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Design 4 Every Drop: A Water-Wise Landscape Design Approach for the Intermountain West

Abstract

The Design 4 Every Drop Program addresses Utah's water challenges by offering a hybrid workshop combining online and in-person learning to introduce participants to the water-wise landscape design process. Participants gain knowledge in landscape design, water conservation principles, and irrigation efficiency improvements. Pre- and post-workshop surveys showed a 114% increase in knowledge and an 86% increase in participants' intent to apply water-saving techniques. Most participants (88%) were satisfied with the designs they created through the workshop, and 36% planned to implement all learned strategies. The program effectively empowers individuals to make water-efficient changes to their landscapes, fostering broader community-level conservation efforts. The program establishes a replicable model that other Extension professionals throughout the arid west could incorporate into their county programming. However, a long-term follow-up survey is needed to assess the implementation of water-saving practices and overall water savings.

Introduction

Communities in Utah, like those in other arid states, are facing significant challenges, including water shortages, rapid population growth, and increasingly severe climate projections (Gillies et al., 2012; Perlich et al., 2017). Landscape water conservation has emerged as one of the primary strategies for addressing these challenges within the broader context of water resource management (Endter-Wada, 2014).

Civic leaders acknowledge that current water use and management strategies continue to lead to recurrent events of municipal water depletion. This conservation only in the face of imminent crisis mentality often results in water supply insecurity, crop failures, damage to both municipal and private landscapes, and frustration among water consumers (Utah Department of Water Resources, 2008).

However, altering traditional landscaping practices presents a notable challenge, particularly when confronted with deeply ingrained cultural norms (Hayden et al., 2015; Nassauer et al., 2009). To effectively drive change in these practices, community members require practical resources that inspire shifts in cultural perceptions and an opportunity to reimagine function, aesthetics, and landscaping, especially regarding water conservation.

A landscape design process offers an opportunity to assess the location, value, and water usage of landscape elements strategically, prior to installation. A study focused on the transition from traditional turf to water-efficient landscaping suggests that such a shift can result in annual water savings of up to 19 gallons per square foot of turf removed when irrigation systems are upgraded to be more efficient and people are educated on the proper care and maintenance of xeric plants (Addink, 2005).

The aim of this course was to provide more than a list of water conservation tips. The focus was on teaching participants a comprehensive design process that would allow them to assess their landscapes holistically, introduce participants to xeric landscape design principles, and improve their ability to implement broader water-conserving systems.

Objectives

The primary objectives of this project were:

1. To develop educational materials for a residential water-wise landscape design workshop, including a curriculum, an instructional framework, and a workbook designed to facilitate the participants' design process.
2. To collaborate with Extension faculty to pilot the workshop throughout Utah.
3. To assess the quality of the course and evaluate whether participants knowledge and attitudes toward landscape water conservation improved, and if the workshop achieved measurable improvements in water conservation within their home landscapes.

Methods

Building upon the successes and shortcomings of a prior asynchronous, online landscape design course entitled Design 4 Everyone (Zwahlen and Powell, 2022), we identified certain aspects of the design process that could benefit from in-person interactions. Although some elements of the online course format proved effective, many participants struggled with aspects of online learning. Consequently, we adopted a hybrid approach, offering an online self-paced component and an in-person workshop.

Participants were given access to an online course 6–8 weeks prior to the in-person workshop. The course was hosted on the Canvas platform and included text, illustrations, and video content. The online portion focused on providing essential background information, including terminology, water conservation principles, and foundational design concepts. It also guided participants through conducting a site inventory and analysis of their landscape, as well as measuring their site and creating a scaled base map.

Rather than requiring participants to submit assignments online, a workbook was created to accompany the course. This workbook enabled participants to gather and organize site-specific information, which would inform their design decisions during the in-person workshop.

The online portion of the course was organized into the following modules and associated learning objectives:

Module 1 - Learning The Principles of Water-Wise Landscape Design

Learning Objectives:

- Students learn the basic principles of water-wise landscape design: planning and design, soil analysis, appropriate plant selection, using practical turf areas, efficient irrigation, using mulches, and appropriate maintenance.

Tasks and Assignments:

- Students are asked to reflect on how their current landscape measures up to the water-wise principles they have learned.

Module 2 – Knowing Your Site and Your Needs

Learning Objectives:

- Students learn measuring techniques and drawing conventions, including scale, to create a base map of their site.
- Students learn items to include in a site inventory such as structures, utilities, circulation, vegetation, site conditions, and water data.
- Students learn a method for conducting a site analysis.
- Students learn how to determine their design goals and strategies.
- Students learn how to translate their design goals into physical landscape components.
- Students learn to understand spatial and functional relationships.

