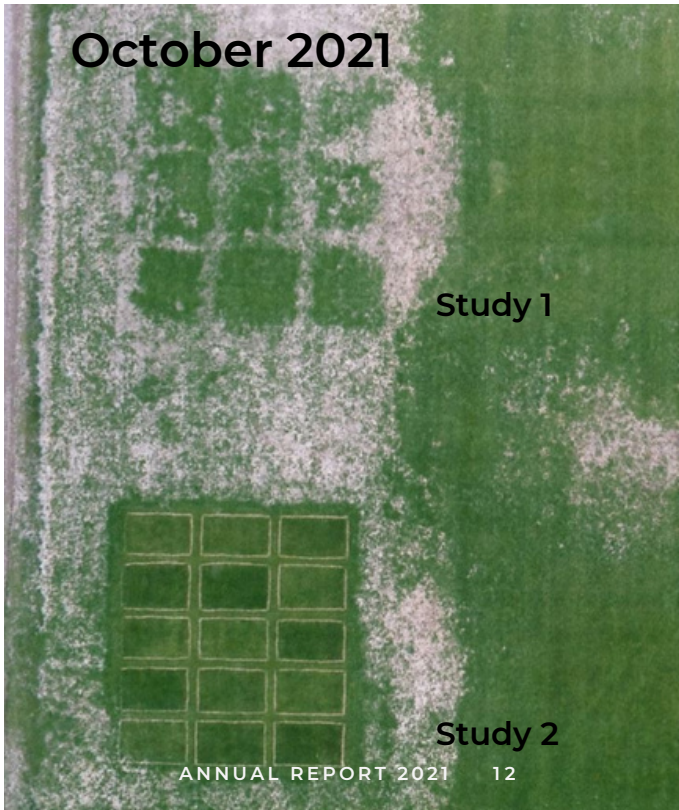
- What amount of fertilizer is most beneficial during drought conditions without applying excessive amounts?
- Used different fertilizer amounts under reduced irrigation (50% ET)
- The treatments were 1, 2, 3, 4, and 6 lbs of nitrogen/1000 sq ft.
- This is the first of a three years study to allow the turf to acclimate to the different fertilizer treatments

TAKEAWAY:

- Turf plots with higher N treatments recovered more quickly from the effects of reduced irrigation,
- but earlier in the height of summer (approximately July) the differences in the treatments were not as evident







National Turf Evaluation Program (NTEP) Creeping bentgrass putting green trial

LOCATION
UAES Greenville Farm

Creeping bentgrass is a high maintenance cool-season species commonly used on golf course putting greens and other facilities requiring low growing turf species.

In collaboration with the National Turfgrass Evaluation Program (NTEP), a new creeping bentgrass (*Agrostis stolonifera*) putting green trial was seeded at the end of the summer 2020.

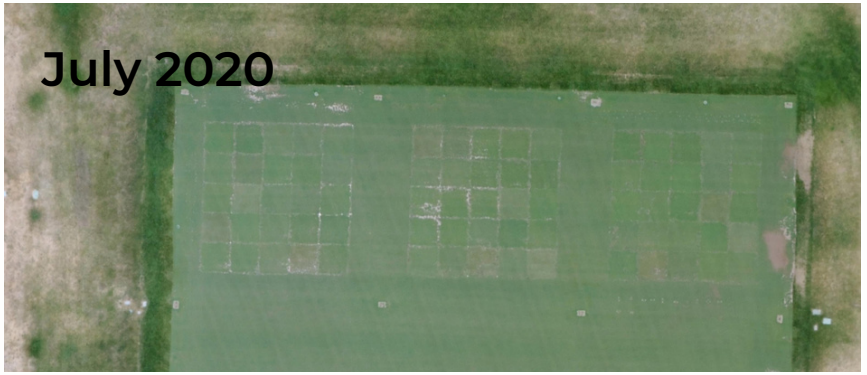
CWEL turf researchers will be evaluating 25 different varieties of creeping bentgrass over the course of 5 years.

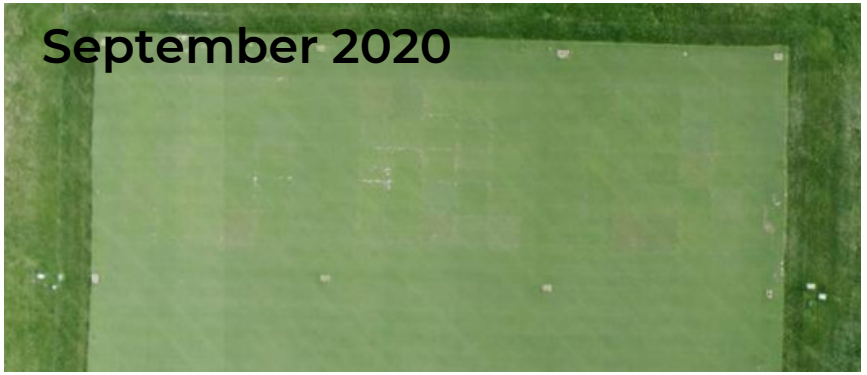
Characteristics investigated include:

- genetic color
- density
- fall color retention
- spring green up
- overall visual quality

Plots were mowed 3 times per week at a height of 1/8". Plots were irrigated 3 times per wk at 80% ET* during the hottest part of the summer and every 3rd day during the mild part of the season also at 80% ET (less than evaporation and traspiration replacement value).

*ET - Evapotranspiration: The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants.





National Turf Evaluation Program (NTEP) Fine fescue trial

This trial includes a range of fine fescue species including creeping red fescue, chewings fescue, hard fescue, and sheep fescue.

- 2020 - plot seeded in fall
- 2021 - first year of evaluations
  - Irrigated to prevent stress to ensure full establishment
- 2022 - Irrigation will likely be reduced so that moderate drought stress occurs

All plots performing well under the conditions specified for the trial.

NTEP data for the Logan location as well as all the other sites can be found at [https://ntep.org/]

Clover Inclusion for Value Added Turf

LOCATION
UAES Greenville Farm

Plants, Soils and Climate and CWEL graduate student Paige Boyle is investigating Kentucky bluegrass and clovers alone as well as combinations of bluegrass and different clovers to see if the clovers persist, help prevent weeds, and reduce nitrogen fertilizer requirements.

