

WATER SECURITY, LANDSCAPING, AND SPRINGS HEALTH: RESIDENTIAL
PERCEPTIONS IN ALACHUA COUNTY, FLORIDA

By
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To everyone who cares about water and is willing to read something like this

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Abstract of Thesis Presented to the Graduate School
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Requirements for the Degree of Master of Science

WATER SECURITY, LANDSCAPING, AND SPRINGS HEALTH: RESIDENTIAL
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By

Emily Sara Ott

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The perceptions of residents are a vital part of socio-ecological systems and water security solutions. Qualitative data was collected from 5 focus groups to better understand residential perceptions of water security, the connection between landscaping practices and springs health, and responsibility for water security within the Santa Fe River Springshed. Most participants were recruited from high water use neighborhoods with manicured turfgrass landscapes. Analysis of participants' responses was guided by the grand-level theory, hermeneutics, especially concepts of pre-understanding and horizon. The Value Belief Norm model was a mid-level theory that helped structure findings.

Participants were concerned about water scarcity and future water security. They thought that other citizens would perhaps be motivated to conserve water by personal impacts and costs of water problems. In contrast, participants did not perceive their own water use to be a cause of water scarcity and pointed instead to other users such as water bottling plants, agriculture, and industry. They were also skeptical about political

decision-making about water permitting and development. Participants reported their own water use behaviors were constrained by neighborhood landscaping norms and saw this as a barrier to change. They felt varying degrees of pressure to conform to neighborhood landscaping norms and they discussed their behaviors they perceived to conserve water. The implications for water practices and the need for future research have been discussed.

CHAPTER 1 INTRODUCTION

The Big Picture: Global Water Conservation as Ethical Imperative

Satellite imagery taken from far away in our solar system reveals the earth to be a tiny blue dot (Sagan, 1994). Despite the abundance of water on earth that colors us blue from across the solar system, freshwater scarcity has been a problem of increasing magnitude. Water covers approximately 70% of our planet's surface, but most of the earth's water is salty (Perlman, 2012). Less than three percent of the water on the planet is fresh, and what's more, only a fraction of that is available to water-dependent ecosystems and animals (including humans) (McKee, 2011). Globally, water demand has been increasing, while the amount of water has remained the same (Srinivasan, Lambin, Gorelick, Thompson, & Rozelle, 2012; Water Resources Group, 2012). In some places the demand-supply gap has resulted in unsustainable withdrawal rates from surface and groundwater (Srinivasan et al., 2012; Water Resources Group, 2012).

Factors affecting water scarcity have included population growth, human-driven land use changes, and variable environmental cycles (Barnett, 2007; Current population, 2012; Delfino & Heaney, 2004; Falkenmark et al., 2007; Marella, 2009; McKee, 2011; Purdum, et al. 2002; United Nations Department, 2005; Water Resources Group, 2012). Water scarcity has impacted an increasing number of people around the world, causing economic loss, disease, and death (United Nations International Strategy for Disaster Reduction [UNISDR], 2007; Water Resource 2012). Approximately 3.575 million people die each year from water-borne diseases (Water crisis facts, 2009). Considering the tremendous number of people suffering without adequate, safe water resources at present, and the rapid growth of the human population (more than seven

billion and counting), securing safe water for current and future generations around the world is ethical and imperative.

Global Water Use

The population of people who do not have access to safe water for drinking, cooking, and cleaning currently verges on 894 million, almost three times the population of the United States (Water Resources Group, 2012). Global statistics on water availability, usage, quality, and amounts that can be withdrawn without environmental harm are limited (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2009). Despite this uncertainty, there has been widespread agreement that 70% of the freshwater available on earth is being used for agriculture (McKee, 2011; Pearce, 2006; UNESCO, 2009).

Agricultural efficiency has represented an important leverage point or place to intervene in the socio-ecological system to save water (Meadows, 2008). For example, traditional flood irrigation techniques are estimated have contributed to the waste of 60% of water with only 40% of water reaching crops (Pearce, 2006). Though domestic use accounts for only 10% of the world's freshwater consumption, in the U.S. it is more significant; using less water in our homes, especially in wealthy nations like the United States of America (US) is important (UNESCO, 2009). As environmental facilitator and consultant Alan AtKisson (2011) wrote, "we *must* do sustainable development as if our lives depended on it- because increasingly, many people's lives do" (p. 16).

Water Use in the U.S.

Americans use more water per person than those in most other countries (Hart, 2008; Yin, 2006). This has also been an apparent 'water divide' in the country (Barnett, 2007). As far back as the 1870's, the western reaches of the US appear to have been

more arid than the east (Barnett, 2007). During that decade, then head of the U.S. Geological Survey and explorer Major John Wesley Powell reported to Congress that states west of the 100th meridian would need water sharing and systems to do so equitably (Barnett, 2007). To the east of that line, however, he predicted people could settle and survive anywhere due to the substantially higher average rainfall that would (among other things) water crops (Barnett, 2007). Historically, the eastern side of the US water divide has been substantially more water secure than the western side (Barnett, 2007).

While the eastern US typically received more rainfall than the west, eastern states have not been immune to water shortages. Ballooning growth has been blamed for water shortages in some eastern cities, especially in times of drought (Barnett, 2007). High water use lifestyles have transcended the vast diversity of ecosystems across this expansive nation and have become the norm (Barnett, 2007). Nowhere in the US has water scarcity been more ironic than in the historically and ostensibly sopping thumb of Florida (Barnett, 2007).

Florida's Water

Florida has more coastline than any other state in the US. With saltwater surrounding the state on three sides, 7,800 freshwater lakes, 1,700 streams and rivers, and 700 springs that make up perhaps the largest concentration of freshwater springs on the planet, freshwater has been apparently abundant (Fernald & Purdum, 1998; Florida Springs Task Force, 2000; Marella, 2009). The "mirage," as Barnett (2007) terms it, of incessantly flowing freshwater resources might factor into Floridians' extraordinarily heavy water usage: according to one source, every Floridian uses

approximately 65 more gallons per day, than the average American (Water Conservation, 2004).

Historical overabundance

Historically, the state's water problem has been the reverse (Barnett, 2007). In 1860 when Florida's population was only 140,423 clustered mostly along Florida's northern border, water covered much of the state (Barnett, 2007). In those early days Florida's settlers viewed water as a hindrance to development and civilization (Grunwald, 2006). The change to historically low groundwater levels of the present was relatively swift; only a hundred years ago inhabitants of the state believed ditching and draining swampland was a moral imperative (Barnett, 2007; Grunwald, 2006).

The successful ditching, draining, filling, and marketing of Florida (in tandem with mosquito control and air conditioning) facilitated the increase of the state's population to 4,951,560 by 1960 (Barnett, 2007; Florida Population, 2000). From 1960 to 1990 the population swelled an impressive 400 percent (Florida Springs Task Force, 2000; Delfino & Heaney, 2004; Marella, 2009). The seemingly ever-burgeoning population of Florida necessitated an ever more extensive matrix of canals and levees to control water resources (Fernald & Purdum, 1998; Purdum et al., 2002). Demand for water resources to support Floridian health and sanitation, economic prosperity and development grew along with the population (Delfino & Heaney, 2004; Florida Springs Task Force, 2000; UNESCO, 2009). Over time water treatment infrastructure was developed to meet increasing demands for safe water for public use.

Public supply

In 2005 (the last year of a comprehensive assessment of water use in Florida reviewed for this thesis), the state was the fourth most populated in the US, supporting

17.92 million thirsty residents (Marella, 2009). Approximately 90 percent of Florida residents were served by public water supply in 2005, gulping down 6,837 million gallons per day (mgd) 37 percent of which was withdrawn from surface water (Borisova & Carriker, 2009; Marella, 2009). Most of the water used by the public is mined from deep within underground aquifers, or porous underground rocks called 'karst' (Borisova & Carriker, 2009; Florida Springs Task Force, 2000; Purdum et al., 2002).

Groundwater

As environmental journalist, consultant, and author, Fred Pierce (2008) pointed out, "pumping out an aquifer will leave it empty forever—unless that aquifer is being refilled" (p. 20). Despite the fact that Florida receives an average of 50 inches of rain per year—substantially higher than the national average of 30 inches annually—Florida's groundwater levels have been historically low (Alachua County Water Conservation Initiative, 2010; Average, 2004). This is because not all rainfall refills aquifers through percolation (Delfino & Heaney, 2004; Florida Springs Task Force, 2000; Purdum et al., 2002). Much of the rain that falls on Florida flows into the sea that surrounds the state, either through evaporation or by flowing as runoff into streams and rivers that feed into the Gulf of Mexico, Straits of Florida, and Atlantic Ocean (McKee, 2011).

Water cycle

While water is constantly moving through what we know as the water cycle not all stops in the cycle are equal (Boudreau et al., 1996). In terms of availability, for instance, water can be trapped in the ocean or otherwise inaccessible to humans and ecosystems (Boudreau et al., 1996). When freshwater falls as rain in to the ocean, it often spends many years evaporating, only to be rained back into the ocean (Boudreau et al., 1996). Additionally, since humans are made mostly of water, as the total biomass

of humans on the earth tripled in the last century, so too did the amount of water that has comprised human bodies (Purdum et al., 2002; Pearce, 2006). Population increases in Florida, therefore, pose another challenge to efforts to sustain sufficient water quantity.

Water quality

Another pressing threat to water security is pollution. Water has been called the universal solvent because it can clean almost anything (Purdum et al., 2002). That same property, however, leaves water susceptible to contamination (Purdum et al., 2002). Heavy metals, oil, sediments, fertilizers, plant debris, bacteria from septic tank seepage, pet waste, and trash have all been observed entering and degrading Florida's waterways (Alachua County Water Conservation Initiative, 2010; Delfino & Heaney, 2004; Florida Springs Task Force, 2000; Karst Productions, 2003). The effects of these contaminants can be intensified when water quantities are lower.

Nutrients like nitrogen and phosphorus (commonly present in fertilizer) have been drivers of plant growth, but when nutrients runoff the landscape they were intended to nourish, they can lead to algae blooms, proliferation of harmful bacteria, low levels of dissolved oxygen vital to the survival of plants and animals (Florida Springs Task Force, 2000). Nutrient excess can result in loss of habitat, fish kills, and even the collapse of entire fisheries (Alachua County, 2010; Delfino & Heaney, 2004; Florida Springs Task Force, 2000). Excess nutrients, therefore, can have disastrous effects on socio-ecological systems.

Springs

Nutrient levels, of nitrates in particular, have been increasing in many springs in Florida including Ginnie, Itchetucknee, Manatee, Poe, Volusia Blue, and Wakulla

(Barnett, 2007; Brown et al., 2008; Champion & Upchurch, 2003; Florida Springs Task Force, 2000; Hallas & Magley, 2008; Katz, 2004). This is because of the combined and potentially compounded effects of lack of rainfall during a drought for much of the past decade, land use changes brought on by intense human population growth, and increasing demand for and extraction of groundwater that the springs rely on to keep flowing (Champion & Upchurch, 2003; Florida Springs Task Force, 2000; Katz, 2004). Many springs' water quality has been compromised by lower rates of water flow and increased concentrations of nutrients (Florida Springs Task Force, 2000).

Algal growth present in many springs has signaled high nutrient concentrations and flows at many springs have trended downward over time indicating lowering groundwater levels (Barnett, 2007; Florida Springs Task Force, 2000; Fultz, 2012; Long, 2011; Suwannee River Water Management District [SRWMD], 2013). The first to dry up completely from groundwater over-pumping was Kissengen Springs in 1950 (Barnett, 2007; Barnett, 2011b; Harrington, Maddox, & Hicks, 2008). More recently, a citizen has reported Bonnet, Convict, Falmouth, Peacock, Royal, and Little Fanning Springs have periodically ceased to flow (Long, 2011). These observations have been buttressed by springs flow monitoring data on these and over a dozen springs listed as "inactive" at the time of this documents' publication (see SRWMD, 2013).

Springs have been called the windows into the aquifer (Purdum et al., 2002; Taylor, n.d). Since those same aquifers provide for most of us, springs are effectively windows into our drinking water (Taylor, n.d.). Increasingly, the view through these windows reveals a precarious future for our water supply (Protecting, n.d.). An increasing number of researchers, leaders, and authors have been asserting the ethical

imperative to balance our water use with the resource capacity of this, our tiny blue planet (see UNESCO, 2009; Hanh, 2010; Lama, 2010; AtKisson, 2011; Barnett, 2011a). We must adapt to be more efficient, do more with less, and realize the miniscule modicum of difference changing individuals' behavior can make in our world. While the amount of water used in the public supply has been less than that used for agriculture in Florida that has not diminished our moral obligation to use less water (Barnett, 2007, 2011a).

Landscape irrigation: an opportunity

One area of opportunity to behave morally and save water in Florida has been the irrigation of residential landscapes (see Haley, Dukes, Miller, 2007). Dukes, Miller, and Haley (2005) reported to the St. Johns River Water Management district that the quantity of water used for irrigating outdoor landscapes in their sample of Central Florida homes was between 46 percent and 75 percent of total household use. With an average of 62% of total household water used for landscape irrigation, there is room for conservation (see Dukes et al., 2005).

Turfgrass has been regarded as a thirsty groundcover, a perception that has contributed to widespread overwatering of lawns (Alachua County Water Conservation Initiative, 2010; Haley, 2011; Trenholm, Unruh, & Cisar, 2001). For years, University research publications on turfgrass irrigation have recommended watering only when the grass demonstrates a need for water, indicated by curling of leaves or impressions of footprints that remain noticeable in the grass (Jones, Lippi & Trenholm, 2006; Trenholm et al., 2001; Zazueta, Brockway, Landrum, McCarty & Haman, 2011). Further, research shows that innovative landscaping practices and irrigation technologies can use less water without harming lawns (Haley, 2011; McCready et al. 2009).

Existing landscaping conservation efforts

In order to reduce turfgrass irrigation, the Extension service and University of Florida researchers have developed programs and strategies to help Florida residents conserve water. One example is the University of Florida Cooperative Extension Service's Florida Yards and Neighborhoods (FYN) program, which created a set of nine Florida-Friendly Landscaping (FFL) principles (see Florida-Friendly Landscaping, 2009). Principles included selecting plants appropriate for the soil, light, and climate of the residence (right plant, right place), grouping plants with similar watering needs to reduce overwatering (water efficiently), and mulching around plants to reduce evaporation (Florida-Friendly Landscaping, 2009).

Principles aimed at reducing a landscape's effect on water quality have included fertilizing appropriately (never before rain, within ten feet of a water body, or on an impermeable surface), protecting the waterfront with shoreline buffer plantings, and reducing storm water runoff by capturing rain water in features on the landscape like rain gardens and permeable walk and driveways (Florida-Friendly Landscaping, 2009). The FFL principles and other education and behavior change campaigns have the potential to help us adapt to the reduction in our groundwater levels. Still, there remains a need for effectively framed and well-targeted communication of strategies to move Floridians to protect our springs and groundwater resources. Understanding how residents think their landscaping behavior impacts Florida's water security can help meet that need.

Statement of the Problem

While springs health has been declining, the withdrawal of water out of aquifers has outpaced the rate at which it can be replenished. Despite record low groundwater

levels Floridians are withdrawing more groundwater than is sustainable and using fresh, potable water to irrigate nonedible landscapes.

Rationale

Florida's higher than average per capita water use and declining groundwater levels makes it a good place to study landscape water conservation. Florida provides us a valuable opportunity to better understand how perceptions may be linked to behavior for water resource conservation. By understanding Florida residents' perceptions of the connection of their landscaping behaviors to springs health and water security we can develop a deeper understanding of benefits and barriers to conservation behaviors. Understanding benefits of and barriers to changing residential water use behaviors can provide insight into ways to possibly leverage conservation behaviors among groups in the socio-ecological context of the Santa Fe River Springshed (see Berkes, Colding, & Folke, 1998).

Purpose

The purpose of this study has been to understand perceptions of landscaping, springs health, and water security among a subset of high water users within the Santa Fe River Springshed, and generate insight on how to motivate water conservation behavior.

Objectives

The objectives of this study have been to increase our understanding by:

- Describing this audience in terms of their perceptions of a) Florida's water security, b) landscapes' connection to the springs, and c) their responsibility for water security (perceived control over adverse consequences to water resources).

- Providing insight (based on historical, socio-ecological, and personal contexts) as to how and why participants have expressed the degree of their connectedness to springs health and responsibility for water security.

Significance of the Research

Started a dialogue. This study is significant for several reasons. First, this work has pulled together a significant amount of social research for pro-environmental behaviors and water conservation. The literature review and references can be a resource for future water conservation researchers and practitioners. Through the data collection process, this research has also helped create a dialogue between water managers and residential end users within the study area. Listening to each other may have helped to build trust, community, and an increasing collaborative effort to conserve water within the region.

Challenged assumptions. The epistemological approach (or method of knowledge generation), hermeneutics, used by the author of this study has potentially important contributions to the discipline of Agricultural Education and Communication. As explained further in chapter three of this thesis, hermeneutics has been known as the theory of interpretation (Crotty, 1998). The author has believed conducting interpretive, qualitative social research within a discipline typically dominated by quantitative methods can be helpful to challenge potentially unrecognized assumptions. Any reader of this thesis may be able to identify assumptions about reality and knowledge they previously and perhaps unknowingly took for granted through exposure to the interpretivist way of thinking used in this study (Gadamer, 1989).

Informed research. The methods explained in chapter three of this thesis may also inform future qualitative research for pro-environmental behavior and water

conservation. Aspects of the methods and some of the findings of this research may be transferable to other areas of social research in the future for resource management.

Informed practice. Finally, this research may be helpful in resource management decision-making. By qualitatively investigating residential perceptions qualitatively this research has generated helpful insights for water managers, Extension Agents, and citizens. Insights included information that can help inform future resource management efforts including community-based social marketing and education campaigns.

Assumptions

The researcher made several assumptions worth noting:

- A foundational assumption of the project was that we can improve educational programming and effectively use limited resources for conservation outreach by better understanding the public's perceptions, beliefs, and values.
- Because of correlation between population growth in Florida and water resource degradation, the researcher assumed residents have an imperative to conserve water in the future. People have had a tremendous impact on the quantity and quality of water resources. Thus, the researcher logically concludes every human has needed to use less water.
- Participants spoke honestly with researchers and did not willfully misdirect them.

Definition of Terms

Select terminology relevant to water research has been defined here:

- **ALGAE.** Tiny plants or plant-like organisms including phytoplankton (free floating in water), periphyton (attached to vegetation), and benthic (algae on the bottom) (Florida Lakewatch, 2000).
- **AQUIFERS.** "Underground rocks that hold water" (Purdum et al., 2002, p. 53). In Florida, there are multiple, overlapping, and complexly interconnected aquifers (Upchurch, Chen, & Cain, 2008).
- **GROUNDWATER.** Water located underground in aquifers that may recharge as surface water percolates downward (Barnett, 2007, 2011a; Purdum et al., 2002).

- **EUTROPHIC.** A description of the level of ‘biological productivity’ in a body of water (Florida Lakewatch, 2000, p. 11). Hypereutrophication, or high biological productivity, can cause algal blooms and fish kills (Florida Lakewatch, 2000).
- **EXTENSION SERVICE.** Also known as ‘Cooperative Extension; a “nation-wide, non-credit educational network” designed to “provide useful, practical, and research-based information to agricultural producers, small business owners, youth, consumers, and others in rural areas and communities of all sizes” (United States Department of Agriculture National Institute of Food and Agriculture, 2012, p. 1).
- **KARST.** A geologic term describing the limestone bedrock of Florida as “a pocked terrain formed over millions of years as water dissolved the limestone to create sinkholes...springs...and mysterious underground rivers and caves (Barnett, 2007, p. 2).
- **NUTRIENTS.** Chemicals required by algae and aquatic plants to grow (Florida Lakewatch, 2000). Entering water bodies from a variety of sources, “nitrogen and phosphorus are the two most influential nutrients in Florida” water (Florida Lakewatch, 2000, p. 19).
- **NITROGEN.** A chemical that stimulates the growth of landscape plants but can also stimulate the growth of algae and aquatic plants upon entering watersheds (Florida Lakewatch, 2000; Harrington et al., 2008).
- **PHOSPHORUS.** Another chemical that stimulates the growth of landscape plants and, upon entering watersheds, also stimulates the growth of algae and aquatic plants (Florida Lakewatch, 2000; Harrington et al., 2008).
- **RUNOFF.** Rainfall that flows into waterbodies and/or the ground through sandy soils and porous, karst limestone rather than flowing into surface water bodies or being absorbed by plants (Florida Department of Environmental Protection, n.d.; McKee, 2011).
- **SOCIAL-ECOLOGICAL SYSTEM.** A term first used by researchers Berkes et al. (1998) “to emphasize the integrated concept of humans in nature” (Folke, Hahn, Olsson, & Norberg, 2005, p. 443).
- **SPRINGS.** Locations at which groundwater “flows naturally to the land surface” (Purdum et al., 2002, p. 57).
- **SPRINGSHEDS.** Areas of groundwater (and land contributing to groundwater recharge) that contribute to the recharge and flow of springs (Upchurch et al., 2008; Santa, 2009).

- **STAKEHOLDERS.** Individuals or groups who are impacted by or can impact parts of a social and natural system affected by management decisions and actions (Reed, 2008).
- **SURFACE WATER.** “Found on the earth’s surface...including lakes, rivers, streams, estuaries, ponds and reservoirs (Florida Lakewatch, 2000, p. 28).
- **SUSTAINABILITY.** Can be generally defined as “the ability of a system to continue working (and evolving) over the long term” (AtKisson, 2011, p. 9).
- **SYSTEM.** Refers to a “collection of elements that are linked together in a web of cause-and-effect relationships” (AtKisson, 2011, p. 8). The whole planet is a system comprised of countless other imbedded and linked systems (AtKisson, 2011).
- **WATERSHED.** The land or surface area that contributes runoff water flows into a water body (Florida Lakewatch, 2000, p. 36; Purdum et al., 2002).
- **WATER SCARCITY.** Has been viewed as a relative concept that has described “the point at which the aggregate impact of all users impinges on the supply or quality of water under prevailing institutional arrangements to the extent that the demand by all sectors, including the environment, cannot be satisfied fully” (United Nations Department, 2005, p. 1). Scarcity may be a “social construct (a product of affluence, expectations and customary behavior) or the consequence of altered supply patterns - stemming from climate change for example,” (United Nations Department, 2005, p. 1).
- **WATER SECURITY:** Referred to a state of adequate supply to satisfy the demands of all sectors of water users including efforts to protect against contamination and disruption (United Nations Department, 2005; Water Security, 2012).
- **WELLS.** Man-made excavations or structures created to access groundwater.

Chapter Summary

Florida is experiencing warning signs of water insecurity (Barnett, 2007; Protecting springs, n.d.). The state has experienced drought conditions for the better part of the last decade, and has been observing record low groundwater levels (Barnett, 2007; Delfino & Heaney, 2004; Marella, 2009). This historically unprecedented situation has already meant the cessation of spring flow at locations throughout the state (Barnett, 2007, 2011b). Many springs have experienced decreased flows and harmful

concentrations of nutrients in the Santa Fe River spring system (Long, 2011). All of these observations have been indicators of present and impending water insecurity (AtKisson, 2011; Meadows, 2008; Protecting springs, n.d.).

Since these effects are so highly correlated with tremendous human population growth and land use change, it is unsustainable to continue behaving in the same ways we have in the past. While agricultural production has been the largest consumer of water in the state, residential use is a close second (McKee, 2011). Most of residential water is used to irrigate nonedible landscapes (McKee, 2011). One seemingly easy place to realize water conservation is landscape irrigation (see Barnett, 2007; Baum, 2005; Haley, 2011; Jones, 2006).

