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Redefining Landscape Norms: Exploring the Influence of Normative Landscaping Patterns in Washington County, Utah

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REDEFINING LANDSCAPE NORMS: EXPLORING THE INFLUENCE OF NORMATIVE LANDSCAPING PATTERNS IN WASHINGTON COUNTY, UTAH

by

Ryan White

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ABSTRACT

Redefining Landscape Norms: Exploring the Influence of Normative Landscaping Patterns in Washington County, Utah

by

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Utah State University, 2017

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Social norms are known to have a significant influence on people's conservation behaviors. In Washington County, Utah water conservation is becoming increasingly important due to a growing population, limited water supply and the anticipated effects of climate change. Because traditional turf landscaping consumes a large portion of urban water usage, conservation messaging has focused heavily on promoting landscape efficiency and alternative landscape norms. In order to evaluate whether a shift in normative landscaping has occurred, we surveyed three Washington County populations: visitors to a local conservation garden, individuals who had participated in conservation programs and workshops, and members of a homeowner association. The results showed a strong injunctive norm or approval of neighbors choosing alternative landscape patterns such as desert landscaping. Washington County residents, however, do not feel strong social pressure to conform to a particular normative landscape pattern which indicates a

dominant descriptive norm does not exist. Demographic variables significantly correlated with actual landscape preferences. In particular, households with children were more likely to prefer lawn-dominant landscapes rather than desert landscaping. Conservation messaging will be most effective if tailored to the needs and concerns of specific demographics. Recommendations are given for promoting descriptive norms in favor of low-water landscape alternatives.

(97 pages)

PUBLIC ABSTRACT

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Ryan White

As water supplies in the American West become increasingly strained by growing populations and threats of drought and climate change, water managers and governments are working to maximize water-use efficiency. With well over half of municipal water being used on outdoor irrigation, improved landscape water efficiency has been a clear candidate for conservation messaging. Because social norms play a significant role in what conservation behaviors individuals adopt voluntarily, conservation messaging strategies often try to influence and shift norms in favor of improved behaviors. A clear understanding of the existing norms, demographics, and cultural values of an area is essential to tailoring relevant and effective conservation messages.

The purpose of this research was to identify landscape norms in Washington County, Utah and whether residents had perceived a shift in norms over time toward desert-adapted landscapes. We also researched whether social norms played a significant role in the types of landscapes residents preferred. To answer these questions, we surveyed three populations: visitors to a popular, local conservation garden, participants in conservation programs and workshops, and members of a homeowner association. Based on their responses, we found that residents did perceive a shift in landscape norms

toward desert landscapes. The vast majority of respondents also indicated approval of homeowners using desert landscaping in their neighborhoods, regardless of their own landscaping decisions. However, little social pressure exists to motivate homeowners to adapt to a specific neighborhood norm. As such, conservation strategies in Washington County should emphasize the approval and growing use of appropriate water-conserving landscape norms.

To increase effectiveness, conservation messaging should address the needs of specific demographics. For example, because we found that homeowners with children tend to prefer larger amounts of lawn, conservation messaging needs to demonstrate how child-friendly alternatives to lawn-dominant landscapes can meet the needs of children. In addition to suggestions for improving voluntary behavior changes, we discuss how policies can help to accelerate changes in landscape norms.

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Ryan White

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CHAPTER I

INTRODUCTION

As populations in the American West grow, so does the demand for water. In addition to increased numbers of people using this finite resource, climate change is disrupting normal precipitation patterns and is expected to cause further strain on the availability of water in this arid region. Washington County, Utah has been among the fastest growing areas in the Southwest and is expected to more than triple its current population by 2050. As such, efficient use of water will be crucially important for sustaining a large population in Washington County's desert environment.

Landscaping accounts for more than half of residential water use in Washington County. Though local landscaping has historically been dominated by traditional water-demanding lawns, there appears to have been an increase in desert adapted landscaping during the last decade. This shift has created a wide spectrum of what could be considered normative landscaping in Washington County. Because normative influences have been shown to significantly motivate people's conservation behaviors, understanding how residents perceive landscape norms and identifying variables that affect norms is valuable for developing water conservation messages and strategies. Neighborhood norms in particular are a major determinant of what type of landscape homeowners choose. In situations where a neighborhood has more than one norm, homeowners tend to feel less pressure to conform and more independence to choose the landscaping they prefer. What we wanted to know was whether the increase in desert landscaping in Washington County was viewed as an acceptable alternative norm to

traditional lawn or was part of a broader cultural shift to redefine the dominant landscape norms in favor of water-conserving landscaping.

Research Objectives

This study sought to better understand Washington County, Utah landscape norms and identify factors that influence residential landscape choices. In particular, we wanted to answer the following questions: (1) how concerned are residents regarding landscape water conservation; (2) have they perceived a change in landscape norms over time; (3) what is their neighborhood norm; (4) do neighborhood landscape norms influence residents' behavior; and (5) what landscape norm would they choose when several norms are present in a neighborhood?

To meet these objectives we developed a survey that was distributed to three separate Washington County populations. The first group was visitors to Red Hills Desert Garden, a demonstration garden sponsored primarily by the Washington County Water Conservancy District (WCWCD). The second group was from an email list provided by the WCWCD of individuals who had participated in various conservation programs such as gardening workshops, irrigation audits, and rebates. The third group included residents of a Homeowner Association. These populations helped us to compare norms between several distinct Washington County demographic groups. While the results from the populations surveyed are generalizable to a large portion of Washington County residents, the results should not be considered representative of all county residents.

CHAPTER II

LITERATURE REVIEW

The Need for Conservation

Turfgrass lawn is arguably the most widely cultivated ornamental landscape plant on earth. Globalization has made the culture of the lawn a worldwide phenomenon, often in open contradiction to the natural ecology of the areas where lawns are now grown (Ignatieva et al., 2015). In the United States, lawn has become the dominant element of the archetypal all-American landscape. Author Michael Pollan (2003) remarked, "Nowhere in the world are lawns as prized as in America. In little more than a century, we've rolled a green mantle of it across the continent, with scant thought to the local conditions or expense" (p. 55). So engrained is the cultural import of a manicured lawn, that any divergence from this norm can stimulate tension and contempt between neighbors (Feagan & Ripmeester, 2001; Kaufman & Lohr, 2002). Nevertheless, a slowly developing landscape counterculture has emerged over the last several decades, voicing concerns such as the negative ecological impacts of lawn or the practical limitations of sustaining large swaths of green grass in incongruous environments. In many areas throughout the world, strained water supplies are making the discussion of lawn and its role in the landscape ever more salient (Ignatieva et al., 2015).

Examples of the strain on water supplies are well represented throughout the southwestern United States. Local and state governments are increasingly facing "water wars" over allocations and rights to water (Gehrke, 2013; Goode, 2015; Parker, 2015). Though struggles for water have always been a part of the West's history, growing

populations are amplifying the challenge. "Sun Belt" cities such as Phoenix, Tucson, and Las Vegas have experienced rapid growth during the last several decades. Though the recent recession brought the growth to a near standstill, an improving economy has shown the slowdown was only temporary (Toppo & Overberg, 2015). As a smaller city in the Sun Belt, Saint George, Utah has also been among the fastest growing metropolitan areas in the nation (US Census Bureau, 2014). Saint George is expected to grow from its 2010 population of 72,897 to nearly 250,000 by 2050. Including the surrounding metro area, the overall population of Washington County, Utah is projected to grow from 138,748 in 2010 to just under 500,000 residents in 2050 (Governor's Office of Planning and Budget, 2015; U.S. Census Bureau, 2014).

As one of the driest cities in the United States, Saint George receives only 8.25" of precipitation annually (Western Regional Climate Center, n.d.). Of this precipitation, approximately half occurs during the growing season and often comes in the form of brief heavy downpours that produce more runoff than saturation of the soil. As a result, supplemental irrigation is required to keep landscape plants and gardens healthy during the hot summer months when average daytime temperatures can reach well over 100° F. As much as 60% of urban water usage in Washington County is attributable to outdoor landscape irrigation (WCWCD, 2010). Landscape irrigation is largely what makes residents of America's Southwest among the highest users of water per capita in the country (Poschman, 2013). Saint George is often cited as being on the upper end of per capita use at 241 gallons per person per day (Nuding, 2013). Water managers suggest caution when interpreting these data because methods for calculating per capita usage can

vary substantially from state to state (Prettyman, 2015; WCWCD, 2010). For example, Utah does not count seasonal residents in its city population numbers. With an estimated 25% of homes in Washington County owned by seasonal residents who are not reflected in population numbers but whose homes still require water to keep their landscapes alive, per capita usage appears higher (City of St. George, 2013). Still, local and state water managers are aiming to reduce overall per capita use by 25% by 2025 (Governor's Position on Water, n.d.).

With an already harsh and arid environment, climate change impacts are predicted to further complicate the West's troubled water future. Temperatures will be hotter with rain events occurring less frequently and with increased intensity. Most Utah communities rely on winter snowfall in the mountains to provide steady runoff to replenish reservoirs during summer months. Under climate change scenarios, mountains will receive more precipitation in the form of rain instead of snow, causing rapid runoff and an inability for reservoirs to capture and replenish water supplies throughout the dry season (Blue Ribbon Advisory Council on Climate Change, 2007; Sundwall, Rolfs & Brown, 2012; US EPA, 2009).

With climate change, population growth, and current water usage rates, Washington County will soon be consuming more water than is locally available (WCWCD, 2010). Recognizing these trends, water managers are planning for development of new water resources including the controversial 139 mile Lake Powell Pipeline that would divert water from Lake Powell at Glen Canyon Dam to reservoirs in Kane and Washington Counties. Opponents of the pipeline cite a variety of concerns

including its high cost and uncertainties in dependable water supplies to transport through the pipeline due to expected flow reductions in the Colorado River from climate change (Christensen, Wood, Voisin, Lettenmaier, & Palmer, 2004). Some opponents suggest future water needs can be met at a lower cost primarily through increased conservation practices (Nuding, 2013). The Washington County Water Conservancy District (WCWCD) maintains that even the strictest conservation measures will not negate the need for additional water supplies (WCWCD, 2010). Regardless, the WCWCD and Saint George City have enacted a variety of conservation programs that have contributed in part to an 18% decrease in per capita water use since 1995 (City of Saint George, 2013). Further conservation will still be necessary, however, and understanding the various influences on outdoor water conservation behavior is important for water managers to develop conservation strategies (Mayer, Lander, & Glenn, 2015).

Promoting Conservation

Since the mid-1990s, water conservation programs in Washington County have focused heavily on educational outreach and public messaging regarding both the need for and ways to reduce water consumption (City of St. George, 2013; WCWCD, 2010). Numerous studies show the importance of conservation education as a crucial step in creating awareness and cultivating a generally favorable attitude towards conservation (Barr & Gilg, 2007; Fielding et al., 2013; Gobster, Nassauer, Daniel, & Fry, 2007; Hurd, Hilaire, & White, 2006; Hurd, 2006). Public awareness, however, is only the first step in promoting conservation since actual behavioral change involves overcoming a multiplicity of additional barriers (Barr & Gilg, 2007; Endter-Wada, Kurtzman, Keenan,

Kjelgren, & Neale, 2008; Kilgren, Endter-Wada, Kjelgren, & Johnson, 2010; Martin, Peterson, & Stabler, 2003; McKenzie-Mohr, 2000a; Schultz, 2011; Shaw, 2004; Yabiku, Casagrande, & Farley-Metzger, 2008).