Paige is comparing plots that are fertilized with those that are not to see if nitrogen impacts clover/grass dominance. Fertilizer applications were applied once in the fall, irrigated as needed, and mowed once a week during the growing season to a height of 3.5 inches.

Turf Team

Kelly Kopp

Professor Extension Water Conservation / Turfgrass Specialist / CWEL Director

Paul Johnson

Professor Turfgrass Science

Paul Harris

Research Technician

Paige Boyle

Graduate Student PhD

Ornamental & Landscape Horticulture

- Water requirements of trees and perennial landscape plants
- Effects of short-term drought on landscapes
- Development and use of drought-tolerant and native landscape plants
- Tolerance to salinity in landscape plants
- Alternative sources of water for use in landscape irrigation

Research Projects

Ornamental and Native Plants

Drought Tolerance

- Climate Ready Landscape Plants
- Drought Tolerance of Hybrid buffaloberry
- Drought Tolerance of Feather reedgrass

Salt Tolerance

- Salt tolerance of Woody Landscape Plants
- Salt Tolerance of Native Plants

Propagation

- Propagation of Utah Native Plants: Cutting Propagation (I)
- Propagation of Utah Native Plants: Cutting Propagation (II)
- Selection and Propagation of Native Plants for Low-Water Landscaping

Nodulation in Native Nitrogen Fixing Plants

- Diversity of Frankia Strains in the Nodules of Shepherdia ×utahensis
- Diversity of Frankia Strains in the Nodules of Shepherdia ×utahensis
- Nodulation of Ceanothus Velutinus

Technology

- Application of Sensorweb™ Irrigation Control System in Plant Production
- Quantifying Evapotranspiration of New Landscapes Using Landscape-scale Drainage Lysimeters
- Water content sensor integrity: is your sensor still accurate?

Specialty Crops

- Establishing Pinyon Pine Orchards for Nut Crop Production on Marginal Lands
- Developing a Maple Syrup Industry for the Interior West Through Extension and Research

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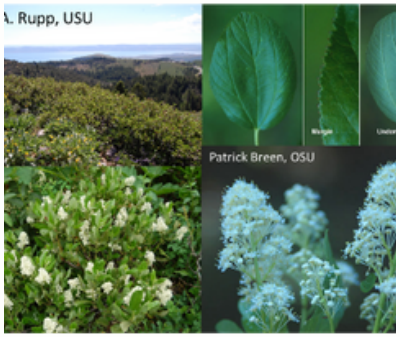
GREENHOUSE & FIELD TRIALS

Utah Agricultural Experiment Station's North Logan Greenville Research Farm & Kaysville Research Farms & Greenhouses



Wild population of *Ceanothus velutinus* in Logan Canyor
green leaves and long clusters of white flowers.

Highlights

Climate Ready Landscape Plants

LOCATION:
UAES Greenville Farm

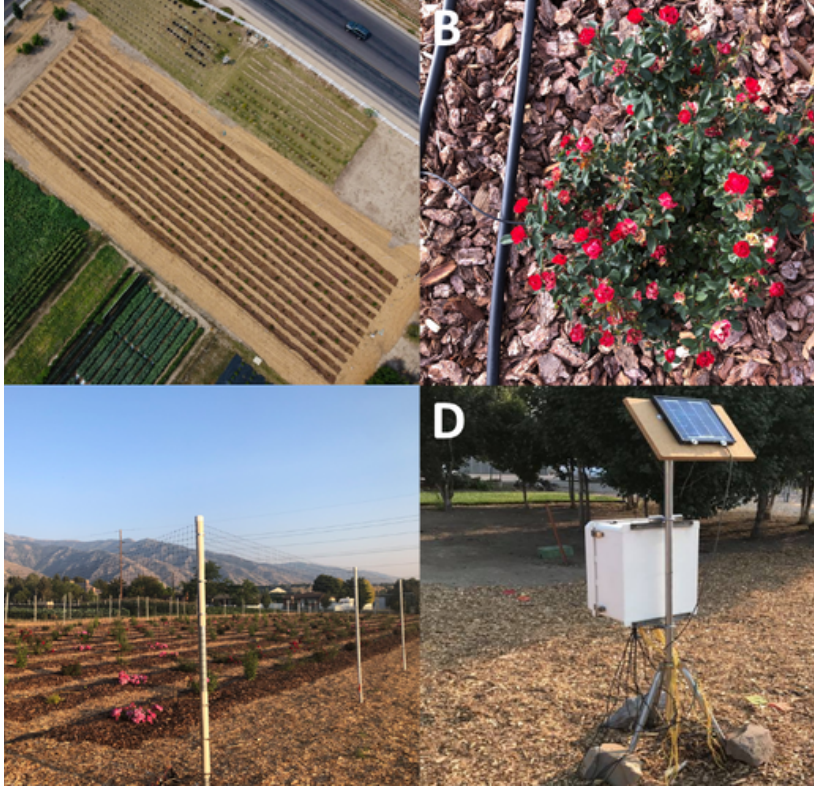
OUTCOME: Evaluate field performance of landscape plants under deficit irrigation to determine how much water can be saved while maintaining plant visual quality and health.

WHAT WE WILL DO:

- Plant water requirements are yet to be defined for most landscape plants
- The field trial consisted of 456 plants, 19 newly-developed landscape plant taxa (A-D)
- In 2021, plants irrigated when the cumulative evapotranspiration (ET0), recorded using a Utah AgWeather Station (Utah Climate Center, Logan, UT), reached 0.90 inches
- In 2022 and 2023, plants will be irrigated at 20%, 50%, or 80% ET0 for 20 weeks from May to September
- Soil moisture sensors installed at the depth of 10 and 50 cm to record soil moisture content
- Plant visual quality, morphological and physiological parameters will be recorded monthly in 2022 and 2023

LONG-TERM GOAL: Create an extensive western regional landscape plant evaluation network that utilizes a standardized method to evaluate plant performance under deficit irrigation in six different climates and soil types.

This collaborative project includes a large team led by the University of California, Davis and includes Oregon State University, The University of Arizona, and the University of Washington. Funding is provided by the Specialty Crop Multi-State Program, administered by USDA Agricultural Marketing Service (AMS).