Tasks and Assignments:

- Students are required to create a to-scale basemap of their site (Figure 1).
- Students perform a site inventory (Figure 2).
- Students conduct a site analysis (Figure 3).
- Students are asked to write their design goals and a vision statement.
- Students create a design components list and mood board (Figure 4).
- Students create exploratory functional diagrams (Figure 5).

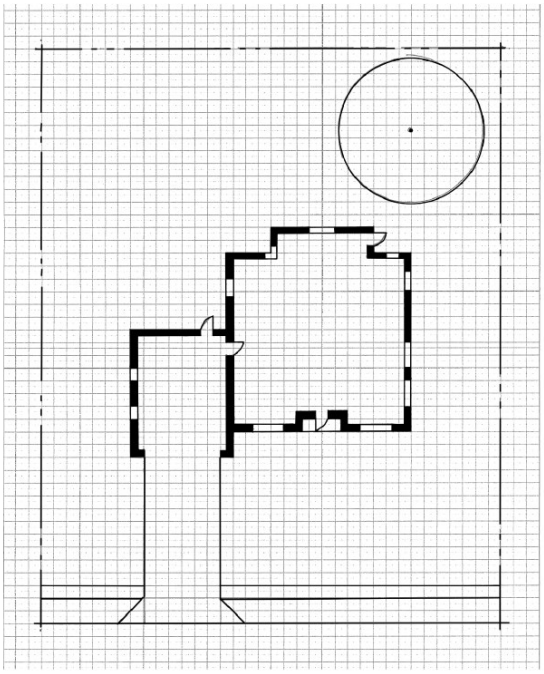


Figure 1. Example of a base map drawing.

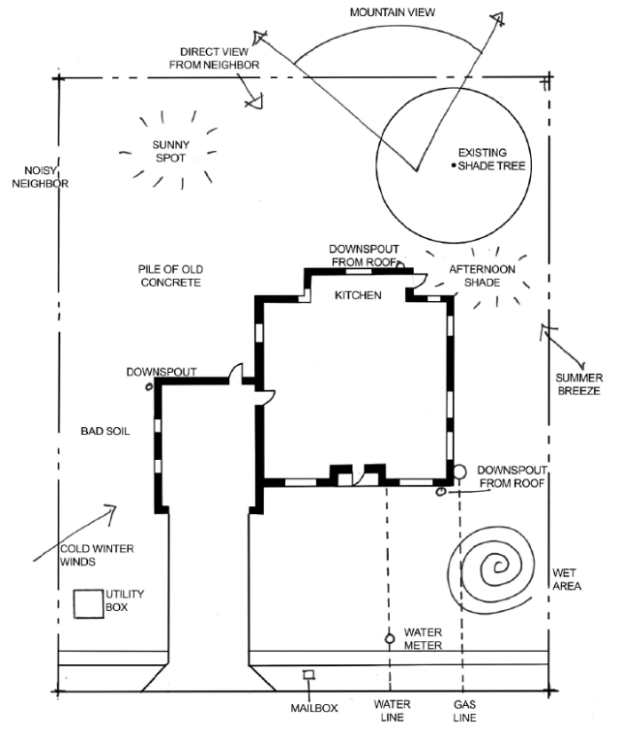


Figure 2. Example of a site inventory.

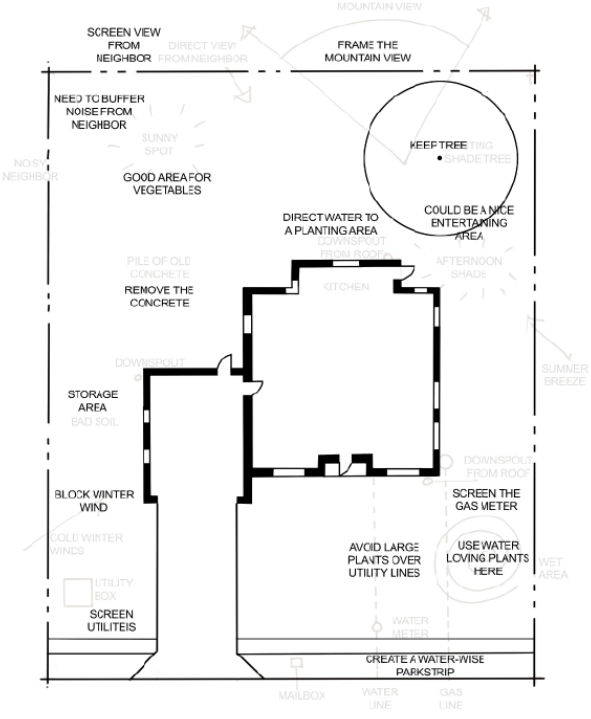


Figure 3. Example of a site analysis.