Though water conservation education is important for influencing attitudes, a number of variables can make voluntary behavioral changes to landscape water use more difficult to achieve. Barr and Gilg (2007) divide these variables into three categories: *social and environmental values* that may make someone more or less likely to be concerned in the first place; *situational variables* such as education, socio-economic status, or geographic location; *psychological variables* such as perceived threat, the perceived ability to make a difference, or social pressures and cultural norms. Each of these categories will be discussed in more detail in the following paragraphs.

Social and environmental values. An Australian study suggests educational materials mostly influence the behaviors of those people who are already conservation-minded or who are seeking further information rather than to one who receive the resources through general outreach methods (Dolnicar, Hurlimann, & Grun, 2012). A similar study in the Phoenix area found that individuals who held stronger environmental views were more likely to make compromises toward water conservation in their landscaping choices, even if their preferences leaned more toward lush high-water landscapes (Yabiku et al., 2008).

The real challenge for water managers and conservation directors is to get their messages to have impact beyond those people who are already inclined to conserve (American Water Works Association (AWWA), 2010). In New Zealand, Van Heezik

had higher success promoting bio-diversity by fostering a dialogue with some of her research participants versus other participants who only received impersonal one-way information (Van Heezik, Dickinson, & Freeman, 2012). This finding suggests conservation education may be more effective at a personal and neighborhood level where resources can be more effectively tailored for relevance to the individual or locale. This personal approach can foster a more consensual attitude toward conservation behavior changes (Barr & Gilg, 2007), though the time and resources to wage such a campaign may be impractical for many conservation promoters. However, when considering how costly new water development projects can be, the cost of these personalized conservation programs may be more feasible in comparison.

Situational variables. One of the most common barriers to conservation is the expense of upgrading existing appliances, landscaping, or irrigation systems to be more efficient (Endter-Wada et al., 2008). Policies, ordinances and other incentives are often used as a means of overcoming situational variables and encouraging behavior changes. Rebate programs for removing lawn, converting spray irrigation to drip irrigation, and installing low-flow devices are often used to subsidize these expenses. Water price increases have been used as a disincentive to wasteful water use. However, if not implemented thoughtfully, increasing water rates can have some negative economic consequences, particularly on lower income households. Renwick and Archibald (1998) demonstrated that household water demand is indeed responsive to price changes. What they also found was lower income households were five times more price responsive than wealthier households. As a share of their budget, low income households bear much

more of the conservation burden under water price policies. The challenge of demand management cost structures is to make them as equitable as possible. Tiered pricing can help with this challenge by ensuring a basic affordable water rate for standard use while excessive water consumption will cost the user more. Though increasing water rates can be an effective conservation tool, as with any mandated change, it is also an unpopular political move. As a result, policy makers are often more interested in promoting voluntary conservation measures (Hurd, 2006).

One consideration when promoting landscape water conservation is the potential for the urban heat island effect. During the 1970's and 1980's, much of Tucson and Phoenix underwent a dramatic change from more traditional water-loving landscapes to "zeroscapes"—landscapes covered in gravel and devoid of plants (Martin, Peterson, & Stabler, 2003; McPherson, 1990). Because hard and unshaded surfaces absorb more heat than plants, the cities saw a 2° F increase in average temperatures. The incentives in Phoenix and Tucson to use less water resulted in an over-correction that created a new problem of increased utility use to cool buildings. Any financial savings from water conservation were more than offset by the increased energy bills. McPherson concluded that any landscape incentives must include minimum standards and should provide homeowners with the tools to determine strategic plant placement for maximum benefit (1990).

More recently, a study by Vahmani and Ban-Weiss (2016) found if all lawn in the Los Angeles area were replaced by densely arranged drought-tolerant plants, daytime temperatures would still increase by several degrees due to decreased evaporative cooling

from heavily irrigated plants. However, unlike the urban heat island effect, they found nighttime temperatures would be cooler than they are presently. They argue that while daytime temperatures would be hotter, our bodies will be able to recover better at night, thus allowing us to handle the heat better. This scenario further illustrates the need to develop model landscape standards and ordinances.

As a water wholesaler, the WCWCD requires each of its municipal customers to develop conservation plans and landscape standards for their respective communities (2010). While guidance is provided, each city has the flexibility to determine the extent and enforcement of their policies. Saint George's current Landscape Standards (2015) require commercial projects to use locally appropriate plant materials and avoid turf lawn except for specific uses. Residential landscapes, on the other hand, are given much more flexibility with appropriate plants and lawn sizes encouraged but not explicitly required. While this encouragement may lead some people to choose locally appropriate landscaping, others are still choosing high water-use options, illustrating the challenge of voluntary conservation measures.

Psychological variables. Perhaps the greatest predictor of a person adopting conservation behaviors is whether individuals feel personally threatened by the environmental consequences if they do nothing (Baldassare & Katz, 1992). People are often more concerned about immediate economic gains rather than planning for environmental risks that may not be as readily apparent in the present (Shultz, 2011). Residents of Las Cruces, New Mexico cited water shortages as the most likely reason they would conserve water on their landscapes (Spinti, St. Hilaire, & Van Leeuwen

(2004). Likewise, in Las Vegas, Nevada resident's awareness and concerns regarding ongoing drought was positively correlated with increased support for water conservation policies (Salvaggio, Futrell, Batson, & Brents, 2014). Unfortunately, once the immediate threats of water shortages dissipate, it is not uncommon for people to slowly revert back to their previous habits and norms (Fielding et al., 2013).

Severe drought in California in recent years has compelled residents to adopt substantial conservation behavior changes due to the immediate threat of water shortages. In response to the drought, in 2014 California Governor Brown issued Executive Order B-29-15 mandating a 25 percent decrease in urban water use. Though Washington County has not recently faced drought of the same severity as California, there is wisdom in creating landscapes and communities that will be resilient when such shortages come. Because the risk of drought is always present, conservation messaging should reflect the seriousness of the threat. To be resilient, communities must consider new approaches to how growth occurs and the form it will take, including landscaping. Joan Nassauer (2005) stated, "People are not inherently averse to improvement…New landscape patterns that are immediately recognizable as improvements will be seen as real alternatives to present landscape trends" (p. 274-275). Achieving long-term landscape water conservation goals will likely necessitate a shift in landscape patterns and norms.

The Role of Social Norms

Social norms or normative patterns are strong predictors of individual decisions and behavior (Gockeritz, Schultz, Rendon, Cialdini, Goldstein, & Griskevicius, 2009; Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). As previously noted,

conservation messaging has the strongest influence on people who are already interested in conservation behavior. On the other hand, individuals who do not have strongly held opinions or are less influenced by information campaigns or financial incentives will instead look for social cues to determine what is normal and appropriate (Berg, 2008; Corral-Verdugo, & Frias-Armenta, 2006; Fielding et al., 2013; Kaufman & Lohr, 2002; Schultz, 2011). Therefore, conservation messaging that focuses on positive normative behaviors can be highly effective in promoting behavioral changes (Lapinski, Rimal, Devries, & Lee, 2007; Schultz, 2011). Promoting positive behaviors is often done through the use of descriptive norms. Descriptive norms are helpful for people to decide what the most positive or accepted behavior is when several options are available (McKenzie-Mohr, 2000b; Schultz et al., 2014).

A compelling example of the effects of descriptive social norms was demonstrated in a study involving water conservation messaging as relating to hotel towel usage. After determining 75% of hotel guests were already reusing their towels for several days, in an effort to boost that percentage, Goldstein, Cialdini, and Griskevicius (2008) created two versions of water conservation messages to be placed in hotel rooms. The first was a standard conservation message with a "Help save the environment by reusing your towel" theme commonly found in hotels. The second version included a normative message that read, *"Join your fellow guests in helping to save the environment. Almost 75% of guests who are asked to participate in our new resource savings program do help by using their towels more than once"* (p. 474). Guests who

received the normative message were significantly more likely to reuse their towels than guests who received only the environmental message.

As it relates to landscape water conservation, social pressure to conform to deeply entrenched landscape norms can be a major hurdle to overcome (Blaine, Clayton, Robbins, & Grewal, 2012; Kaufman & Lohr, 2000; Nassauer, 1995; Yabiku et al., 2008). This pressure to conform tends to be strongest at the neighborhood level (Blaine et al., 2012; Nassauer, Wang, & Dayrell, 2009). Because homeownership is a major financial investment and since the condition of other homes in a neighborhood can impact property values, people are often hesitant to adopt a landscape pattern that lies outside of the established neighborhood norm for fear of reducing property values and creating tension with neighbors (Nassauer, Zhifang, & Dayrell, 2009). As a result, while broader cultural norms may reflect a particular landscape style, neighborhood norms weigh in much more heavily on homeowner's decisions (Dzidic & Green, 2012).

Landscape norms also vary across income levels. High-income homeowners in the southwest typically use far more water for extra amenities such as swimming pools, water features and oasis themed landscaping. Concern about water conservation is less likely to translate to action among the affluent because they want to maintain their high water use amenities to comply with the social norms of their neighborhood culture (Harlan, Yabiku, Larsen, & Brazel, 2009).

Homeowners in a Canadian study who have been bold enough to go against landscape norms described facing judgment from their neighbors, but hoped in time their decision would foster a new alternative landscape norm (Feagan & Ripmeester, 2001).

Similar sentiments were expressed in Australia where many individuals indicated a willingness to adopt alternative landscapes but were waiting for someone else to do it first before they would follow suit (Dzidic & Green, 2012). Though these individuals expressed hope for creating an alternative norm, they did not expect them to ever become the dominant norm. However, research indicates social norms can have a more powerful effect than people perceive. Several studies measuring the effect of social norms suggest people tend to give much less credit to the power of normative influences on behavior than the data indicates it actually does (Gockeritz et al., 2009; Nolan et al., 2008). This may be due in part to familiarity. Though people often have negative reactions to things that are different, continued exposure over time may improve those initial perceptions (Yabiku et al., 2008).

Through a combination of education and descriptive normative messages, social norms may evolve over time to be more accepting of conservation principles (Hurd, 2006). De Oliver (1999) conducted a survey in San Antonio and discovered a generally positive attitude towards water conservation was quite trendy. However, actually supporting specific conservation measures and practices was less favorable among respondents. Likewise, Larsen and Harlan (2006) found that Phoenix area homeowners viewed desert landscaping as the socially correct motif for front yards while backyards were often preferred to be much more verdant. Similar results were found in various surveys throughout the west (Hilaire et al., 2010; Hurd, 2006; Martin et al., 2003). Though it may be suggested that this shows some duplicity in conservation behavior, it can also be argued that backyards get more recreational use and lawns and dense shade

better foster such lifestyles. More research is necessary before reaching too many conclusions about the meaning of these seemingly disparate landscape choices. Gobster et al. (2007) describes how the context a landscape functions within will significantly influence aesthetic preferences. Therefore, understanding the cultural meaning and function of different landscaped areas is crucial when encouraging alternative norms.

Because of culture and functional uses, establishing new landscaping patterns that require less water as a normative alternative to more traditional landscapes is complex. As noted earlier, long-term behavior changes are often difficult to achieve if the changes are compulsory due to imminent water shortages or enforced regulation. Fielding et al. (2013) believe long-term change is best achieved through voluntary conservation approaches because they will influence a cultural shift in expectations and understanding. However, the shift toward desert adapted landscape patterns in the Phoenix area may be influenced less by cultural preferences and more by the use of Codes, Covenants and Restrictions (CC&Rs) or Home Owner Association (HOA) policies established by the builders of master planned communities (Martin et al., 2003). The popularity of such communities in recent decades may at least suggest an implicit acceptance of desert landscaping as an appropriate landscape form, whether or not the individual homeowners would have made such landscape choices in the absence of regulations.