Top and center: Climate ready landscape plant trials and video recording Bottom: Field trial of 26 ornamental grasses for use in the Intermountain West

Selection and Propagation of Native Plants for Low-Water Landscaping

LOCATIONS:
UAES Research Greenhouse and Greenville Farm, Logan, UT
USU Botanical Center, Kaysville UT

WHAT WE WILL DO:

- Select superior woody plants with characteristics amenable to attractive, functional, low-water landscaping
- Determine appropriate means of propagation and production
- Evaluate landscape performance
- Introduce into the landscape industry

THE TAKEAWAY:

- The long-lived nature of woody, native plants is such that any project must be considered on a scale of years
- A number of species have already been evaluated in depth with several developed to the point of release to the landscape industry
- Several of these have developed to the point of being considered for release, including:
    - Bigtooth maple ('Alice' and five other selections)
    - Littleleaf mountain mahogany ('Hoodoo' and 'DoubleDown' selections)
    - Creeping Oregon grape ('Semi-Gloss', 'Matte', and 'Angel' selections)
    - Mountain lover ('Teton' and 'City Creek' selections)
- Continue to investigate additional species for ease of propagation, nursery production, and performance in the low-water landscape

Top: Littleleaf mountain mahogany seedlings in potting media Bottom: Single Littleleaf mountain mahogany seedling

Quantifying Evapotranspiration of New Landscapes Using Landscape-Scale Drainage Lysimeters

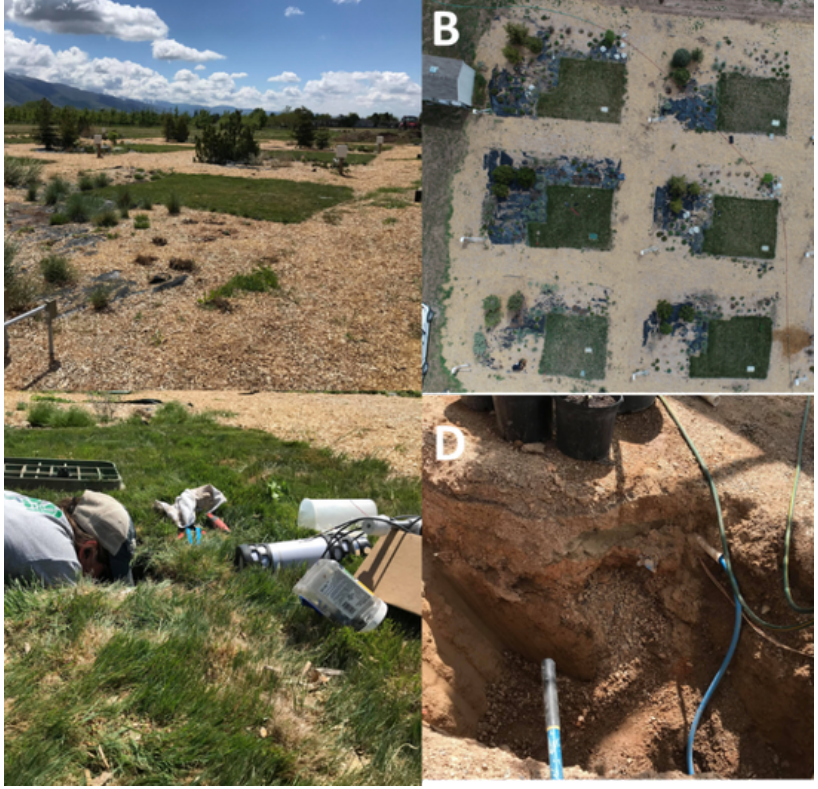
LOCATION:
UAES Kaysville Research Farm, Kaysville, UT

OUTCOME: Quantify water requirements of landscapes with different plant types

- Utah landscapes are typically comprised of plants requiring different amounts of water as well as different types of plant materials which creates a challenge for urban landscapes

WHAT & HOW:

- Plants were established under well-watered conditions
- Water use will be measured under increasingly limited conditions to define minimum water needs for water-efficient landscapes



Drought Tolerance of Feather reedgrass (Calimagrostis x acutifolia)

LOCATION:
UAES Greenville Research Farm, North Logan, UT

Dr. Youping Sun and graduate student JJ Chen are working on drought tolerance of Feather reedgrass (Calamagrostis ×acutiflora)

THE QUESTION: How little water can Feather reedgrass use and still produce enough to be worth using on marginal land for potential use in bioenergy

This is a joint project with researchers in the USU Chemistry Department.

Highlights: Specialty Crops

Establishing Pinyon Pine Orchards for Nut Crop Production on Marginal Lands

LOCATIONS
Raft River Mountains, UT
UAES Research Greenhouse, Logan, UT
UAES Blue Creek Farm, Box Elder County

BACKGROUND:

- Pine nuts have high demand in the United States but production is low when compared to worldwide production
- Locally available pine nuts are collected from wild single-leaf pinyon pine (Pinus monophylla) and two-leaf pinyon pine (Pinus edulis), which are highly variable in their productivity
- Pinus monophylla and P. edulis are slow-growing, long-lived, and drought-tolerant trees native to the western U.S. Pinus edulis requires 25-30 years to reach maximum productivity while P. monophylla requires 35 to 100 years
- Pinus monophylla produces large nuts with soft shells, whereas P. edulis has smaller nuts with hard shells
- A side-grafting technique was used at Utah State University to propagate superior-producing P. monophylla accessions by side-wedge grafting on P. edulis seedlings, which resulted in a success rate of nearly 80% (Lawson et al., 2021)

OUTCOME:

- Increase yield of a high value drought tolerant crop (pine nuts) that can be produced on marginal land

HOW:

- Identify wild, high-yield trees
- Determine the most effective method of clonal propagation
- Trees grafted in spring, summer, and fall using side-wedge method

TAKEAWAYS:

- Preliminary results indicate that grafting multiple times of year is possible with a good success rate
- Results may indicate that pinyon pine grafting is a reliable method of clonal propagation
- Further research to look at optimizing the grafting process
- Establish two field trial plots to evaluate grafted pinyon pine performance and productivity in different climate zones and types of soils