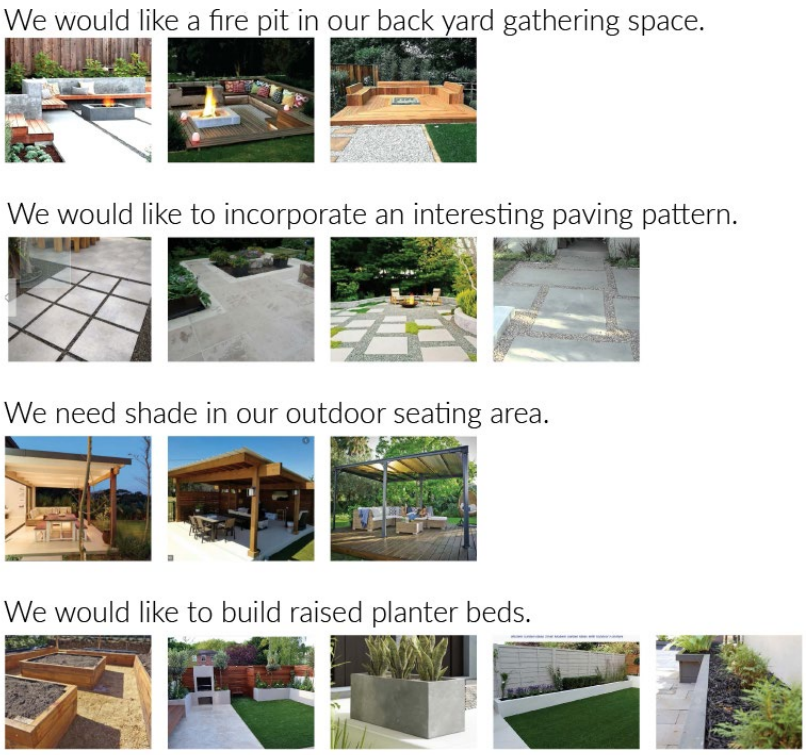


Figure 4. Example of a mood board

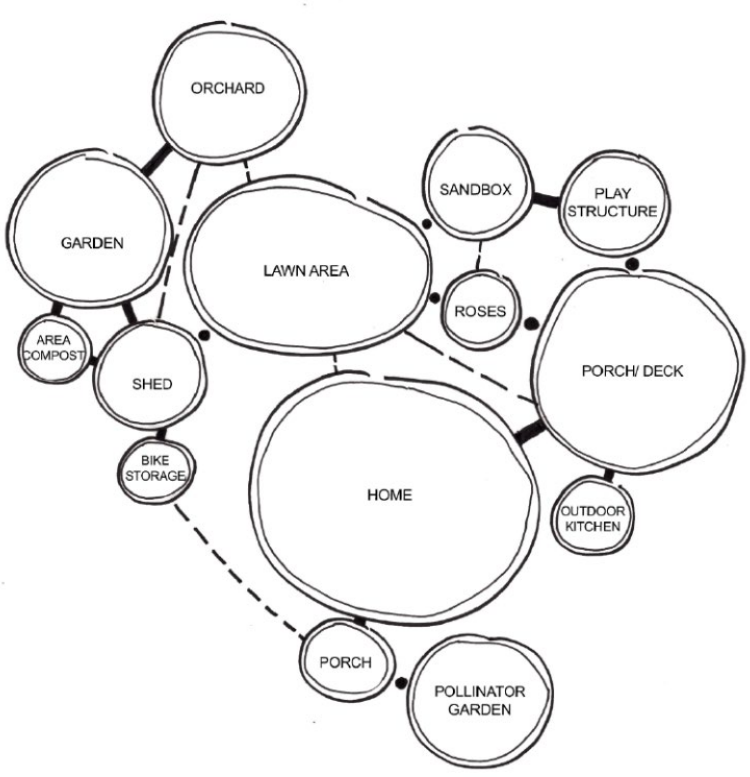


Figure 5. Example of an exploratory functional diagram.

Module 3 – Creating a Water-Wise Landscape Design

Learning Objectives:

- Students learn the elements of design: line, shape, form, color, and texture.
- Students learn principles of design, including balance, unity, and pattern.
- Students are introduced to the concept of outdoor rooms.

Tasks and Assignments:

- Students are asked to determine what outdoor rooms their landscape will require.

In addition to the online course, Zoom meetings were held prior to the in-person workshop. These sessions served several functions: providing participants an opportunity to meet the instructors, addressing any questions, and facilitating the understanding of concepts, particularly drawing to scale. Additionally, these meetings allowed participants to connect with their peers, exchange ideas, and receive subtle reminders to complete their pre-workshop assignments. These assignments helped the participants develop a thorough understanding of their site and were crucial for them to maximize the in-person workshop experience (Figure 6).

Figure 6. In-person workshop.