Exploring the impact of historical and contextual factors on residential perceptions and water use behaviors may help inform the development of more relevant and effective behavior change and education campaigns. Conserving water for future generations means that many individuals will need to take steps to behave more sustainably (see Blake, 1999; McKenzie-Mohr, 2000; Stern, 2000; Zelezny & Schultz, 2000). By adapting to current threats to Florida's water supply we can work towards ensuring this tiny blue planet will have enough fresh clean water for future generations to drink and even swim in together (Protecting springs, n.d.).

CHAPTER 2 LITERATURE REVIEW

Introduction

In this chapter, research is presented on environmentalism and general pro-environmental behavior. This body of literature provides a foundation for researching water conservation behaviors and creates an historical and demographic context. Many studies have found that despite the public's awareness of environmental issues, it does not automatically lead to pro-environmental behaviors. Community-Based Social Marketing (CBSM) provides a theory-based framework for overcoming the gap between knowledge or awareness of an issues and actual conservation behaviors. Theories of pro-environmental behavior that have informed CBSM are discussed. Elements of another theory, Stern, Dietz, Abel, Guagnano, & Kalof's (1999) Value-Belief-Norm (VBN) theory are also discussed followed by a review of research on landscape norms. The results of qualitative research on water conservation behaviors are presented, followed by the conceptual model that helped guide data analysis. The chapter concludes with a review of trends in this body of literature as well as gaps in previous research this thesis intends to fill.

Environmental Behavior Research: A Historical Perspective

Environmental psychologists and other social researchers have been interested in the relatively new concept of 'socio-ecological' issues, since the inception of the environmental movement (Mustafa, Smucker, Ginn, Johns, & Connely, 2010; Schultz & Zelezny, 1999). The term "socio-ecological" refers to the environment and environmental issues as both social (human) and environmental (natural or non-human) (see Berkes et al., 1998). Understanding the environment to be made of both human

and non-human elements has been taken into account by the use of the term 'environmentalism' in this thesis. The definition of 'environmentalism' used in this thesis follows Slocombe (1984) who called this often poorly defined concept "the art and science of shaping society at all levels in order to ensure the long-term viability not only of the natural environment but also of the entire earth and all its contents—of society" (p.285).

The start of a social movement centered on environmentalism in the US, is usually placed in the early 1970's when Earth Day was first celebrated and landmark environmental legislation was passed including the Clean Air, Clean Water, and Endangered Species Acts (Hartman, 2000; Mustafa et al., 2010). Since the beginning of research on socio-ecology, or human-nature relations, one area of inquiry has been how people conceptualize their environments and think about their own impact on the environment (Kurz, Donaghue, & Walker, 2005). Research has shown individuals have often failed to acknowledge the negative environmental impacts of their own behavior (Canter, Nelson, & Everett, 1992; DeLorme, Hagen & Stout, 2003). As environmental quality has declined, the percentage of people that identify themselves as environmentalists increased (Johnson, 2010; Kempton, Boster, & Hartley, 1995). According to a survey from 1990, 73% of Americans identified themselves as environmentalists (Johnson, 2010; Kempton et al., 1995).

Demographics and environmentalism. Environmentalism, or peoples' actions to shape society to ensure the long-term viability of socio-ecological systems, has trended based on demographic characteristics including gender and age (see Berkes et al., 1998; Slocombe, 1984). Trends based on gender and age have been reviewed below.

Gender. Zelezny, Chua, and Aldrich (2000) conducted a meta-analysis of many psychological studies and concluded female participants exhibited more “environmentalism,” or self-reported concern about environmental issues, than males. Zelezny et al. (2000) reportedly validated this hypothesis in two subsequent survey-based studies, in which female participants, regardless of age or location within the study area, indicated both stronger environmental attitudes as well as higher levels of participation in pro-environmental behaviors than their male counterparts (Zelezny et al., 2000). Greater environmentalism of female participants was attributed to the cultural impact of increased levels of socialization to care for others compared to males (Zelezny et al., 2000).

The conclusion that women had higher environmental concern and were more willing to change their behavior has been supported by findings of other research (Arnocky & Stroink, 2010; Karpiak & Baril, 2008; Kollmuss & Ageyman, 2002; Zelezny et al., 2000). Stern et al. (1993), found women were more attentive to information that illustrated connections between the environment and things they valued. Whether more socially altruistic, attentive to information about environmental impacts, or other factors, women have been found to express more environmentalist attitudes and report performing more pro-environmental behaviors (Kollmuss & Ageyman, 2002; Stern et al., 1993; Zelezny et al., 2000).

Age. Age has been another demographic factor linked to environmentalism, empathy, sympathy, altruism, and concern (Corral-Verdugo & Pinheiro, 2006; De Young, 2000; Fransson & Garling, 1999; Kollmuss & Ageyman, 2002; Larson, Ibes, & White, 2011; Schultz, 2000; Schwartz, 1970; Schwartz & Howard, 1981). Van Liere and

Dunlap (1980) discussed the hypothesis that younger people express concern about environmental degradation more than older people. Differences in attitude based on age has been documented by many researchers (Franson & Garling, 1999; Howell & Laska, 1992; Van Liere and Dunlap, 1980). Howell and Laska (1992) found younger people in their study exhibited more environmental concern than older people and proposed this was due to differences in attention; younger people attended to information about environmental problems more readily than other people and were thus more concerned.

Knowledge/Awareness-Behavior Gap

Environmentalism and concern may not equate to pro-environmental behaviors, however (Corral-Verdugo, 1997; Dunlap et al., 2000; Kollmuss & Agyeman, 2002; Stern, 2000, McKenzie-Mohr, 2011; Thompson & Barton, 1994). Similarly, young people that report more environmental concern may not behave in ways any more pro-environmental than people who exhibit less (Corral-Verdugo, 1997). Younger people have been found to have a more short-term outlook and to lack competence to behave in pro-environmental ways than older research participants (Corral-Verdugo, 1997; Stern, 2000). A younger person may not have skills necessary to retrofit their home to be more energy efficient, for example. Older and younger research participants have thus been found to be different in terms of environmental concern and pro-environmental behaviors (Corral-Verdugo & Pinheiro, 2006; De Young, 2000). Knowledge or awareness of an environmental problem, therefore, does not equate to pro-environmental behavior; there is a knowledge/awareness-behavior (KAB) gap (see McKenzie-Mohr, 2011).

Research on water conservation has helped illustrate this gap between knowledge, awareness, and behavior. While “knowledge regarding water conservation

behaviors is essential in implementing strategies for preserving this vital resource,” having knowledge has not always been enough to insure people conserve resources (Corral-Verdugo, 2002, p. 536). Participants’ education level and reported awareness of environmental impacts has been shown to be unrelated to their actual behaviors (Robbins, Polderman, & Birkenholtz, 2001). Robbins et al. (2001) reported that better educated participants used more chemical inputs on their yards and therefore had a potentially greater impact on water quality. Those better-educated people both realized and acknowledged the risks of using such products to the environment and humans (Robbins et al., 2001).

Some researchers have theorized that better-educated, wealthier residents would conserve more than poorer people, but there is evidence showing the inverse (Franson & Garling, 1999). Many studies have reported wealthier people use more water (Askew & McGuirk, 2004; Beal, Stewart, & Fielding, 2011; Corral-Verdugo, Bechtel, & Fraijo-Sing, 2003; Hanak & Browne, 2006; Larson et al., 2011; Osmond & Platt, 2000). De Oliver (1999), for example, found wealthier people saved less water than poorer people even when they were explicitly asked to conserve. While knowledge is a necessary precursor for pro-environmental behavior, the KAB gap has illustrated that human behavior is complex and impacted by many other variables (McKenzie-Mohr, 2011). In order to change behaviors, campaigns have needed to address more variables than just knowledge and awareness (McKenzie-Mohr, 2011).

Overcoming the KAB Gap

Community-Based Social Marketing

Community-Based Social Marketing (CBSM) is a framework for developing behavior-change campaigns that overcome the KAB Gap (McKenzie-Mohr, 2011). This

outcome-focused set of strategies has been used to develop campaigns with community in-put that effectively communicate conservation messages (McKenzie-Mohr, 2011). By researching the benefits and barriers to pro-environmental behaviors, CBSM experts have attempted to increase the benefits and/or decrease the barriers of adopting pro-environmental behaviors (Weinreich, 1999). Other strategies of CBSM include targeting specific audiences because of their likelihood of them changing their behavior or the large impact that changing their behavior would have on a given resource (McKenzie-Mohr, 2011; Weinreich, 1999). The CBSM approach has focused on measurable changes in behavior, not any particular theory or model (Lefebvre, 2000). Instead, this framework for changing behaviors, not just changing minds, has borrowed from many theories of pro-environmental behavior. These have included the health belief model (see Rosenstock, 1990), social cognitive theory (see Bandura, 1991), theory of reasoned action (see Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), and diffusion theory (Lefebvre, 2000; see Rogers, 2003).

Values, Beliefs, Norms, and Environmental Behavior

Another theory of environmental behavior has been Stern et al.'s (1999) VBN theory. This theory has a causal model; values influence beliefs, beliefs influence norms, and norms influence behaviors (Larson, 2010; Slimak & Dietz, 2006; Stern, 2000; Stern et al., 1999). VBN theory has been adapted from several social theories including Schwartz's (1977) theory of altruism and Dunlap, Van Liere, Mertig, & Jones' (2000) New Ecological Paradigm (NEP) scale (Larson, 2010; Slimak & Deitz, 2006; Stern, 2000). The following discussion provides an overview of not only the comprehensive causal model of VBN theory, but also other studies that investigated similar concepts. Most broadly, VBN theory has stated that specific environmental

behaviors occur because of behavioral norms, which are impacted by beliefs and values (Stern et al., 1999).

Values

Values are the foundation of the VBN model (Stern et al., 1999). According to VBN theory, values typically change little and relatively slowly over a person's life (Slimak & Deitz, 1999). Values are general sentiments that broadly influence judgments about the environment (Larson, 2009; Stern, 2000; Stern & Deitz, 1994; Schaaf, Ross-David, & Broussard, 2006). Value orientations help people evaluate the believability of environmental threat information (Schwartz, 1994; Slimak & Deitz, 2006; Stern, 2000). Considered enduring and relatively stable, values serve as "filters or amplifiers" of information about threats to objects about which a person cares (Slimak & Deitz, 2006, p. 1691).

In Stern et al.'s (1999) VBN theory, altruistic values (based on impacts on other people), biospheric values (focused on the good of the environment in and of itself), or egotistic values (based on personal impacts) are the fundamental lenses through which people view and understand environmental problems (see Nordlund & Garvill, 2002). Core factors affecting environmental perceptions, therefore, have been degrees of concern with the wellbeing of other people, health of the environment, and a participant's own wellbeing (Stern, Dietz, & Kalof, 1993; Slimak & Deitz, 2006). Following Schwartz (1994), the above-mentioned classifications correspond with self-transcendent (altruistic or biospheric) and self-enhancing (egotistic) values (Stern et al., 1999). The following sections define and describe these different types of values including both social and ecological-altruistic values, egocentric, and anthropocentric values.

Social-altruistic values. Social-altruistic values have been based on a person's perception about the costs or benefits of environmental behavior to other humans (Schultz, 2000). People with a social-altruistic value orientation have cared about environmental issues in terms of effects that impact other individuals or social communities (Schultz, 2000). Environmentally responsible behaviors (Kaplan, 2000) and positive attitudes towards environmental protection have been linked to altruistic, self-transcendent values (Larson, Cassagrande, Harlan, & Yabiku, 2009; Nordlund & Garvill, 2002). Multiple studies have provided evidence supporting the idea people with self-transcendent or collective values are more willing to engage in pro-environmental behaviors than those with less altruistic values (Karp, 1996; Nordlund & Garvill, 2002; Schwartz, 1994; Stern & Deitz, 1994; Stern, Dietz, & Black, 1985-1986; Stern et al., 1998; Stern et al., 1995).

Concern for other people, or empathy, was also investigated by Stern (2000), who, along with other scholars, has linked altruistic and biospheric values to caring about environmental issues (Larson et al., 2009). Stern (2000) found a distinction between social-altruism and ecologic-altruism in terms of the underlying reasons contributing to their environmental concern, which has been linked with other research on biospheric values (Larson, 2010; Thompson & Barton, 1994; Whittaker, Vaske, & Manfredi, 2006).

Ecological-altruistic values

As mentioned previously, ecological-altruistic values are focused on the good of the environment in and of itself (Nordlund & Garvill, 2002). Rather than valuing the environment for the ways it can benefit or affect humans, those with ecological-altruistic

values appreciate nature for its own sake and stress the wellbeing of nature (Dunlap et al., 2000; Larson, 2010; Nordlund & Garvill, 2002; Thompson & Barton, 1994).

Ecological-altruistic values and behavior

Since altruism has been related to doing something for others with no benefit to oneself, behaving towards the environment in altruistic ways has been equated to self-sacrifice (Kaplan, 2000). Research has found positive correlations between ecological-altruistic values and environmentally responsible or pro-environmental behaviors (Kaplan, 2000; Nordlund & Garvill, 2002; Thompson & Barton, 1994). Research has also shown that collective social values (related to altruism) and appreciating an intrinsic value of the environment lead to more concern about the environment than those who value the environment as a means for self-enhancement (Nordlund & Garvill, 2002; Schwartz, 1994; Stern & Deitz, 1994).

Egotistic values

Egotistic values place a greater emphasis on personal gains of behaviors than the wellbeing of other people or behaviors' environmental effects (Schultz, 2000; Stern & Deitz, 1994). Research has supported the egotistic-individualist link as egoism has been related to both antisocial and anti-environmental behaviors (Corral-Verdugo & Fraís-Armenta, 2006). While egoism has been linked to the anti-environmental behavior of wasting water (Corral-Verdugo & Fraís-Armenta, 2006), egotistic values can also influence environmental action (Schultz, 2000). People with an egotistic value orientation have been concerned about environmental issues when they are impacted directly by them (Schultz, 2000; Stern & Deitz, 1994). A person with egotistic values may be equally concerned about an environmental problem as someone with ecological

values, but perhaps only when they perceive the problem to threaten themselves directly (Schultz, 2000).

Anthropocentric values

While the egotistic value orientation is more personally focused (Schultz, 2000; Stern & Deitz, 1994), both social-altruistic and egotistical values have been focused on effects for humans; people with these values are concerned about environmental issues based on impacts on other people or themselves (Thompson & Barton, 1994).

Anthropocentrism is another classification of values by which people judge the plausibility of environmental information (Nordlund & Garvill, 2002; Thompson & Barton, 1994). People with anthropocentric values become concerned about environmental issues when they have perceived costly outcomes and negative effects for people (Thompson & Barton, 1994). There is evidence that people with an anthropocentric value orientation have less awareness of and concern about environmental problems (Nordlund & Garvill, 2002).

Anthropocentric values have been tied to utilitarian beliefs, that the environment is composed of resources meant for humans to use for survival, wellbeing, and comfort (Corral-Verdugo, Betchel, & Fraijo-Sing, 2002). Anthropocentrism has also been central to the human exception paradigm, a set of beliefs which considers humans as separate from nature and “outside rules of the natural world” (Betchel, Corral-Verdugo, and Pinhero, 1999, p. 249). All of this research provides evidence that the values held by a person can directly affect their beliefs about the environment, which is another important aspect of VBN theory (Stern, 2000; Stern et al. 1999).

Beliefs

The three components of beliefs as defined by VBN theory are worldview, beliefs about the adverse consequences of behaviors to things of value, and a person's perception of their ability to reduce threats to those valued objects (De Young, 2000; Geller, 1995a, 1995b; Kaplan, 2000; Stern, 2000; Stern et al., 1999). These concepts have been operationalized by previous research as the New Ecological Paradigm (NEP) scale (Dunlap & Van Liere, 1978; Dunlap et al., 2000).

Worldview

Stern et al. (1999) used the 'worldview' as a synonym for 'paradigm.' Similarly, Dunlap (2008) defined 'worldview' as the degree to which people view the world from a certain paradigm. One of the most widely-used measures of worldview is the NEP (Corral-Verdugo, Carrus, Bonnes, Moser, & Sinha, 2008; Schultz & Zelezny, 1999; Stern, 2000). The NEP has been called a "constellation of values, attitudes, and beliefs" (Dunlap & Van Liere, 1978, 2008), illustrating the interconnectedness of concepts in previous research on environmental behaviors (Larson, 2010). First conceived by Dunlap and Van Liere (1978), the NEP scale measures attitudes about the environment and how people relate to and affect nature (Dunlap et al., 2000; Stern et al., 1993). The three main attitudes measured by the NEP scale have been "balance of nature, limits to growth, and human domination over nature" (Dunlap et al., 2000, p. 429).

The inventory also measures perceptions of the abundance or scarcity of resources, faith in science and technology, humans' ability to change the environment, rights of humans to use the environment, and ecological rights (Dunlap & Van Liere, 1978; Dunlap et al., 2000; Larson, 2010; Larson et al., 2009; Slimak & Deitz, 2006). Despite assessing the above-mentioned concepts through targeted questions, the NEP

has been criticized as limited to measuring only general environmental concern (Schultz & Zelezny, 1999). The concepts addressed by the NEP have been called poorly operationalized and difficult to compare across multiple studies (Larson, 2010).

While the construct of worldview is somewhat general and ambiguous, the validity of NEP's measurement of those concepts has been supported by other research (Dunlap et al., 2000). One study, for instance, found the instrument had good internal validity among participants in the United States (Schultz & Zelezny, 1999). Through ethnographic interviews, Kempton, Boster, and Hartley (1995) found that the NEP scale corresponded to three sets of cultural values among Americans.

One set of environmental beliefs is that the natural resources on which humans depend are limited (Kempton et al., 1995). Another set of environmental beliefs is that nature is devalued when materialism increases and contact with the environment declines (Dunlap et al., 2000; Kempton et al., 1995). Researchers also observed a cultural model expressing nature as balanced, interdependent, complex, and susceptible to imbalance by human activity (Dunlap et al., 2000; Kempton et al., 1995). These cultural models corresponded with the facets of the NEP scale thereby buttressing the scale's validity (Dunlap et al., 2000; Kempton et al., 1995).

The NEP's validity was also strengthened through repeated use (Corral-Vedugo et al., 2002; Dunlap et al., 2000; Dunlap & Van Liere, 2008). Several studies show that the NEP is positively related to participants' environmental knowledge, level of environmental concern, and awareness of consequences (Arcury, 1990; Arcury, Johnson, & Scollay, 1986; Dunlap et al., 2000; Furman, 1998; Pierce, Steger, Steel, & Lovrich, 1992).

Consequences

A person's beliefs about the adverse consequences of their actions on the environment are an important component of the VBN model (see Stern et al., 1999; Stern, 2000). Awareness of consequences has been related to concern as a person has to be aware that a problem exists in order to be concerned about the escalation of that problem (Hansla, Gamble, Juliusson, & Gärling, 2008). Awareness of consequences has also been used interchangeably with concern (Hansala et al., 2008).

Concern for the environment has been thought to increase when people experience the environment (Hockett, McClafferty, & McMullin, 2004). However, there has been only weak evidence to support whether experiencing a resource through recreation will increase concern about that resource. Hockett et al., 2004 found that experiencing a water resource through recreation did not lead to an increase in pro-environmental behavior and stewardship of that resource.

Experiencing a resource by participating in resource monitoring programs, though, has been shown to increase participant awareness (Gommerman & Monroe, 2012). Fernandez-Gimenez, Ballard, and Sturtevant (2008), for instance, found that collaborative resource monitoring lead to an increased understanding of observed ecosystems. Water quality monitoring has also been found to increase participants' awareness of water issues and engagement in implementing solutions (Gommerman & Monroe, 2012; Pretty et al., 2007). While the VBN model theorizes that awareness of consequences leads to pro-environmental behavior, the research has been inconclusive about how experiencing a resource actually does this (Hockett et al., 2004).

Control

In addition to concern and awareness of consequences as precursors to action, a person's perceived ability to impact those consequences has also been important (Larson et al., 2009; Stern, 2000; Stern et al., 1993; Stern et al., 1999). Competence and awareness of action strategies are related to a person's perception of their ability to mitigate negative consequences to the things they value (see Ajzen & Fishbein, 1977; Corral-Verdugo et al., 1997; De Young, 2000; Geller, 1995a, 1995b; Kaplan, 2000; Stern, 2000; Wilson, 2012). The higher a person's awareness of strategies they can use and the higher their ability to act increased their pro-environmental behavior (Grob, 1995).

The concepts of fairness and trust have also been found to potentially impact the degree of control and responsibility individuals feel to conserve water (Johnson, 2010; Jorgensen et al., 2009). Johnson (2010) found that a "perceived lack of fairness in sharing conservation" was a significant way people understood local water conservation efforts. Individual homeowners who were interviewed felt like other people in their region were not conserving water, which could potentially impact the motivation of those participants to conserve (Johnson, 2010).

Similarly, Jorgensen et al. (2009) described how residents' trust of water management organizations as well as others within their communities impacted how likely they were to conserve water. Overall, if people think that water shortages have been caused by institutional mismanagement or that other people have not complied with water conservation policies, they are less likely to conserve themselves (Jorgensen et al., 2009).

Another concept that impacts perceptions of control is self-efficacy, which is an individuals' confidence in their ability to solve a problem (Bandura, 1994; Meinhold & Malkus, 2005). Locus of control has also been cited as important and refers to a person's perspective about the success of their actions (Meinhold & Malkus, 2005). An external locus of control is a perception that regardless of how an individual acts, the outcome will be affected by external factors (Meinhold & Malkus, 2005). If a person has an external locus of control, they may feel like their actions are futile and be less likely to behave in pro-environmental ways (Cleveland Kalamas, & Laroche, 2005; Meinhold & Malkus, 2005). When people have an internal locus of control, they believe they can control environmental outcomes and this influences pro-environmental behaviors (Cleveland et al., 2005). That is, when they act, the outcomes of their behavior will be as they intended (Meinhold & Malkus, 2005).

Norms

Norms have been described as ways in which people typically behave (Stern, 2000). Following the VBN model, norms are established when communities of people perceive an ability to control environmental impacts and many of them act on it (Stern, 2000). Norms can be categorized as personal (how someone expects themselves to behave), subjective (how a person perceives other people expect them to behave), and social (how communities or groups normally behave), and they have been studied within environmental contexts (Askew & McGuirk, 2004; Corral-Verdugo & Fraís-Armenta, 2006; Grove et al., 2006; McKenzie-Mohr, 2011; Nordlund & Garvill, 2002; Robbins & Birkenholtz, 2003).

Personal norms

Beliefs about how human behavior impacts the environment in adverse ways and a sense of control over those adverse impacts can lead to personal obligations to act, or personal norms (Stern, 2000). Nordlund and Garvill (2002) defined personal norms as “a feeling of moral obligation to protect the environment” (or something else a person values) (p. 743). The Norm Activation Theory states that the activation of a personal norm is an important precursor to pro-environmental behavior (Nordlund & Garvill, 2002; Schwartz, 1977). Lam (1999) found that having a moral obligation to conserve water was a positive, significant predictor of intentions to conserve. Corral-Verdugo and Fraís-Armenta (2006) found that personal normative beliefs pertaining to water conservation directly influenced the degree to which people conserved water. Not all social norms have led to pro-environmental behaviors, however.