Developing a Maple Syrup Industry for the Interior West Through Extension and Research

LOCATIONS
Cache County, Utah
Carbon County, Utah
Davis County, Utah
Missoula County, Montana
Santa Fe County, New Mexico

BACKGROUND:

- Maple syrup is an important agricultural commodity in the United States with a total value of $130 million in 2019
- Maple syrup production periods and annual yields vary widely between years and regions and depend heavily on climatic conditions
- Expanding syrup production outside the northeastern U.S. to western states where maples grow will help supply the ever-increasing demand for maple syrup while providing additional income for landowners who wish to utilize their maple resource
- Increasingly, consumers are demanding locally produced agricultural products and are willing to pay premium prices for locally produced maple syrup, especially where it is a novel and unique product
- Bigtooth maple (Acer grandidentatum) and boxelder (Acer negundo) are native to the Intermountain West. Norway maple (Acer platanoides) and other non-native maple species are common in the urban and suburban areas of the region. Although there is great potential to tap these maple species for syrup production, very little Extension or research has been conducted to help advance this incipient industry

WHY: Spark the development of a robust maple syrup industry in the Intermountain West.

OUTCOME:

1. Educate landowners and homeowners about maple sap collection and production processes through targeted Extension programs
    a. Conducted virtual workshops in various locations in January and February, 2022
2. Determine sap yields of bigtooth maple, boxelder, and Norway maples in the Intermountain West. using traditional buckets/bags, natural gravity-based 3/16" tubing systems, and high vacuum tubing systems

This project is supported by a USU Extension Grant and USDA Agricultural Marketing Service (AMS) Acer Access and Development Program

Ornamental and Landscape Horticulture Team

Youping Sun

Assistant Professor Landscape Horticulture

Shital Poudyal

Assistant Professor & Extension Ornamental Horticulture Specialist

Michael Kilcrease

Reseach Technician

Asmita Paudel

Graduate Student PhD

JiJhong Chen

Graduate Student PhD

Jesse Mathews

Undergraduate researcher, PSC, CWEL

Macie Sanders

Undergraduate researcher, PSC, CWEL

Collaborators / Cooperators

Kelly Kopp
Professor / Extension Turf Specialist, PSC, CWEL Director

Larry Rupp
Emeritus Professor / Extension Landscape Horticulture Specialist, PSC

John Carman
Professor Plant Genetics, PSC

Reagan Wytsalucy
Extension Assistant Professor Agriculture & Natural Resources, San Juan County, USU

Benjamin Scow
Professional Practice Extension Assistant Professor
Agr. & 4H, Washington County,
USU

Ryan Stewart
Professor Plant & Wildlife Sciences, BYU

Jerry Goodspeed
Director USU Botanical Center / Ogden Botanical Gardens

JayDee Gunnell
Director / Extension Professor, Cache County Extension

Stephen Love
Professor, Aberdeen Research and Extension Center, University of Idaho

Jim Klett
Professor Landscape Horticulture, Ornamentals, and Nursery Management, Colorado State University

William A. Varga
Professor Emeritus PSC; Consultant, Perennial Favorites

Darren J. McAvoy, Extension Assistant Professor, CNR, USU

Steve J. Price,Extension Assistant Professor, USU, Price,UT

Paul Harris,Research Technician, PSC, CWEL, USU

Kelly L. Kopp, Professor and Extension Specialist, PSC, CWEL, USU

Rolston St. Hilaire,Professor, New Mexico State University, Las Cruces, NM

Patrick O. Kelly, Education Program Director, Stokes Nature Center, Logan,

UTCO-INVESTIGATORS/COOPERATORSMichael Farrell, CEO, The Forest Farmers, LLC, Lake Placid, NY

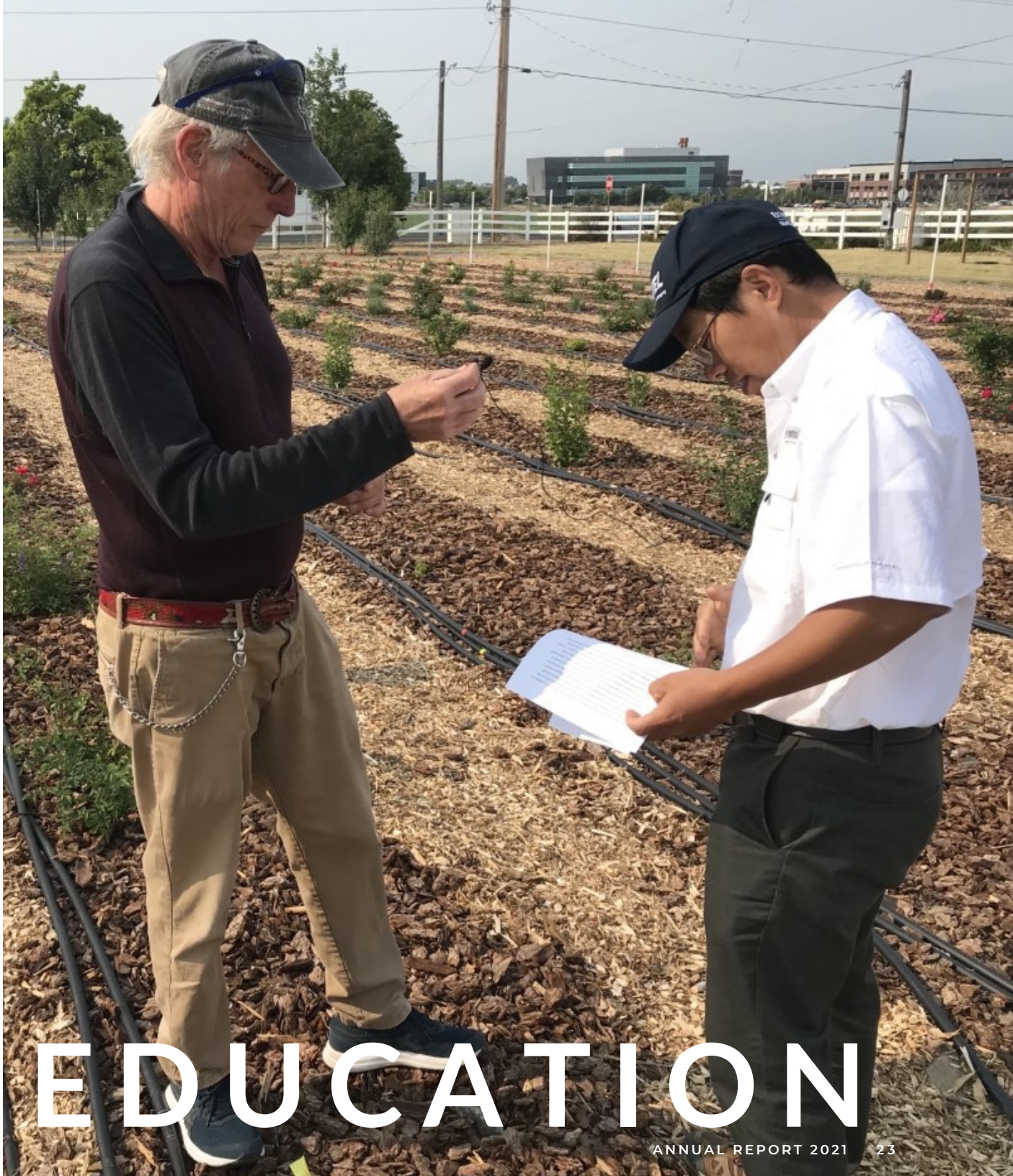
David Knudson, Owner, Montana MapleWorks, Missoula, MT