Joan Nassauer (1995) suggests landscape patterns are affected by culture and landscapes also affect culture. Unless someone consciously evaluates the reasons for their landscape decisions, they will likely adopt a landscape pattern that matches the culture of their community. Nassauer contends, “If normative landscape models are

proposed without being grounded in the full range of cultural values, they will be overwhelmed by the momentum of custom" (Nassauer, 1995, p. 236).

Evolving Landscape Norms

Promoting ecologically healthy landscaping norms puts much of the impetus on designers to develop patterns that blend cultural expectations with ecological needs (Ignatieva et al., 2015; Nassauer, 2005). Education regarding the ecological benefits of increased bio-diversity or water conservation may help some people to better appreciate the aesthetic of alternative landscapes (Corral-Verdugo & Frias-Armenta, 2006; Gobster et al., 2007). However, the aesthetics of monoculture or high water-use plants frequently outweigh the appreciation of ecologically beneficial aesthetics (Dzidic & Green, 2012; Feagan & Ripmeester, 2001; Shaw, 2005). Frequently cited concerns regarding alternative landscapes are that they appear messy, cluttered or neglected (Dzidic & Green, 2012; Gobster et al., 2007; Nassauer, 2007).

Joan Nassauer (2007) proposes one solution for the negative opinions of "messy" ecological landscapes is to insert "cues to care" that demonstrate intentional human intervention rather than neglect or laziness. Cues to care may include interesting architectural features, art pieces, bold planting configurations, and consistent maintenance. Gobster et al. (2007) stated, "Care is an aesthetic that, unlike the scenic aesthetic, depends on perceptible cues of continuous human presence. It invites human engagement in changing and maintaining landscapes, and this engagement is perceived as benevolent" (p. 967).

Understanding the social cues particular landscape patterns send about homeowners is important. An interesting survey at a university in a southwestern city found students perceived higher amounts of lawn to reflect more positively on the character of residents in homes with lawn than on residents with desert landscapes (Neel, Sadalla, Berlin, Ledlow, & Neufeld, 2014). One possible explanation for this result is that the students may recognize such landscape patterns as signs of success or wealth that inspire their own aspirational goals. Alternatively, the neatness and tidiness of a well-kept lawn may reflect desirable character traits such as discipline and responsibility.

Normative landscapes contribute to a community's sense of place and may help to explain a common finding that long-time residents in the arid southwest are less likely to view desert landscaping favorably than more recent residents who have relocated from different climates and regions (Harlan et al., 2003; Hilaire et al., 2010; Larson, Wutich, White, Munoz-Erickson, & Harlan, 2001; Martin et al., 2003; Spinti et al., 2004 ; Yabiku et al., 2008). While the normative landscape for long-time residents often includes larger proportions of lawn, newer residents may have different expectations of what a desert southwest landscape will look like and be more open to low-water alternatives. Similar results were found in a Spanish suburb. While researchers did not discover one predominant landscape norm, they did find second home owners and part-time residents from other areas were much more likely to prefer native Mediterranean landscaping and gardens (Garcia, Llausas, & Ribas, 2014).

Lifelong residents of a community frequently base their sense of place more on culture, history and social relationships whereas newer residents may relate to geography

and other environmental variables as the defining characteristics of a place (Hay, 1998; Stedman, 2006). Though both sides claim a strong connection to place, conflict sometimes arises between long-term residents and relative newcomers over appropriate solutions to various environmental issues a community may be facing. Because differing interpretations of a community's sense of place can lead to opposing opinions regarding appropriate landscape patterns, water conservation messaging must understand and be sensitive to a multitude of viewpoints (Kianicka, Buchecker, Hunziker, & Muller-Boker, 2006).

Though a longer length of time living in the southwest tends to predict less interest in alternative low-water landscape patterns, a survey of Guelph, Ontario, Canada residents showed the opposite effect. Long-time residents were in fact more supportive of water restrictions and open to reducing lawn area than newer residents (Atwood, Kreutzwiser, & De Loe, 2007). This finding reiterates the importance of verifying the actual opinions and norms within each community rather than assuming a common result is generalizable everywhere.

Cultural norms vary widely across the Southwest requiring a customized approach in each city. A series of studies in New Mexico show how much variation can exist even at the regional level (Hurd et al., 2006; Hurd, 2006). Santa Fe, Las Cruces, and Albuquerque residents all had differing landscape norms and conservation ethics with Santa Fe fostering a long established cultural norm that uses little or no turfgrass (Hilaire, VanLeeuwen, & Torres, 2010). While researchers have found a growing awareness among residents for the need to conserve water on landscaping in places like

Albuquerque, Las Vegas and St. George, cultural and environmental variables encouraged other cities such as Santa Fe, Tucson and Denver to begin actively promoting landscape changes decades ago (Berg, 2008; Hilaire et al., 2010). Learning from the experiences of cities with established conservation cultures is valuable, but it is important to acknowledge the variables that influenced those changes are often unique and may not translate easily to the cultures of other communities (Gobster et al., 2007).

Washington County Norms

Understanding how landscape norms in Washington County, Utah have developed over time requires some background knowledge of Mormon settlement throughout the Intermountain West. Mormon settlers first arrived in the Salt Lake Valley in 1847, seeking seclusion to practice their religion without persecution. Within a decade Brigham Young sent families throughout the region to establish additional settlements, including present-day Washington County approximately 300 miles south of Salt Lake City. In contrast to non-Mormon settlements in the West, Mormon communities tended to be highly organized, if not somewhat aesthetically homogenous, utilizing a grid system for roads and property for the purpose of establishing "Zion" (Francaviglia, 1978). In addition to the obvious need for self-reliance in these remote locales, Mormon leaders encouraged the planting of large orchards and gardens around the home and shade trees to line the streets for the purpose of creating beautiful Eden-like societies notwithstanding their arid and semi-arid settings (Wheeler, 2011). In practice, Mormon settlers attempted to recreate the landscapes they were familiar with and idealized from their previous

homes in Illinois, New England and Europe (Carter, 2015; Francaviglia, 1978; Wheeler, 2011).

In order to accomplish these ideals, Mormons developed impressive irrigation networks throughout the region, harnessing runoff from mountain streams. Being in one of the more arid environments, Washington County settlers struggled for decades to tame the rivers and develop reliable water supplies for the homes and gardens. As a testament to their grit and determination, mature cottonwoods, ash, mulberries and sycamores can be found lining the streets and shading homes in the historic parts of the county. Some Mormons view this as a literal fulfilment of scripture: "…and the desert shall rejoice, and blossom as the rose" (Isaiah 35:1 KJV). With modernization and a shift towards grocer imported food, Mormon gardens and orchards gradually reduced in size to be replaced by the all-American lawn. Though the original self-reliance aspect of Mormon landscapes has shifted, an emphasis on verdant Edenic landscapes persists in the ethos of many residents throughout the Mormon culture-region (Francaviglia, 1978; Shaw, 2005).

Population growth in Washington County was slow until the 1970's when the completion of Interstate 15 through Saint George made the county easily accessible. The greater Saint George area quickly began attracting new residents including many seasonal retirees to resort-style communities built around golf courses. Similar to other Southwestern cities, the desert oasis mentality featuring lush semi-tropical plants became prominent in residential landscaping. The influx of people required the development of new water supplies and reservoirs to meet demand. By the 1990's, planners recognized the demands of continued growth would eventually exceed the water available locally

and began organized efforts at promoting conservation. With landscapes using more than half of the water supply, they became a clear target for scaling back.

During the building boom of the past decade, much of the development in Saint George and Washington County involved construction of entirely new neighborhoods whose landscaping styles were codified by HOAs. These HOAs increasingly incorporated desert-style landscaping as opposed to traditional lawns. Though varying amounts of lawn still remain a prominent feature in most landscapes, the practice of planting lawn from property line to property line seems to have diminished. As such, Saint George now has a wide variety of normative landscapes ranging from predominantly lawn to a mix of lawn with desert borders, and even no lawn with desert plants and gravel mulch. Though new landscape styles and trends have emerged, little is known regarding Washington County residents' perceptions of these new patterns and what they consider to be appropriate norms.

Established neighborhoods and newer developments in the Saint George area that are not regulated by HOAs often have a mix of landscape styles. Finding homes with low-water renovated landscapes within established neighborhoods is not uncommon. A study in Michigan indicated if no particular landscape style dominates a neighborhood, homeowners feel more freedom to choose a landscape based on their own personal preferences (Nassauer, 2009). It is unknown whether Saint George residents feel a similar landscaping freedom or are instead trending toward desert-adapted landscapes due to evolving normative pressures.

The American Water Works Association (2010) stated, “The importance of quantitative research to effective water efficiency communications programs cannot be overstated… It is better to invest in information first than to discover after expending the full budget whether or not the outreach assumptions are true” (p. 9). Understanding what factors motivate preferences, behavior and decision making is imperative to gauge landscaping and conservation trends within a population (Corral-Verdugo & Frias-Armenta, 2006; Nassauer, 2005; Spinti et al., 2004; Yabiku et al., 2008). Because normative beliefs tend to play a significant role, the purpose of this study was to better understand how Washington County residents perceive landscaping norms and whether social pressures are influencing new trends. Additionally, we were interested in the influence of landscape decision factors when several norms are present in a neighborhood.

Feedback on aesthetic values, conservation values, and the perceived role of social pressures will be informative for policy makers, designers, and water managers to fine tune their messaging (Hilaire, et al., 2010; Sanagorski & Monaghan, 2014) in order to promote normative landscape patterns that reflect the values of the community while conserving water for future growth.

CHAPTER III

METHODOLOGY

For this study we conducted a survey to measure residents' views regarding water conservation in Washington County, Utah and to what extent social norms influence their landscaping decisions. The research questions are as follows: (1) How concerned are residents regarding landscape water conservation, (2) have they perceived a change in landscape norms over time, (3) what is their neighborhood norm, (4) do neighborhood landscape norms influence residents' behavior and (5) what landscape norm would they choose when several norms are present in a neighborhood?

Survey Populations

Because collecting a representative sample of all Washington County residents was not feasible with respect to time and available resources, we selected three populations for comparison. The first population surveyed included visitors to Saint George's Red Hills Desert Garden (Garden), a recently established conservation garden managed by the WCWCD that is free to the public. While the exact demographics of garden visitors are not known, the garden is prominently located adjacent to a popular hiking area and anecdotal experience suggests it draws a much more diverse range of visitors than similar conservation gardens throughout Utah. That said, we suspected the garden population would likely skew slightly more favorably toward conservation. Many tourists from outside Washington County visit the garden and were also invited to participate for comparison. Rather than having visitors take the survey at the garden we

asked them to provide an email address for us to email the survey link to them. Additionally, we offered entry into a drawing for one of five $20 Amazon gift cards as an incentive to participate. During peak hours on weekends, we approached visitors directly to participate whereas the rest of the time the tablet was in a kiosk. The kiosk was set up for one month from February 25, 2016 to March 26, 2016 during regular daytime hours. The survey links were emailed within 24 hours.