Research on residents’ beliefs and landscaping practices has found other personal norms to be detrimental to water security and the environment (Robbins & Birkenholtz, 2003; Robbins, Polderman & Birkenholtz, 2001). Maintaining a manicured yard has been seen as a moral obligation, for example, despite the fact that it is an intensive use of resources and may harm the environment through water use and pollution (Grove et al., 2006; Mustafa et al., 2010; Robbins & Birkenholtz, 2003; Robbin et al., 2001; Schuler, 1995). While one person may perceive a moral obligation to maintain their yard to a certain normal aesthetic regardless of the environmental impacts, another person may think it moral to maintain their yard with the least amount of water and supplemental nutrients possible (Mustafa et al., 2010). Personal moral norms can vary depending on how an individual relates to nature, their degree of

awareness of consequences of their behavior on the environment, and how able they feel they can mitigate those consequences (Stern, 2000).

Subjective norms

Research participants have pointed to subjective norms, or what others expected of them, when they explain why they maintain their landscape to a lush aestheti even though this behavior is associated with increased water use (Askew & McGuirk, 2004). Subjective norms, therefore, have been linked to attitudes about water and water use on residential landscapes (Askew & Mcguirk, 2004; Seligman & Finegan, 1990). In one study of water use and residential perspectives in suburban Australia, residents expressed the need to maintain a lush green landscape around their home out of respect for their neighbors (Askew & McGuirk, 2004).

Social norms

Social norms, or ways that communities and groups normally behave, have also impacted individual environmental behavior (Ajzen & Fishbein, 1980; Cleveland et al., 2005; Robbins et al., 2001). Uniform, manicured turf-grass lawns have been associated with high property values by some homeowners despite the significant water use and impact on water quality (Dorsey, 2010; Harris et al., 2012). Data has supported the idea that yard and turfgrass management have been public expressions of membership to certain “lifestyle group[s] and...uphold[ing] the prestige of [residents’] neighborhoods” (Grove et al., 2006, p. 592). Yards have been seen as public symbols of cultural capital and opportunities to “display taste and distinction” (Askew & McGuirk, 2004, p. 606), as well as cultural identity (Mustafa et al., 2010).

The traditional turf grass lawn and its required maintenance has been seen by residents as a way of investing in and appreciating one’s community (Dorsey, 2010;

Grove et al. 2006; Larson et al., 2009; Nielson & Smith, 2005; Pickett et al., 2008; Robbins et al., 2001; Robbins & Sharp, 2003; Whitney, 2010). Uniform, manicured, and intensively-maintained yards can, therefore, yield a sense of neighborhood unity and have been seen as symbols of buy-in to neighborhood property value, certain lifestyles, the consumptive economy, and civic life (Grove et al., 2006; Pickett et al., 2008; Robbins et al., 2001; Whitney, 2010).

Social norms in landscape preferences

Social norms have been viewed as influential to landscape preferences (Nassauer, Wang, & Dayrell, 2009). Nassauer et al. (2009) found that neighborhood aesthetic norms (inferred from pictures on their survey) dramatically influenced respondents' own landscape preferences. Nassauer et al. (2009) found the "broad cultural norm of a conventional turf lawn was strongly preferred" only when neighboring yards were likewise turf-dominated (p. 286). When neighboring yards on the survey of preferences were depicted as "native prairie gardens," the respondents overwhelmingly chose a landscaping look that conformed to the neighboring landscapes (Nassauer et al., 2009). While several studies on preferences have revealed that people value the aesthetic quality of a traditional, lush, green, monoculture lawn, this may be the case only when that is the dominant landscape (Nassauer et al., 2009; see also Askew & McGuirk, 2004; Nielsen & Smith, 2005).

Nassauer et al.'s (2009) study indicating a strong impact of landscape norms on landscape preferences took place in Michigan, but much of the research on residential landscape preferences has been conducted in arid desert cities (see Harlan, Yabiku, Larsen, and Brazel, 2009; St. Hilaire et al., 2008; St. Hilaire, VanLeeuwen, & Torres, 2010; Larson, Cook, Strawhacker, & Hall, 2010; Martin, 2008; Yabiku, Cassagrande, &

Farley-Metzger, 2007). Larson et al. (2009) found three prominent themes behind residents' landscape preferences in Phoenix, Arizona including "desires for attractive, comfortable landscapes of leisure encompassing pluralistic tastes, [and] lifestyles" (p. 921). Similar socio-cultural aspects of leisure and entertaining were also provided by residents who explained the meanings of their yards to researchers in Australia (Askew & McGuirk, 2004).

Qualitative Social Research for Water Conservation

While most of the research reviewed for this study has been conducted on perceptions of residential landscaping and water conservation in Australia and the southwestern US, research on residential irrigation has also been conducted in the historically water-rich southeastern US. Within the Tampa Bay watershed, for example, landscape preferences were explored qualitatively (Mustafa et al., 2010). The researchers used Robbins' (2007) term, "lawn people" to describe participants that had predominantly turfgrass lawns and those that installed water conserving landscapes were called "xeriscape people (Mustafa et al., 2010).

Researchers found similarities between those residents who integrated some xeriscape principles into their landscape and those who intended to do so (Mustafa et al., 2010). Both of those groups discussed their landscape choices by evoking global-scale perspectives and awareness of potential, widespread water crises (Mustafa et al., 2010). The participants they described as 'lawn people,' however, discussed their landscape choices by evoking neighborhood and national scale perspectives (Mustafa et al., 2010). Landscaping behaviors were motivated by a desire to display privilege and distinction (Mustafa et al., 2010). According to the researchers, 'xeriscape people' believed their adoption of xeriscape principles was an equivalent display of "privilege

and distinction” (Mustafa et al., 2010, p. 300). Personal, subjective, and social norms, therefore, impact preferences, intentions, and behavior as theorized by the VBN model (Stern, 2000; Stern et al., 1999).

In a study conducted in Central Florida, focus group participants were asked about their experience with and perceptions of water quality and quantity, the causes of degradation, and potential solutions (DeLorme et al., 2003). Investigators coded (categorized) the material and organized it into themes across six focus groups (DeLorme et al., 2003). Most participants reported that their indoor, municipally supplied water had a bad taste and therefore poor quality, while some participants reported water quality had declined since they were children growing up and swimming in the area (DeLorme et al., 2003). Researchers reported that many participants also observed declining water levels in ponds and lakes (DeLorme et al., 2003). When asked what had caused the decline in water conditions, participants offered varied and interrelated causes including population growth, development, industry, a lack of planning, poor leadership, and water mismanagement by apathetic homeowners (Delorme et al., 2003).

In general, participants believed individual homeowners could make a positive difference, though they were reportedly frustrated by their perceived lack of control over water quantity and quality (Delorme et al., 2003). Participants “considered the local water crisis to be a complex issue that encompassed political, economic, and social agendas,” (Delorme et al., 2003, p. 33). Delorme et al., (2003) found that focus group participants exhibited high awareness of and serious concern about water quality. In line with previous research, participants were also “reluctant to see their own connection the

community problem,” tending to “depersonalize and disassociate themselves from the broader natural and social context,” (DeLorme et al., 2003, p. 33).

Context

Contextual factors outside of individual research participants have been found to impact individual behavior (see DeLorme et al., 2003; McKenzie-Mohr, 2011). There has been a lack of research linking contextual factors, like a person’s homeowner status or sense of connection to place, with pro-environmental behaviors (see Russell & Fielding, 2010). Contextual factors have been taken into account by the VBN model in the form of social norms. Dominant landscape styles, for example, impact the amount of water people use on their landscapes as well as influencing behaviors that impact water quality.

Russell and Fielding (2010) concluded that contextual factors have impacted water conservation and have been important to consider when conducting research on conservation behaviors. Neighborhood norms of landscape preference and landscape maintenance, for example, both impact the choices made by individuals (see Cialdini & Trost, 1998; Larson et al., 2009; Robbins & Sharp, 2003; Russell & Fielding, 2010). Corral-Verdugo (2002), for instance, found that participants of his study from a water-scarce city in Mexico conserved more water than those in a non-water-scarce city despite the fact that all participants had the same levels of water-conservation skills.

Conceptual Model

The conceptual model that helped form the theoretical basis for this research was a combination of the value-belief-norm (VBN) theory (Stern, 2000; Stern et al., 1999) and other research on similar concepts that have added depth to their model (Dunlap, 2000; Kaplan, 2000; Schultz, 2000). Figure 2-1 at the end of this chapter has

illustrated an initial impression of how the critical elements of these theories work to influence pro-environmental behavior. This model of pro-environmental behavior was one filter over the lens through which the researcher viewed and analyzed the data (see Chapter 3); other factors also influenced the findings and discussion (see Chapter 4).

Moving from “Values” in the left of the model to the right, values influence beliefs (Stern, 2000; Stern et al., 1999). The biospheric value orientation for instance can lead to a worldview that ecology has inherent rights and resources are limited (Dunlap, 2000; Stern, 2000; Stern et al., 1999). Alternatively, social altruistic and egocentric value orientations, both within the anthropocentric value cluster, can be linked to beliefs that resources are unlimited and meant for human exploitation (Corral-Verdugo et al., 2008; Dunlap, 2000; Stern, 2000; Stern et al., 1999). Anthropocentrism can also lead to beliefs such as faith in human innovation through physical science and technological hardware (Stern, 2000; Stern et al., 1999).

Aside from a person’s worldview or paradigm, the awareness of consequences of water use behavior and perceived control of those consequences impact behavioral norms (Stern, 2000). Beliefs may impact behavior directly, but norms are often influenced by what people do (Corral-Verdugo et al., 2003; Nordlund & Garvill, 2002; Schwartz, 1977). Beliefs shape what people view as personal (Corral-Verdugo & Fraís-Armenta, 2006; Nordlund & Garvill, 2002; Schwartz, 1977), subjective (Askew & Mcguirk, 2004; Seligman & Finegan, 1990), and social norms (Grove et al., 2006; Mustafa et al., 2010; Robbins et al., 2001; Stern, 2000; Stern et al., 1999).

Perceptions of other’s resource use are related to social norms and contextualize how someone assesses their own resource use behavior (Corral-

Verdugo, Frías, Pérez, Orduño, & Espinoza, 2002; Corral-Verdugo & Frías -Armenta, 2006; McKenzie-Mohr, 2011; Robbins et al., 2001). How someone perceives others using water in their community is another aspect that may impact behavior (Corral-Verdugo et al., 2002; Corral-Verdugo & Frías -Armenta, 2006). Benefits and barriers to behavior are also contextual factors that can help explain the gap between knowledge, awareness, and behavior (Kollmuss & Agyeman, 2002; McKenzie-Mohr, 2011).

Conclusion

According to Corral-Verdugo (2002), within the literature on pro-environmental behaviors, water use has been one of the least studied practices. In order to understand pro-environmental behaviors and the contextual factors that influence them this study has focused on the residential perceptions of water use in their communities, their experiences with water resources, and their own behaviors. While previous research on residential perceptions has focused mainly on landscape preferences, gaps exist in linking preferences and environmental awareness to behaviors (Askew & McGuirk, 2004; McKenzie-Mohr, 2011; Larson, Casagrande, Harlan, & Yabiku, 2009; Larson et al., 2010; Nassauer et al., 2009).

Research on pro-environmental behaviors generally has provided insight into precursors to behavior (Fransson & Garling, 1999). Anthropocentric values such as social altruism and egoism, as well as biospheric values have influenced environmental beliefs including awareness of consequences or concern, and control of consequences, or responsibility (Corral-Verdugo et al., 2008; Corral-Verdugo & Frías-Armenta, 2006; Nordlund & Garvill, 2002, 2003; Thompson & Barton, 1994). Beliefs such as the abundance or scarcity of resources and degree of rights inherent to ecology have impacted perceptions of personal, moral obligations and social norms (Askew &

McGuirk, 2004; Corral-Verdugo & Fraís-Armenta, 2006; Dunlap et al., 2000; Grove et al., 2006; Mustafa et al., 2010; Nordlund & Garvill, 2002; Robbins et al., 2001; Schwartz, 1977; Stern et al., 1999). Values, beliefs, and norms, can influence how people behave towards the environment (Stern, 2000; Stern et al., 1999).

Understanding contextual aspects in environmental behavior research has been supported by previous research (Corral-Verdugo & Frías -Armenta, 2006; McKenzie-Mohr, 2000, 2011; Weinreich, 1999). According to CBSM, understanding the perceptions of particular audiences is a vital piece to changing their behavior (McKenzie-Mohr, 2000, 2011; Weinreich, 1999). This study also focuses on specific audiences to understand perceptions about specific water resources and water conservation behaviors (Corral-verdugo et al., 2002; Fransson & Garling, 1999; Larson, 2010).

While it has been important that increasing numbers of people around the world conserve water, the specifics of conservation strategies should be as diverse as the unique contexts in which they are enacted (McKenzie-Mohr, 2011; Mustafa et al., 2010). Physical science and technological innovations alone will not lead us away from the socio-ecological crises caused by water scarcity (Oskamp, 2000). To solve environmental problems, social science has had a crucial role to play by helping to understand then change behavior (Zelezny & Schultz, 2000).

In order to promote water conservation behaviors it is necessary to connect current landscaping practices and residential perceptions of springs through research. In the context of the study area, the perceptions of water conservation and landscaping behaviors have not been researched. As is explained in the next chapter, participants'

perspectives were examined hermeneutically in order to arrive at a new understanding of water security, springs health, and personal responsibility for resource sustainability.

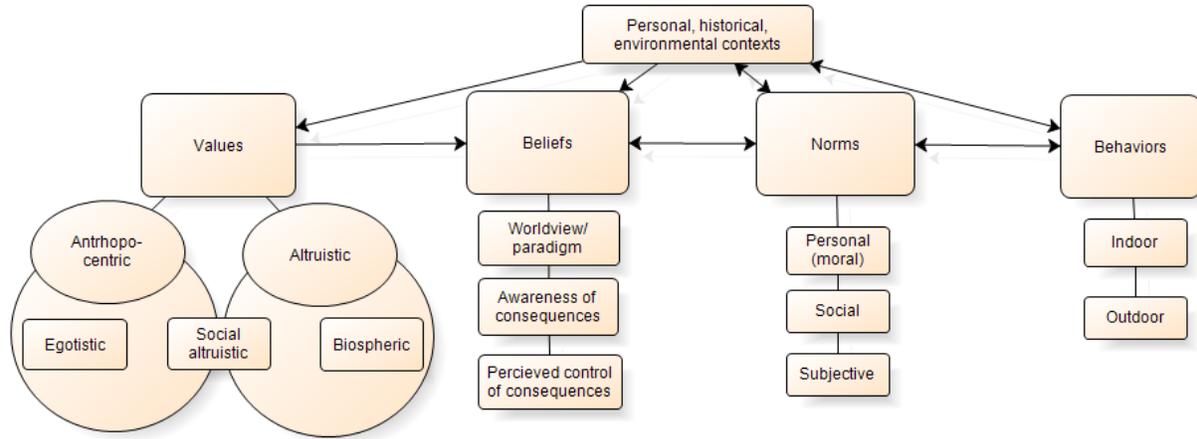


Figure 2-1. Visual depiction of conceptual model based on literature. Adapted from Dunlap (2000), Kaplan (2000), McKenzie-Mohr (2011), Schultz (2000), Stern (2000); Stern et al. (1999).

CHAPTER 3 RESEARCH METHODS

Introduction

This chapter discusses the theoretical perspective used in this study, data collection, and analysis methods. First, the value of closely examining ontological and epistemological assumptions are discussed. Next, the theoretical perspective of hermeneutics is explained. Aspects of hermeneutics, including prejudice and horizon of understanding, are outlined and described. After the theoretical underpinnings particular to this study are discussed, study methodology is explained. Recruitment, data collection, and data analysis methods are outlined and described in detail. Validation criteria is also discussed at the end of the chapter (see Lincoln & Guba, 1985).

Theoretical Perspective

A researcher's understanding of reality (ontology) and theory of knowledge (epistemology) make up the theoretical perspective of any research project (Cashin, 2003; Crotty, 1998). Research methods, including the scientific method, have been shaped in fundamental ways by assumptions about reality and how people know what they know (Crotty, 1998; Patterson & Williams, 2002). Addressing these issues may seem "esoteric [or exclusively academic] philosophy far removed from the practice of science" at first, particularly because many studies do not explicitly discuss their ontological and epistemological assumptions (Patterson & Williams, 2002, p. 14). Nevertheless, these theoretical perspectives and assumptions about reality and knowledge have had large impacts on study methods as well as findings (Patterson & Williams, 2002). Thus, the argument has been made that ontological and epistemological assumptions of any study should be known, selected for their explicit

appropriateness to the research, and explained (see Christopher, Richards, & Christopher, 2003; Patterson, & Williams, 2002).

Hermeneutics

The theoretical perspective used in this study was hermeneutics. The primary goal of hermeneutics is to advance understanding (Koro-Ljungberg, personal communication, 2011). The hermeneutic viewpoint is that “*all* knowledge as interpretive and hammered out in traditions of understanding,” whether positivist or postmodern, qualitative or quantitative, etcetera (Christopher et al., 2003). Through this perspective, knowledge has been seen as interpretation, always situated within one’s historical and cultural contexts as well as ‘pre-judgments’ based on previous experiences (Christopher et al., 2003; Gadamer, 1975, 1989). Following this perspective, new knowledge is always dependent on and influenced by prior knowledge (Gadamer, 1975, 1989; Patterson & Williams, 2002).

Prejudice as precondition for understanding. Hermeneutics rejects the idea that “observation... precedes prior conceptions” (Patterson & Williams, 2002, p. 18) or “hypothesis follows observation” (Smith, 2000, p. 9). Rather, hermeneutics holds that participant and researcher background, culture, tradition, history, past experience, and prior knowledge, amongst other contextual factors, all influence scientific interpretation (Patterson & Williams, 2002; Sammel, 2003). As Christopher et al. (2003) discussed, objectivist social science “[has] abstract[ed] away from the rich appearances, felt meanings, and meaningful relationships of everyday experience... regard[ing] things, even human behavior, as neutral events or processes, and to creatively map their structural make-up and causal dynamics from such a temporarily disengaged and objectifying perspective” (p. 9). Thus, the characteristic objectivism of physical science

methods has been said to have “impoverished” social science by having “force[d] [social scientists] to study human beings at a distance” (Slife & Williams, 1995, p. 195) which has been “not only impossible, but probably somewhat inauthentic” (Christopher et al., 2003).

Horizon of understanding. In his exposition of philosophical hermeneutics, Gadamer (1989) called the prior knowledge that influences all understanding ‘prejudice,’ pre-judgments, or pre-understanding. He provided a metaphor to describe the process of coming to an understanding with another person (Gadamer, 1989). According to Gadamer (1989), the pre-understanding we have of a given topic of discussion forms our ‘horizon’ of understanding (p. 302). True understanding involves what Gadamer (1989) called a “fusion of horizons” with another person or text (p. 306).

Historical emphasis. The meaning of what someone said according to Gadamerian hermeneutics, “is never purely a function of the original intention of the author/speaker, but rather equally dependent on the historical situation of the reader/listener” (Sammel, 2003, p. 159). Understanding, Sammel (2003) wrote, “is not about *reproducing* the predefined, intended meaning in as accurate form as possible, but rather *producing* meaning through the interplay of dialogue between the author/reader or speaker/listener” (p. 159). Meaning, therefore is “always temporal, situational, progressive, and shared through interactions....Meaning, to Gadamer, is not stable; it shimmers” (Sammel, 2003, p. 158).

Part to whole. Similar to the metaphor of horizon of understanding, when speaking with another person, the iterative, or back and forth process of coming to understand what the text means has been a process of dialogue, explanation, and

clarification that, when successful, culminates in both parties' pre-understandings fusing into a new understanding (Gadamer, 1989; Grondin, 1995). Another of Gadamer's (1989) contributions to hermeneutics, therefore, has been documenting the movement of the process of understanding (see Crotty, 1998). Gadamer (1989) stated that the "movement of understanding is constantly from the whole to the part and back to the whole" (p. 291). In order to understand something, a person begins with a general and rudimentary idea of the whole meaning (Crotty, 1998). Understanding is then built on that which is already understood (Crotty, 1998). The historical and social context of research participants is an element of this whole and a "prime source of understanding" (Crotty, 1998, p. 95).

Contextual. In order to understand a research topic, it has been vital to grasp the broader context in which it occurred (Patterson & Williams, 2002). Since hermeneutics has recognized the influence of culture, previous experience, and prior knowledge on human understanding, hermeneutics has been seen as a means of approaching a more colloquially 'realistic' understanding of human perceptions and behaviors (Christopher et al., 2003; Gadamer, 1989; Patterson & Williams, 2002). The environment has constrained how people have observed and experienced reality, but people have had the ability to attend to different aspects of their environments and have acted in purposeful ways within given contexts (Gadamer, 1989; Patterson & Williams, 2002; Thompson, Locander & Pollio, 1989; Valle, King, & Halling, 1989).

Thus, in one sense, a hermeneutical analysis of perceptions of human behaviors and the environment has cast a wider net, attempting to capture social, cultural, economic, environmental, and other contextual factors that could have affected

participants' responses-- even if the participants themselves have not recognized those factors as influencing them (Patterson & Williams, 2002). In this way, this type of interpretive analysis has provided uniquely rich insight into how residents perceive that their landscape management practices have affected the environmental health of local springs. Further, hermeneutics has been particularly appropriate for social research about resource conservation.

Holistic, rich, and emergent. Hermeneutics has afforded a more holistic understanding of “the rich appearance of things,” including values, emotions, and the illogical complexities of everyday life (Christopher et al., 2000, p. 4). This approach aims to start productive dialogue rather than seeking a law of human behavior theorized in a model (Christopher et al., 2003; Patterson & Williams, 2002). The goal of hermeneutics has been, as Packer and Addison (1989) declared, “to keep discussion open and alive,” (p. 35) and as Patterson and Williams (2002) stated, “[make] possible the continual emergence of new insights from the research process” (p.24). Patterson and Williams (2002) explained, “meaning and behavior [have] not [been] seen as fully integrated, closed systems, but [have been] thought to be open and subject to change” (p.28). Based on that assumption, “predictions may be neither possible nor useful” (Patterson & Williams, 2002, p. 28). This has been in contrast to arguably more traditional social science research that has remained “limited to confirmation or disconfirmation of prior hypotheses” (Patterson & Williams, 2002, p. 24).

Based on hermeneutical commitments human experience and reality cannot be reduced to isolated concepts (Patterson & Williams, 2002). Reality and human behavior cannot be “decomposed into independent units of basic information that can be

described by multivariate models” (Patterson & Williams, 2002, p. 15). Rather than continuing to approach social science with purely rational, empirical, and objective means through abstraction of the complexities in real-life situations, hermeneutics has opened new possibilities of understanding ‘messy’ social systems (Christopher et al., 2003).

Appropriate. The environment has been constantly changing and because of this conservation work is never finished. People are responding to the environment and changing the context further. By acknowledging through hermeneutics the never ending process of fusing horizons of understanding, conservation of the environment has been a constantly moving target (see Gadamer, 1989). Sustainability and hermeneutical inquiry have both been rightfully conceptualized as processes rather than outcomes (see AtKisson, 2011; Gadamer, 1989). In this study, the processes of collecting and analyzing data were influenced by hermeneutical methods.

Methodology

After the study was designed and draft data collection guides completed, Internal Review Board approval was obtained for the project. A team of four researchers collected, transcribed, and then analyzed textual data. This thesis includes additional analyses by the author (referred elsewhere as the singular ‘researcher’). The researcher was a part of the research team conducting preliminary data analysis as well as the additional analyses presented in this thesis.