Jon White, Owner, Brooke Ranch, Paradise, UT

Justin Stubbs, General Manager, Coldwater Ranch, Paradise, UT

EDUCATION & OUTREACH

The Center for Water-Efficient Landscaping's (CWEL) outreach and education programs are geared to provide expertise and information to statewide Utah State University (USU) Extension offices, the green industry, water purveyors / institutions, and the general public.



CWEL researcher Youping Sun (right) is mic'd up for a video shoot by Extension media specialist Dennis Hinkamp at the Utah Experiment Station's Greenville Farm in North Logan.
Photo credit: JiJhong Chen

Programs & Projects

- Qualified Water Efficient Landscaper (QWEL)
- Water Check
- WaterMAPS™
- Water Well With CWEL Webinar Series
- Water-Wise Landscape Demonstration Street
- Tabling at events and conferences

Qualified Water-Efficient Landscaper (QWEL)

CWEL administers the **QWEL program** for the state of Utah.

This program began in California and has since spread to several states where is has been adapted to meet the specific needs of each state or region.

CWEL personnel are in the process of developing an online version of the QWEL program.

CWEL is unique among water conservation efforts in that its mission is restricted to working within the issue of efficient landscape water use only.

Currently, it is estimated that approximately 50-65% of Utah's culinary water is used for landscape irrigation.
CWEL is unique among water conservation efforts in that its mission is restricted to working within the issue of efficient landscape water use only.

Outreach education programs are geared to providing expertise and information to state-wide Extension offices, the green industry, water purveyors/institutions, and the general public. CWEL achieves these goals through collaboration with federal, state, and local agencies as well as Utah's green industry.

Water Check

WATERCHECK
A USU EXTENSION PROGRAM

Water Check is a free program designed to help homeowners, commercial, and institutional property owners to evaluate the efficiency of automated sprinkler systems and provide customized irrigation schedules.

Currently, it is estimated that approximately 50-65% of Utah's culinary water is used for landscape irrigation. Research has demonstrated that the amount of water applied to landscapes could be reduced substantially.

Outreach education programs are geared toward providing expertise and information to state-wide Extension offices, the green industry, water purveyors/institutions, and the general public.

extension.usu.edu/cwel/watercheck

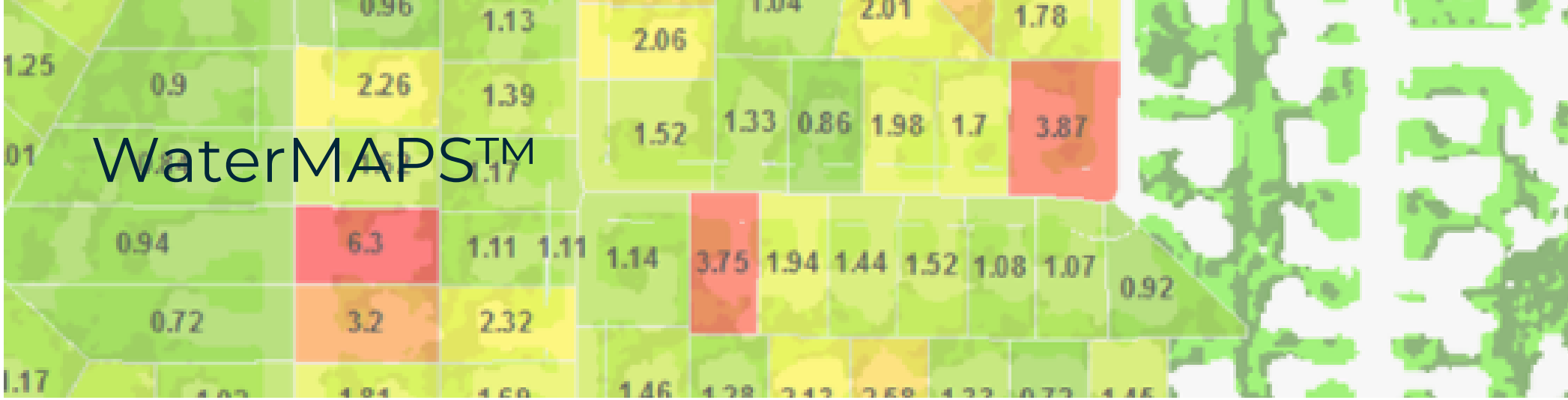
Free!

Since 1999

residential

commercial/ intstitutional

offered in 10+ municipalities & counties



WaterMAPS™

WaterMAPS™
Water Management Analysis and Planning Software

WaterMAPS™ is a custom water demand management tool that has been developed by an inter-disciplinary team of Utah State University researchers for the purpose of promoting urban landscape water conservation.