For the second population we utilized an email list provided by the WCWCD (Conservancy). The list includes approximately 1,200 email addresses compiled from people who have attended garden workshops hosted by the WCWCD, participated in free residential irrigation audits or interacted with the WCWCD in some other way and agreed to be emailed with news and updates. As such, we expected this population to skew heavily in favor of increased landscape water conservation since they had already demonstrated interest in conservation information and resources. The first email was sent on March 3, 2016. The email included information about an upcoming garden workshop, a status update on reservoir levels and the invitation to participate in the survey. We offered the gift card incentive to this group as well. The email "open" rate was 26.5%. A second email was sent on March 18, 2016 with an open rate of 25.3%.

The third survey population consisted of residents of a residential development governed by an HOA. The HOA sent the survey link to their email database of 273 on March 15, 2016 with a reminder five days later. The development has 284 lots built primarily since 2000 or later. The median home value based on Zillow.com estimates is $301k whereas the median for all of Saint George is $212k (US Census Bureau, 2014),

Table 1.
Response Rates by Population

	Target Population	Washington County Respondents	Non-Washington County Respondents	Total Respondents	Response Rate
HOA	273	113	36	149	58%
Conservancy	1200	113	2	115	10%
Garden	351	69	55	124	35%

putting the HOA in the top quarter of home values for the area. The neighborhood population is largely made up of retirees and couples with no children in the home. The landscaping was established by the property developer, creating a consistent landscape style throughout. Typical homes have small patches of lawn comprising 33-50 percent of the front yard with desert-adapted plants and gravel mulch filling in the rest. The backyards tend to have more lawn on average but are more variable with some yards being almost entirely lawn while others have no lawn. Because the landscaping is highly uniform, we were interested to find out how residents interpreted the neighborhood norms. Response rates for all three populations are shown in Table 1.

Questionnaire Content

The questionnaire was divided into several sections (See Appendix). The first section focused on views and concerns regarding landscape water conservation in Washington County. Participants were asked to rate their own level of concern as well as how concerned they perceived their neighbors to be regarding landscape water conservation. They were also asked whether they had noticed any shift in landscape

trends and whether their personal views toward desert landscaping had improved over time. Finally, they were asked to rate how much pressure they felt from their neighbors and from government entities to conserve water on landscaping.

The second section focused on understanding the participants' neighborhood norms and how they influenced their own decisions. To determine neighborhood landscape norms, participants were asked what proportion of their landscapes are comprised of lawn and whether that was typical for their neighborhood. A series of questions focused on pressures to conform to neighborhood norms and the acceptability of divergent landscape patterns. A hypothetical question was asked to determine what type of landscape participants would install if they moved into a neighborhood with both turf-dominant landscaping and desert landscaping present. This was used to understand whether a broader cultural shift in landscape norms is occurring regardless of norms at the neighborhood level. Another series of questions were included to determine what variables are most important to participants when making landscape decisions such as style preference, HOA requirements, wanting to fit in, function, cost, maintenance, and water conservation.

Demographic questions were included throughout at relevant points in the survey as well as several at the end. Age, gender, presence of children, and length of time living in the area were included to compare results with similar surveys completed throughout the southwest that found interesting correlations between these demographic variables and landscape preferences.

Analysis

Most of the survey questions utilized a 7-point Likert scale to make coding and statistical analysis efficient. Simple descriptive statistics utilizing frequencies were run on the combined results and then for each survey population separately. Independent-samples *t* tests were the primary method for identifying differences between survey populations and variables. Significance was determined at the $p = .05$ level. When significant differences were found, the effect size was measured using eta square (η^2). Effect sizes were considered small, medium, and large at the .01, .06, and .14 levels respectively. Correlations between variables were measured using Pearson's correlation coefficient and were considered small, medium, and large at the .10, .30, and .50 levels respectively.

Limitations

Because we only surveyed three distinct populations, we cannot conclude our results are representative of all residents of Washington County, Utah. Both the HOA participants and the conservancy email participants tend to be near or at retirement age. Census data shows 19.6% of Washington County's residents are 65 years and over (US Census Bureau, 2014). This proportion may actually be much higher since many part-time residents are not included in the census data. As such, this is an influential demographic represented by two of our survey populations, albeit proportionally overrepresented. Garden participants show more demographic diversity and are more representative of the county demographics. However, respondents tended to be from the communities nearest the garden, thus underrepresenting residents of further communities

such as Hurricane or Springdale (see *Figure 1)*. Though we would expect some variations in our results from a more representative sample, we believe many traits of the populations selected are shared by large proportions of Washington County residents, thus making the results broadly generalizable.

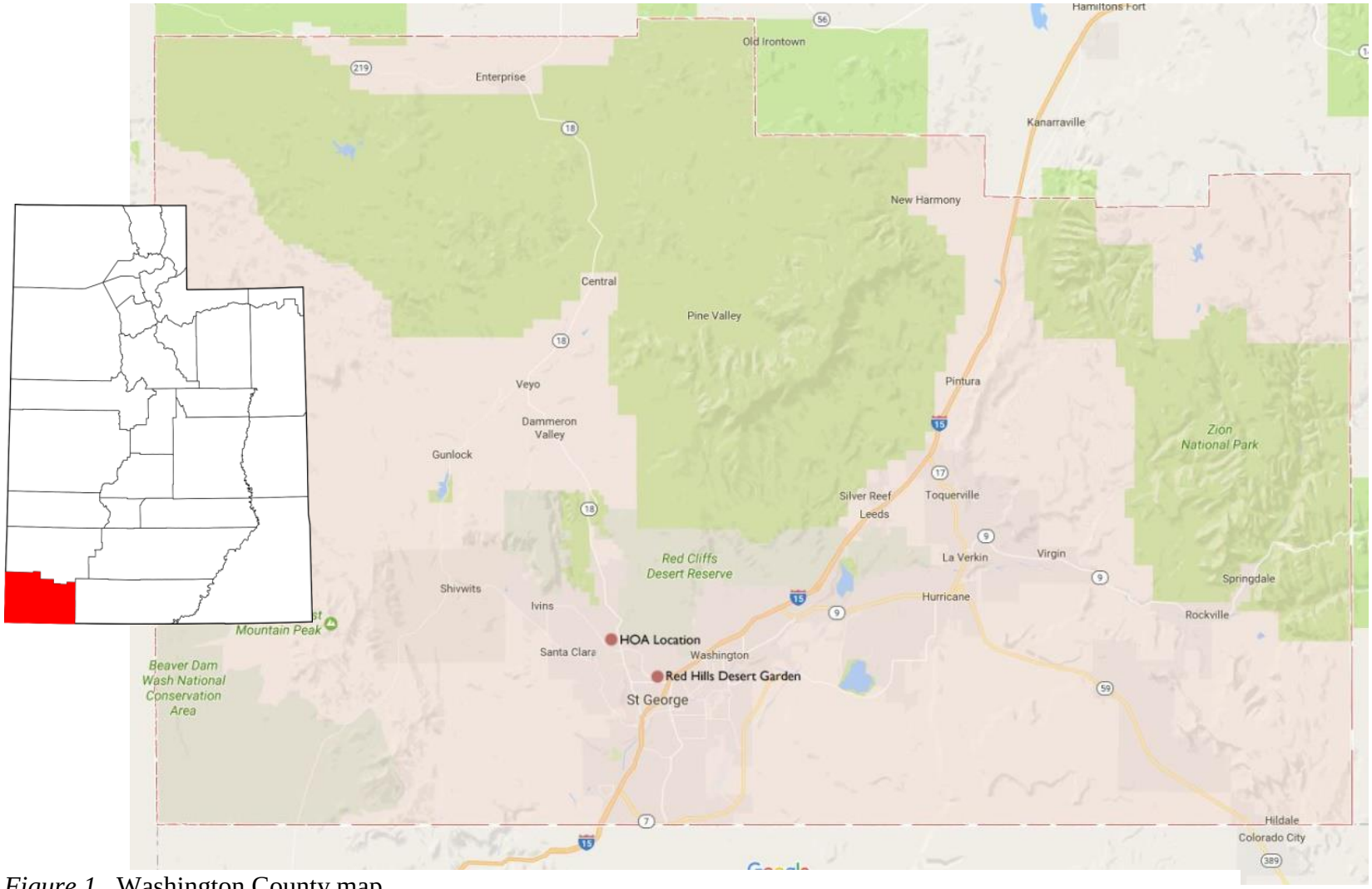

Figure 1. Washington County map.

CHAPTER IV

RESULTS

For this study we conducted a survey to answer the following research questions: (1) How concerned are residents regarding landscape water conservation, (2) have they perceived a change in landscape norms over time, (3) what is their neighborhood norm, (4) do neighborhood landscape norms influence residents' behavior and (5) what landscape norm would they choose when several norms are present in a neighborhood.

Demographics

The total number of responses recorded from all three population samples was 388 with a similar sample size from each population. Garden visitors provided 124 responses. Of those, 69 were Washington County residents and 55 were non-Washington County residents. The conservancy email list provided 115 responses with all but two being Washington County residents. The HOA provided 149 responses with 113 being Washington County residents and 36 non-Washington County residents. Among the 24% of participants who were not Washington County residents, 1% (n=4) lived in adjacent counties, 19.3% (n=75) were from Northern Utah (generally along the Wasatch Front), and 3.6% (n=14) were from outside Utah. The remaining 76% (n=295) were Washington County residents. Because we were primarily interested in Washington County residents, non-residents were excluded in our analyses except where specifically noted otherwise.

Table 2 shows the demographic frequencies and means associated with the Washington County residents of each population sample. The genders of the HOA and conservancy groups were identical with a fairly even split between men (n = 54) and women (n = 51). The garden respondents had a similar number of women participants (n=48) but far fewer men (n=16). Combined, females represented 54.7% (n=150) and men 45.3% (n=124).

The ages of both the HOA and conservancy participants skewed heavily to the upper end with 91.1% (M= 4.54, SD=.66) and 87.3% (M=4.44, SD=.87) aged 55 or more. Garden visitors were more evenly distributed with a mean in the 35-54 year age range (M=3.02, SD=1.24). The presence of children under 18 in the home followed a similar pattern with 95.5% (n=105, M=.07, SD=.38) of HOA and 91.7% (n=100, M=.22, SD=.80) of conservancy participants having no minor children living with them. Fifty six percent of garden visitors had one or more children under the age of 18 living at home (M=1.20, SD=1.39).

Approximately two thirds of participants had lived in Washington County for six or more years and 46.4% had lived in the county for 11 or more years. Only 16% of respondents had lived in the county for more than 20 years. The HOA and conservancy populations were, once again, fairly comparable with more than two thirds of residents having lived in the county for at least six years. The garden visitors represent a more evenly distributed range of residency lengths with almost half having lived in the county for five years or less.