Timeline of Recruitment, Data Collection, and Analysis

Recruitment, data collection, and analysis for this project took place over the course of three calendar years. The following list is an overview of steps in the process:

- September 30, 2011 emailed 706 residents through management company's electronic mailing list
- October 7, 2011 mail sent to 71 households of a neighborhood on well water
- October 11, 2011 mail sent to 83 residents of another neighborhood on well water
- October 28, 2011 mail sent to 100 residents of the neighborhood solicited by email on September 30
- November 2, 2011 focus group one
- November 7, 2011 focus group two
- November 17, 2011 focus group three
- December emails sent to contacts for friends in another neighborhood
- January 18, 2012 focus group four
- February 2, 2012 focus group five
- February-May 2012 preliminary analysis
- March 27, 2013 project team meeting about preliminary analysis
- May, 2012 preliminary analysis report
- May-August, 2012 preliminary literature review
- July 8, 2012 flood water river and springs tour
- February 28, 2013 thesis defense, feedback from experts on committee
- March 6, 2013 river and springs tour
- April, 2013 final analysis

Recruitment

The participants in this research were all residents of western Alachua County, living within the Santa Fe River Springshed. Participants were solicited to participate in the five focus groups by a variety of channels that varied by neighborhood. For most of the target neighborhoods, residents were mailed an invitation in October, 2011 to

indicate their interest in participating in the research by emailing the research coordinator. A total of 254 letters were sent inviting residents to participate. A mailer was sent to 83 residents of one neighborhood in the study. Another of the neighborhoods was solicited by mail strategically targeted at 71 that were not on municipally supplied water but who relied on private well water. Another 100 letters were mailed to a neighborhood managed by an external company supplemented by an additional email sent to 706 resident email addresses through the management company's electronic mailing list.

When response rates were low, as with one of the neighborhoods, members of the research team contacted people whom they knew lived in those targeted communities to invite them to participate and/or help the researchers gain access to their neighbors. Those residents who contacted the research team were encouraged to participate in a focus group and bring a neighbor with them. Four of the five focus groups (focus groups numbered one, two, four, and five) had at least one couple in attendance together. A member of the research team personally knew two of the three residents who hosted the focus groups in their homes. Participants of all six focus groups were compensated by complimentary dinner catered by a local restaurant and three free passes donated by a privately owned spring located on the Santa Fe River.

Data Collection

Researchers collected textual data for this thesis in two parts. The first part involved data from five focus group transcripts and responses to open-ended items on a short questionnaire that was completed by focus group participants as part of their pre-group consent form packet. Fifteen telephone interviews made up the second part of data collection. Data from the focus groups and interviews were analyzed and used to

help inform the creation of several marketing campaign mock-ups. The third part of the broader project from which this thesis data was collected involved a pre-test of those marketing materials by a pre-test focus group.

The interview and campaign pre-test focus group analysis is not presented in this thesis. That data was collected as part of the bigger project that involved the development of a springs protection education program designed for residential homeowners. The scope of this thesis has been analyzing the first five focus groups. The researcher paid particular attention to the historical context of the neighborhoods. The personal histories of both the focus group participants and the researcher impacted the researcher's interpretation. Both data collection and analysis adhered to commitments of hermeneutic methods. Data collection and analysis procedures have been detailed below.

Data collected during part one included focus group transcripts and questionnaires completed by participants. The five neighborhoods that participated in the focus groups were selected with a goal of getting representation of three types of residential water users: 1) those supplied by municipal water by Gainesville Regional Utilities, 2) those supplied by Progress Energy Utilities of Alachua, and 3) those who supplied their own well water. The neighborhoods on municipal water were targeted because of their known high levels of past water used (based on municipal water use data). Neighborhoods on well water were selected because of their apparent well-manicured yards on what was known to be fast-draining sandy soils (based on county hydro-geologist recommendation).

These focus groups took place between November 2, 2011 and February 2, 2012. A resident living in the neighborhood from which we sampled for those groups hosted each of the first three focus groups. The last two focus groups took place in the side room of a coffee shop located conveniently near the targeted residents' homes. The last focus group (focus group five) was the only mixed-neighborhood group, including two participants from the neighborhood where the coffee shop was located, while four participants came from a different neighborhood in the study area, and one participant lived adjacent to but not inside of that neighborhood.

At least two researchers, a moderator and a note taker were present at each of the five focus groups. Focus groups one, two, and four had all three researchers in attendance, so one served as additional note taker and observer of those groups. The researcher who authored this thesis was a note taker for the first two groups, missed the third group (due to illness), and moderated the final two (of the first five) focus groups. Midway through each focus group, the researchers showed a short film that discussed information about North Florida springs and called for their conservation generally (see Skiles, Karst Productions, & the Suwannee River Water Management District, 2007).

After each focus group one researcher on the team, the consistent note taker who attended all five of the first focus groups summarized their impressions of both the content of responses as well as process of focus group moderation. These impressions were discussed among the expert team of three researchers, and in accordance with hermeneutic methods, were used to inform subsequent focus group process and follow-up questions (Patterson & Williams, 2002).

Modifications in focus group process included eliminating the use of flip chart notes intended to both recap focus group proceedings towards the end of the groups. Researchers determined groups were not enhanced by reviewing a detailed summary of their prior conversation. Instead, the note takers kept legal pad notes and used emergent themes from the group discussion to prompt further group reflection after the guide questions had been answered. In order to encourage participation from all people in the group, the moderators also spurred dialogue among participants by asking questions such as “does anybody else feel differently?” Increasing the amount of probing questions asked by the moderator (e.g. “what makes you say that?”) was a strategy that helped encourage participants to describe why they felt a certain way.

Another procedural modification was designed to maintain an equal balance of power among participants. Participants were asked answer an ‘icebreaker’ question rather than introduce their background (see Krueger & Casey, 2000). This was intended to prevent residents from framing themselves with their credentials in a way that might discourage equal participation among group members (Krueger & Casey, 2000). The moderators also invited each participant to respond to every question from the guide in order to foster more equal contributions from everyone. Inviting people explicitly was a strategy intended to draw out less assertive participants (Krueger & Casey, 2000). The procedural modifications were consistent with the hermeneutical principle that question guides enable conversation rather than limit dialogue to only those questions (Patterson & Williams, 2002).

Data Analysis

Following the completion of each focus group the audio recordings were transcribed, checked for accuracy, formatted, and uploaded into Nvivo 9 Qualitative

Data Analysis software. After the transcripts were uploaded into the program, the researcher (author of this thesis) completed one round of open coding. During this analysis phase, the researcher read through the focus group transcripts and categorized chunks of data into an increasing list of categories or codes. Codes were created inductively with the goal of expanding the range of codes to capture minute differences in perspectives (Richards, 2009). Throughout the open coding process a detailed audit trail was maintained using the journal memo capability in Nvivo as well as the annotation capabilities of the program (see Bazeley, 2007; Flick, 2009; Richards, 2009).

After the first round of open coding, the process and resulting range of codes was presented and discussed with the note taker who attended all five of the focus groups. A first phase summary report was created to describe the collective focus group themes the researcher felt were most important as well as individual focus group contexts and emergent themes specific to individual groups. In order to describe the groups collectively, several strategies were employed by the researcher. To get a general overview of categories that the researcher most frequently coded, summary reports were generated using the Nvivo software. While the frequency that the researcher categorized data chunks into specific codes did not provide a total picture, this strategy was a starting point that helped her know which themes she perceived in the data and how often.

After reviewing the coding summary report, the researcher began an iterative or back and forth process of reflecting on the five focus groups as a whole as well as within the individual groups from the set of five. The researcher would record ideas

about the meaning of topics raised in all groups as well as themes present in only some of the groups by typing notes into another electronic memo document in Nvivo or by writing hand written notes. The researcher then returned to the focus group transcripts to make sure her new understanding was supported by participant's statements in the transcript. This "filtering process" allowed limited judgments, or prejudices, to be identified and discarded (Crotty, 1998; see Gadamer, 1989). The statements providing evidence to support the new understanding (formed by a fusion of the textual data and the researcher's pre-understanding) were copied and inserted into the preliminary report (see Crotty, 1998; Gadamer, 1989).

The descriptive summary, demographic information, and thematic analysis from the first round report, and the note taker's focus group notes were used by a professional marketer to create mock-ups of advertising campaign materials. The coding report, therefore, influenced the creation of marketing materials. These materials included several different campaign identity logos and signs that were pre-tested in a final sixth focus group, though the analysis of the market testing focus group is out of the scope of this thesis.

After the preliminary analysis of focus group transcripts, the researcher conducted a more in-depth literature review that informed her writing of chapter two of this thesis. The researcher then engaged in another round of data analysis focusing on values, beliefs, norms, and behaviors that helped her better understand the relationships between and among themes in the data. She started chronologically and re-read the focus group transcripts in the order the research team had conducted them while simultaneously listening to the audio recordings. Again, data chunks were coded

by selecting statements made by my participants and dropping them into categories. The researcher kept a textual record of thoughts she had by using Nvivo's annotation tool as well as typing observations and reflections into an electronic memo document in the software.

Another round of analysis involved the researcher recording reflections on the collective and disaggregated parts of the data. She wrote her new understandings of the focus groups collectively (whole) and individually (part) by recording handwritten notes as well as typing into a separate word document. Writing itself was a method of inquiry and analysis-- a method of asking questions of and interpreting the data. The author would refer back to the transcripts as well as the categories she had created in Nvivo. The researcher drafted her findings based on her preliminary understanding, previous literature, notes from the analysis process, preliminary analysis reports, and the focus group data. The process of formulating her new pre-understanding of participants' perspectives of water security, concern about water security, and perceived responsibility for springs health was non-linear, interpretive, and valid inasmuch as the findings are plausible.

Measures of Validation

Lee Cronbach (1982), the creator of a measure of statistical probability commonly used to validate psychometric findings, said "validity is subjective rather than objective: the plausibility of the conclusion is what counts. And plausibility, to twist a cliché, is in the ear of the beholder" (p. 108; see Patterson & Williams, 2002). The measures taken to help readers assess the trustworthiness of this study and the plausibility of the interpretations offered by the researcher have been manifold. The researcher detailed

data collection and analysis methods to provide indicators of the interpretive rigor of this study (see Guba & Lincoln, 2005).

Within the data collection and analysis methods, the audio recording the focus groups as well as consistent note taking was an aspect of the data collection that can be seen as insuring transcript accuracy and bolstering the trustworthiness of the textual data (Flick, 2009; Lincoln & Guba, 1985; Richards, 2009). To maintain transcription consistency, a single person was employed to transcribe the first five focus groups based on explicit transcription guidelines written specifically for transcribing data for this study.

The conventions included transcribing participant statements word for word rather than correcting grammar or tense to afford the opportunity for potentially different subsequent interpretations. Laughter was also recorded as a scene note as researchers thought that was an important element in recording the tone of individual statements and in some cases, the level of agreement by other group members. The length of pauses or other more detailed conventions, however, were not recorded for the sake of time and scope of the larger marketing project. The conventions were intended to help the transcriber avoid selectively recording certain participants' statements, recording statements in systematically different ways that could impact their meaning, or other forms of bias. Upon the transcriber's completion of each focus group transcript, the author of this thesis listened to the audio file while reading the transcript to check its accuracy.

Through the data collection and analysis phase of this research, an audit trail was maintained (Bazeley, 2007; Flick, 2009). During the analysis phase, the researcher

continually referred back to the data to confirm, refine, or deny her interpretations and understanding. The understanding at which the researcher arrived was influenced (and made possible) by her pre-understanding of the issues of water security, the connection between peoples' landscaping behaviors and springs health, and residential homeowners' responsibility for conserving water (see Gadamer, 1989). The understanding was also grounded in the data itself (see Gadamer, 1989). What research participants said in their own words, has been presented to show what influenced the researcher's new understanding (see Richards, 2009).

As another level of validation, the author of this thesis met with members of the research team to discuss the accuracy of her interpretation. Further, the content of this thesis was reviewed by a thesis committee of three academic researchers who assessed methodological rigor as well as the plausibility of findings and conclusions made by the researcher. This work has been presented as only a partial truth intended to sustain a flow of ideas, conversations, and collaborative decisions about water use, values, and conservation (see Guba & Lincoln, 2005). While the researcher has acted in good faith to approach genuine understanding, ultimately, the true test of the validity and value is in the readers' judgment of the insightfulness and utility of these interpretations (Gadamer, 1989; Patterson & Williams, 2002).

Chapter Summary

The theoretical perspective and research methodology used for this study was Hermeneutics, an innovative application to environmental issues and specifically water security. The ontological and epistemological assumptions of hermeneutics have been valuable in helping to diversify the approach to an understanding of environmental behaviors. Following Patterson and Williams' (2002) assessment of hermeneutic

ontology, “rather than seeing reality in terms of a multivariate system of discrete elements (variables), [this study] envisions [residential perceptions of landscape management and springs health] as holistic units” (p. 15). According to this ontological commitment of hermeneutics, because of the importance of context in understanding and interpreting (Patterson & Williams, 2002), broader historical, cultural, and personal contexts have been addressed throughout the interpretation of results presented in this thesis.

The researcher collected data from five focus groups then coded, described, and wrote a preliminary report. The data collected from the focus group questionnaire and transcripts was the only data used for the hermeneutic analysis presented in this thesis. The author of this thesis revisited literature and theory before engaging in another round of coding (axial coding). Finally, a narrative analysis of data chunks pertaining to residential perceptions of their yards, the springs, and perceptions of two prominent themes (scarcity and abundance) was conducted. Focus group results and implications are discussed in the following chapters.

CHAPTER 4 FINDINGS AND DISCUSSION

Introduction

This chapter discusses research findings. Consistent with hermeneutical theory, the chapter begins with a description of the pre-understanding that impacted the project. First, the research team's pre-understanding of the project is described briefly. Next, the researcher describes her horizon of understanding at length. The author's pre-understanding provided the foundation on which the understanding of the focus group data was constructed. Personal, historical factors that influenced her interpretation of data are presented. This personal history charts the course by which the author grew into taking personal responsibility for understanding what is happening to springs and local water security generally. The author's pre-understanding, or horizon of meaning, directed her focus (although somewhat unconsciously at first) to certain aspects of and concepts in the focus group data. Those factors guiding her focus during the analysis process are discussed.

Following the pre-understanding sections, this chapter includes an accounting of important topics discussed by each focus group. Reporting the findings also involved describing the data through the lens of the VBN model. The focus group data and summaries have addressed the research objectives in order to understand participant perspectives on water security, the connection between landscaping and water security, and perceived responsibility for water security. A thematic description of focus group data is followed by a description of participant behaviors as self-reported in a pre-focus group questionnaire (See Appendix A). A summary of participant demographics is presented followed by a summary of findings within the VBN framework. The

researchers' personal reflections on the findings are also presented. These personal reflections were an attempt by the researcher to have a dialogue with the data, to discuss multiple perspectives on a topic participants discussed, and to add an additional dimension of meaning to generate understanding of the data.

Pre-understanding

The research team pre-understanding of the issue influenced the creation of the focus group demographic survey and focus group guide questions (see Appendices A and B). This horizon of understanding was the perspective from which the research team and the author of this thesis started to better understand participant perspectives. Like two people looking at the same sunset in different locations, the researchers and participants began this process with different perspectives of water security, springs health, and personal responsibility. When focus group participants described their horizons, the aspects of the description that were similar or different to the researchers' horizon were recognizable. Aspects of the research team's collective pre-understanding including goals and assumptions, as well as the author's pre-understanding are described below.

Research Team Pre-understanding

Researchers thought residents who had experienced the springs as visitors would think they were amazing and worth saving. The creation of a focus group instrument was guided by a foundational belief that residents who experienced local springs would want to preserve them. Since homeowners (as an aggregate group) are the second largest group of water users in Florida (Borisova & Carriker, 2009; Marella, 2009), researchers felt reducing demand by helping homeowners conserve water was an important piece of the water security puzzle. Researchers thought that residents

within springsheds were responsible for helping to conserve water and would follow best management practices for landscape maintenance to reduce non-point source pollution. Understanding homeowner perspectives could help resource managers communicate how and why people can conserve resources.

Researchers collected data in order to develop a CBSM campaign to encourage landscaping behaviors that would have a reduced impact on springs health.

Researchers originally thought that the participants with documented high water use might be generally concerned about water conservation, but likely were not aware of specific information or the scope of the problem. Residents in high water-use neighborhoods that might lack awareness about the impact of their landscaping practices on local springs were originally targeted. Understanding perspectives and effective communication was assumed to be a valuable way to reduce residential water use and change landscaping behaviors. Researchers were trying to understand residential perspectives to know how to speak to other residents in a way they would be receptive.

Reaching that high water use target audience would allow researchers to better understand what could be communicated to them to motivate pro-environmental landscaping behaviors. Participants were thought to be potentially more likely to landscape in 'springs friendly' ways (practices that would reduce the impact on springs health) if they learned their water use and landscaping might have an impact on spring flow rates and water quality. Researchers were also interested in what participants already did and could do in the future to conserve water and reduce runoff on their landscapes. The research questions were intended to explore participants' awareness

of water security issues and to better understand reasons underlying their landscaping behaviors. Questions were designed to foster conversation among the focus group participants about the benefits and barriers to conserving water as well as awareness of best management practices for residential landscape management. Researchers wanted to see which user groups did participants think were responsible for water conservation and what was normal for their neighborhood.

Another preliminary goal of the research was to assess what these participants thought should be done to protect the springs. Researchers also thought that by understanding these participants' opinions after watching a springs protection video, they could develop marketing materials for a behavior change campaign. The analysis of video responses was not within the scope of this thesis, but the premise that understanding perceptions of these residents could help develop a behavior change campaign to increase conservation behaviors influenced the questions analyzed for this project. Without information about specific threats to springs and how their behaviors could be responsible for the current health of the springs, researchers thought that participants would probably not feel personally responsible for conserving springs.

Researcher Pre-Understanding

Having grown up in Gainesville I didn't realize how special springs were until I moved to North Carolina for college. It was surprising to me that not only did some people never experience jumping into cool, clear spring water, but most people did not even know what a spring was. I took it upon myself to explain what springs were, how beautiful they looked, and how spectacular they felt. One of my earliest memories involved a spring, and I would recount it fondly and in great detail to my friends. Now, I will recount it once more: on a hot summer day about a quarter century ago, I found

myself walking down a sun-speckled footpath that led me to a deep appreciation for North Florida's springs.

Love for springs

Descending through towering oak trees I peered up at substantial branches draped in silver beards of Spanish moss floating on the diagonal of an occasional breeze. Toddling down deeper in the cool shade, the forest floor seemed to be covered with thousands of cypress knees flowing up from the increasingly moist earth like wooden dollops of rain frozen the exact moment after smacking the surface of a puddle. My brother was the only family member with me. He and his friend raced in front of us down the meandering line of bare dirt that traced a small, serpentine, rolling ridge. Thick mats of dark leaves and the feathery vestiges of regal evergreen foliage lay on both sides of the narrow walkway. It was clear the trail was hard-packed by many bare feet and sandals before us. As my brother hurdled a muddy low spot far ahead of us the woman next to my three-year old frame told me to pick up the corner of my towel that dragged across the rich brown soil.

Puddles and pockets of dark leaves, and standing pools of tea-colored water increased in prevalence and size as we approached a sunny clearing in the distance. Dianne called sweetly to her son and my brother for them to wait for us before jumping in. She helped me traverse the dark mud puddle and shortly thereafter we emerged from the forest. We arrived at the bank of our spring. The sun shone brightly on the grassy slope, glistened off the beige sand, and pierced down through a writhing boil subtly pushing up the surface of the large, clear, deep pool before us. In the blue-green water, light rippled, wiggling in darting webs across thick noodles of flowing, snake-like grasses. When the grasses would part, they would reveal a crevasse through massive

walls of white dimpled stones deep on the bottom, down into the darkness of the watery underworld.

Changes over time

Looking back on that memory, the luxury of taking the beauty of Poe Springs for granted was short lived. In the years following that moment, burned into my memory probably as one of my first adventures without my parents, I frequented Poe Springs close to every summer. Few of my glimpses of the spring over time involved only a handful of people; I remember crowds, rowdy boys trampling up a clay bank to punch out fistfuls of gray mud balls to throw at each other, clouding the cool water. I remember a rope swing from a tall gnarled oak leaning over the Santa Fe River at the end of the clear spring run that the even rowdier, older boys would careen off of into the warm, sweet tea colored river water. The evolution of the built environment around the spring happened drastically in my memory. First the boardwalk separated my feet from the ground on the path to Poe, then a concrete wall and stairs held back the bank, and pavilions. I saw how fast things changed.

The springs have not been the only things changing quickly; I too have changed. After earning my high school diploma in Gainesville, I left Florida to for a small college in North Carolina where I double majored in Peace & Conflict Studies and Psychology. After I graduated, I enrolled in a transformative professional development program at the University of Florida (UF). UF's Natural Resource Leadership Institute (NRLI) is an intensive program for environmental professionals to learn conflict management techniques pertaining to contentious natural resource issues throughout the state of Florida. The eight-month long program opened my eyes to myriad controversial, often political issues around the state, many involving water. I realized environmental issues

are invariably social issues. I knew I wanted to dedicate my graduate studies to helping ameliorate local social-ecological problems.

During this same period of time, I inherited two kayaks from a family friend and began going on semi-regular day trips to the Santa Fe River. I paid close attention to the water levels and clarity, the wildlife (usually negatively correlated to the levels of human noise), the amount of people, and how much garbage I would pluck out and toss in the nose of my boat. I saw springs that were being loved to death, and I watched as water levels dropped steadily over almost half a decade of drought. I noticed how different some of the springs looked. Many of the once prolific wide-blade grasses were coated with a slimy brown film.

I continued to go, to bear witness, to pull cans and bottles and bags and Styrofoam out of the water, and to expose more friends to my regular river route. On one of the last trips I took before collecting focus group data, I noticed that the tea-colored tannic water of the Santa Fe River was clear. I realized that the water had been so low in the river it had been fed exclusively by clear spring water. For the first time I could see to the bottom of the riverbed. It was clear that levels were critically low. Jumping into the crystal clear, seventy-two degree spring water on that hot day reminded me, as always, the springs have been worth saving.

Landscaping

During this period of time I lived in a detached, single family home with a yard that I did not irrigate. I preferred the complexity of different volunteer groundcovers to grass that needed my time and attention. I enjoyed flowers year round by allowing plants that didn't care to grow in my landscape. I would periodically arrange my landscape by trimming bushes, but my only criteria for removing plants was whether

they were invasive, grew sharp spines but no flowers, or would burden me with their hitchhiking seeds.

Research

When approached to intern with the Alachua County Department of Environmental Protection Water Conservation Coordinator, I was excited at the prospect of increasing my level of natural resource stewardship beyond my occasional, casual, one-person river clean up. I was excited to participate on this team of researchers for several other reasons. I had entered into graduate school because I genuinely wanted to make a positive impact on the environment through researching people and I thought this project was an opportunity for me to help do just that. I was thrilled that a county agency was so interested in conducting research to help conserve and protect springs.

At that point, the goals that we discussed included targeting high water users to better understand how they related to the springs (if at all) and how they viewed the connection between their landscape management and springs health. In the fall of 2011, I began by helping create research instruments and an application for Internal Review Board approval. By spring semester 2012, I was coordinating data collection and conducted one round of analysis to inform the development of a Community-Based Social Marketing Campaign.

Through the first phase of the analysis process, I was both immersing myself in qualitative theory, qualitative data analysis, and teaching myself Nvivo 9. This thesis has therefore represented both a starting point and learning process into the world of qualitative research. Through the dialogues I had with my research team, mentors,

other social researchers engaged with qualitative data analysis, and staff people at Nvivo's software developer, QSR, I learned by doing the first round of open coding.

After the first phase of the project, I returned to literature, theory, and information about the historical, social, and political context. In short, I became more aware of the fore-structure of understanding or horizon of meaning from which I approached the first phase of analysis (see Gadamer, 1989; Packer & Addison, 1989). I reflected how that shifted as my horizon fused with the literature I reviewed in previous chapters (Gadamer, 1989; Patterson & Williams, 2002). The literature helped me understand contextual factors that may have influenced participants' responses in the focus groups (Patterson & Williams, 2002).