The tool identifies urban properties with irrigated landscapes that have the greatest “capacity to conserve” water so that conservation information and interventions can be directed and tailored to water users at those locations.

It also helps water suppliers assess the effectiveness of conservation program delivery by monitoring site-specific and service-area changes in landscape water use efficiency over time.

The mission of the WaterMAPS™ team is to provide technical assistance to water suppliers in support of urban water demand management, conservation programming, and water planning and policy decisions.

WaterMAPS™ was developed as an analytic and public information tool to help municipalities, water districts, and managers of pressurized secondary irrigation systems better understand patterns of landscape water use. Water applied to landscapes constitutes approximately 65-75% of urban residential water demand in the United States West.

Urban landscapes contribute to the health of urban environments and their residents, yet they are often watered in excess of the actual water needs of the vegetation. Increasing landscape water use efficiency offers one of the greatest opportunities for reducing urban water demand in order to manage scarce water supplies in the context of aridity, drought and climate variability.

https://watermaps.usu.edu/

Water Well With CWEL Webinar Series

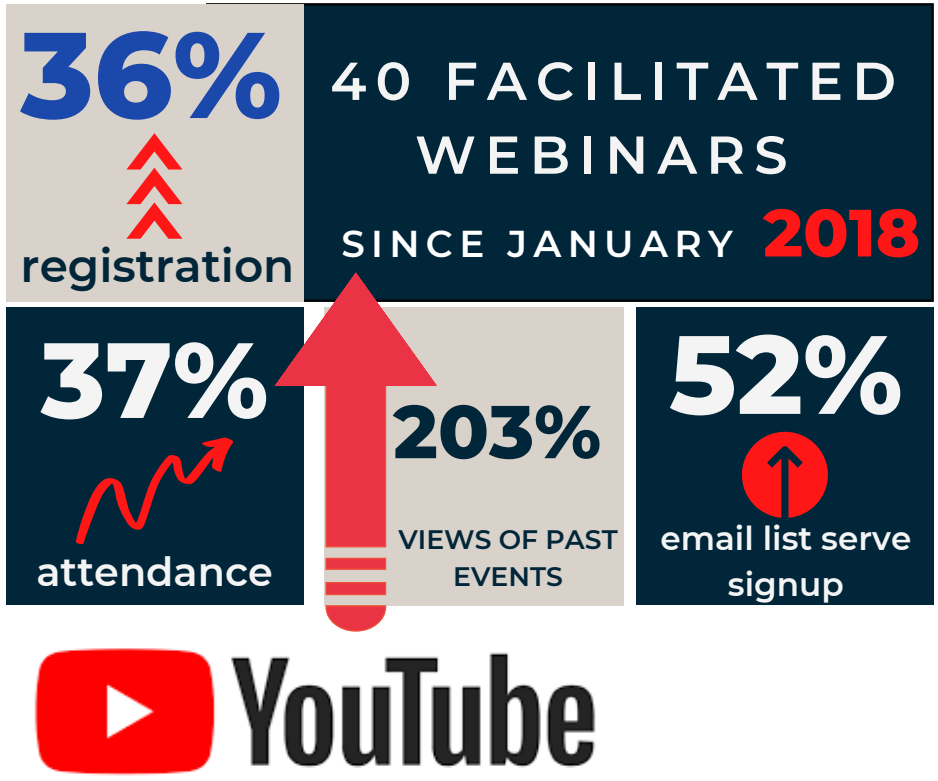
CWEL
Center for Water-Efficient Landscaping
WEBINAR SERIES

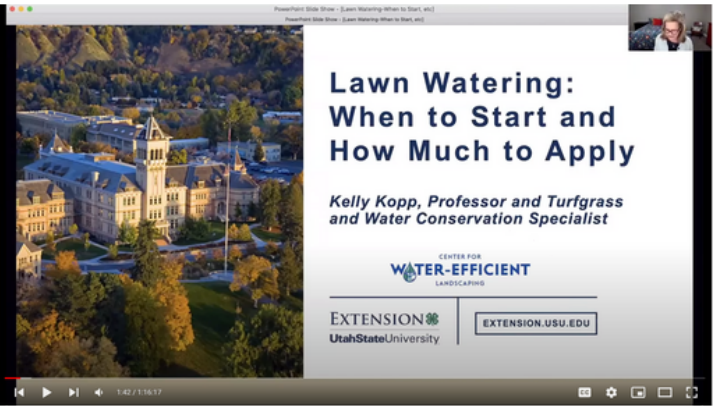
The **Water Well With CWEL** webinar series is a CWEL outreach program that provides a way to reach a sizeable audience that may not be able to spend time or money on travel to conferences, workshops, or classes.

Each event covers a different topic related to improving water efficiency in both the landscape and urban agriculture settings.

Where applicable, webinars provide continuing education units (CEUs) required for organizational certification of water conservation and related professions.

https://extension.usu.edu/cwel/webinars





CWEL
Center for Water-Efficient Landscaping
WEBINAR SERIES

Results of a January 2022 **webinar attendee survey** provided feedback on what was gained and implemented in landscape water conservation as a result of attending 9 webinars in 2021.

765 attendees / 436 unique viewers / 51 provided feedback

Implemented projects as a result of webinar attendance include:

- Turf reduction and increased use of native and drought tolerant plants
- improved irrigation systems and irrigation scheduling
- social media messaging
- Installation of green roofs
- Utilized smart technologies to manage landscape water use
- Incorporated rainwater harvesting
- Incorporated water-wise landscape principles into professional landscape designs

100%

water conservation knowledge

90%

gained

IMPLEMENTABLE IDEAS

39% already implemented ideas . 53% intend to

86%

ACQUIRED USEFUL RESOURCES

Water-Wise Landscape Demonstration Street

Welcome to Utah State University's Water-Wise Demonstration street! Our goal is to provide you with water-efficient ideas that are easy to replicate in your home landscape.

This project wouldn't be possible without the help of our amazing partners & funding from the Utah Water Initiative. We're just getting started and do not have a lot of content to share yet, but it's coming.