Table 2.
Demographic Frequencies and Means

Variables		HOA	Conservancy	Garden	Combined
Gender	Female (1)	51	51	48	150 (55%)
	Male (2)	54	54	16	124 (45%)
	Mean	1.51	1.51	1.25	1.45
	SD	.502	.502	.436	.499
Age	18-25	0	2	6	8 (3%)
	26-34	0	2	19	21 (7%)
	35-54	10	10	18	38 (13%)
	55-64	31	28	10	69 (24%)
	65 or over	71	68	11	150 (53%)
	Mean	4.54	4.44	3.02	4.16
	SD	.656	.873	1.241	1.087
Children	0	105	100	28	233 (82%)
under 18	1	3	1	13	17 (6%)
living at	2	1	3	12	16 (5%)
home	3	1	4	7	12 (4%)
	4	0	0	1	1 (.04%)
	5 +	0	1	3	4 (1%)
	Mean	.07	.22	1.20	.39
	SD	.376	.798	1.394	.966
Length of	<1 year	5	3	6	14 (5%)
residency	1-2 years	4	8	11	23 (8%)
	3-5 years	20	24	16	60 (20%)
	6-10 years	25	26	9	60 (20%)
	11-20 years	46	32	11	89 (30%)
	> 20 years	13	19	15	47 (16%)
	Mean	4.26	4.19	3.78	4.12
	SD	1.238	1.298	1.647	1.373

Table 3.
Means and Standard Deviations by Population Samples

Variables	HOA		Conservancy		Garden		Combined	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
How concerned are your NEIGHBORS about conserving water on landscaping?	4.95	1.309	4.26	1.764	4.26	1.681	4.53	1.612
How concerned are YOU about conserving water on landscaping?	5.77	1.300	6.27	1.123	5.40	1.317	5.87	1.282
Have landscaping trends become more inclusive of desert landscaping over time?	5.25	1.440	4.94	1.434	5.63	.981	5.20	1.380
Have your personal preferences toward desert landscaping improved over time?	5.87	.878	5.97	1.411	5.09	1.343	5.73	1.257
Do you feel pressure from NEIGHBORS to conserve water?	3.22	1.245	2.92	1.459	2.80	1.372	3.01	1.366
Do you feel pressure from GOVERNMENT ENTITIES to conserve water?	4.17	1.579	3.38	1.936	4.08	1.604	3.84	1.764
What proportion of your landscape is covered by lawn?*	3.72	.826	3.99	1.029	3.64	1.048	3.81	.957
Compared to your own home, how much lawn do most homes in your neighborhood typically have?**	3.18	.573	3.31	.930	3.00	.886	3.20	.800
I would likely reduce my lawn area if several of my neighbors did	3.80	1.765	4.09	1.809	3.48	1.462	3.86	1.738

(Table Continues)

Variables	HOA		Conservancy		Garden		Combined	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
I approve of my neighbors having desert landscaping, regardless of my own landscape	5.72	1.293	6.51	.883	5.90	1.287	6.08	1.196
My neighborhood has a wide variety of landscaping styles	3.31	1.561	4.56	1.792	4.13	1.847	3.97	1.800
I feel pressure to conform to my neighborhood landscaping style	4.31	1.831	3.23	1.888	3.10	1.763	3.64	1.916
Desert landscaping is acceptable in my neighborhood	5.39	1.740	6.11	1.324	5.44	1.742	5.69	1.615
If you were to build a new home in a neighborhood where half of the homes have turf-dominated landscapes and the other half had desert landscapes, what would you choose? ***	2.64	.647	2.74	.549	2.14	.846	2.54	.721
Influence on landscaping decisions: A strong preference for a particular landscape style	5.22	.976	5.38	1.206	4.98	1.225	5.24	1.127
Influence on landscaping decisions: HOA landscaping requirements	5.61	1.138	4.44	2.194	4.10	2.166	4.85	1.934
Influence on landscaping decisions: Wanting to fit in with my neighborhood	4.50	1.444	3.72	1.772	3.39	1.845	3.97	1.716
Influence on landscaping decisions: Space for recreation or entertaining	4.77	1.359	4.84	1.587	5.73	1.115	4.98	1.458

(Table Continues)

Variables	HOA		Conservancy		Garden		Combined	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*
Influence on landscaping decisions: Low cost	5.15	1.096	5.47	1.292	5.27	1.150	5.30	1.194
Influence on landscaping decisions: Ease of maintenance	5.76	1.116	6.07	.960	5.63	1.216	5.86	1.087
Influence on landscaping decisions: Minimizing water use	5.90	.948	6.25	1.151	5.39	1.218	5.94	1.126
Influence on landscaping decisions: A landscape appropriate for my climate	6.06	.827	6.35	1.076	5.69	1.257	6.11	1.046

Note: Responses based on a 7-point Likert scale unless otherwise noted.

*5 point scale: 1=All or almost all of it, 5=None

**5 point scale: 1=A lot less lawn, 5=A lot more lawn

***3 point scale: 1=Primarily Turf, 2=Combination, 3=Desert

Concern Regarding Conservation

Our first research question was to determine how concerned residents are regarding landscape water conservation. We found an overall moderate level of concern regarding water conservation with variations based on length of time lived in Washington County, age, and the number of children living in the home.

Table 3 shows the means and standard deviations for the combined responses as well as for each population sample. All means are based on a 7-point Likert scale unless otherwise noted. The survey question that directly asked about their individual concern regarding water conservation had a mean response of M=5.87 (SD=1.28). The conservancy group indicated the highest personal concern (M=6.27, SD=1.12) followed by the HOA (M=5.77, SD=1.30) and garden group (M=5.40, SD=1.32). An independent-samples t test showed the difference between the conservancy and garden group means was significant, $t(124) = 4.54$, $p<.001$, with a large effect size ($\eta^2 = .14$). The high level of concern was expected from the conservancy group as they are primarily comprised of individuals who had proactively engaged in conservation programs and workshops in the past. Because the garden group had such a high percentage of non-Washington County participants (see Table 1), we compared levels of concern between residents and non-residents and found no significant difference between Washington County residents (M=5.40, SD=1.32) and Northern Utah residents (M=5.43, SD=1.04). In other words, Washington County residents do not appear to be any more or less concerned about water conservation than Northern Utah residents.

Interestingly, while participants tended to rate higher levels of individual concern for conservation, they did not perceive their neighbors as having the same level of concern. The overall mean for their neighbors' concern about landscape water conservation fell between neutral and somewhat agreed (M=4.53, SD=1.61). While the conservancy (M=4.26, SD=1.764) and garden (M=4.26, SD=1.68) groups were more neutral, the HOA (M=4.95, SD=1.31) somewhat agreed that their neighbors were concerned about water conservation. An independent-samples t test measuring the difference between the HOA and garden was significant, $t(115) = 2.87$, p=.005, with a moderate effect size ($\eta^2 = .06$). This suggests some neighborhood norm of conservation concern may exist within the HOA whereas garden respondents do not perceive similar norms in their neighborhoods.

Because respondents knew the nature of the survey, some of the variation between personal concern and the perceived concern of neighbors may be a result of over self-reporting. However, internal consistency is shown by comparing two similar questions with different wording. A Pearson correlation coefficient calculated using the garden group shows a strong correlation, $r = .53$, $p < .001$, between the level of personal concern about conserving water on landscaping and how important a person considers minimizing water use when making landscape decisions.

No correlation was found between level of concern and length of time lived in Washington County for the HOA or conservancy groups. On the other hand, a moderate negative correlation, $r = -.39$, $p = .001$, was found for the garden sample. This is similar

to findings from other studies that found long-time residents are often less concerned about landscape water conservation (Hilaire et al., 2010; Martin et al., 2003).

A small correlation, $r = .24$, $p < .001$, between level of concern and age was found in all three population samples. This may seem counterintuitive since one might expect a correlation between age and length of residency. This may be explained, however, by the high number of retirees who relocated to Washington County more recently than younger individuals who have lived in the area longer. Perhaps most interesting is a negative correlation, $r = -.30$, $p = .018$, between level of concern and the number of children under 18 living in the home. Although it would seem reasonable that parents would be more concerned about water conservation for the sake of their children, this result suggests residents with young children are less concerned about water conservation than those with no children living at home. Possible explanations for this will be discussed in later sections.

Landscape Trends

The second question we sought to answer was whether participants had perceived changes in landscape norms and trends over time. Respondents somewhat agreed that Washington County landscape trends had become more inclusive of desert landscaping.

The combined mean was 5.20 (SD=1.38). The difference between the conservancy (M=4.94, SD=1.43) and garden (M=5.63, SD=.98) was significant, $t(147) = -2.988$, p=.003, with a medium effect size ($\eta^2 = .06$). Thus, the garden group perceived a greater shift in trends toward desert landscaping than the conservancy group.

Interestingly, though the garden group perceived a larger shift in overall trends, their personal preferences towards desert landscaping had only somewhat improved over time (M=5.09, SD=1.34) while the HOA (M=5.87, SD=.88) and conservancy group (M=5.97, SD=1.41) agreed theirs had improved more than the overall trend. Again, the independent-samples t test indicated the difference between the conservancy and garden groups to be significant, $t(174) = 4.068$, $p<.001$, with a medium effect size ($\eta^2 = .09$).

Improved personal preferences towards desert landscaping correlated, $r = .31$, $p < .001$, with increased age while a negative correlation, $r = -.35$, $p < .001$, was found with the number of children living in the home. This correlation suggests that while preferences toward desert landscaping had improved over time, preferences had improved less among younger families with children. Some explanations for this may be families with children tend to be younger and have not had as much time for their preferences to evolve or they have other pressing issues to worry about.

No correlation was found between length of residency and improved personal preference for desert landscaping in the HOA or conservancy groups. However, a medium negative correlation, $r = -.30$, $p = .01$, was found for the more representative garden sample. Again, this finding aligns with results from other studies that found longer-term residents were less likely to prefer desert landscaping compared to relative newcomers (Larson et al., 2011). As would be expected, a strong correlation, $r = .60$, $p < .001$, was found between personal concern about landscape water conservation and improved preference for desert landscaping among the garden group.

Neighborhood Norms

To identify neighborhood norms, we analyzed four questions: What proportion of their landscape is covered in lawn, whether homes in their neighborhood have comparable amounts of lawn, whether they perceive their neighborhood as having a wide range of landscaping styles, and whether desert landscaping is acceptable in their neighborhood.

Lawn proportions. On a 5-point Likert scale with 1=almost all lawn and 5=no lawn, the mean amount of lawn for all residents was M=3.81 (SD=.96). or slightly less than half of their landscape was lawn. The conservancy group had the least lawn with a mean of "less than half" (M=3.99, SD=1.03). Not surprisingly, the HOA had the most consistent response with 66% indicating less than half of their landscape was lawn (M=3.72, SD=.83). The mean amount of lawn for garden visitors was slightly less than half (M=3.64, SD=1.05) and had nearly 38% indicating half or more of their landscape was lawn. For comparison, the mean for garden visitors from Northern Utah was M=3.31 (SD=1.47). An independent-samples t-test did not find any significant difference between Washington County and Northern Utah residents. This result was surprising because in our experience lawn makes up much more than half of the typical Northern Utah landscape. This discrepancy may indicate some confusion over the wording of the original question: "What proportion of your private landscape is covered by turf lawn?" The wording "turf lawn" was used to differentiate between lawns composed of grass species and lawns composed of groundcovers such as clover or thyme. However, based on a number of responses that appeared inconsistent with responses to

other questions, it is possible this wording may have been unfamiliar and confusing to some participants who may have interpreted it to mean artificial turf or some other alternative to conventional lawn.

Neighborhood lawn norms. As for what the typical amount of lawn is in their neighborhoods, 60.5% of respondents indicated it was about the same as their own landscape. On a 5-point Likert scale with 1=a lot less lawn and 5=much more lawn, *M*= 3.20 (SD=.800) indicating most participants homes match their neighborhood norm or have slightly less lawn. Again, the HOA is most consistent with 72.8% (*M*=3.18, *SD*=.57) describing their neighborhood lawn norm as "about the same" as their own landscape. The conservancy group (*M*=3.31, *SD*=.93) responded with 47.3% having the same amount of lawn as their neighborhood norm, 38.4% having less than their neighborhood norm, and 14.3% having more lawn than their neighborhood norm. The garden visitors (*M*=3.00, *SD*=.80) responded with 63.5% having the same amount of lawn as their neighborhood norm, 19.3% with less lawn than the neighborhood norm, and 17.3% with more lawn than their neighborhood norm.