The in-person workshop, which was held on a Friday evening and all day Saturday, combined instructional sessions with guided studio time. Participants applied the knowledge they gathered through their individual site analyses to create concept

diagrams and schematic landscape plans. This hands-on segment of the design process benefited from in-person instruction. It allowed participants to refine their plans with the support and encouragement of the instructors.

Throughout the workshop, participants developed their designs further by adding drainage diagrams, planting plans, and hydrozone maps. The workshop also included outdoor demonstrations of water-wise landscaping strategies and irrigation design. Participants were provided with additional resources, such as plant selection guides and design references, to support the continued refinement of their landscape plans. The workshop was organized into the following learning objectives and activities:

Evening Session

Learning Objectives:

- Students review the design process.
- Students learn how to adapt ideal functional diagrams to the real-world conditions observed in their site inventory and analyses.

Tasks and Assignments:

- Create 3 concept plans (Figure 7).

Full Day Session

Learning Objectives:

- Students learn how to refine their concept plan and develop form studies.
- Students learn how to refine their form study into a detailed schematic plan.
- Students learn how to use grading to utilize water on-site.
- Students learn how to choose appropriate plant materials.
- Students learn how to implement water-wise irrigation strategies.
- Students will observe water-wise landscape design principles in person.

Tasks and Assignments:

- Students will create multiple form studies (Figure 8).
- Students will choose 1 form study to develop into a schematic plan.
- Students will create a water flow diagram and hydrozone map (Figures 9-10).
- Students will create a planting design.

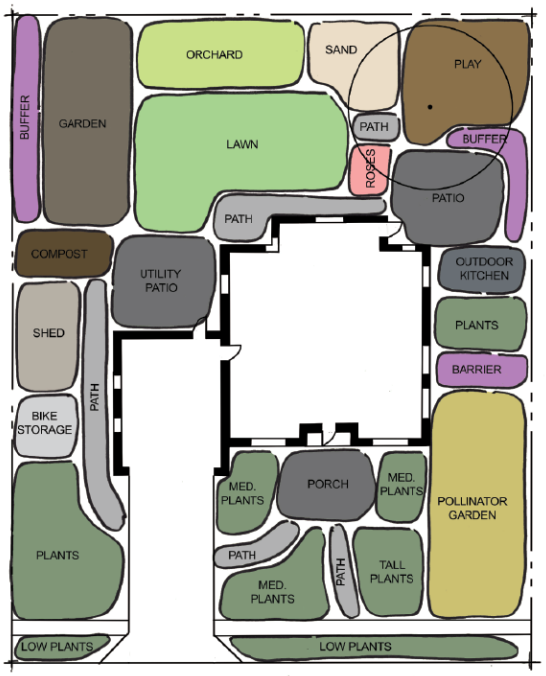


Figure 7. Example of a concept plan.

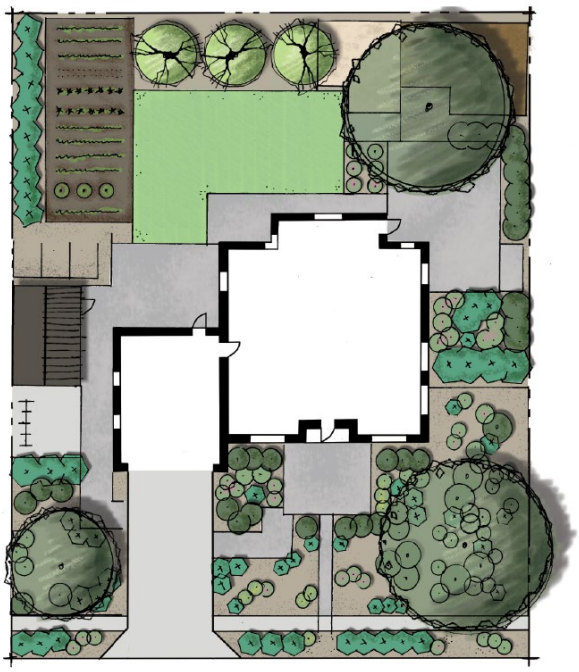


Figure 8. Example of a form study.