Through this process I was also able to better understand my personal history as well as epistemological and ontological positions (Patterson & Williams, 2002). I have realized I have viewed the possibility of attainable and objective laws of human behavior as highly unlikely (Patterson & Williams, 2002). I realized I think that all research is influenced by researcher bias, as well as historical, social, political, and economic contextual factors (Crotty, 1998; Patterson & Williams, 2002). In line with the hermeneutical perspective outlined by Patterson & Williams (2002), I think these contextual influences have been unavoidable. In my mind the problem is not that studies and their findings have not been objective and neutral; the problem is the hypocrisy of proclaiming objective neutrality of methods and findings.

I have gained a greater appreciation for the realistic and practical considerations afforded by hermeneutical theory and methods. I was excited about the opportunity to further the understanding of these participants' perspectives by analyzing data using

hermeneutics. After one cycle of analysis of the data that was used to inform mock-up marketing materials for a campaign, I wanted to analyze the data again and see what more could be illuminated from a deeper dive into the data.

Urgency

Just over two decades since I ventured down that footpath and swam against a powerful current of water boiling up from the deep crack in the limestone with only my brother, his friend Robbie, and Robbie's mom, Poe Springs had become drastically different. In a statement released by the Alachua County Department of Environmental Protection (ACDEP) on May 17, 2012, record low flow rates had been recorded. In a local news interview, an ACDEP representative stated Poe Springs could possibly stop flowing in the near future (Ryan, 2012). The urgency of this research was particularly salient in my mind when I read that Poe Springs was flowing at unprecedented low rates. It was predicted that it may stop flowing altogether and that was equal parts sad and scary to me. It felt like I was losing a part of my childhood. I mourned the loss of sharing that magical, beautiful swimming hole with friends and relatives in the future.

I was also scared because I have believed that springs are windows into the aquifer that is the source of our drinking water. If our springs start becoming cesspools of polluted water, so too does our drinking water; if our springs dry up, so too could our drinking water. I was also worried that a variety of species and delicate ecological systems may collapse as their spring and riverine environments dried up. I worried that the potential loss of biodiversity could negatively impact our own capacity to adapt to changes in the environment. On top of water quantity issues that threatened Poe Springs, I recognized other problems. I saw aquatic invasive plants like water hyacinth and at times, thick mats of algae, caused by nutrients from septic systems, runoff, or

other unknown causes. I noticed many areas on the Santa Fe River smelled very much like excrement.

Rapid changes

Shortly after that crisis-level situation of low flows in Poe Springs, two tropical storms dumped a significant amount of water that ended up flooding the Santa Fe River and several North Western Florida Counties. Somewhat fortunately, tropical storms Beryl and then Debbi contributed to significant flooding of the Santa Fe River by the beginning of July, 2012. The huge amount of rain flushed many rivers in North Florida, and some did help recharge aquifers and keep the springs flowing (Swirko, 2012; Wetherington, 2013).

My horizon of understanding the Santa Fe River expanded when I kayaked on the week after the floodwaters had crested. For the first time in my life, I was able to Kayak down a significantly longer section of the river because the current was much faster than I had ever experienced. I was able to see where many more springs were located though this time they were mostly covered by tannic floodwaters. I saw how quickly water levels could change and my perspective began to shift. While the lasting effects of the flooding remain to be seen, the one thing I concluded was that we can depend on things always changing.

Personal responsibility

Things have changed so fast, that I believe it is important to learn how to respond to changes ever more effectively and quickly. I think it is important to understand ourselves deeply and think critically about how we perceive and adapt to changing conditions. I think the goal is not to find one magical natural law of human behavior, but

to start a perpetual dialogue about how we can understand these changes, how we influence them, and how we might evolve to live better in spite (or because) of them.

Through this work, I have hoped to further the understanding of how we think about our water and how we can help each other conserve for a more sustainable future. Ideally, this thesis will not only inform and provide insight, but also inspire further critical thinking and questions about how we value and use water, one of our most precious resources. I believe that every moment, every person changes the world. It is up to us to, as Gandhi charged, “be the change we wish to see in the world.”

Focus Group Discussion

Below is a description of all of the focus groups analyzed for this thesis. The focus group context, overview of neighborhood characteristics, and historical aspects of the neighborhoods in which participants resided that may have impacted the focus group discussion were reported. A description of major themes discussed by each group has been included. The researchers’ personal reflections on what themes might mean and questions that arose, inspired by participants’ responses, have also been provided.

Overall context. The five focus groups analyzed for this thesis were conducted between November 2, 2011 and February 2, 2012 (see Figure 4-1 at the end of the chapter). All of the groups took place between 6:30 P.M. and 8:30 P.M. on weeknights with dinner provided by the research team. The first three focus groups took place inside the homes of residents who also participated in that focus group. The last two focus groups took place in a coffee shop that was located in a central location conveniently near the homes of the participants targeted for those groups. At least two members of the research team were present at each of the five groups. Focus groups

number one through four were comprised of residents from one target neighborhood, while focus group five had participants located in two different neighborhoods, with one participant living adjacent to but not inside of one of the neighborhoods.

Neighborhood characteristics. While all of the participants resided in areas known or thought to have high average water use, each of the neighborhoods had different characteristics. Furthermore, each group was comprised of participants with a variety of occupations and years of experience living in their current home and in the Gainesville, Florida area. Summaries of neighborhood characteristics including homeowner's association status and water supply source as well as average participant demographics are listed below in Table 4-1.

Focus Group One

Context. Focus group one (FG1) took place in a neighborhood built earlier than all of the other focus group neighborhoods. The seven participants of this group had the oldest average age ($m= 70$ years) and had lived in the Gainesville area for more years on average ($m= 50$ years) than participants of all the focus groups (see Table 4-1). Three participants were women. Four of the participants of FG1 indicated they were retired while the other three participants were employed in construction, computer systems, and engineering. All of the residents of the FG1 neighborhood received water from their own wells and had septic tanks for their wastewater.

Neighborhood history. The neighborhood in which FG1 participants lived attracted residents who were interested in living in large homes with large lots but without the prestige of other neighborhoods. Participants discussed the housing options that met the criteria of having large lots and homes when the neighborhood was first being developed and when many of them bought their homes. They discussed their

interest in buying into that neighborhood because it was apparently less prestigious than other neighborhoods that were being developed at that time (see Norms section below). The neighborhood history influenced how these participants perceived and discussed landscaping in their neighborhood, water security, and their responsibility for water security.

HOA status. While the FG1 neighborhood did have a homeowners association the deed restrictions were seldom enforced according to participants and they were fairly accommodating of individual liberties. During FG1 participants joked that they could keep livestock in their yards.

Participant 1, female, age 52: I think that we're more tolerant. You know if someone's working on their car out front, we're not calling the Homeowner's Association.

Participant 4, female, age 70: That's right.

Participant 1: We're also a lot more tolerant to the individuality of our neighbors.

Participant 4: Because compliance isn't our thing.

Participant 2, male, age 61: We have neighborhood rules sometimes.

Participant 1: We have deed restrictions but they're very limited. No hogs.

Participant 6, male, age 79: You can have a horse.

Participant 1: You can have a horse, but not a hog.

Because of their limited deed restrictions, these participants were able to maintain their landscapes to a wider range of aesthetics than were demanded by other stricter neighborhood covenants. For these participants, however, that did not mean they were in greater control of their landscape maintenance. More participants in this neighborhood hired contractors to perform landscape services than any other focus

group (see Table 4-1). Because of this, the specific landscaping practices performed on their yards were somewhat out of their control.

Concern. These participants expressed their concern over future water in divergent ways. Some participants knew local people whose wells were compromised during drought.

Participant 1, female, age 52: Just past Jonesville [less than ten miles away] they actually, during the drought, got sand in their well. We've heard of neighbors in our neighborhood that had sand in their well when the drought was really bad and the water table was low. Never happened to us, but it made us very conscious.

Another participant brought up water bottling when discussing why he was 'very definitely worried' we won't have as much water as we do now.

Participant 5, male, age 82: They're sellin' it. That water's being taking out and not going back out into the environment, and one of the things that the country's going to be concerned with is lack of water.

Personal reflections on water bottling. Water bottling is a complex issue with many different perspectives. On one hand, funding for water protection in Florida has been drastically reduced; in contrast, private water bottlers have capital to invest in monitoring water quantity and quality, and have a vested economic interest in maintaining the sustainability of the resource. In this respect, water bottlers can invest in better understanding and potentially protecting the resource.

I also think it's interesting that bottling was mentioned by so many participants as a causal factor in water scarcity—bottling seems to be a visible symbol of water scarcity. It's hard to know how to gauge the impact of 2,000 gallons of water used by a household. It is easy to go to a grocery or big-box store and see a wall with hundreds of bottles of water. Perhaps it is difficult for people to comprehend the scale of their individual choices when dealing with water. Artist and activist Chris Jordan (2006) has

addressed the collective impact of what he called the “unconscious collective choices.” Jordan (2006) By visually depicting two million plastic bottles, the amount Americans unconsciously use without a second thought every five minute (Jordan, 2006).

I also think that readily available bottled water enables people to not think about where their water comes from. On a camping or car trip, I try to bring my own reusable bottles full of filtered Gainesville tap water. Anytime I do anything active, especially outdoors in Florida, one of the first things I think about is how much water I will need. Dehydration and heat stroke can be deadly. I don't know how many people know how much water they need or think very much about where their next glass of water will come from. In contrast to the micro-level concern about water supply for one activity discussed here (water bottling), participants of this focus group seemed to discuss their concern about water issues on a much larger scale.

Scales of concern. A global frame was used by one participant to discuss their concern that water security was a worrisome issue. This participant discussed scarcity on a global scale relative to local abundance.

Participant 2, male, age 61: The Chinese are proposing to divert the Yangtze River for 800 miles to provide water to where the people are. And worldwide, they have that trend here, too, as people are moving to cities, the concentration of people, with a certain amount of political power, so that they will need water, and they will get from whatever it is. Here we're blessed with a lot of water.... we have a lot of water. It would take a while for us to get used to not having water by just pushing a pipe into the ground.

Personal reflections on global-scale perspectives. The scale at which someone perceived socio-ecological issues may provide insight about how to frame conservation messages. A global perspective of interconnectedness could indicate a person's comprehensive understanding of large social and ecological systems. Being

able to think about problems on this scale, however, may also serve to desensitize someone from their own responsibility. Perceiving the existence of huge, complex, interconnected social and ecological systems may overwhelm an individual's perception of their own, albeit small, daily impact.

Concern as a multifaceted issue. Regardless of the scale at which these participants expressed their concern over future water security, this group indicated that they understood water security to be a complex, multifaceted issue. In response to the first question asked by the focus group facilitator, "do you ever worry that we won't have as much water as we do now?", participants discussed many issues. The breadth of participant understanding expressed in response to this question ranged from technological innovations to conserve water, political issues at multiple scales (district, regional, and state levels), saltwater intrusion into groundwater, development, tourism, water used by the mining industry, and the relative impact of residential use to other groups of water users.

Connectedness. When asked if they thought their landscaping behaviors had an impact on the springs even though they lived far away from them, these participants indicated their practices were connected to water quality by varying degrees. First, participants who perceived a direct connection said:

Participant 1, female, age 52: I personally absolutely think that we do. I think that every ounce of fertilizer that people put in their yards end up in the aquifer and that effects our springs....where does it go? Where can it possibly go? The water is so close to our surface that it has to end up somewhere. Our septic takes have to, hopefully they perk, but if they don't, it has to end up somewhere.

Participant 7, female, age 73: That bothers me worse than anything.

Moderator: Anybody else think that your actions here in Gainesville have an impact 20 or 30 miles away?

Participant 4, female, age 70: Well absolutely.

Subsequent male participants indicated doubt that their behaviors impacted the health of local water directly, however. The following statements in the conversation sparked by this question reflect how these participants felt there was enough spring water that residential behaviors did not impact springs health.

Participant 5, male, age 82: It's a lot of water underneath [us], a tremendous amount. I wish I knew which way it flows; if it flows north or south or east or west? Is there more than one underground river so to speak? Ten miles away there's another one? It would be interesting to me to know what's going on.

Participant 6, male, age 79: I don't think so.... I think the estimates about 8 billion gallons from the springs daily....Silver Springs is dumping enough water to water all the lawns in this part of the state. So, can you channel that? It's just being wasted.

Moderator: Anybody else?

Participant 3, male, age 71: Locally, pretty much all the water that we remove from the aquifer is returned to it....Whether you're watering your lawn or using a septic tank, it's ending up that way.... Industry and products are our big makers of nitrates. So it's all around us. Still, we produce a little bit ourselves.... Luckily it's not too bad on health, but of course the fertilizers impact on creatures, plants, [and] algae.

These participants' opinions about the degree their behaviors impacted springs health may have been a reflection of their professional backgrounds as scientists and engineers.

Faith in science and technology. This group of people included several retired engineers and there was much discussion about the potential solutions from scientific innovation and new water technologies. They seemed to understand that industrial use impacted springs health negatively by producing nitrates, while believing that technological innovation would provide solutions to water problems.

One participant discussed potential water savings from industrial production or power plants.

Participant 6, male, age 79: Coming from industry, I think the cool or flush equipment and so on... that can [help] from an engineering side in my option, but it may need some additional research.

Desalinization plants were talked about as a potential solution to ensure adequate water supply for the future if there was the political will to support investment in research and development.

Participant 1, female, age 52: It's always baffled me that Florida would not do research or any kind of R [research] and D [development] at all on desalinization plants where...the Middle East uses...desalinization plants primarily as their water source. Where our solutions, as in South Florida where they don't have as much fresh water, their solution for providing water is to pump it from the Suwannee River, at least that's what I've read. Why is there not any kind of research or forward looking planning for possibly using the desalinization plants to help provide water for population?

Personal reflections on technological innovation and politics. These participants seemed to have faith in science but doubts about the political system as mode for solving water security problems. This was striking to me because I personally think no matter how effective or efficient a technological innovation can be demonstrated to be, the choice to invest and use the technology is ultimately a social and political one. Physical science may be able to demonstrate the efficacy of the technology, but whether a technology is used, ignored, or discarded gets worked out within political spheres. The political cynicism of these participants (see below) doesn't necessarily make me hopeful for my future perspective on political decision-making. There have been significant delays in the political decision-making necessary to live within the physical means of the Earth (see Club of Rome, n.d.).

Political cynicism. Participants of this focus group also addressed other political issues related to their sense of control over water security. In response to questions about future threats to water security and how springs might be protected, participants discussed political issues and the conflict between water management districts as well as individual counties.

Participant 6, male, age 79: A county like Alachua really doesn't have much muscle on the state legislature....and to add one thing... I don't think that it should be resolved in individual counties. I think that there needs to be some sort of master plan.... Other counties, those are going to conflict. To me, this is bigger than [individual counties]. The State, should be taking the leadership... But... when politics are involved, that breaks it up so I'm real concerned that in the next five to 10 years you won't get any kind of group that agrees.

This political conflict was tied to a general sense of an external locus of control; these participants were knowledgeable of regional-scale political conflict that had more of an impact than their individual landscaping and water use behaviors.

Participant 4, female, age 70: [I'm] concern[ed] about the political issues between the two water districts. Philosophically they are different....I think that I am a good steward. However, I am very skeptical about the whole political system and are there people as conscientious as many of us are?

This participant also brought up being frustrated by learning that water was being taken from the area by another municipality.

Participant 4, female, age 70: The water is going to Jacksonville now. And then...what I heard was that Jacksonville may not be utilizing the water well, that they may be using that water in a way in which they don't have to. They're using prime water when they could use grey water. So, that bothers me.

Other issues these participants linked politics to growth and development.

Participant 7, female, age 73: I think that it's terrible the way that Florida is allowing all of these people to come in and build these condominiums where thousands are people sucking up water! Where's it coming from? Where's it going? Down the toilet. It's terrible. I really think, [a south Florida County], somehow ruled that an acre can only support so many people and

after that you don't have any more growth. And it's a way to control that... I don't know if can do it all over the state, I doubt it, because of politics and so forth, but it made sense to me.

Unregulated pumping of groundwater, even in times of drought, was also discussed as a political issue threatening water security and the springs.

Participant 1, female, age 52: I was at Poe last month and the water was very low at Poe. And like what you said, they're pumping the water out. I don't know how much that contributes to the water levels, but I don't understand why we would allow that when we're already experiencing the low water.

Participant 2, male, age 61: Yeah, you know, there's no qualms about it. I mean it's just, somebody does a permit, and it's approved in a heartbeat.

While less explicitly political, another large-scale issue this group discussed were the effects of current construction practices on residential irrigation practices.

Participant 1, female, age 52: In the [local planned communities] of the world... what they do is they go in, they cut down all the trees, dig up all the natural plants, they pour a bunch of builders sand on top, then they put sod down and a bunch of shrubs that are not indigenous to us. And then they water it for three months to try to get it to stay. That's ridiculous.

Participant 2, male, 61: And builder's sand doesn't hold water and it does not support lawns... so if it's not raining, it needs water. And that's horrible.

Responsibility. Because of these relatively larger political issues, these participants focused less on individual conservation behaviors and the personal steps they take to conserve water. These participants expressed a feeling that they were not part of the problem. One participant stated residents were easy targets for politicians to regulate, which seemed to reflect the sentiment residents were not the most responsible for water issues.

Participant 6, male, age 79: The easiest person to regulate is the individual homeowners and they're not the major producers of any of this problem.

While this assertion was disputed by another group member, it seemed this group of participants felt they were not the cause of water insecurity.

Participant 4, female, age 70: I think that I am a good steward.

Participant 6, male, age 79: We just put a new dishwasher in and it uses maybe a third to a half of what the old one did.

Participant 1, female, age 52: We don't water our yard at all and it's just as green as everybody else's. So we try to do our part with water conservation.

Participant 6, male, age 79: It's an automatic [to conserve water] because we have to turn that pump on. If more [well] water is pumping, the electric bill goes up.... I don't use [my irrigation system] when it rains.

Personal reflections on relative water use comparison. Looking towards the bigger water consumers for a larger water savings is important. Management of resources may be optimized by focusing attention on those who use more water (see Gladwell, 2007). Blaming other people or justifying one's own overuse is an unhelpful distraction, though. Both large water users like agricultural producers and industries and individual homeowners need to conserve more water. The person who is truly easiest to regulate is one's self.

There are many barriers to individual water conservation behaviors. Psychologically, for example, it is really difficult to admit that you participate in environmental degradation and cause lowered groundwater levels. I think it is a natural phenomenon to perceive one's own innocence. To think that residents are partly responsible for water pollution, endangerment and loss of plant and animal species, dry river sections, sinkholes, or dead springs is difficult. Claiming responsibility for environmental devastation is also claiming the responsibility to change. How can researchers, managers, and marketers communicate individual impact and responsibility to conserve water?

Irrigation behavior. Based on self-reported questionnaire responses about landscaping behaviors, this group as a whole irrigated more frequently than other focus groups. This could have been attributed to the fact that this first group occurred before a shift in irrigation restrictions from two days per week to one day per week. Three participants in this group irrigated twice a week, the maximum number of days per week to irrigate allowable by law at the time of the focus group. There has not been, however, a minimum amount of days residents must water their yards. Just because more frequent irrigation is allowed doesn't necessarily mean plants need more water. A comparative assessment of irrigation frequency was not possible due to the other focus groups taking place after the change in regulatory period. Regardless of how frequently these participants irrigated compared to other groups, these participants did not feel pressure from their neighbors to irrigate yet they turned on their sprinklers every day the law allowed.

Norms. FG1 described having few social norms regarding landscape aesthetics. They considered themselves and their neighbors to be less concerned with prestigious looking yards than neighborhoods immediately around them.

Participant 4, female, age 70: I think that this neighborhood is a little A typical, I mean I walk the neighborhood and the older sections, and they were all built, our house was '72 it was one of the newer ones in the street over. Nobody has, I can't think of the word, high style landscaping. Many of us have someone come mow and trim our yards, but I don't think we see the showcase kind of yards that require extra water. You know for the plants, a lot of us have a lot of natural, native plants and so the style here is that of natives.

They also contrasted their landscaping with other planned developments. Participants discussed how they were more tolerant of their neighbors' behaviors than in other

neighborhoods with deed restrictions, but also more “resistant to compliance” with association rules.

Participant 4, female, age 70: Philosophically, when we moved out here (and many of us have been out here a considerable amount of time) we chose to be here rather than the country club.... We were like the rebels that came out here. The ones that didn't want to be in the more manicured landscaped subdivision.

Participant 2, male, age 61: They [the country club neighbors] had the prestige and this didn't...

Participant 4: We never have had a sign that distinguishes us....It's a personality....It's like the hippies versus the university type person versus the successful business person that had to have more prestige.... But we're probably more resistant to compliance than when you go to [the planned community where FG4 took place], you agree to be a part of that community and comply with the association.

Participant 1, female, age 52: We're also a lot more tolerant to the individuality of our neighbors.

Participant 4, female, age 70: Because compliance isn't our thing.

Subjective norms. This group expressed feeling less pressure from their neighbors to maintain a certain landscape aesthetic than they assumed residents of other planned communities felt. The subjective norm they described, or what they felt their neighbors expected of them, was to respect their freedom to maintain their landscapes as they saw fit. Speaking to neighbors about their irrigation practices, therefore, was not something participants discussed, even when they observed their neighbors wasting water.

Participant 1, female, age 52: We know when people are watering up this hill; it enters our swale and crosses our driveway and heads down towards the, because we're on clay, most of that water ends up in runoff in that sewer down at the bottom. A whole bunch of it does because it comes right through our yard. We have a drainage swale right across from our yard....So as it comes down that hill from [our neighbors' yard]...It goes right past our front door, right across our driveway...We're always amazed

because we're like: Could they stop watering? Clearly its helping our yard but it's kind of a waste.

FG1 summary. Overall, this group of participants was concerned about Florida's water security and was aware of both personal and regional consequences of wasting water on residential landscapes. On some level these participants were aware their landscapes were connected to the health of the broader environment. The relative impact of their behaviors on springs health and water security, however, was overshadowed by other, larger forces. This group of participants felt there were individual steps they could take to decrease their water consumption, but felt there were larger-scale political issues affecting water security over which they had little control.

Focus Group Two

Context. Focus group two (FG2) was different from FG1 as it took place in one of the newest neighborhoods that participated in this study. Residents in this more recently constructed neighborhood had the lowest average time spent in their current homes (m= 3 years) of any focus group, they also had spent the least amount of time in the Gainesville area (m= 15 years) of any of the focus groups (see Table 4-1). Regardless of the time spent in the area, these participants had the second oldest average age (m= 64 years) of all the focus groups and three of the participants indicated they were retired. The remaining participants included one stay-at-home mom, an artist, and a university employee. Four participants were female while only two participants were male.

Neighborhood history. Neighborhood characteristics were different from FG1 in several ways. First, this neighborhood was the most recently constructed while the neighborhood of FG1 was one of the oldest. All of the homes in this neighborhood were

on municipally supplied water and their wastewater was treated by the city sewer system. This neighborhood has also had an active homeowner's association that would have contacted homeowners if their yards do not meet the aesthetic standards required by their neighborhood bylaws. At least one of the participants of this focus group was on the HOA Board and had actively transitioned their yard from a manicured turfgrass monoculture, typical of homes in the neighborhood, to a more diverse and more xeriscape-type yard of mulched beds and plants. This individual would speak with neighbors about alternative landscaping strategies rather than fine a resident for having brown spots on their lawn. This participant could also show neighbors what alternatives might look like and speak to the transition time between initially making landscape changes and the time needed for plants to become well-established.