Neighborhood Landscape Variety. Respondents were nearly evenly split on whether their neighborhoods had a variety of landscape styles with *M*=3.97 (SD=1.80) on a 7-point Likert scale. Naturally, the HOA residents with their regulated landscapes tended to somewhat disagree (*M*=3.31, *SD*=1.56). A small negative correlation, $r = -.25$, $p < .001$, showed the more influence HOA regulations had, the less diversity of landscapes respondents perceived. The conservancy group (*M*=4.56, *SD*=1.79) and garden group (*M*=4.13, *SD=1.85*) were slightly more likely to agree that their

neighborhoods had a diversity of landscapes. Though the means hover around neutral, the standard deviations demonstrate neighborhood norms and levels of landscape uniformity vary. A small correlation, $r = .27$, $p < .001$, was found between neighborhood landscape variety and age of homes suggesting older neighborhoods have more variety of norms. This finding was supported with an independent-samples *t*-test measuring the difference in landscape diversity in neighborhoods built before 2000 (M=4.86, SD=1.64) and after 2000 (M=3.61, SD=1.73). The result was significant, $t(270) = 5.430$, $p<.001$, with a medium effect size ($\eta^2 = .09$).

Neighborhood acceptance of desert landscaping. A large majority (83%) of respondents agreed on some level that desert landscaping was acceptable in their neighborhood with M=5.69 (SD= 1.615). The HOA had the lowest mean level of agreeance (M=5.39, SD=1.74) likely due to the degree of uniformity in its landscaping. The conservancy group most enthusiastically agreed (M=6.11, SD=1.32) that desert landscaping was appropriate for their neighborhoods while the garden group had a mean of M= 5.44 (SD= 1.74). An independent-samples *t*-test measuring the difference between the conservancy and garden samples for acceptance of desert landscaping in their neighborhood was significant, $t(79) = 2.443$, p=.02, with a medium effect size (η^2 = .07). Despite the differences, this confirms our assumption that Washington County residents are open to a variety of landscape norms, though it does not yet answer the extent to which norms are influencing behavior.

Normative Influence

Several questions were analyzed to determine whether social norms were influencing actual landscape behavior. When asked whether respondents felt pressure from their neighbors to conserve water on landscaping they somewhat disagreed with M=3.01 (SD=1.37). Only 9% agreed on any level they felt pressure from their neighbors. Though some variation exists between samples, they are of little practical significance. A medium correlation, $r = .42$, $p < .001$, was found between the perceived pressure from neighbors to conserve and the perceived water conservation concern of neighbors. These results suggest residents generally do not feel strong social pressure to conserve water unless they believe their neighbors are concerned about conservation.

Respondents felt slightly more pressure from government entities to conserve water with M=3.84 (SD=1.76). The perceived increased pressure from government entities, albeit small, is likely attributable to the fact these entities are engaged in conservation marketing. Thirty-nine percent responded they feel at least some pressure from government to conserve water on landscaping, though only 4% strongly agreed. The conservancy group tended to disagree more that they felt pressure from the government than the other samples with 44% indicating they either “disagreed” or “strongly disagreed”. An independent-samples t-test measuring the difference between the conservancy (M=3.38, SD=1.97) and garden samples (M=4.08, SD=1.60) regarding perceived government pressure to conserve water was significant, $t(154) = -2.60$, p=.01, though the effect size was small ($\eta^2 = .04$). This finding suggests the participants were at

least aware of public water conservation messaging, though it is perceived to be low-pressure.

Unless a person lived in an HOA where landscaping is regulated, participants did not view neighborhood norms as having a significant influence on their landscaping decisions. Several questions illustrate this. The first question asked whether they feel pressure to conform to their neighborhood landscaping style and resulted with a mean between "somewhat disagree" and "neutral" (M=3.64, SD=1.92). The HOA (M=4.31, SD=1.83) agreed slightly more than neutral while the conservancy (M=3.23, SD=1.89) and garden groups (M=3.10, SD=1.76) somewhat disagreed. From the garden sample, a medium negative correlation, r = -.*34*, p = .02, was found between pressure to conform to neighborhood landscape styles and a neighborhood having a variety of styles present. This reflects the results of Nassauer et al., (2009) who found when multiple landscape norms are present, people feel less constrained to conform to a specific landscape style.

The second question asked them to rate how much influence trying to fit in with the neighborhood norm had on their landscaping decisions and resulted with M=3.97 (SD=1.72) or mostly neutral. Again, HOA residents (M=4.50, SD=1.44) tend to skew the mean further to the "agree" side. The conservancy (M=3.72, SD=1.77) and garden groups (M=3.39, SD=1.85) were less concerned about fitting into their neighborhoods. Concern about fitting in had a medium correlation, r = .39, p < .001, with age. That is, younger respondents were less concerned with fitting their neighborhood's landscape norm. Wanting to fit in also correlated, r = .33, p < .001, with how concerned respondents perceived their neighbors to be regarding landscape water conservation.

When asked whether they would reduce their lawn area if several of their neighbors did, most disagreed or were neutral with *M*=3.86 (*SD*=1.74). Garden participants (*M*=3.48, *SD*=1.46) indicated they would be least swayed with 80.7% either disagreeing or neutral. However, from the garden sample a medium correlation, $r = .44$, $p = .001$, was found between reducing lawn if neighbors did and wanting a landscape that fits in with the neighborhood. The vast majority approved of their neighbors having desert landscaping regardless of their own (*M*=6.08, *SD*=1.20). While some participants acknowledged the influence of social norms for their landscape decisions, most participants perceived a strong independence over their landscape choices.

Choosing Between Norms

In the case where multiple norms are present in a neighborhood, we wanted to understand whether a dominant cultural norm exists that might influence people to give preference to a particular landscape. To measure this we asked the following hypothetical question: *"If you were to build a new home in a neighborhood where half of the homes have turf-dominated landscapes and the other half of the homes have desert landscapes, what type of landscape would you choose for your own home?"* The options were "primarily turf landscaping", "desert landscaping", or "other". They then described the reason for their decision. The descriptions given for the "other" category all described a hybrid combination of the "primarily turf" and "desert" landscaping. As such, the "other" category was placed in the middle of a 3-point Likert scale for analysis. The combined results strongly favored desert landscaping (*M*=2.54, *SD*=.72) with 67% choosing desert landscaping, 14% choosing primarily turf, and 19% choosing a hybrid of

the two. The HOA (*M*=2.64, *SD*=.65) and conservancy samples (*M*=2.74, *SD*=.55) were very comparable with only 9% and 5%, respectively choosing primarily turf. The garden sample (*M*=2.14, *SD*=.85) had nearly 30% choose primarily turf, 43% desert, and 27% with a hybrid. An independent-samples *t*-test measuring the difference between the conservancy and garden samples' choice of landscape was significant, $t(69) = 4.57$, $p<.001$, with a large effect size ($\eta^2 = .23$).

Much of the variation in landscape choice can be attributed to demographics. Within the garden sample, a strong negative correlation, $r = -.50$, $p < .001$, was found between length of time lived in Washington County and landscape preference, further confirming that longer-term residents tend to be less inclined to choose desert landscaping. Once again, the presence of children appears to influence landscape preference. The independent-samples *t*-test found the difference between the landscape chosen by people with children and people without children living at home to be significant, $t(48) = -5.53$, $p<.001$, with a large effect size ($\eta^2 = .39$). A moderate negative correlation, $r = -.42$, $p < .001$, was found between number of children present and landscape preference suggesting the more children living in a home, the less likely they are to choose desert landscaping.

For people who chose primarily turf, the main explanations they gave were they simply preferred the look and feel of lawn and lawn is more kid-friendly. Less frequently given reasons included lawn is more useful, keeps surroundings cooler, and is easier to maintain. People who chose desert landscaping primarily cited the need to conserve water, that desert landscaping is attractive, ease of maintenance, and simply because "we

live in a desert". Some lesser stated reasons included desert landscaping is environmentally responsible, they prefer native vegetation, and want to avoid the Lake Powell Pipeline. All of those people in the "other" category described that they would prefer a mix of lawn and desert landscaping. They wanted some lawn area for recreation and relaxation, its cooling benefits, and for contrast as a design element. Several indicated they would only put lawn in the backyard where they would use it. Many of the descriptions in the "other" category actually align with the definition of desert landscaping as given at the beginning of the questionnaire. Though we kept them separate for the analysis, practical application of the "other" category would boost the numbers of individuals choosing desert landscaping.

CHAPTER V

DISCUSSION

Conservation Concern

Washington County residents expressed moderate levels of concern regarding the need for landscape water conservation. As expected, the conservancy group expressed higher concern than the more representative garden sample. Within the garden sample there was no difference between responses of Washington County residents and Northern Utah residents. This was somewhat surprising since Washington County is much hotter and drier. However, although the climates are significantly different, both areas are grappling with the challenges of providing water to burgeoning populations. As such, landscape water conservation messaging has been common in both regions for over a decade. The moderate levels of concern may be indicative that conservation messaging has at least created an awareness of the potential for water shortages.

The fact most respondents rate their neighbor's concern lower than their own suggests discussions about water challenges do not commonly occur between neighbors, and are therefore not a pressing issue. Peter Gleick, co-founder of a water think-tank, cited a line from John Steinbeck's *East of Eden* to describe how people tend to respond to drought (Lohan, 2016). Steinbeck (1952) wrote, "And it never failed that during the dry years the people forgot about the rich years, and during the wet years they lost all memory of the dry years. It was always that way" (p. 6). Evidence of this is shown in several studies that have found without an imminent environmental threat, few people will proactively make substantial behavioral changes (Barr & Gilg, 2007; Spinti et al.,

2004). As Gobster et al. (2007) described, "…it is difficult for people to understand, care about, and act purposefully upon phenomena that occur at scales beyond our own direct experience" (p. 960). While the abstract threat of drought may be in the back of people's minds, it alone may not be responsible for driving normative change.

Though below average precipitation has occurred in recent years, so far it has not led to significant water restrictions for most Washington County residents. One exception is residents of the small Washington County town of Toquerville who have faced significant restrictions to their secondary irrigation allowances (Whitney, 2015). However, none of the survey responses came from Toquerville residents for comparison. Improving conservation behaviors when no imminent threat of water shortage exists is difficult. As such, Washington County homeowners have generally not had to make the tough decisions or sacrifices regarding their water use as California residents have during the same period. Along with a mandatory 25% reduction in urban water use and cash incentives to remove lawn, many California residents have replaced their lawns with drought-tolerant landscaping (Hargreaves, 2015). With the strict water restrictions now lifted, Gleick suspects many behaviors will revert to being less water conserving. However, due to the significant time and money involved in landscape renovations, the water conserving benefits of the new landscapes will likely be retained (Lohan, 2016). While it may take imminent threats to achieve rapid change, there is certainly prudence in preparing communities to be resilient in the face of shortages rather than reactionary.