Currently, there are site plans and plant lists for the four properties that have been installed thus far and we're hoping to add 6-8 sites by the end of 2020. Installation cost and water use comparisons are coming soon. Also, keep an eye out for virtual landscape tours which will highlight the efficiency of appropriate design, smart irrigation technology, and stormwater management that has been incorporated into each of these landscape designs.

https://www.usudemonstrationstreet.com/

Additional Outreach Activities

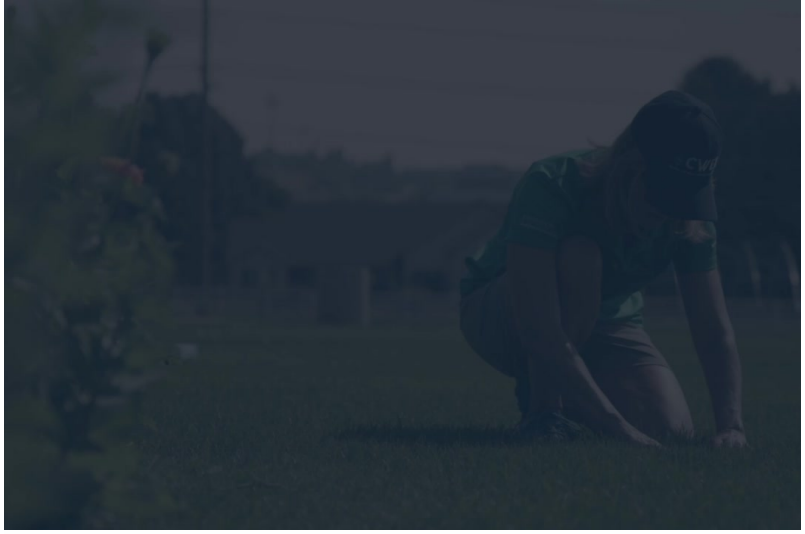
Left: **Drought '21 Campaign** in collaboration with USU Extension Marketing and the Division of Water Resources to develop simple landscape signage urging reduced landscape water use during the drought.

- CWEL Field Day (held every even year)
- Campaigns
- Conferences
- Public Events
- Social Media
- Turfgrass Integrated Pest Management Advisory
- Utah Public Gardens (UPG) Network (under normal circumstances CWEL coordinates garden tours with and for network members twice yearly and manages the UPG website)
- Video
- Water-Efficient Landscape Management masters degree

Right: Shital Poudyal and Kelly Kopp staff a booth during the Loveland Living Planet Aquarium's Water Conservation Day in Draper, Utah.

CWEL Researcher Youping Sun discusses his latest field trial, *Drought Tolerant Ornamentals Project.*

https://youtu.be/EoJDOt3dfCs



CWEL turfgrass researcher Kelly Kopp discusses how to manage your turfgrass heading into the fall (Fall 2021)

https://youtu.be/ryU3FhGK9iw

Extension Outreach & Education Team

Shital Poudyal

Assistant Professor Extension Ornamental Horticulture Specialist

Kelly Kopp

Professor Extension Water Conservation / Turfgrass Specialist / CWEL Director

Candace Schaible

Professional Practice Extension Associate Professor Horticulture and Water Conservation

Collaborators & Cooperators

Jake Powell

Assistant Professor Extension Specialist Landscape Architecuture & Environmental Planning

USU Janet Quinney Lawson Institute for Land, Water, & Air

CWEL director, Dr. Kelly Kopp (at right, third from left), met in September, 2021 with Governor Cox and team, Utah State University President Cockett, and other members of the Utah State University faculty to discuss the upcoming inaugural report from USU's Janet Quinney Lawson Institute for Land, Water, and Air.

The report will provide the most up-to-date research findings by USU faculty and collaborators on natural resource issues facing the state of Utah.

Colorado River, Moab, UT
Photo credit: Susan Buffler

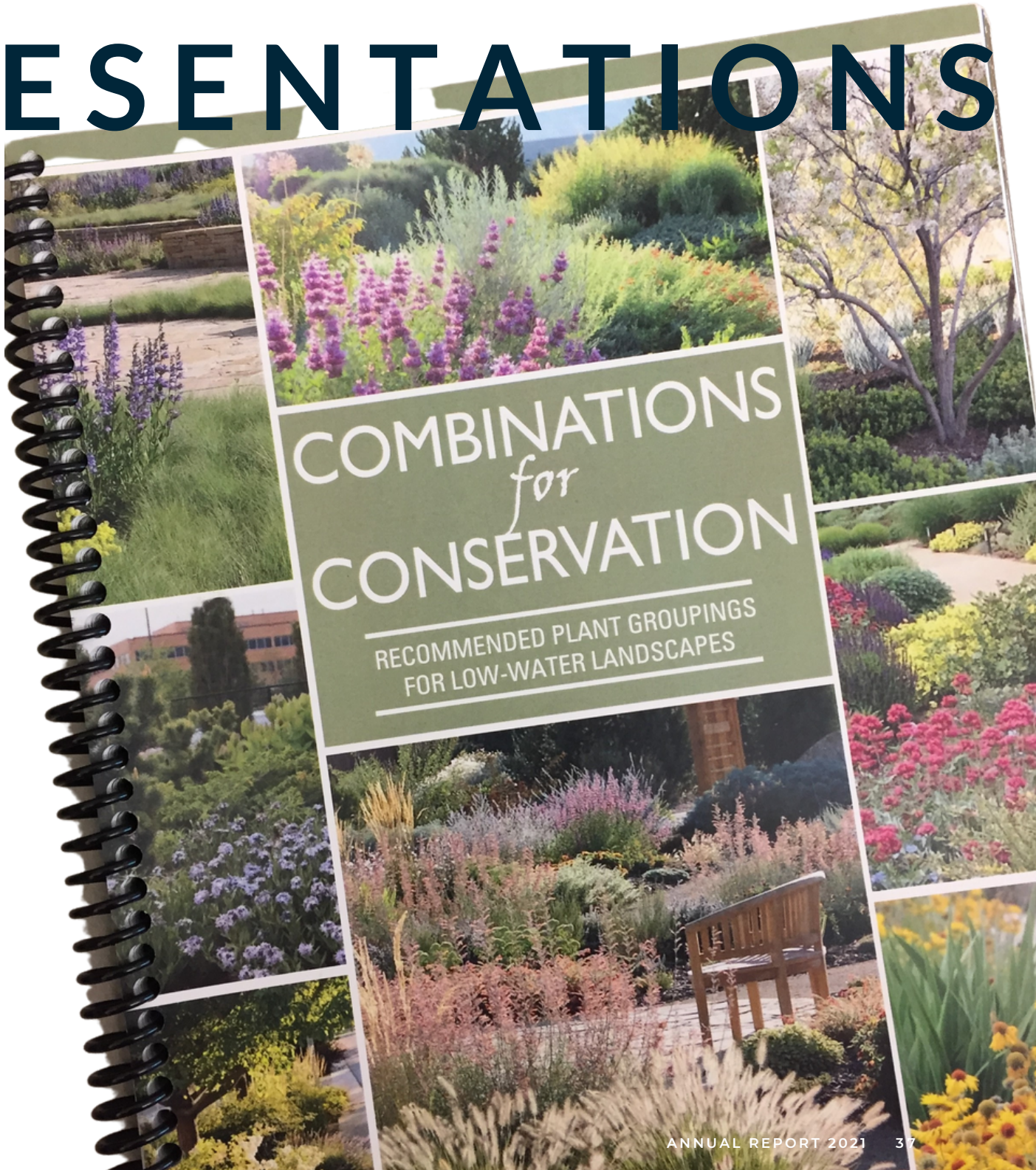
Utah State University is building new pathways to engage policy makers with important research in land, water, and air. The institute is an interdisciplinary initiative designed by President Noelle Cockett to bring together two critical discussion spaces - USU's research programs and state, county, and city governments - to create a positive impact for Utah.