Neighbors as information network. The participants in this focus group discussed talking with their neighbors about landscaping more than any other neighborhood represented in this study. These residents, many newer to the area, seemed to rely on each other for landscaping information and had heard from UF Cooperative Extension about landscaping best management practices for water conservation. They discussed water security on a larger, more global scale than FG1, framing their concern about future water security in terms of climate change and food security.

Participant 12, male, age 54: I think it's important to note that the amount of water on the planet is pretty much finite, but it is changing in its sort of composition from having what used to be an abundance of fresh water to now too little fresh water and too much salt water as the ice caps melt and fresh water sort of bleeds into the ocean where the salinity makes it unusable for human kind.

Participant 9, female, age 68: I certainly do worry [that in the future we won't have as much water as we do now]....I know that the groundwater is

getting lower and lower, and we need that. I know that the summers are getting hotter and drier. And the winters too. I've only been in Florida for three years, but from my experience that's been happening. Water is a daily necessity. I'm a gardener and I grow a lot of edible plants, which you do need to water, so I'm worried about... food supplies, not for me, but in general.

Personal reflections on scale and concern. This has been called the first generation of humans who have fully realized there are physical limits to the natural resources on which our lives depend (see Gayeton & Howard-Gayeton, n.d.) I agree, the amount of freshwater on the planet is basically finite. Evoking grand-scale narratives about global climate change and water running into the ocean could have divergent impacts on peoples' behavior. In one sense, large scale environmental changes dissuade people from acknowledging the impact that individuals have and lessen their responsibility to change their behavior to reduce their negative impact. From another point of view, climate is changing and we need to adapt as a species in order to survive. Regardless of our control over the causes or severity of impacts, we still need to understand more, adapt, and evolve.

Irrigation waste. These participants reported that in their neighborhood, conserving water on their landscapes may not be the norm. Participants said they were upset when they saw neighbors wasting irrigation water.

Participant 8, female, age 76: When participant 9 and I walk in the mornings, we've noticed a lot of times people running their irrigation systems and it's just rained or it is raining, or the wind...blowing, or they're doing it in the middle of the day in the hot sun and that's just stupid. It's wasteful.

Participant 13, female, age 36: It frustrates me...we have a neighbor that just has an automatic sprinkler, and it's raining and she's sprinkling. Or it just rained yesterday and she's sprinkling. And I think it's because she doesn't know how to set the sprinklers right. That's another issue. My husband tells me, 'well, it's her water bill.' But it's wasting water!

Personal reflections on money as a motivator for behavior change. These comments raise the issue about whether money is really a motivator for behavior change. Do people who use many thousands of gallons of water to irrigate their lawns really care about saving money? I think that it is clear people who use several thousand gallons of water per month on their landscapes are fighting to protect and maintain their plants. Once people have invested in their neighborhood, turfgrass, and landscape aesthetic, they would have to spend more money to replace their dead landscape than they would to pay their monthly water bill. Paying more money to use more water may seem less costly than replacing their lawn and plants. They either don't see or don't care about the impacts of their water use beyond their property lines.

Norms. Several participants indicated how social norms of landscape aesthetics were active in this neighborhood, however. While transitioning from turfgrass to mulched plant beds, for example, some neighbors referred to one participant's home as "the mulch house." Another participant who loved their rain barrels, echoed social norms of landscaping existed in this neighborhood by expressing she felt pressure from neighbors because she had rain barrels.

Participant 13, female, age 36: we do have rain barrels, which I love. And it was built to be able to water my plants with rain water. It's a really great feeling, and I encourage to try and get the neighbors to do it, some of them think we're weird, but you know, I don't mind I think it's great... and I have two young kids, and I make them wash, I put a bucket in there and bathe them with the buckets [instead of] filling up the whole tub with water, having the water run constantly, we fill up the bucket and we do that because I think that it saves a ton of water.... If you care in Florida I think it's frustrating.... People look at you like you have three heads sometimes here... you know, [about] the rain barrels, 'oh, why do you have those?'... to be able to water my plants with rain water..

Personal reflections on children impacting water use, conservation practices. Participant 13 indicated having young children and stirred up some

interesting and conflicting ideas about parents' conservation behaviors. On one hand, I can see how having children would make me feel like I wanted to do everything in my power to make the world they inherit as good as it can be. On the other hand, I expect raising kids is like the adage sprinting to catch up. There are likely many times when parental decision-making revolves less around what is the least resource-consumptive behavior for the future of children and is influenced more by immediate needs and immediate convenience because of time and resource constraints. Teaching conservation behaviors to children did not come up in the first focus group.

Common problems. These participants' stories about their alternative landscaping and rain barrels reflected that neighbors of these participants were not used to the water conserving landscape practices of mulching and collecting rainwater. While participants felt like few other people in their neighborhood were conservation-minded, one participant expressed that her neighbors were relatively tolerant of aesthetically unsatisfactory turfgrass because everyone had problems with their grass.

Participant 13, female, age 36: it's a constant topic of conversation, is this grass, and I don't understand why we're having this conversation all the time. It's like, recently, our backyard has so much weeds and things like that, so we thought maybe we should dig it all up and try to plant something more native. Like we were told, centipede grass would work. So, we tried that. And you know, where the grass wasn't growing, it still didn't grow. Even with the new soil, it still didn't grow. So, we're like, I don't know, maybe grass isn't supposed to grow in those places at all... it's a constant battle I feel like with this grass.

Even those that preferred turfgrass over mulched beds realized that grass was not meant to survive in certain places in their yards and they had been transitioning towards more beds.

Participant 12, male, age 54: Still the St. Augustine grass kind of guy. I convert probably 100 to 200 square feet a year into something that's other than grass. The grass just kind of dies because the trees are bigger and

there's more shade, then I pull up the grass and mulch that area. So, it's kind of a natural progression, but I am definitely going in that direction.

Participant 9, female, age 68: I've seen a lot of [people making changes to their landscapes]. Started a revolution.

Personal reflections on neighborhood diffusion of ecological landscaping

aesthetics. The fact that one person's landscaping behavior in a neighborhood can spark a larger-scale change is a really exciting idea. I wonder if there is a difference in rates of adopting alternative landscapes within a neighborhood when people make drastic changes to their landscape all at once versus when they transition to a more Florida-Friendly yard slowly over time.

I've perceived first-hand how one person's individual example of changing residential landscaping can transform a residential monoculture into a backyard oasis of biodiversity; one of my friend's neighbors has grown a landscape that supports gregarious populations of wild birds in their backyard. The residents maintain small ponds and plants that support a wide variety of insects in their backyard and the result is an island of song birds chirping on a cul-de-sac in the middle of a small city. I know, therefore, that one household can make a tangible impact in maintaining healthy ecosystems.

The prospect of growing the impact of that one household by communicating the benefits of supporting local biodiversity and diffusing the message of Florida-Friendly Landscaping's goal of creating wildlife habitat is exciting. The connection between biological diversity in residential landscaping and water security may seem unclear at first. Animals support plant growth in a variety of ways and plants absorb nutrients in water. I think that to truly work towards the goal of water security we need to do so in a comprehensive way that takes into account as many nested systems within the

overarching, tremendously complex and constantly changing socio-ecological system. The question 'how do we work towards future water security?' is embedded in the more comprehensive question of 'how do we live sustainably?' Recognizing the interconnection between our own behavior, the health of the broader ecosystem, and our own health and well-being is important. Perhaps perceiving the interconnectedness of complex interdependent systems is on the horizon of human evolution.

Cost as a barrier. The upfront cost of transitioning to drought tolerant plants and mulched beds was cited by participants as a barrier to adopting that pro-environmental landscaping strategy.

Participant 12, male, age 54: if you have a decent looking lawn, it's a lot cheaper to maintain a decent looking lawn than it is to rip the lawn out and replace it with Florida-Friendly Landscaping. So, we can encourage Florida-Friendly Landscaping, I don't think this homeowners association discourages it at all. The problem is that it is an individual choice and if you're going to remove turf grass and put in Florida-Friendly Landscaping, you better be ready to put up the capital.

Participant 13, female, 36: Initially, sure, it's going to cost a ton of money, and I'm not saying everybody needs to just all the sudden go to it. I'm not just talking about our committee, I'm talking about people in generally... in Florida.

While discussing the costs of transitioning to water conserving landscapes, the conversation shifted from a focus on individual responsibility of this neighborhood to a broader audience of Floridians generally. Mulching and planting native plants was seen as being less expensive and better for the environment over time, however.

Participant 9, female, age 68: Yes, It was expensive, but I knew that's what I wanted. It's more expensive [up front], but I'm thinking over the long term. In the long term my feeling is that it is not more expensive. If you look over the period of say, ten years, it's a lot less expensive and better for the environment over a long term.

Benefits. Participants shared several other personal benefits of planting native, Florida-Friendly, and edible plants. These participants did not transition away from the traditional turfgrass monoculture for purely environmental reasons.

Participant 9, female, age 68: I think Florida-Friendly Landscaping and native landscaping can be much more interesting than just grass, or a combination of the two.

Participant 11, male, age 81: Another big factor... cost wise is the products: figs, blue berries, pears, peaches, all these fruits and vegetables you get. You go to [the grocery store] now and you look at the prices on some of this stuff, and we almost feel as if we ought to put this stuff in a safe when we pick it.

Decreasing lawn maintenance was also cited as a reason for creating mulched beds in a resident's landscape.

Participant 8, female, age 76: I'm going to get rid of that grass, slowly but surely.... I think it looks better, and it's a whole lot less work once it's done, unless you enjoy mowing grass.

Connectedness. Regardless of the personal benefit of transitioning to more Florida-Friendly Landscaping, participants in this group recognized their landscape practices were connected to springs health and water security. They also seemed willing to learn more about things they could do to help protect springs and conserve water.

Participant 12, male, age 54: In the area of the springs, you see the sign where they tell you, 'you are in the concentrated springshed area' and...it has a direct an almost immediate impact on the springs. But you know the spring shed everywhere in North Central Florida, even when you're far away from the springs as we are here, it's all interconnected once you get down into the Floridan [aquifer]. So, it's just important that we all realize that we have this natural resource here and our individual actions...have a direct impact. Although it may take decades for it to occur, what we do today really affects the quality of the springs over time.

Participant 8, female, age 76: Individual conservation is absolutely essential.

Participant 13, female, age 36: I think the easiest thing for me personally would be in my day to day life, what we should be doing or not doing to protect the springs? I'd be interested in that first and foremost.... Are we doing the right things? I think there is an over use of pesticides here. Do we cut down on pesticides? Do we lower the fertilizing the grass? What do we need to do starting here that effects the springs? And yeah, we have these ideas, sure. But what is the right or wrong answer? What do we need to be doing?

Control. Despite wanting to behave in pro-environmental ways, these new-to-Florida residents needed more information about how they could landscape for springs conservation. The lack of awareness in this group was a cause of their not controlling the adverse consequences of landscaping behaviors on water security. One potential reason for these participants' openness to learning about Florida-Friendly Landscaping practices was that this group of participants seemed to have less awareness of broader issues impacting Florida specifically than participants in FG1. The focus of these participants on individual behaviors they could personally perform on a daily basis might have been influenced by a lack of awareness of the broader social and political issues brought up by FG1.

Statements that have reflected the lower awareness of broader social and political issues that impact water security in Florida among these participants (relative to FG1) included:

Participant 9, female, age 68: Personally, I don't know, I don't even know who controls or manages the springs.

Participant 13, female, age 36: I agree like politically, and government needs to obviously get in there and just make everybody aware. I think awareness is key.

Personal reflections on political cynicism. Could the political system as it stands serve to actively discourage conservation behaviors? Could it be that more people know about large-scale decision-making leads them to view their personal

impact as futile? How can the state and local government encourage conservation behaviors among its citizenry? How could the government operate in a way that conserves natural resources and provides an example for citizens and other organizations?

Water theft. Despite discussing political conflicts less frequently than FG1, these participants still talked about other places taking water from the area.

Participant 8, female, age 76: For the last ten years I've been hearing about all the problems. That Miami would love to have our water and Jacksonville would love to have our water. Well poeey! They can't have our water!

Personal reflections on the water theft narrative. Is the problem of future water scarcity really one of other people using too much? This narrative of other places stealing local water seems to eschew personal responsibility to conserve. Rather than preventing or combatting other more water-scarce areas from using local water, could the conversation be more productive if we focused on how to cooperate so that we all use less water? Water flows across socio-political boundaries. At what point can one location say the water is theirs and not someone else's?

Changes over time. While this group discussed less about the potential political causes of water problems, they were still aware of changes in water quantity and quality they had observed even in the short amount of time they had lived in the region.

Participant 12, male, age 54: When we first got here around 2005, I snorkeled in Alexandra Springs in the Ocala National Forest. That was a pretty nice snorkel at that time. And no more than three years later, I went down and the change was just astonishing. The algae bloom was really disgusting. Clearly, you know, nitrate saturation there, I just won't go back there. It is not an enjoyable dive anymore. So, I think that's just one example of the trend that I'm seeing a lot more algae. Um, you know people not taking care of the springs, you know, trash and cans and stuff on the bottom. It's really a national treasure that's at great risk right now.

Participants in this group also discussed pollution from lawn chemicals and trash as a significant threat to springs health. The impact of lawn chemicals generally as well as the direct physical impact of irresponsible visitors of springs was understood by these participants.

Participant 9, female, age 68: The use of pesticides, in general, all over Florida, all over America, has got to be detrimental to the springs... it brings in nitrogen, that creates the algae that [participant 12] was talking about and kills a lot of the other native plants that might be there that would also affect the fish and the life in the springs. It's all interconnected. So, I think that's what humans do, and trashing, just bringing in trash... the pollution. I think people taking them for granted and not taking care of them.

Participant 12, male, age 54: My own personal feeling is that we need to protect our natural resources and strike the balance between strong economy, but also protecting what is maybe one of the main drivers of our economy, which is tourism. You know, publicizing the springs, getting people to use them in a caretaker fashion ... really promote that ecotourism type of aspect.

FG2 summary. These participants were generally aware that residential landscapes and residents' behaviors impacted water security. They expressed their concern for future water security on a global rather than a local or regional scale. While they mentioned Jacksonville and other places in Florida withdrawing water from the area, that was not used by these participants as a reason their personal behaviors would be futile. Rather, these participants want to learn more about specific pro-environmental behaviors they could practice on a daily basis to conserve water. While these participants seemed open to the idea they were responsible for water security, they expressed needing more information to landscape for local springs health. This group of participants represented a unique target audience for water conservation programming; they were concerned but still needed to know more information about socio-ecological water issues and what specific steps they could take to act.

Focus Group Three

Neighborhood history and context. Focus group three (FG3) participants had the second highest average of years spent in the Gainesville area (m=26), but the second lowest average age (m= 51) of all of the focus groups. Three of the participants were retired while the remaining three were employed in construction materials sales, transportation, and as a librarian. Three participants were female and three were male. All of the homes were on municipally supplied water and sewer. FG3 took place in a neighborhood that had been experiencing some changes. A golf course associated with the neighborhood had recently closed for financial reasons. The closing of the golf course and several new laws detailed later in this chapter were cited as reasons why the homeowner's association had been losing influence to regulate the aesthetic quality of resident's yards.

While the golf course reportedly irrigated with reclaimed water, none of the participants had access to reclaimed irrigation water and did not think any of their neighbors used reclaimed water either. Participants of this group seemed to be more knowledgeable of local water issues than those of FG2 when discussing nuances of agricultural production, listing many sources of threats to springs health, and describing visiting many springs in the area. Several of the participants of this group had significant levels of awareness and thought about different angles of the water security problem. This group seemed to have divergent perspectives more than any other group with the exception of perhaps focus group 5.

Concern. For example, some participants were concerned about water security regionally because they had seen low water levels while recreating.

Participant 24, female, age 67: I think it's a big problem that's already happening, because I learned to swim in Ichetucknee Springs and it's a different place than it was back then. We kayak a lot and it's just sad, the shape of the springs. You can't go up the little run to and Camp Kulaqua anymore; it's sad. I think [water insecurity is] already happening.

Other participants had perceived the decline of water levels over time within the region.

Participant 32, male, age 37: Keystone and Melrose and some of those places have dried up completely. I had a friend who... had a lake front house and it dried up the next year- I mean gone. Literally you couldn't even see water two years later 100 yards away.

Another participant, however, shared a view of perceived abundance of the aquifer as a source of hope for the future. This hope was coupled with a faith in the process of human innovation to create water-saving technologies, especially as the cost of water continues to rise.

Participant 17, male, age 57: It's truly amazing when you see what the aquifer will support and do. And with the amount of people that are in Florida.... To me that's what gives me hope that all we have to do is put our mind to the things that we're going to do.... I mean this technology just keeps coming and coming and...the higher the [cost of] water gets the more they're going to create this stuff.

Faith in science. This previous individual and other participants seemed to have faith in technological innovation and engineering to solve water security problems in the future. Rain barrels were brought up several times. The discussion ranged from the simplicity of retrofitted trashcans that were easily made and installed by homeowners to the complexity of mandatory in-ground cisterns.

Participant 32, male, age 37: I have a garbage can that I just cut my down spout, put a little hose on it and we just [got a little rain] last night [and] that thing's full.... It's just little things like getting all of your water off the gutter. Maybe making [the rain barrel] look nice, maybe... dig you a hole, drop you down a little something nice. Make it so you don't think it's a big, gross thing on the side of your house that you can't use because that's what detracts people.

Participant 14, male, age 54: I foresee it being mandatory for contractors to install systems in the ground, catching rainwater.

Participant 17 had a large-scale vision of piping water from flooded areas to those in drought across the nation.

Participant 17, male, age 57: Focus on pipelines and things like that, pumping stations. If somebody had the political will we could take the places where we have the flood waters, put them at the headwaters of some of the rivers further west and further north and make this water a lot more equitable, to keep the aquifers recharged.

Irrigation waste. Despite the perceptions of technological innovations as a way to improve water security, one technology, in-ground irrigation systems, were cited by this group as being the cause of significant water waste. Irrigation systems were also a cause of waste because they enable people to set their systems and forget about their water use. Sometimes systems would be scheduled when people were away for months at a time.

Participant 14, male, age 54: The snow birds can go back up north and the irrigation system will still be active.... They're set up where they can run all summer while they're up north not paying any attention to them.

Systems also caused waste when they were improperly maintained. Participants discussed that systems needed to be adjusted periodically to ensure water was sprayed on plants but not roads, sidewalks, and driveways. Irrigation systems needed to be checked regularly as sometimes parts of the systems could break.

Participant 32, male, age 37: Well, if you ever pull [into or out of this neighborhood], their sprinkler system... it's just watering asphalt. I have to roll my window up driving by because there's one right by the office that will shoot you right in the face. And they have it on all the time and of course the golf course went out.... On the greens...they have one that shoots water up this much [points to ceiling], water comes out and it goes everywhere. This is not a sprinkler system it's just a blown head. Nobody fixed it.... it's a lot of waste.

One way this group was aware of water local security issues was how they understood the water wasted by broken or improperly set irrigation systems impacted water quantity.

Participant 32, male, age 37: You look at apartment complexes that are everywhere in Gainesville. When we moved back from Texas we moved in to [an apartment within the study area]. All they did was clean off the driveway with their water. I mean, it's bad. Just imagine if they did that at every apartment complex, how many we got here, and then these campus apartments, I'm sure they're just as bad.

These participants also discussed how lawn chemical runoff impacted water quality.

Participant 24, female, age 67: The runoff from [this neighborhood] goes into [the] creek and out here in the woods it sinks into the aquifer. So everything we do in this neighborhood, even without curbs, encouraging it... [runoff from this neighborhood] goes into the ground.

Participant 16, female age 60: We've got a lot of sinkholes in here.

Responsibility. While this group described awareness of how the landscaping behaviors in their neighborhood impacted springs health, they did not consider themselves as part of the problem. Rather, these participants shared ways they conserved water or did not use chemicals.

Participant 32, male, age 37: I don't really fertilize [my yard]. I have a bag that I've had for two years.

One participant with a more Florida-Friendly yard than her neighbors described how she talked to her neighbors about her pest management.

Participant 24, female, age 67: My neighbor talks about her chemical barrier she had between her yard and mine.... One thing I tell my neighbors too, because people come to see my yard... I tell them about when you have a monoculture one bug can come in and wipe you out. Because I have a little bit of St. Augustine and Bermuda grass that blew in and some frog fruit and all the other things one bug's not going to wipe me out. He may be a bug that I want to keep... you're creating a habitat. But people come by my yard and say, 'do you have snakes?' And I say, 'I hope!'

Personal reflections on biodiversity. Participant 24 expressed what I interpreted to be pride in landscaping in an ecologically sensitive way. What influences people to move towards feeling pride in landscaping in pro-environmental ways? How does someone develop an understanding of the benefits of biodiversity in their landscape? We are dependent on the health of our environment for our survival. We benefit economically from having biodiverse landscapes. How do people understand the benefits of pro-environmental behaviors and move towards acting as stewards of the environment?

Awareness. Statements participants in this group shared illustrated their perception that typical residents lacked of awareness about the impact of their landscaping behaviors on water quality.

Participant 32, male, age 37: A lot of people don't realize [fertilizer can runoff into waterways]. [For] a lot of people it doesn't even come into their mind. They know the spring as blue and it's clear enough. If it's murky that day maybe it's because it hasn't rained in two day, that's what people think.

To remedy this perceived lack of awareness, these participants discussed a need for publicity and advertising campaigns to educate people about water security issues.

Participant 24, female, age 67: People don't know what the signs that say 'spring protection area', nobody knows what that means. [It means] there's a sinkhole there somebody needs to be protecting. I don't think we're doing a good job at all. We have to have it out there; an advertisement or something so everybody can see it. It's got to be in their face...just like seatbelts... In your face.

Participant 17, male, age 57: The majority of the public will go for it because they realize its common sense. You drink out of that faucet water right there, put that water into the ground. It's just one big circle.... the trick is, you've got to realize that that hole goes right into the Floridian Aquifer.... That's what the public needs to be made aware of.

Political issues. In addition to advertising and education for springs protection, participants in this group raised the issue that residential lawn chemicals are not regulated as much as they are in agriculture.

Participant 17, male, age 57: [Dairy farms] get watched because they're the most visible, but your biggest problem is: does anybody track all of the nitrogen fertilizer that goes out of [big box stores] that gets put on people's yard every time the grass turns a little yellow? Does anybody ask them?

Participant 32, male, age 37: Have you ever tried to buy spray paint lately? You have to sign off for it. So if that's a big deal... [fertilizer could be regulated because] everybody knows to fertilize your lawn.

Personal reflections on resource limitations. This dichotomy illustrates the value conflicts that are illuminated by natural resource issues. Do we have to choose between dairy production and healthy drinking water? Do we have to value swimming in springs over the feeling of soft grass between our toes in order to conserve spring water quality? These are tough decisions that we currently face and will continue to face in the future. Natural resources are limited to the extent they can replenish faster than the rate they are depleted; there are limits to growth (see Club of Rome, n.d.; Meadows, Randers, & Meadows, 2006). Thinking about how much water we really need to live well is pressing. How can we manage, move, and use water to sustain ourselves and the systems that sustain life? I think we have gotten to a point in human history where we have to work with nature not against nature. Can we evolve enough to understand our collective impact and understand the necessity of solutions that are arrived through collective decision-making and action?

Regulation. Regulating residential fertilizer was something this group felt was worth discussing. Enforcing regulations intended to influence water security more generally was also important to this group.