Evolving Norms

Although water availability tends to be taken for granted, our results indicate changes in perceptions and approaches toward landscaping are evolving in Washington County. A majority of respondents agreed that desert landscaping had become more common over time. Conservancy respondents were somewhat less likely to agree which suggests they have been dissatisfied with the degree to which desert landscaping has been embraced. This may indicate that the use of desert landscaping has been increasing gradually rather than through a rapid shift in behavior.

Social norms are most effective at influencing behavior when injunctive norms and descriptive norms are aligned (Gockeritz, et al., 2009). Injunctive norms are behaviors that people approve of. Descriptive norms are the behaviors people perceive to be the most common. Though desert landscaping may not yet be the dominant norm in Washington County, it received a high injunctive norm or strong approval as an appropriate alternative to traditional landscaping. Most individuals agreed desert landscaping was appropriate in their neighborhoods and expressed support for neighbors who chose desert landscaping. This finding creates a good opportunity to reinforce the high injunctive norm through conservation messaging. Because homeowners typically want their landscaping to be socially acceptable (Blaine, et al., 2012), statements such as, "A majority of Washington County residents approve of the use of desert landscaping in their neighborhoods," may strengthen the resolve of individuals wanting to adopt an alternative norm. Though our findings regarding neighborhood norms for lawn use were inconclusive, the fact that most respondents acknowledged feeling very little pressure to

conform to neighborhood norms suggests enough variation exists to allow homeowners ample freedom to choose their preferred landscape type. Because a variety of norms appear to be present and acceptable, current descriptive norms do not have as much influence (Garcia, et al., 2014; Gockeritz, et al., 2009; Nassauer, et al., 2009). Therefore, improving the descriptive norm in favor of desert landscaping as the new standard will be necessary to increase landscape behavioral change.

The results from the survey question regarding which landscape type people would choose if they were to build a new home in a mixed-landscape neighborhood may be evidence that desert landscaping is increasingly becoming the descriptive norm for new construction. The majority of all three survey populations indicated they would choose desert landscaping or primarily desert landscaping with some functional use of lawn. Combining the previous injunctive message with this descriptive norm could be helpful to establish or strengthen desert landscaping as the new norm. Messaging may read, "A majority of Washington County residents approve of desert landscaping in their neighborhoods and would choose desert landscaping if they were to build a new home." While the results of this hypothetical scenario demonstrate a growing acceptance and preference for desert landscaping, they do not account for all of the actual barriers to changing existing behaviors.

Demographic Factors

Most of the variation in responses correlates with demographic factors—most notably the age of respondents and the presence of children in the home. Higher age correlated with more concern regarding the need for water conservation as well as

improved perceptions of desert landscaping. Additionally, the vast majority of participants from the conservancy group were near retirement age or older. Though this study did not seek to answer why older individuals were more concerned and engaged in water conservation issues, several explanations are possible. Some studies have found decreased levels of civic involvement or engagement in environmental issues among younger generations (Twenge, Campbell, & Freeman, 2012). However, others dispute these findings arguing different generations simply define civic engagement differently, thus making comparisons less straightforward. In fact, some people even suggest civic engagement among millennials is higher than previous generations (Spengler, 2014).

Another explanation may lie in the amount of financial freedom and leisure time different generations have to devote to civic engagement. Whereas younger civic minded individuals may be involved with PTA's and coaching children's soccer, individuals approaching retirement often seek to engage in complex environmental and social welfare issues (Howe, 2012). This may be particularly applicable in a place like Washington County with its large retiree population. As a result, conservation messaging developed specifically for older demographics may have the potential to yield higher behavioral change results.

Conservation messaging for younger generations must compete with other pressing life concerns. When water shortages are not causing immediate problems, conservation likely takes a back seat to issues such as careers, finances, leisure time, and raising children. Schultz and Zelezny (2003) argue that environmental messages will be more successful if they are geared toward self-enhancing values rather than self-sacrifice

or altruism. In other words, landscape water conservation methods must demonstrate alternatives to high-water use landscapes can meet or exceed the expectations and needs of homeowners.

Yabiku et al. (2008) found even though women were more concerned about environmental issues they were also more averse to xeric landscapes regardless of the presence of children. By contrast, we did not find any significant differences in responses based on gender, though the number of children in a home did correlate with less conservation concern and preference for more lawn. Martin et al. (2003) had similar findings in Phoenix where a majority of families with children preferred lawn in backyards while the most common preference for individuals without children was a desert landscape. In an effort to provide safe space for children to run and play, lawn appears to be the de facto norm without considering other child-friendly alternatives. As Joan Nassauer (1995) stated, “Typically, people believe that a yard, a park, a field, a forest, or a city should look a certain way without questioning the necessity of that appearance" (p. 233).

Water managers and landscape designers should be encouraged to develop and promote models of child-friendly alternatives to traditional lawn. In fact, many proponents of natural play suggest people tend to overestimate the value modern children find in lawn. When competing with electronic entertainment, lawn can be sterile and boring whereas naturalized and unstructured spaces can have the ability to stimulate creative play and foster connections with nature (Louv, 2008; Penick, 2013). In Washington County, families with children are a major demographic who tend to be less

engaged in water conservation. Providing resources and examples of child-friendly spaces with less lawn is an important first step to demonstrate alternatives such as naturalized or unstructured play areas not only exist, but may better serve the needs of today's children.

The motives and barriers to adopting water-conserving landscape behaviors vary between populations. Thus, understanding the diversity of needs between demographics will allow conservation messaging to be better tailored to each audience (Bator & Cialdini, 2000; Larson, et al., 2011). The two demographics discussed here are broad cross-sections of Washington County residents. Additional surveys and focus groups can help to narrow down specific subsections within these populations to better understand their needs and identify strategies to help them achieve improved water efficiency.

Accelerating Normative Change

Although norms appear to be evolving toward less water-intensive landscaping, it is a slow and gradual process. Thus far, this shift has largely been voluntary. Rather than waiting for severe drought to compel widespread changes, accelerating the adoption of new norms can be aided by increased institutional support.

Municipalities, schools, universities, and other public institutions can lead the way in water-conserving landscaping. A shift in public landscapes is vital for several reasons. First, modeling appropriate landscaping will help protect them against criticism. The American Water Association (2010) stated, "While critics of water conservation measures have difficulty gaining traction for their positions-- after all, who wants to promote water waste-- they will frequently attempt to paint the sponsoring utility as

hypocritical based on its own water use practices.... By recognizing poor water use habits, the utility both establishes itself as a leader and inoculates itself against criticism" (p. 7). New public landscapes in Washington County tend to follow this philosophy to varying degrees. Some older traditional landscapes have even been renovated in recent years, including the Saint George city offices, to reflect the conservation message. As cities upgrade older, thirstier landscaping, documenting and publicizing the process through press releases and social media will demonstrate their commitment to conservation.

A second benefit of public entities modeling appropriate landscaping is the normalizing effect on residents who frequently see and use them. As previously noted, desert landscaping is perceived to be an appropriate alternative landscape but is not necessarily the dominant landscape norm. Though little research has been done on the influence of municipal landscapes on residential norms, it is reasonable to assume that increasing the visibility of desert appropriate landscaping in public spaces can help to bolster the dominance of a new norm. In addition, using regionally appropriate landscaping can add to a city's *genius loci*, or sense of place. Achieving a distinctive sense of place conveys the values of a community and will help to establish norms. As a study by Neel et al. (2014) suggests, changing the symbolic meaning of different landscape types could substantially impact homeowner's self-presentation and influence their willingness to adopt water-conserving landscapes.

Along with city parks, schools, and buildings, public botanical gardens can play a significant role by demonstrating and educating about appropriate landscaping that meets both the functional and aesthetic needs of residents. Though conservation messaging and

landscape workshops have certainly gained support from segments of Washington County residents, the prominent locations of demonstration gardens such as the Red Hills Desert Garden and The Garden at Tonaquint Park are great opportunities to reach additional populations as shown by the increased demographic diversity of the survey respondents. Evidence increasingly shows that promoting positive behavior alternatives is more effective than preventing undesirable behaviors (Schultz, 2011). Demonstration gardens should be at the forefront of best practices for water conservation and continually evolve to highlight new technologies, plants, and appropriate design trends (Miller et al., 2004).

While Municipalities can endorse and promote desirable landscape norms, other barriers prevent many people from making desired changes. These barriers typically include cost, experience, time, or HOA regulations, to name a few. A survey of Washington County residents by Julie Gillins (2015) identified self-efficacy, or the perceived ability to make specific changes, as the biggest contributor to an individual's behavioral intent. Conservation messaging and municipal policies must identify barriers to the adoption of water-conserving landscapes and develop programs to overcome such barriers (Hurd et al., 2006; McKenzie-Mohr, 2000b).

Though top-down regulations and ordinances are usually politically unpopular, they can be helpful for overcoming or preventing barriers to conservation. Because cost, time, and expertise are typically major barriers, even though many homeowners are dissatisfied with their landscaping they are unable to make improvements. Many entities in the western United States, including the WCWCD, offer various incentives and rebates

to offset some of the costs of landscape renovations. Though these incentives are helpful, they are of little practical benefit if ordinances do not require high landscape standards for new home construction. In other words, it is more effective to make sure landscaping meets high-functioning standards the first time rather than trying to make costly changes after the fact. Martin et al., (2003) described how the increased prevalence of planned communities in the Phoenix area increasingly places landscape decisions in the hands of developers rather than homeowners. Similar patterns are found in Washington County. Even though these planned developments often have water-conserving landscapes installed, they typically have fewer trees and provide fewer functional benefits to the homeowner (Martin et al., 2003). A non-functional landscape is a waste of land and resources and contributes to negative images of water-conserving landscapes. It is the responsibility of governments and builders to develop policies that will make high-functioning and attractive water-conserving landscapes the norm in new development (Dzidic & Green, 2012). Municipalities in Washington County have nominal residential landscape ordinances and would benefit from updated standards that reflect their commitments to water conservation as well as ensuring functional benefits to the homeowner and community.

As opposed to traditional neighborhoods where norms tend to establish naturally over time, the responses from the HOA survey group highlight the significant role HOAs play in regulating landscape norms within neighborhoods. While people often prefer the cohesiveness and uniformity such landscape standards create in their communities, HOAs can also create barriers that prevent homeowners from making water-conserving changes

to their landscaping. Minimum amounts of lawn in front yards are frequently required by HOAs for aesthetic purposes while homeowners who perceive no functional value from their front lawns are unable to make changes. In 2003, section 373.185 of the Florida Statutes on Local Xeriscape Ordinances removed the ability of HOAs to prohibit "Florida-friendly Landscaping" or xeriscaping in their neighborhoods. Comparable statutes now exist in Colorado and Texas. Washington County municipalities should consider similar statutes that would continue to allow HOAs to regulate neighborhood design standards but prohibit minimum lawn requirements. HOA boards can consult with landscape architects and residents to establish landscape standards that provide flexibility for homeowners who choose landscapes with no lawn.

A large portion of the HOAs in Washington County cater to retirees and second-home owners from other areas. As Garcia, Llausas and Ribas (2014) described, residents new to an area and second-home owners are often attracted to features of the natural environment and prefer their landscaping to reflect that environment. There is evidence from our survey results that similar attitudes exist among retirees and newer arrivals to Washington County. Some of the most successful housing developments have trended towards landscape motifs that embrace the desert aesthetic. On the other hand, many older HOAs, resorts and retirement communities have done little to update their outdated and inefficient turf-centric landscapes. Municipalities and water providers can seek out these communities to provide consultations and resources to help them update their landscapes to be more efficient.