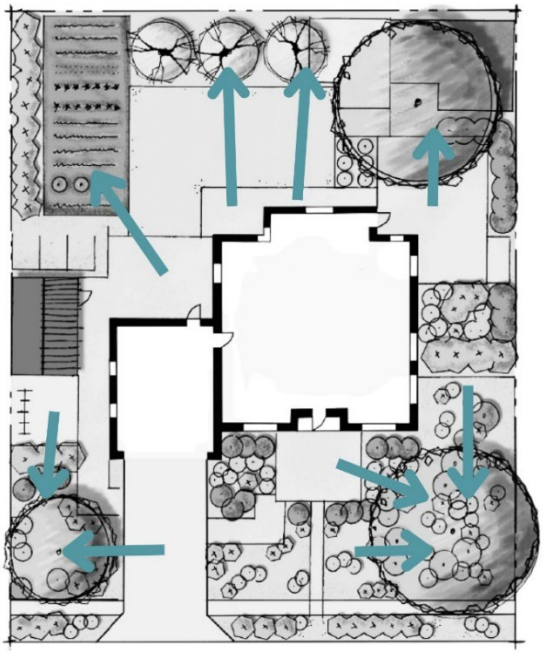


Figure 9. Example of a water flow diagram.

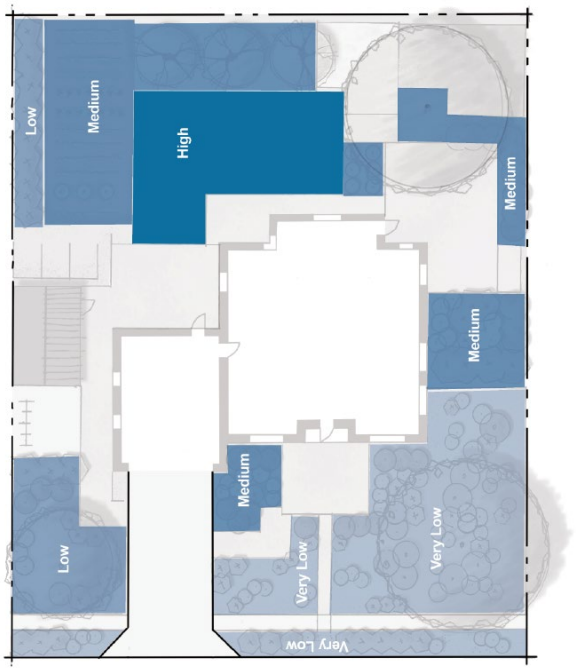


Figure 10. Example of a hydrozone map.

Participants were surveyed at the beginning of the online portion of the course and again following the in-person workshop. Surveys were matched using the last digits of participants' phone numbers to ensure anonymity while tracking changes in knowledge and intentions.

Evaluation

Prior to participants engaging in the online course content, they were invited to complete a pre-course assessment to establish a baseline regarding their knowledge of landscape water conservation principles, their current landscape water conservation practices, and their general attitudes toward water conservation.

At the conclusion of each class a paper course evaluation/feedback survey was provided to each participant and participation was voluntary. The survey asked participants the same questions as they answered in the pre-course assessment. The following questions were requested:

- How would you rate your current knowledge on the following topics?
    - The need for landscape water conservation
    - Conducting a site inventory of my property
    - Establishing landscape design goals for my property
    - Assessing the functionality of my landscape
    - Creating multiple landscape design alternatives
    - Selecting plants to include in a landscape design
    - The principles and elements of design
    - Utilizing hydrozones
    - On-site water harvesting
    - Using landform to facilitate water movement
    - Water efficient irrigation strategies
- To what extent do you intend to do any of the following in your landscape?
    - Use hydrozones on my property
    - Use a smart irrigation controller
    - Use mulch to retrain soil moisture in my landscape
    - Evaluate my landscape for non-functional turf
    - Eliminate non-functional turf
    - Harvest rainwater
    - Use water-wise plant varieties
    - Use a water budget for my landscape
    - Use climate data to adjust my irrigation schedule

The post-workshop review also asked the questions:

- What from this workshop do you intend to implement within the next 1 to 6 months?
- How satisfied are you with the landscape design you developed in this workshop?

Evaluations were returned to the instructor after completion. Each participant used a numeric identifier assigned to them at the pre-course assessment on the post course evaluation to allow for individual pre/post comparisons while maintaining anonymity.