Participant 24, female, 67: And aren't we supposed to be on alternate days? Nobody's ever enforcing that. [Irrigation] should be [allowed on] alternate days and it should be at night. They really should be fining people who have it on during the day.

Participant 17, male, age 57: It's the water management district...we're at the breaking area between the St. John's River [Water Management District] and the Suwanee River [Water Management District]. But if water gets tight enough, the further south you go they have the water police.

Political controversy over water policy decisions including regulations over septic tank inspections was also discussed.

Participant 17, male, age 57: Less than a year ago [the] state passed regulations [that] everybody that's got a septic tank on... house, we're going to make everybody start checking those on a regular basis and re-service them. As soon as it dawned on the general public that this was going to cost them \$100 a year because every 4 or 5 years they were going to spend 4 or 5 hundred dollars to get their septic plans checked, it was just unreal the outcry that you heard.... and the thing you've got to realize is, every place there's a house with a septic tank on it, that thing is doing just as much as any herd of cows is doing.

This participant believed the relative impact of one residential septic system was the same as a herd of cattle. Another participant alluded to political problems in suggesting several potential steps a campaign to reduce nutrient pollution in bodies of water.

Participant 32, male, age 37: You could do clean ups, fundraiser, and then a petition. And then why not kick everybody [out], if you ever make a law, try to help them make the law, which is kind of an act of God. Why don't you just have them, you cannot live [within hundreds of feet of] the springs.

Participant 24 agreed and suggested making rules that septic tanks had to be even farther away from the springs than houses near springs. This conversation among participants suggests it is easy to understand that people living directly on a body of water impact those water bodies. However, these participants did not think they had a significant impact on the springs as they lived many miles away from them.

Participant 17 ultimately broke the septic tank issue down into one of political fairness.

Participant 17, male, age 57: People have to realize, that's part of it, if you live in one of those areas [and have a septic tank]... see, we pay to have a sewer system to have the water treated, so we're paying to take care of ours.

This participant expressed that it would be fairer if people who lived close to the springs on septic tanks had to pay for the inspection and maintenance of their waste systems. Historically, however, regulating rural septic systems has been controversial.

Personal reflections on regulation. Enforcing regulations takes resources including staff time, money, and infrastructure. The current political climate in Florida has trended towards de-funding water protection organizations such as springs working groups and environmental protection departments in the state. The citizens who participated in this focus group recognized the importance of regulating potential water pollution including septic tanks and yard chemicals like fertilizer. Environmental regulations pertaining to water quality help manage the costs of cleaning water for human consumption. Protecting water quality is much less expensive than cleaning water after it has been impaired by unfettered and unregulated contaminants. Asking political candidates' views on environmental regulation and enforcement is important before electing politicians into office. Will they financially support enforcement of environmental protection or will they "save money" and remove environmental regulations and enforcement funding?

Participants also discussed relative water quality impacts and fairness during their discussion about water regulations. Highlighting relative impact or relative resource use is important. We all have needs and different beliefs about what are appropriate uses of

water. Some residents may value lush yards in their neighborhoods over having rivers and springs in which to recreate. Currently, during periods of significant drought, unsustainable withdraws of groundwater, and climate change more generally, we have arrived at the precipice of deciding among things we care about. Is swimming in a spring a birthright? Is having a manicured, thirsty landscape more valuable than clean, flowing springs? Are there ways we can conserve enough water so we do not have to choose between residential uses and ecological function?

Water theft. Rather than discussing what else these participants could do to conserve water personally, like the first two focus groups, these participants indicated other places were using unfair amounts. Participants indicated their awareness of how Jacksonville's water use had been affecting local water levels. One participant also expressed concern about the possibility other places in Florida taking local water.

Participant 14, male, age 54: I agree. [Losing local water is] already happening, especially when you hear about pipelines going to South Florida.

Other participants were concerned about water being shipped out of the area as bottled water.

Participant 16, female, age 60: I think we might lose our water especially if we let them bottle water in the springs.

Participant 24, female, age 67: That bottled water is a scam. It's just such a scam.

FG3 summary. Overall, FG3 had experience visiting springs and were aware of the connection between their landscape maintenance and springs health. Participants were generally concerned about having affordable, clean water in the future. Despite their concern, this group had divergent perspectives about the scale of homeowners' impact on water security. Time was spent comparing residential water use and nutrient

impact collectively and generally to production agriculture. Fairness in distributing the cost of water use, impairment, and conservation was a prominent concept discussed. This group felt that other residents in their neighborhood and the local area probably did not care about water conservation and needed more information.

Beyond being informed about ways to conserve water, these participants discussed how water conservation legislation needed to be backed up by regulation. Larger political issues were seen as having a larger relative impact than individual homeowner behaviors. Still, some participants expressed pride about having changed their water use and landscaping practices to foster ecological health. How and why adopters of water conservative landscaping practices have come to behave in pro-environmental ways is worth further investigation in the future.

Focus Group Four

Context. Focus group four (FG4) took place in the village center of a mixed-density planned community located in the study area. While the average age of participants in FG4 was 62, only one participant worked full time as a small business owner. One participant was a partially retired veterinarian and four of the participants were fully retired. Participants of this focus group had spent the lowest average amount of time spent in the Gainesville area ($m = 13$ years). The gender distribution was evenly split in FG4 with three female and three male participants.

Neighborhood history. While all participants of FG4 were under the umbrella of the planned community, participants were from different neighborhoods and housing densities within the development. One participant lived in a condo within the high-density village center without a landscape to maintain. Another participant in this group was a renter and did not know about the maintenance of her landscape. The other

participants lived in detached single-family homes, but were from different subdivisions within the development. There were reportedly nine separate HOAs within the planned community and participants represented at least two different HOAs. While reclaimed water was available in some of the areas of the community none of the participants who attended this focus group had access to reclaimed water for irrigation. Rather, all of these participants were serviced by municipally supplied water and sewage treatment.

Concern. Participants in this group were concerned about local water security because they had seen water scarcity in other places. Participants had traveled to water scarce areas of the United States including Texas, Georgia during periods of drought, and water scarce areas of the world including Ethiopia and Dubai. Participants relayed that in typically drought-stricken areas of the country, water table levels are reported daily on the news.

Participant 21, male, age 66: In San Antonio, Texas...the local news broadcast gave you two things: the cedar pollen count and the level of the water table....Every single time you watch the news... on all the channels, because of their dealing with drought over the years. There are different stages for water restrictions clearly marked on a little chart that looks like a thermometer [that] tells you exactly what the water table is measuring today and how dangerous it is. It's in peoples' face all the time.

Participant 22, male, age 64: [In] Missouri...they have lake levels and dams and reservoirs there in the newspaper and on the news.

Personal reflections on communicating urgency. Reporting water information seems like an important part of a solution; people need to be informed about the status of water resources and their impact on those resources. Literature on the 'Tragedy of the Commons' has captured some of the complexity of possible effects of reporting water supply decline (see Barnett, 2007; Hardin, 1968; Schlager & López-Gunn, 2006). Reporting dwindling water supplies could lead to people consuming even more. Still,

helping people understand what is happening is important. The more informed people become, the more they can reach their potential to live mindfully. Once we know what is going on, then we can begin a process of deciding what to do and agreeing to do it (AtKisson, 2013). Reporting groundwater levels, like relative rainfall amounts (either at the airport or University of Florida rain gauges) has occurred in Gainesville's local news for years, and could be a valuable part of informing people and increasing water conservation behaviors.

Concern continued. Participants also discussed their exposure to different ways of how different cultures related to water. One participant relayed that on St. Croix Island, cisterns for catching rainwater for household uses were mandatory because rivers had dried up over time. Several other participants described using less water in the past.

Participant 21, male, age 66: In the old days you had a reservoir that you collected rain water off of your house (I'm talking about Texas) and not everybody got a bath every night depending on how much water you had in the reservoir.

Another participant described a similar experience of having grown up conserving water and then contrasted that with what she saw as a current culture of entitlement to which other participants agreed:

Participant 18, female, age 50: I remember when I was a child, going to my grandmother's house and she had an outhouse and when we took a bath (I had two sisters) we all got in the same bathwater. When you went to the bathroom you didn't flush every time. I don't know...we're so entitled as a society to be comfortable and have everything we want and have big yards with green grass.

Personal reflections on spatial and temporal perspective. These participants, like those of all other focus groups, understood their local water situation in relation to other places' or previous times'. Relative to participant 18's childhood experiences with

water scarcity, she recognizes current attitudes as “entitled” to resource use. Perspectives like this may be important to move people towards changing their behavior. Understanding the insecurity of water experienced in other places or the degradation of local water resources over time might be an important part of moving towards concern and pro-environmental behaviors.

Awareness of water behaviors in water insecure areas or recollection of past times of water insecurity may not be enough to move people towards conserving water, however. Having a spatial or temporal perspective may have helped generate concern among these participants, but there is still a gap between their concern and their feelings of personal responsibility for future water security and springs health. How can perspective be leveraged to motivate people to conserve water? Comparing current water conditions with past conditions might inspire people to behave in pro-environmental ways if combined with information about irrigation waste.

Irrigation waste. While these participants described their concern by evoking images of far-away places, local irrigation waste was discussed. These homeowners reportedly irrigated less than the amount allowed by irrigation ordinances, but they still saw waste in their neighborhoods. Irrigation of ‘common area,’ or areas of community green space, was discussed as being excessive and expensive. Participants who observed irrigation waste from common area systems discussed feeling frustrated by the politics of their HOA boards in their neighborhoods. Several participants in this group were actively involved on their HOA boards and one suggested a cultural shift in maintenance practices among board members could happen. The paradigm shift

required to make conservation behaviors the norm could be achieved by focusing on the economic incentive of conserving water even in an affluent planned development.

Participant 21, male, age 66: It's really disturbing here in this community.... You have to wait for the sprinkler to pass so you can drive your car down the street... not only sprinkling the street but the grass on the other side of the street, all the way around the whole island [traffic circle median]. And this goes on whether it's raining or whether it's sunny or whatever. They have this schedule...but I know something about how to set irrigation heads and there's a way to do it... they could put all the water on the grass where it's supposed to be and not on the streets.... they have sprinklers that commonly completely wet the street and you have to look and say 'did we get any rain last night?' Well, no that's the sprinklers.... the frequency in which they water in this area... it was far more times a week than I water.... They had consulted [a pest control company] and I didn't understand why... didn't they use someone affiliated with extension or the University of Florida instead of [a pest control company]? That doesn't make any sense to me. But, you know how that [the association] works. I know that we do not need to water three times a week in our area, but nobody in my area that does private watering waters that frequently... I haven't watered for probably three months, but our area gets watered three times a week.

Another participant jumped into the conversation at this point and discussed steps his HOA board (of which he was a part) took to cut costs by changing the landscape maintenance schedule with the landscape contractor they hired. These cost savings happened to also be implicitly environmentally friendly since taller grass can require less irrigation (see Trenholmn, 2001).

Participant 19, male, age 64: We cut back on mowing... because we'd have people driving around all the time in the winter time, mowing when there wasn't any grass to mow. If your association is proactive and thinks through some of these things, you can do the same job without spending a lot more money. It's a matter of breaking out of your paradigm that you're used to... and it's extremely difficult [to break the paradigm].

The political difficulties this participant mentioned that have been associated with getting HOAs to think differently and break free from the inertia of tradition were echoed in the following participant's further, frustrated conversation:

Participant 21, male, age 66: To expand a little bit on the sod that we're required to grow, there was some discussion the other night at our meeting. They have chosen the type of grass that requires an increased amount of water and chemicals to control insects, pest insects, and fungus. Why can't we go to something that doesn't have these requirements for pesticides and chemicals as well as water? Nobody wanted to talk about that. So this is where a lot of the problem is stuck, really. You've got to break through, somehow, to make people say, well, I know we quit falling back on... well that's in our bylaws. Well, yeah, they can be changed. And why can't we change them as we learn more about what's important now than what was important 20 odd years ago?

Personal reflections on institutional delays and decisions for sustainability.

Historical traditions of landscape aesthetics and maintenance have tremendous inertia. Just because water has been used in certain ways in the past (i.e. for watering lawns) does not justify continued use when the context has changed. In drought conditions, as population grows, and as housing and commercial development spreads allocations of finite water resources may likewise need to change. Change can be hard, but change is constant; our task is to adapt to changing situations. Reducing or eliminating lawn irrigation has represented a first wave behavior to reducing water demand and adapting to our changing water situation. At what point will people understand the urgency of water problems? When will people relinquish their sense of entitlement to an unsustainable landscape and change their landscaping and water use behaviors to positively impact their community beyond their property lines? At this point not only is water used to support resource-intensive landscapes, but water is wasted.

Exported water. Aside from wasted irrigation water and HOA issues, the larger-scale issue of permitting water bottling was also a topic of conversation in this group. Permits to pump and export water out of the local community were issued by agencies and organizations governing water use and bottled water was seen as a source of ineffective, unfair water management.

Participant 19, male, age 64: A lot of like the bottled water you drink probably comes from one of the springs.

Participant 22, male, age 64: I think that's crazy, to allow people to take that water that's a resource that should belong to everyone for their own I gain.

Personal reflections on exported water. Bottled water may be an obvious way that water moves out of a local socio-ecological system. Water is perhaps less obviously exported in the form of agricultural products or products that require water to be manufactured. Understanding 'virtual water' cycles into and out of local socio-ecological systems adds another level of complexity to local resource management for water security (see Yang & Zehnder, 2007). Understanding the concept of virtual water may make homeowners feel even less responsible for future water security, however.

Responsibility. The relative impact of keeping homeowners' landscapes alive compared to that loss of water because of a large bottling corporation was seen as unfair. Regulating homeowners' landscape irrigation while thousands of bottles of water were being shipped out of the region was discussed. Residential water use compared to water bottling industries was called into question by a member of this group, who cited the relative impact of bottled water exports as a potential reason residents justify their personal use of water.

Participant 22, male, age 64: But it is hard to conserve when, you know, we turn off the faucet when we brush our teeth... again in High Springs, sending out ten truckloads of bottled water a day, and you think, there's no way I could waste that much water in half a lifetime or something.

Political issues. This participant also suggested that other industries be regulated during drought periods rather than residential homeowners.

Participant 22, male, age 64: It seems like when we go through periods of drought and the water restrictions are made on the individual consumers, maybe they ought to do something to these bottling plants? Or, I don't know how you tell a dairy farmer where you can't pump as much water, you

know? Cows have got to drink, but if there was... if there was some way you could get their attention and realize that, well, maybe we need to cut back on production or whatever, during these periods.

Further, participants were skeptical of the amount of actual power water managers had to control water withdraws from the area. Political skepticism was also expressed in this group.

Participant 22, male, age 64: How much power do the water management districts have? I know they have a large amount of funds to work with and there had been some talk about abuses over the years but... like the one they call SWFWMD in south Florida, and they've got Suwannee and St. Johns up here. But, how much clout do they actually have besides saying, well you've got to cut back on how much water you use. I mean, are they in charge of the guy who says I need to start pumping another 500,000 gallons a day for my... this... you know, we're enlarging our dairy out here or something. Or the guy says we want to start buying a lot of water and shipping out 10 to 20 semi loads a day of bottled water. Who actually controls how much water they can use and what their limits are?

Participant 19, male, age 64: Talking about it from the higher level to the management groups, the government groups... to say that's there's politics in this would be a gross understatement [many laughing in agreement] and you know that tends to get pretty contentious today.

Personal reflections on political cynicism. People could make positive change by moving towards collective political action in reaction to perceived political ineffectiveness. While changing one's own behavior is the starting point to ensuring a water-secure future, raising others' awareness and moving towards collective action is also important. What will it take to move people towards individual and collective action towards a possible future that is water secure?

Control. Overall, the dialogue about irrigation wasted in common areas, water bottling, and political clout reflected a sense that residential homeowners had little control over water security. This was emphasized towards the end of the focus group after participants had watched a short film calling for protection of the springs in North

Central Florida. Participants were left wanting to know what specific things they could do to help preserve the springs. They did not know what they could do to control adverse consequences of water overuse.

Participant 23, female, age 59: Well, I don't know. I just feel sad when I see things like that. You know, we're making everything dirty. But, that doesn't help anything either.

Participant 20, female, age 70: It's all so interconnected...what are some specific things that we might do?

Reflections on control and responsibility. The more people understand, the more they become aware of complexity. Someone could be overwhelmed by the complexity of a socio-ecological issue like water security. Inaction could be the result of feeling disempowered or hopeless in the face of huge and complex problems. How can we communicate the urgency of pro-environmental actions like water conservation behaviors without having unintended consequences? Avoiding a Tragedy of the Commons scenario, where people using common resources unsustainably, should be a goal of all conservation campaigns (see Barnett, 2007, 2011).

One potential strategy for overcoming inaction could be focusing on individual choices we make on a daily basis. People may feel more in control and more likely to do something when focusing on small, personal actions, rather than feeling crushed by focusing on system-wide degradation of natural systems. The first step towards intentional, albeit infinitesimal, water conservation behaviors may be the hardest to take. Once people conserve water in a small way, they may be more likely to change their behavior in more impactful ways.

Focusing attention on behaviors that are relatively easy to promote or adopt may not lead to behavior change on a large enough scale to have an impact. The rate of

adoption of conservation behaviors might also be too slow to afford ecological systems time to recover from social impacts. Still, if more people start doing little things with the goal of future water security, perhaps larger changes will seem more tangible or desirable. The maxim 'many hands make light work' may apply to natural resource conservation.

While many people participate in resource degradation unconsciously through daily choices (see Jordan, 2006) not everyone uses as much water or applies potentially harmful contaminants. There are some organizations and people within socio-ecological systems that likely contribute to ecological problems to a significantly higher degree than other people (see Gladwell, 2007). By identifying those points in the system where potentially greater resource savings or protection could be achieved more easily. 'Many hands' reaching for the 'low hanging fruit,' or relatively easy-to-do behaviors, approach may serve to raise consciousness about individuals' potential to conserve water and protect quality. Focusing on large users and/or polluters to change behavior may usher in larger savings and protection.

Since the homeowners in this study resided in high water use neighborhoods with typically resource intensive yards, they (and especially their neighbors who were not interested in participating in a study about springs protection) could be assumed to be in a high water user category. When talking about concern for future water security and causes of water resource degradation, the participants of all the focus groups discussed categories of users they perceived to be more responsible for changing their behavior. Regardless of the physical impacts of the water using entities, residents pointed fingers at water bottlers, dairy farms, golf courses, phosphate mines,

municipalities, and more. In order to motivate relatively small conservation behaviors among many people, therefore, it may be necessary to simultaneously communicate efforts by entities perceived to consume or pollute in larger measure.

FG4 summary. Overall this group was concerned about water security in general. They discussed global and national-scale perspectives of water scarcity, and local perceptions of irrigation waste particularly in the common areas maintained by their neighborhood HOAs. Neighborhood-scale politics over landscaping decisions were discussed including how HOA politics could be a significant barrier to environmentally friendly landscaping practices. Despite feeling like they themselves conserved more than others, these participants expressed that it was out of the scope of their control and responsibility to overcome political barriers to water security.

Focus Group Five

Neighborhood history and context. The last focus group analyzed for this thesis, focus group 5 (FG5) had residents from two different neighborhoods and one participant from an adjacent neighborhood. Three participants were from a neighborhood that had large manicured yards and were on well water. Their neighborhood was selected for this project because many residents had been caught violating irrigation restrictions. Some residents in this neighborhood had received letters from the County Department of Environmental Protection stating they would be fined if they continued to irrigate outside of the irrigation ordinance days and times. This previous interaction with the county may have impacted the recruitment outcome: of the 83 households that were solicited by mail to participate in the study, only three residents elected to do so.

Three other members of the seven FG5 participants were residents of the same planned community as FG4. All three of those participants (two of whom lived in the same household) had municipally supplied water inside their homes, but reclaimed water for irrigation outside of their homes. The remaining four participants of FG5 pumped their own well water. Three of those four participants on well water lived in a neighborhood with an active homeowners association, while the remaining participant lived adjacent to that neighborhood and did not have association rules governing their landscape. FG5 had the lowest average age ($m = 49$ years) of all the focus groups and the highest number of actively employed people with only two retired participants. Two participants worked as attorneys, one as an engineering company manager, professional fundraiser, and one was a scientist. Four participants were women while three were men.

Participants of this focus group were from the largest geographical area of any focus group and they were also perhaps the most divergent group in terms of perspectives. Not only were these participants from different neighborhoods, they were also recruited in different ways. Three participants in one of the neighborhoods received recruitment letters in the mail and chose to attend. One of those three invited a friend who lived nearby. The remaining three participants were recruited through word of mouth and attended because a friend and/or previous focus group participant asked them to. The divergent motivations for attending this focus group (i.e. interest in talking about springs health or as a favor to a friend) likely contributed to the diversity of perspectives expressed in this group.

Concern. One of the ways the diversity of this group manifested itself was regarding concern over water security. Three participants, in responding to the first discussion question “do you ever worry we won’t have as much water as we do now?” indicated they did not worry about water security very often. The other four participants, however, from the start of the group, had replied they worried about future water security in some ways. Even those who had not frequently worried about water security, however, relayed personal experiences of having experienced changes in water quantity or quality over time. One participant brought up her well’s water table depth:

Participant 25, female, 68: Three years ago I had dig a new well. My old well was 120 feet and my new well is at 200. And the first well was dug in 1963. It is happening.

Another participant discussed changes to wetlands in his hometown elsewhere in Florida:

Participant 26, male, age 34: The bayous have gotten muckier and I don’t know a better way to describe it. It’s just gotten dirtier, nastier over the last 20 years.... I remember it being clear water and when I got back it looks a lot muckier.

This participant alluded to changes in climate by discussing rainfall pattern changes:

Participant 31, male, 43: I grew up in Florida and kind of got used to the rains every afternoon, which don’t seem to be as prevalent now for whatever reason.

Participants also discussed changes specific to springs flow rates and water quality:

Participant 25, female, age 68: [The springs are] greener. You can see it. And there’s places that buddies and I kayak on the Santa Fe River where there’s, springs come up into the river and the waters been so low, there’s no spring. There’s nothing there and you can smell the sulfur smell because the spring is getting drier and drier so the odor is coming out. It is really pretty scary.

Participants in this group also relayed stories about experiencing water scarcity in other places like previous groups had. The following participants discuss other places in the United States that experienced water scarcity:

Participant 31, male, age 43: I've seen where literally, in one year you'll get a hurricane come through the Gulf and Texas will be lush, the following year, literally the ground has been cracked so much, the pipe from our municipal water broke because the ground shrunk so much it took the pipe with it. It was just bad, from one year to the next. So it can happen really fast. Longer term, I don't know where things are going to go, but it was eye opening.

Participant 30, female, age 41: I think it was last year in Georgia they were in such a drought that in one town... they actually came out and did a mass prayer. That really hit me when it was on the news.

Connectedness. These participants seemed to understand that areas of the environment were interconnected. When asked "even though the springs are more than 20 miles away from here, do you think the things that you or your neighbors do affects the health and levels of the springs?" many participants nodded. The participant that spoke first talked about the connection in general terms, however. He also indicated that those with higher socioeconomic status would not suffer from impacts of water scarcity:

Participant 26, male, age 26: What you do in Gainesville doesn't just affect 20 miles away, I think anyone that understands how the earth works, it affects 5,000 miles and in the grand scheme of things, you have to be responsible to some extent for what you do now because not only does it affect distances but time as well, that's kind of what I was saying earlier. And I don't think about it every day, but the reality is we are going to run out of affordable water at some point. We are not going to be effected in this room, but there are going to be people who are affected. So I think so, I think you have to understand 20 miles away is a very small footprint in the scheme of the world I think.