To strengthen that connection, the institute reports directly to the Office of the President and collaborates closely with the Office of Research and the Vice President for Federal and State Relations.

https://www.usu.edu/ilwa/

PUBLICATIONS & PRESENTATIONS

The Center for Water-Efficient Landscaping's research and outreach materials are disseminated through a variety of formats.



Watering the Landscape: Make It Easier With Evapotranspiration (ET)

Candace Schaible, Kelly Kopp, and Helen Muntz

The American lawn is our nation's single largest irrigated "crop" (Lindsey, 2005). In Utah, roughly 65% of our drinking water is applied to residential and commercial landscapes (Center for Water Efficient Landscaping, 2020). Landscapes are typically overwatered, which is why residential and commercial landscape watering is estimated to be one of the largest sources of potential water conservation in the urban setting (Endter-Wada et al., 2008). Plant materials also provide many environmental benefits, such as erosion control, water filtration, and temperature reduction. Knowing how much water to apply to the landscape can be a challenge and is one reason many Utah landscapes are over-irrigated. One source of information that water managers frequently use to minimize over-application of water and dial in the water needs of plants is evapotranspiration (ET).

What Is ET?

Calculating ET and plant water needs can get a bit

Publications & Presentations

- Peer-reviewed journal articles
- Presentations at local, national, and international conferences
- Research bulletins
- Research reports, manuals, conference proceedings, and abstracts
- Extension Fact Sheets and articles
- Books
- Trade journals
- Website and social media
- Video

Publications

Refereed Journal Articles

1. **Chen, J.**, J. Norton, H. Kratsch, **Y. Sun, and L. Rupp.** 2021. Nodu[illegible] *epherdia ×utahensis* 'Torrey' [illegible]d the diversity *Frankia* strains. HortScience 56:762-768.
2. **Chen, J.**, S. Zhen, and **Y. Sun.** 2021. Estimating leaf chlor[illegible]ophyll [illegible]ent [illegible]uffa[illegible]erry using norm[illegible]ence vege sensors. HortTechnology 31:297-303.
3. **Chen, J.**, H. Kratsch, J. Norton, **Y. Sun, and L. Rupp.** 2020. Growth and nodulation of *Shepherdia ×*[illegible]rrey' top controlled-release fertilizer. HortScience 55:1956-1962.
4. **Chen, J.**, H. Xing, **A. Paudel**, **Y. Sun**, G. Niu, and M. Chap[illegible]mineral nutrition of 12 viburnum t with saline water. HortScience 55:1242-1250.
5. Hooks, T., G. Niu, J. Masabni, **Y. Sun**, and G. Ganjegunte[illegible] (*Punica granatum*) in west Texas. HortScience 56:217-2[illegible]
6. **Paudel A.**, **Y. Sun, L.A. Rupp**, and R. Anderson. 2020. *Ce*[illegible] 1871-1875.
7. **Paudel, A.**, **Y. Sun**, **L.A. Rupp**, J. Carman, and S. Love. 20[illegible] *velutinus* and *Cercocarpus montanus*. Native Plants Jour[illegible]
8. Rauter, S., **Y. Sun**, and M. Stock. 2021. Visual quality, ga[illegible] with Saline Water. HortTechnolgy 31(6): 1-8. https://do[illegible]
9. **Sun, Y., J. Chen**, H. Xing, **A. Paudel**, G. Niu, and M. Chap[illegible] to saline water irrigation. HortScience 55:1233-1241.
10. Xing, H., **J. Hershkowitz**, **A. Paudel**, **Y. Sun, J. Chen**, X. Dai, and M. Chappell. 2021. Morphological and physiological resp ornamental grasses to saline water irrigation. HortScience 56(6): 67[illegible]
11. Niu, G., **Y. Sun**, T. Hooks, J. Altland, H. Dou, and C. Perez. 2020. Salt to[illegible] of hygrangea plants varie[illegible] among species within a species. Horticulturae 6(54): 1-12. doi:10.3390/horticulturae[illegible]
12. **Lawson, K.C.**, **L.A. Rupp**, **Y. Sun**, and R. Newhall. 2021. Propagation of pinyon pine: Topworking *Pinus monophylla* to *Pin* rootstocks. Native Plants Journal 22(3): 280-292.
13. **Lawson, K.C.**, **L.A. Rupp**, R. Newhall, **Y. Sun**, and C. Reid. 2021. Propagation of pinyon pine: Selecting and grafting superi *monophylla* accessions to *Pinus edulis* rootstocks. Native Plants Journal 22(3): 293-305.

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UtahStateUniversity.

Extension
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Acknowledgments

Utah Division of Water Resourecs

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