Results

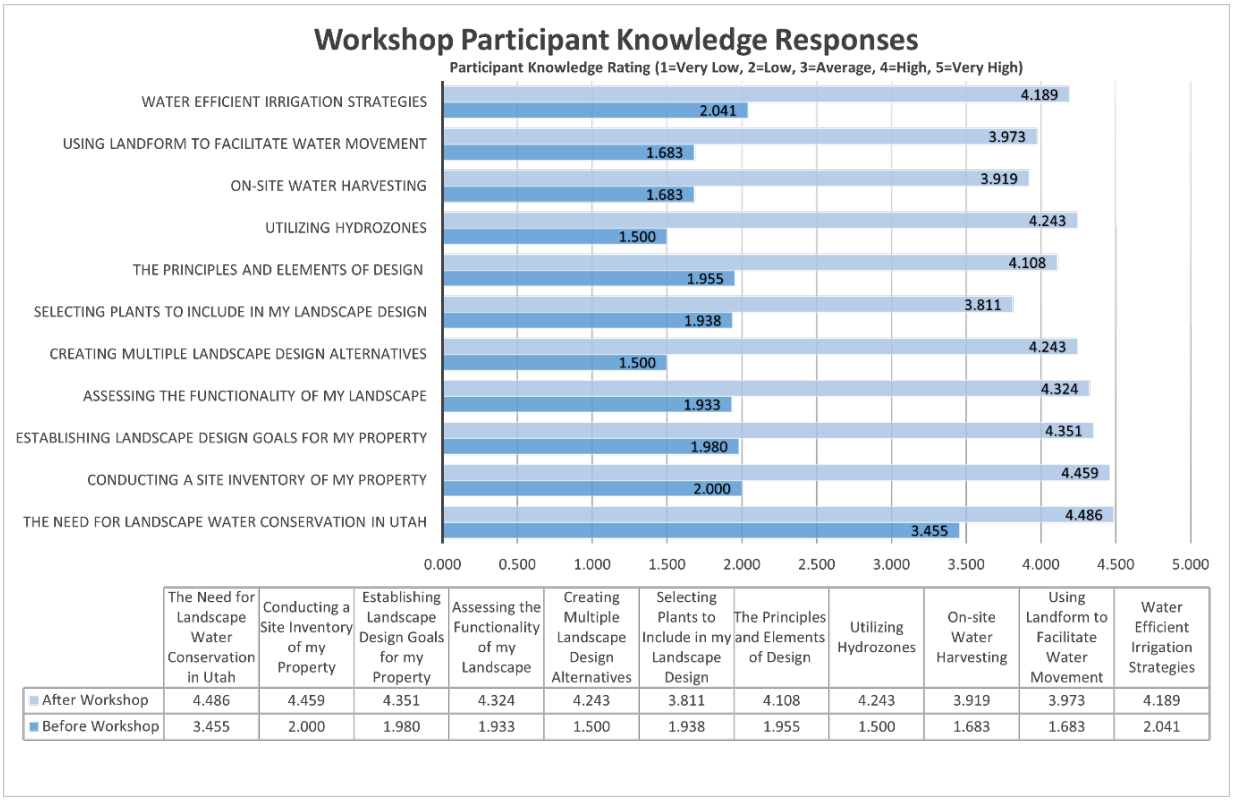
Seven workshop sessions were conducted between the spring of 2022 and fall of 2023, with a total of 83 participants. Class sizes, which ranged from 7 to 15 participants, were intentionally kept small to facilitate interaction between students and instructors. Comparisons between the pre-course assessment and post-course evaluations were made by comparing matched survey responses.

The evaluation of survey results revealed a significant increase in participants' knowledge (Table 1). On average, participants demonstrated a 114% improvement in their understanding of the course material. The smallest increase (32%) was observed in participants' understanding of the importance of water conservation, which was expected, as most participants had some prior knowledge of the subject.

Participants showed a 200% increase in their understanding of how to create landscape design alternatives. The use of hydrozones to group plants with similar water requirements also saw a substantial increase (180%), indicating that these concepts were relatively new to most participants.

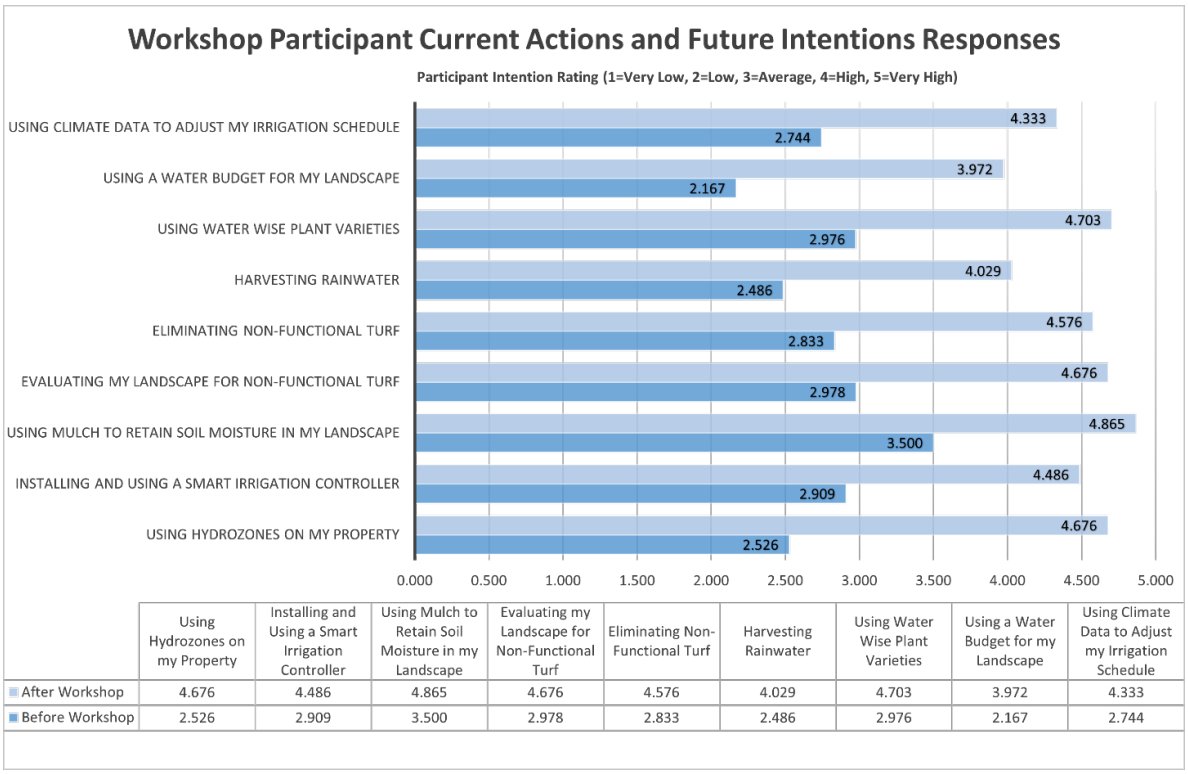
Participants' intentions to implement water-wise design principles increased by an average of 86% (Table 2). Notably, the intention to use landscape hydrozones rose by 117%, while the percentage of participants planning to create a water budget increased by 150%.