Limitations and Further Research

Though our surveys captured responses from a variety of populations, the samples were not representative of all Washington County residents. Most participants came from the communities of Ivins, Santa Clara, St. George, and Washington City whereas Hurricane and other communities on the east side of Washington County had few if any participants. Though we did not ask any questions regarding ethnicity, few minorities agreed to participate when approached in the garden. As such, the views of minorities are likely also underrepresented. Because culture and norms can vary significantly between communities, the perspectives of these underrepresented communities should be sought to ensure conservation messages and strategies respond to their needs. Identifying and surveying neighborhoods of varying socioeconomic backgrounds would help to achieve more representative results.

Because the survey did not include visual examples of traditional and desert landscaping, it is difficult to determine how consistently respondents interpreted those landscape typologies. A series of images may be helpful both for clarifying the features of each typology and to measure preference ratings. This may yield more precise information regarding norms and trends. Interviews and focus groups would be useful for identifying some of the finer nuances regarding residents' landscape preferences and practices.

The influence of institutional landscape practices on norms and preferences are not well documented. For example, the Church of Jesus Christ of Latter-day Saints is a large influential institution in Utah and may have the potential to influence landscape

norms based on its landscaping practices at church buildings. Similarly, municipal landscaping in parks, town squares, or other prominent gathering places may contribute to the local identity and sense of place. Studies on the impacts that municipal, church, and commercial landscaping has on residents would be helpful to identify opportunities for targeted conservation outreach.

Conclusions

Social norms have been shown to play a large role in adoption of conservation behaviors. Influencing norms toward improved behaviors is complex, but can be highly effective for achieving lasting results. Though there may not be an urgency to adopt water-conserving landscapes, there is a growing awareness and recognition of the need to conserve water in Washington County, Utah. Because a strong injunctive norm exists for the use of desert landscaping, there is an opportunity to create conservation messaging to emphasize the approval of alternatives to past norms of traditional lawn-dominated landscaping. Actual landscape behaviors, or descriptive norms, are less uniform and will need to be strengthened in favor of low-water landscaping. Self-enhancing messages rather than self-sacrifice should be emphasized to gain broader support. In particular, households with children need to be shown alternatives to predominantly lawn landscapes exist and can even enhance the function and quality of outdoor spaces for children.

Normative messaging alone will take a long time to create lasting behavior changes without structural changes by municipalities. Municipalities can select for a more dominant norm by updating landscape ordinances to ensure new construction meets

conservation objectives. By bringing the descriptive norms in line with the existing injunctive norms, landscape water conservation can become a way of life rather than reactionary.

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APPENDICES

Appendix

Survey Questionnaire

Survey for Garden Visitors

Professor David Anderson in the Department of Landscape Architecture and Environmental Planning (LAEP) at Utah State University (USU) is conducting research to better understand opinions regarding landscape water conservation and factors that influence landscaping decisions. This information is beneficial for water providers to plan for future water needs. Ryan White, a USU master's student in LAEP is assisting with the research.

Please help us by completing this survey. You have been asked to take part because you have visited the Red Hills Desert Garden or you have provided your email address to the Washington County Water Conservancy District's distribution list. There will be approximately 400 participants from visitors to Red Hills Desert Garden and an additional 400 online survey participants for approximately 800 total participants in this research. The survey will take around 5-8 minutes to complete.

Your responses and comments will be confidential. There is minimal risk of loss of confidentiality since no personal information will be connected to your responses. Participation in this survey is voluntary and you may refuse to participate or withdraw at any time without consequence. There are no direct benefits and no compensation for participating in this study.

For participating, you will be entered into a drawing for one of five $20 Amazon gift cards. If you are chosen to receive a gift card, the Internal Revenue Service (IRS) has determined that if the amount you get from this study, plus any prior amounts you have received from participating in research studies at USU since January of this year, total $600 or more, USU must report this income to the federal government. If you are a USU employee, any payment you receive from this study will be included in your regular payroll.

The Institutional Review Board for the protection of human research participants at Utah State University has approved this survey. If you have any questions or concerns, you may contact the IRB Administrator at (435) 797-0567 or email irb@usu.edu.

We appreciate your time and want to thank you in advance for your participation. Investigator Statement: "I certify that the research study has been explained to the individual, by me or my research staff, and that the individual understands the nature and purpose, the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered."

David Anderson Principal Investigator (435) 797-1984 david.anderson@usu.edu

Ryan White Student Researcher (435) 414-1188 ryanwhite@wcwcd.utah.gov

Consent By marking "agree," you consent to participate in the following survey and acknowledge that you are 18 years of age or older.

- ❍ Agree
- ❍ Disagree

If Disagree Is Selected, Then Skip To End of Survey

Definition For the purpose of this survey, "desert landscaping" includes the following characteristics:

- Turf lawns (if present) are limited to areas where they will be used for recreation or entertaining
- Plants are drought tolerant and irrigated by drip irrigation or bubblers
- Decorative gravel or wood mulch is used to cover the ground around plants

5 Do you live in Washington County, Utah?

- ❍ Yes
- ❍ No

Answer If Do you live in Washington County, Utah? No Is Selected

6a Please enter the zip code for where you live.

Answer If Do you live in Washington County, Utah? Yes Is Selected

6b Please enter the zip code for where you live.

7 How strongly do you disagree or agree that most of your NEIGHBORS are concerned about conserving water on landscaping?

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Somewhat Disagree
- ❍ Neither Agree nor Disagree
- ❍ Somewhat Agree
- ❍ Agree
- ❍ Strongly Agree

8 How concerned are YOU about conserving water on landscaping?

- ❍ Very Unconcerned
- ❍ Unconcerned
- ❍ Somewhat Unconcerned
- ❍ Neutral
- ❍ Somewhat Concerned
- ❍ Concerned
- ❍ Very Concerned

Answer If Do you live in Washington County, Utah? Yes Is Selected

9 Approximately how long have you lived in Washington County?

- ❍ Less than one year
- ❍ 1-2 years
- ❍ 3-5 years
- ❍ 6-10 years
- ❍ 11-20 years
- ❍ More than 20 years

Answer If How long have you lived in Washington County? 3-5 years Is Selected Or How long have you lived in Washington County? 6-10 years Is Selected Or How long have you lived in Washington County? 11-20 years Is Selected Or How long have you lived in Washington County? More than 20 years Is Selected

10 How strongly do you disagree or agree that landscaping trends have become more inclusive of desert landscaping during your time living in Washington County?

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Somewhat Disagree
- ❍ Neither Agree nor Disagree
- ❍ Somewhat Agree
- ❍ Agree
- ❍ Strongly Agree

11 How strongly do you disagree or agree that your personal landscape preferences have changed over time to become more inclusive of desert landscaping?

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Somewhat Disagree
- ❍ Neither Agree nor Disagree
- ❍ Somewhat Agree
- ❍ Agree
- ❍ Strongly Agree

12 How strongly do you disagree or agree that you feel pressure from your NEIGHBORS to use less water on your landscape?

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Somewhat Disagree
- ❍ Neither Agree nor Disagree
- ❍ Somewhat Agree
- ❍ Agree
- ❍ Strongly Agree

13 How strongly do you disagree or agree that you feel pressure from GOVERNMENT ENTITIES to use less water on your landscape?

- ❍ Strongly Disagree
- ❍ Disagree
- ❍ Somewhat Disagree
- ❍ Neither Agree nor Disagree
- ❍ Somewhat Agree
- ❍ Agree
- ❍ Strongly Agree

14 What situation best describes your current residential living situation?

- ❍ I live in a single family residence that I own
- ❍ I live in a condo or townhome residence that I own
- ❍ I rent or live with other people in a single family residence
- ❍ I rent or live with other people in a condo or a townhome
- ❍ I live in an apartment

Answer If What situation best describes your current residential living situation? I rent or live with other people in a single family residence Is Selected Or What situation best describes your current residential living situation? I rent or live with other people in a condo or a townhome Is Selected Or What situation best describes your current residential living situation? I live in an apartment Is Selected

15 Do you have authority to make landscape decisions at your residence?

- ❍ Yes
- ❍ No

If No Is Selected, Then Skip To End of Block

Answer If What situation best describes your current residential living situation? I live in a condo or townhome residence that I own Is Selected

16 Do you have a private landscaped area at your condo or townhome?

- ❍ Yes
- ❍ No

Answer If What situation best describes your current residential living situation? I live in a single family residence that I own Is Selected Or Do you have a private landscaped area at your condo or townhome? Yes Is Selected

17 What proportion of your private landscape is covered by turf lawn?

- ❍ All or almost all of it
- ❍ More than half
- ❍ About half
- ❍ Less than half
- ❍ None

18 Compared to your own home, how much lawn do most homes in your neighborhood typically have?

- ❍ A lot less lawn
- ❍ Somewhat less lawn
- ❍ About the same
- ❍ Somewhat more lawn
- ❍ Much more lawn

Q42 What decade would you estimate the majority of the homes in your neighborhood were built?

- ❍ 2010-present
- ❍ 2000-2009
- ❍ 1990-1999
- ❍ 1980-1989
- ❍ 1970-1979
- ❍ 1960-1969
- ❍ 1950-1959
- ❍ Before 1950

Q43 Please rate your level of agreement with the following statements.

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I would likely reduce my lawn area if several of my neighbors did	❍	❍	❍	❍	❍	❍	❍
I approve of my neighbors having desert landscaping, regardless of my own landscape	❍	❍	❍	❍	❍	❍	❍
My neighborhood has a wide variety of landscaping styles	❍	❍	❍	❍	❍	❍	❍
I feel pressure to conform to my neighborhood landscaping style	❍	❍	❍	❍	❍	❍	❍
Desert landscaping is acceptable in my neighborhood	❍	❍	❍	❍	❍	❍	❍

Q44 If you were to build a new home in a neighborhood where half of the homes have turf-dominated landscapes and the other half of the homes have desert landscapes, what type of landscape would you choose for your own home?

- ❍ Primarily turf landscape (please explain your choice) _____
- ❍ Desert landscape (please explain your choice) _____
- ❍ Other (please explain your choice) _____

Q19 Please rate how important the following factors are for you when making your landscape decisions.

	Not at all Important	Very Unimportant	Somewhat Unimportant	Neither Important nor Unimportant	Somewhat Important	Very Important	Extremely Important
A strong preference for a particular landscape style	❍	❍	❍	❍	❍	❍	❍
HOA landscaping requirements	❍	❍	❍	❍	❍	❍	❍
Wanting to fit in with my neighborhood	❍	❍	❍	❍	❍	❍	❍
Space for recreation or entertaining	❍	❍	❍	❍	❍	❍	❍
Low cost	❍	❍	❍	❍	❍	❍	❍
Ease of maintenance	❍	❍	❍	❍	❍	❍	❍
Minimizing water use	❍	❍	❍	❍	❍	❍	❍
A landscape appropriate for my climate	❍	❍	❍	❍	❍	❍	❍

Q22 What is your gender?

- ❍ Female
- ❍ Male

Q23 How old are you?

- ❍ Under 13
- ❍ 13-17
- ❍ 18-25
- ❍ 26-34
- ❍ 35-54
- ❍ 55-64
- ❍ 65 or over

Q25 How many children (under the age of 18) are currently living in your house?

- ❍ 0
- ❍ 1
- ❍ 2
- ❍ 3
- ❍ 4
- ❍ 5 +