Table 1. Participants' knowledge responses before and after the workshop.



	The Need for Landscape Water Conservation in Utah	Conducting a Site Inventory of my Property	Establishing Landscape Design Goals for my Property	Assessing the Functionality of my Landscape	Creating Multiple Landscape Design Alternatives	Selecting Plants to Include in my Landscape Design	The Principles and Elements of Design	Utilizing Hydrozones	On-site Water Harvesting	Using Landform to Facilitate Water Movement	Water Efficient Irrigation Strategies
After Workshop	4.486	4.459	4.351	4.324	4.243	3.811	4.108	4.243	3.919	3.973	4.189
Before Workshop	3.455	2.000	1.980	1.933	1.500	1.938	1.955	1.500	1.683	1.683	2.041

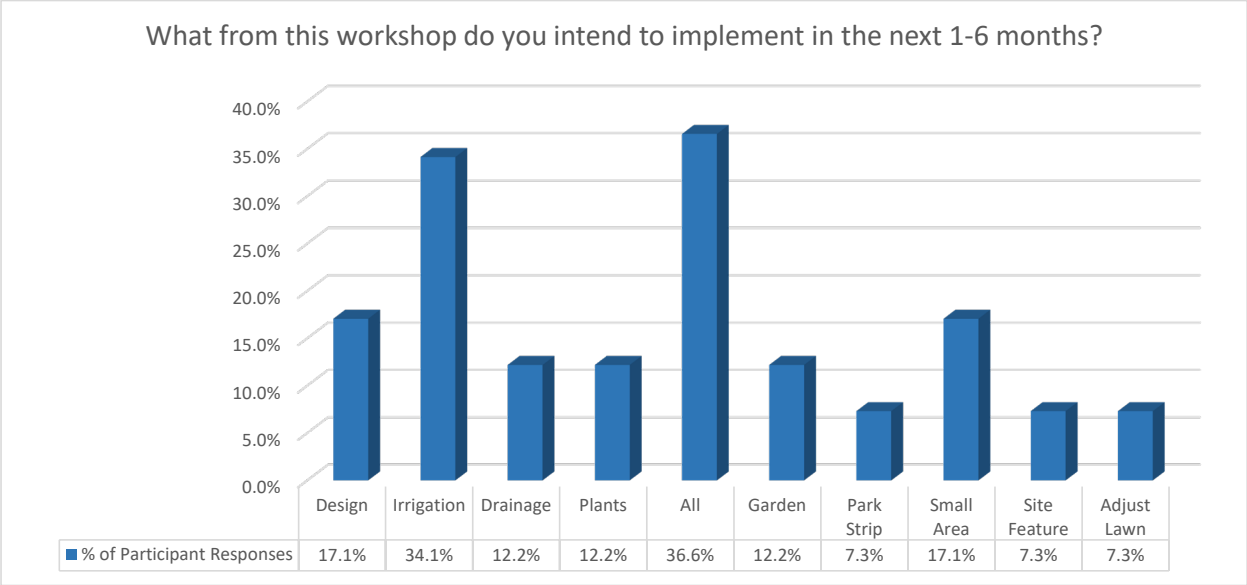
Table 2. Participants' action responses before and after the workshop.



	Using Hydrozones on my Property	Installing and Using a Smart Irrigation Controller	Using Mulch to Retain Soil Moisture in my Landscape	Evaluating my Landscape for Non-Functional Turf	Eliminating Non-Functional Turf	Harvesting Rainwater	Using Water Wise Plant Varieties	Using a Water Budget for my Landscape	Using Climate Data to Adjust my Irrigation Schedule
After Workshop	4.676	4.486	4.865	4.676	4.576	4.029	4.703	3.972	4.333
Before Workshop	2.526	2.909	3.500	2.978	2.833	2.486	2.976	2.167	2.744

Open-ended responses to a question about planned implementations in the next one to six months revealed that 36% of participants planned to apply all aspects of water-wise design learned in the workshop, 34% intended to improve the efficiency of their irrigation systems, and 17% planned to focus on small areas initially (Table 3).

Table 3. Participant intentions for implementing knowledge after completing workshop.



Overall, 75% of participants expressed satisfaction with the landscape designs they developed during the workshop, and 12.5% indicated they were very satisfied with their outcomes (Figure 11).

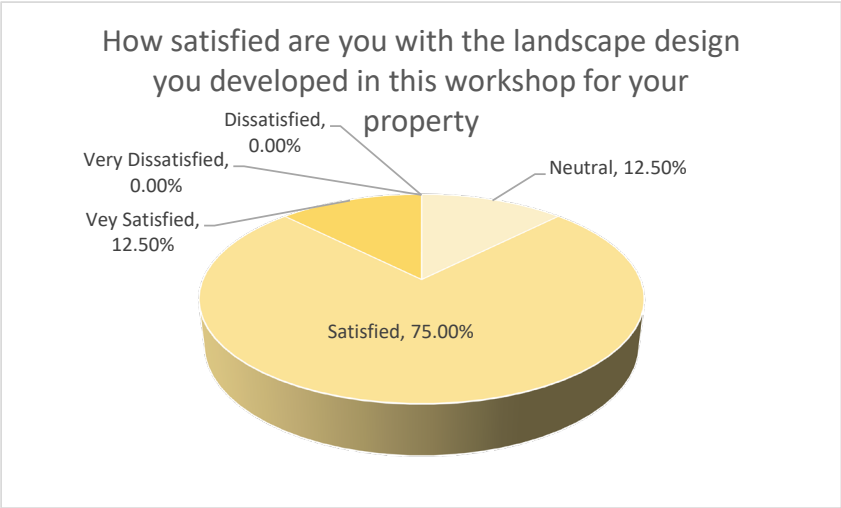


Figure 11. Participant satisfaction with landscape designs developed during workshop.

Discussion

The Design 4 Every Drop program demonstrated a strong capacity to enhance participants' knowledge and intent regarding water-wise landscape practices, validating the hybrid model as an effective educational strategy for this subject matter. The 114% average increase in knowledge, particularly in areas such as creating landscape design alternatives (200%) and understanding hydrozones (180%), suggests that the program successfully introduced complex design and conservation concepts previously unfamiliar to many participants.

The hybrid delivery approach, combining self-paced online learning with live virtual and in-person components, proved to be one of the program's most impactful design elements. The online modules provided critical baseline knowledge, while the in-person workshop allowed participants to transform abstract concepts into tangible outcomes through guided design work and peer/instructor feedback. This hands-on, collaborative environment appears to have been a critical factor in creating detailed, personalized landscape plans, an outcome with which 88% of participants reported satisfaction.

Participants also showed an 86% average increase in intent to implement water-wise practices, with particularly high intent reported for hydrozoning (117%) and creating water budgets (150%). Open-ended responses further revealed participants intended to fully implement the techniques taught (36%) or focus on high-impact changes, such as improving irrigation efficiency (34%). These data points reflect not just knowledge gain, but also a clear shift toward practical application.

A notable limitation of the study is the absence of a long-term follow-up to assess the implementation of water-wise practices and measure the resulting water savings. While participants expressed strong intent to apply what they learned, the lack of post-program data means we cannot confirm to what extent these intentions translated into behavioral change or quantify the environmental impact. Incorporating a follow-up component, such as site visits, water use tracking, or participant interviews, would provide valuable insight into the program's long-term effectiveness and could

substantiate its impact on household water use reduction. Future iterations of the program would benefit greatly from integrating this evaluative component.

Conclusions

The Design 4 Every Drop Program has proven to be a successful addition to Extension programming in Utah. The workshop series has garnered positive feedback from participants and has effectively empowered them to implement water conservation practices within their own home landscapes. We anticipate that as these participants make changes to their landscapes, they will serve as catalysts for broader community-wide shifts in water conservation practices.

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