Personal reflections on socio-economic status. If other upper-middle class people in Florida think they will not feel the pain of future water insecurity, what do less

economically secure populations think? Who will experience the detrimental impacts of water insecurity if not these participants? Do these participants feel they are responsible for the effects felt by other people?

Connectedness and change. Other participants discussed how watching a video about the springs by Wes Skiles et al. (2007) educated them on the source of their well water. By seeing that visual, they realized they were connected to the aquifer.

Participant 25, female, age 68: Well it was shocking, you know. I had never thought about the fact that my well, my pipe is down there in the little river, sucking away.

Participant 31, male, age 43: I pictured a well being porous rock or something that my pump was sticking down into. I saw the same documentary and realized, holy cow, there's a river under there and water flows through there, flows by my pumps. So that was kind of eye opening.... My neighbors across the street, were using bottled water because they have some kind of contamination in their water, I think from somebody's septic tank, it might be their own... but, it opened my eyes. I've got the best darn filter I can find for the water that we drink.

Understanding the connection between her yard and their drinking water motivated one of these participants to change her behavior:

Participant 25, female, age 68: I do as much organic gardening as possible. And I'm not pulling my own cord or anything but I am very aware of my environment and I'm trying to do everything I can to do my little part to not make it any worse, you know?

Awareness. Despite being aware of changes over time and the potential impact of their behaviors on local water security, as a group, most of these participants did not know how much water was used in their household. Regardless of whether they were charged by the utility for the water they used or were on an unmetered well, these participants did not know the kilogallons used by their household per month. One participant relying on municipally supplied water looked at his water bill cost, but did not know the amount of water associated with that price.

Participant 29, female, age 71: No, I don't know. I should. I look at it once and a while.

Participant 25, female, age 68: I have a well so... I have no idea.

Participant 26, male, age 34: I look at the GRU bill and if it's acceptable. There's unacceptable, acceptable, and if it's acceptable then I don't worry about the rest of it. I kind of know what it usually is.... I look at what I'm paying, is this less than what I hear other people paying? Ok, I think I'm doing ok.

Personal reflections on water cost as a motivator for behavior change. Water cost may be an effective motivator for some people to conserve. That idea (that people were and could be motivated to conserve through personal financial impact) was certainly discussed by participants in every focus group. The theory that people are financially motivated to conserve may not apply to people of upper socio-economic status, however. Water cost increases may disproportionately impact poorer people while not dis-incentivizing higher volume water use by wealthier people. Still, economic impact was considered by many participants of this study an important (if not the most important) context in which managers can communicate the value of water conservation.

Irrigation waste. While they were not personally aware of how many thousand gallons of water per month was used in their household, participants were aware their neighbors wasted water. As with other groups, this focus group reported their neighbors wasted water through their yard irrigation practices. Participants discuss their neighbors inefficient irrigation practices in the following excerpt:

Participant 30, female, age 41: I worry a lot about our neighbors. Because we have neighbors that will just water several times a day, at 2 o'clock in the afternoon.

Participant 28, male, age 52: In the heat of the day, yep.

Participant 30: They'll water the street, they'll water anything.

Participant 28: One of my neighbors waters two to three in the afternoon, rain or shine, doesn't matter. I'm always messin' with my system based on how dry [it is and] it's only my front yard too with irrigation, the back is...a natural zone.

Participant 25, female, age 68: The house next door to me, thank god I can't see them because I had enough bamboo planted, but their sprinklers go off every morning about 4:00 every morning and they run until about 5:30, every morning, rain or shine, cold or hot.

Costs create concern. When asked how others might be motivated to conserve water, these participants thought that other people would not conserve simply because of the intrinsic or ecological value of springs. Rather, impacting people by increasing the cost of water was discussed as a potential solution to springs conservation and the water security problem. The following is an excerpt where several participants are discussing how to motivate other people to conserve water:

Participant 31, male, age 43: Everybody is going to put a certain value on what the springs are and what they do for us. If you broke it down to money probably, you could get more people to do something.

Participant 25, female, age 68: It's all about the money.

Participant 26, male, age 34: If your bill is twice as much, if you looked at your bill and you said this is the acceptable range and it's twice as much you know, if we're starting to value water for whatever is it, you'd use less water... I think this is an exceptional crew here; I don't think you're going to get most people motivated by an altruistic thought that the springs will be better if you just use less water. If you think about how you motivate and persuade people, you've gotta get them in the pocketbook.

Participant 29, female, age 71: I agree. Because out of the majority of the people, how many really go to the springs?... I look at our little neighborhood for instance; I don't think anybody goes to the springs.

Participant 26: But if your water, electrical bill doubled next month...ooph [ouch].

Participant 29: I agree. I agree...they're not going to care about the springs, but yes if they charge.

Wells. The cost of water came up when participants on wells discussed their incentive to conserve water.

Participant 31, male, age 43: We're on a well, so to me if the water table drops too much it's going to cost us a lot to drill deeper and remedy the situation.

This built-in incentive was made more complicated, however, by the fact that these participants did not have meters on their wells so they did not know how much water they were pumping. Those on wells were also not charged for the water they pumped:

Participant 31, male, age 43: Especially from a well... I could water all the time except for the cost of electricity. It doesn't cost me a thing.

Costs of technologies. These participants also discussed costs in terms of the start-up costs to adopt water-saving technologies including desalinization plants and reclaimed water irrigation systems. Compared to other groups, these technological innovations were discussed more in terms of their problematic aspects rather than as potential solutions to the water security problem.

Participant 31, male, age 43: The amount of clean water that is available is somewhat a fixed amount over an average and desalinization plants and that kind of thing, you see more and more of those going up in Tampa and places like that, is incredibly expensive. I think if one were to take a look at the true cost of providing clean water, then what we're currently paying is much less than that. I don't know what the difference is. I don't know what a fair amount would be.

Participant 29, female, age 71: We sort of lucked out because...we have reclaimed water for our sprinklers...[but] they say there's way too much, people need to use the reclaimed water... there's been times when the pressure gets really high...and we have blowouts in the valve system.

Subjective norms. Other than the literal, physical pressure that has caused problems with reclaimed water systems, this group discussed social pressure in several ways. One participant who had recently moved into his house told the group how a new neighbor introduced themselves to tell him what they wanted him to do with his yard.

Another participant cited social pressure to recycle as a reason she tried to conserve water. Whether pro-environmental or not, these participants discussed being pressured or influenced by social and subjective norms around them.

Personal reflections on norms. Some conservation behaviors may seem strange until enough people are aware of the intention behind the behavior. Letting grass go dormant in the winter, for instance, may appear offensive to neighbors of conservation-minded citizens. If brown, dormant grass was associated with water stewardship, responsibility, and respect instead of disrespect for neighbors' property values, perhaps more people would conserve water on their landscapes. The more normal a conservation behavior, the more social pressure will push people to conserve.

FG5 summary. These participants had some divergent views about the scope and urgency of local water issues. Participants had experienced other water scarce areas and described having seen changes in water quality and quantity over time. They understood their behaviors were connected to the quality and quantity of local water, but they did not know to what degree as they did not know how much water they used. This group had seen irrigation water wasted as every other group had mentioned. They focused much of their conversation on the costs of water, irrigation, and technological innovations.

Behavior Analysis

Total Focus Group Behaviors

This section has provided an overview of participant behaviors. Measures of participant behavior were the first data collected from participants in the form of a self-report questionnaire participants completed before each focus group. Data collected included whether they hired a landscape contractor for mowing, fertilization, and

irrigation services. Participants were also asked during the focus group what, if anything they did to conserve water. First, the total distribution of behaviors has been described followed by comparisons of each focus group.

Lawn services used

Focus group participants were almost evenly split among those who did not contract out for landscaping services (n=15) and those who hired a contractor for at least one landscaping service (n=17). Of those who hired contractors, five of them did so for only one service; two participants hired for only trimming trees and/or bushes, two for mowing only, and one for pesticide application only. A total of ten participants hired for trimming, ten for pesticide application, eight for mowing, seven for fertilizer application, and five for herbicide application. Only three of the seventeen participants hired contractors to perform all of the services listed including fertilizer, pesticide, and herbicide applications as well as mowing and trimming. Knowing this can provide information about potential areas about which participants have deficient knowledge to perform landscape maintenance, potentially a lack of interest in certain aspects of their landscape maintenance, and/or lack of physical ability to perform certain landscape maintenance tasks. Information about commonly contracted services can also indicate which aspects of yard maintenance are outside of participants' control as has been discussed later in this thesis.

Fertilizing behaviors

Information about fertilizing behaviors was collected because residential fertilizer use has been attributed as one cause of non-point source nitrogen pollution of waterways. Knowing the fertilizer application frequency of the participants with whom we talked provided information to help characterize these participants. Fourteen of the

thirty two focus group participants indicated they did not fertilize their yards. This may indicate that many of the participants were aware of potential consequences of nutrient runoff from fertilizer, for instance. From a practical standpoint, providing fertilizer education programming to those participants would not be appropriate.

The eighteen participants whose yards were fertilized were done between less than one time per year and four times per year, with the majority of participants (n=13) fertilizing twice a year or less. One participant indicated their yard was fertilized “two or three” times per year, three fertilized three times per year, and only one participant fertilized four times per year. Of the eighteen participants whose yards were fertilized, ten did not hire a contractor, but fertilized their yards themselves. Of those ten that fertilized their yards themselves, three did so less than one time per year, two fertilized once, four fertilized twice, and one fertilized four times per year. Aside from the person applying fertilizer four times per year, those that hired contractors tended to fertilize more often than those applying fertilizer on their own. Only one participant hired someone to fertilize less than once per year, two once per year, one twice per year, one said two or three times, and three participants had a contractor apply fertilizer three times per year.

Irrigation behaviors

Participants were asked “on average, how many days per week is your yard watered?” Despite being given response options, several participants used the questionnaire margins to write in an answer or explain their selection. Only two participants indicated they did not know how many times their yard was watered. Twelve of the thirty-two focus group participants reported their yard was watered “only when it rains.” Three participants wrote in their own responses that they watered “less

than one time per week,” “once every two weeks,” and “about four times per year.”

Based on responses, the focus group participants as a whole watered less than the two days they were allowed by county ordinance at the time of the research.

Conservation behaviors

When asked what things they did to conserve water, participants mentioned many behaviors both indoors and outdoors they do that conserve. Indoor behaviors included purchasing efficient appliances:

FG4, Participant 19, male, age 64: We bought a new washing machine and we bought a front loader, and they use significantly less quantity. We replaced the bathroom toilets and we cut down, what is it? 5 quarts per flush? And they work just as good as the other ones do. So, we've done a lot.

FG5, Participant 26, male, age 34: I have habits probably taught by my parents that are water conservation habits. Turn the water off when you're brushing your teeth, turn the water off in between razor shaves.

Other indoor behaviors included conserving water by taking shorter showers:

FG 2, Participant 11, male, age 81: My major conservation effort, I guess, is taking what we used to call a navy shower, which means getting in, wetting yourself, soaping up, shutting the water off, soaping up, and then rinsing with it back on again. Pathetic little effort for the planet.

Outdoor behaviors included making water-saving changes in their landscape:

FG2, Participant 13, female, age 36: Since we've [moved] here [three years ago], we've planted more plants that I learned as well, are more Florida-Friendly plants, drought tolerant is my favorite because I hate to water. I hate watering. Drought tolerant and it looks decent. We have also mulched more areas and we put in a lot more plants into our landscaping.

FG3, Participant 24, female, age 67: I gone and got all the Florida-Friendly lawn things, hay mulch, plant the right plant in the right place. Because my house had no shade I immediately put out a lot of shade trees when I moved in and now I've got leaves. So I'm recycling and nothing leaves my yard; it gets recycled back into it.

FG5, Participant 25, female, age 68: I do as much organic gardening as possible. And I'm not pulling my own cord or anything but I am very aware

of my environment and I'm trying to do everything I can to do my little part to not make it any worse...I put beds in, I got rid of all my grass pretty much, and I'm pretty careful about water around my place. But I'm an old Florida cracker and I love this state and I'd hate to see it being destroyed. So, the only thing I can do is what I can do so I'm doing that.

Capturing rainwater and using water captured indoors were both strategies for saving water mentioned by participants:

FG2, Participant 9, female, age 68: I have three rain barrels, and I'm going to get another one. I actually put buckets in my shower to get any extra water when it's really dry to water the plants. And we have shower water savers on our shower heads. And just try to be very careful about not using... If I have a lot of water from whatever reason, I'll go out and put it on the plants instead of just throwing it. Not all the time, but I try to.

FG3, Participant 32, male 37: I have a garbage can [rain barrel] that I just cut my down spout, put a little hose on it and we just, like [with] last night[s rain], that thing's full.

Another outdoor behavior mentioned frequently was saving water through recommended irrigation practices:

FG3, Participant 14, male, age 54: I only water when it's absolutely necessary, I got out and I look at the grass and if the leaves start to curl, then it needs it. If it's just fine I don't bother to water it. I might take my hose and water individual plants if it's necessary, but that's all I'll do.

FG4, Participant 21, male, age 66: I haven't watered for probably three months.

Summary of Norms, Beliefs, and Values

Findings have been reviewed within the VBN framework in this section. Working backwards through the model from the behaviors discussed above, norms, beliefs, and values have been described and discussed to add another layer of meaning to this conversation with the data. While more deductive than the previous discussion of focus group findings, reviewing the data with this model as a lens was an attempt to gain new insight and understanding of the collection of all five focus groups.

Norms

Social and subjective norms. Neighborhood norms of landscape maintenance and pressure to maintain yards to a normative aesthetic varied among focus groups participants. The degree of social pressure to maintain residential landscapes to certain normative aesthetics varied among these participants. It seemed each neighborhood had different landscape norms and different expectations perceived by participants. FG2, for example, had a neighborhood HOA that had relatively strict rules compared to other focus group neighborhoods. Because they had community-wide problems maintaining their turfgrass to meet those normative aesthetics, however, participants were not cited with violations or fines. Due to the fact that an early adopter of Florida-Friendly Landscaping principles was on the HOA board, these participants reported that the community norms were shifting; not everyone was jumping off the turfgrass bandwagon, but these participants saw peoples' attitudes about alternative landscapes changing gradually.

Personal norms. There was not a lot of discussion of personal moral norms that were discussed among the participants. These participants did not explicitly discuss personal norms, or moral obligations to act to conserve water. This was probably because participants discussed their lack of control over water security. A logical extension of having little impact water security would be to feel little moral obligation to act to conserve water

Beliefs

Concern and Awareness of Consequences

Perspectives led to concern. Participants in every focus group expressed concern about water security. Participants would describe seeing changes over time

including water tables dropping below lakebeds and rivers and springs flowing at decreasing rates. They discussed experiencing water scarcity elsewhere in the nation or globally. Personal experience was also inherent in the ways participants described their level of concern about future water security. Most of the participants of this research expressed concern about future water and all of those who did had a story to share about changes in water quantity or quality over time. For this group, seeing may in fact be believing. People described the temporal changes they perceived as being emotionally upsetting and this personal experience and affective connection might be necessary precursors to believing there is a real water security problem that demands their attention and action.

Participants were also concerned about water security when they had experienced another geographical place that had experienced water scarcity. Participants were impressed by the lack of water in those locations to the point that it seemed they recognized how valuable water was. Both temporal and spatial perspectives of relative water scarcity seemed to provide evidence to these participants that they should be concerned about future water security.

Being concerned about water security was not related to the level of awareness these participants had about their own water use in Florida. While some people looked at the price of their water bill and one well owner estimated his use based on the amount of water softener his household consumed, virtually no participants knew their monthly household water consumption. This is problematic because in order to consume less, people need to know how much water they are using and likely need to track their savings. Tracking the water use of individual appliances (especially their

irrigation systems) would provide participants with better feedback on how to decrease their use (see Allon & Sofoulis, 2006). Aggregate awareness of monthly household and per person water use is a basic but necessary place for these participants to begin increasing their conservation behaviors.

Control and Responsibility

Participants provided specific examples of behaviors they performed or actions they have taken that conserve water. Despite having next to no knowledge of how much water they have conserved, when prompted, these participants discussed purchasing water efficient appliances, watering plants with dishwater, turning the faucet off while brushing their teeth, installing rain barrels, and irrigating infrequently among other behaviors. Most focus group participants reported irrigating their landscapes at or below the frequency allowed by local irrigation laws. In self-reporting water conservation behaviors to water security researchers, these participants could have been influenced by social desirability bias. Regardless of potential bias in reporting their behaviors, these participants expressed they were not the major cause of water problems.

Irrigation waste. Having seen irrigation systems wasting water was another phenomenon talked about in every focus group.

Personal responsibility. All of the focus groups expressed feeling they were not water wasters and were not the cause of water scarcity. Most participants felt like they were conservation minded. Only two focus groups (FG3 and FG5) had participants (Participant 17 and Participant 31) who alluded explicitly to residential users as a major water use group or source of water pollution.

Others' responsibility. Participants generally perceived that water security was ultimately the responsibility of others. This included discussions of other people wasting

water in general and with their irrigation systems. Political issues included general political skepticism that water management districts or other agencies could work together, that governmental agencies couldn't follow their own irrigation restrictions, that water withdrawals were permitted too frequently for development and water bottling, and that other places were taking water from the area.

Worldview

Gender differences. When the researcher looked at all of the participants, there seemed to be gender differences in worldview. Generally, male participants seemed to express having faith that a technological innovations could solve water security problems. Some female participants made statements that reflected an alternative view of water security solutions. One female participant questioned whether technological innovation could help repair wetlands after they have been compromised:

Participant 30, female, age 41: I'm just amazed that you even think you could correct a problem once it's gotten that bad, quite honestly.

Another female participant suggested a septic maintenance insurance cooperative to diffuse the cost of inspecting and repairing septic tanks that could impair water quality:

Participant 1, female, age 52: we could together join as citizens who own septic tanks to pay into a fund and make sure that everybody else has theirs done.... I'm impacted by somebody else's septic tank; everybody is. So we have to willing as a citizenship to come together and figure out how best to invest in those kinds of things. It concerns me sometimes that we get blinded by the political rhetoric and we don't look at the places we can come together as citizens and join our resources for the betterment of all, which is what we need to do.

Values

Anthropocentric

Most of the participants discussed reasons to conserve water that were focused on the impact of water scarcity on people.

Egocentric

Many participants discussed their concern for water security in egocentric terms. They were concerned because of the personal effects of water scarcity. This included having to pay to dig a deeper well if the water table dropped below the end of their pipe. Participants frequently inferred strategies for evoking concern and conservation behaviors in other people that involved leveraging egocentric values. Participants projected egocentric values onto other people in their neighborhood of the broader community. It was thought that other people would be mainly motivated by financial reasons.

Participants of the focus groups were concerned about water security or motivated to conserve water because of the personal impact to them. Even more frequently, participants projected that egocentrism onto others in the general public by telling researchers that the major way to motivate people to conserve water is to impact them financially. Participants in every focus group discussed the costs of water and using price incentives, rebates, and/or regulatory fines to motivate others to conserve water. This reflected an egocentric value frame where these participants thought the general public would only conserve water for personal gain or to avoid financial loss.

While participants suggested water cost was an important leverage point to motivate water conservation, there was evidence to the contrary. Based on a comprehensive evaluation of water conservation programs, Syme, Nancarrow, and Seligman (2000) concluded that “socially based values are probably more important” for motivating water conservation than “economically motivated” values (p. 568). They found the cost of domestic water was sufficiently low that people may not conserve water for economic reasons until the price increases significantly (Syme et al., 2000).

Personal perceptions

Based on these data, however, personal impacts of water scarcity were discussed by those participants relying on well water in several of the focus groups. These participants had heard of other wells going dry, experienced their own well going dry, picking up debris in their well because the water table was precariously near the end of their pipe, or they heard about other peoples' wells being contaminated. This direct personal impact (or potential threat of financial cost of drilling a deeper well or using bottled water due to contamination) was a source of motivation to conserve water discussed by these participants.

Conclusion

Based on these data, participants' perceptions were similar in many ways. Participants tended to discuss issues in an egocentric value frame and most were concerned about the future of water security. They discussed perceptions of water scarcity as reasons why they were concerned. These participants overwhelmingly did not think they were the cause of water problems and they cited many other water use groups they perceived to be the cause. They did not discuss personal obligations to act, but they did express feeling varying degrees of social pressure to conform to neighborhood norms of landscape maintenance.

Table 4-1. Summary of focus group characteristics.

Date	Group number	Zip code(s)	Participant n	Average age of participants	Average time in current home	Average time in Gainesville area	Location
11/2/2011	1	32606	7	70	30	50	Home of resident
11/7/2011	2	32607	6	64	3	15	Home of resident
11/17/2011	3	32615	6	51	5	26	Home of resident
1/18/2012	4	32608	6	62	8	13	Coffee shop
2/2/2012	5	32608, 32618	7	49	11	20	Coffee shop

CHAPTER 5 CONCLUSION

Introduction

This chapter begins with an interpretive narrative of the researcher's new understanding of the issue of water security and springs health. Following the new pre-understanding, study limitations are discussed. Following this, suggestions for future research and potential implications for managers and practitioners are addressed. Finally, the chapter concludes with a summary of final thoughts.

New Pre-Understanding

At this point, I think that issues of water security are really part of broader issues of sustainability. We need to expand our awareness of water issues to capture the social, structural, political, and other environmental systems that impact, are impacted by, and are nested within the watershed system (see Meadows, 2008). In order to move towards springs health, water security, and sustainability, we need to learn, as Frijof Capra (2005) stated, "nature's language," that can provide us with "principles for sustainability" (p. 18). What is happening in nature is constantly changing. Sustainability change agent and United Nations consultant, Alan AtKisson (2013) described that phenomenon by recently stating in an electronic newsletter:

The nature of knowledge is changing. The amount of knowledge is growing so fast that no one can manage it.... The shorthand metaphor is this: knowledge is shifting from a "stock" to a "flow." We should no longer to think of knowledge that accumulates in our minds; it is rather a river in which we must navigate. The "updating" of our knowledge is no longer something that happens once in a while; it is continuous. (p. 2)

Communicating what we understand to others will also be a continual progress. Based on these focus groups and my reflection, I think understanding our individual personal responsibility for future water security is key. Communicating the importance of

individuals practicing conservation behaviors is part of helping others understand their role. There are several themes that participants in these focus groups discussed that can inform how to better communicate with these residents within the Santa Fe River Springshed. The following is a list of communication recommendations. We can communicate

- the scale of collective residential water use;
- the ecological value of water in ecosystems;
- the importance of realizing personal responsibility to conserve;
- the opportunities we have to engage others in water conservation conversations;
- the value of biodiversity in residential landscapes;
- ethical and honorable aspects of landscaping in low-impact ways;
- temporal changes and resource degradation trends to stop and/or reverse;
- efforts to conserve by high water use groups, governmental and non-governmental agencies, and exemplary private citizens;
- the idea that irrigation waste upsets neighbors;
- strategies those neighbors might use to delicately approach people about irrigation systems that may be wasting water.

Scale of collective residential water use. In our communication efforts I think it is clear there remains an opportunity for people to better understand the impact of their personal as well as collective water use. After speaking with the focus group participants in this study, one of the things I was most impressed by was that people did not recognize the collective impact of their daily choices. While these participants were concerned with future water security generally, they did not understand the collective impact of their daily water use as it has contributed to water scarcity. Calculating and

communicating the aggregate impact of households and residential users over time emerged as a need.

This could be done following the example of artist and activist Chris Jordan (2006) who has been exploring visual means of communicating the impact of collective unconscious behaviors such as using plastic beverage bottles and paper cups. These approaches can help us comprehend the somewhat overwhelming scale of the daily decisions we make often without a second thought, like drinking out of a disposable container (Jordan, 2006, 2008). Collective, often-unconscious choices (like taking a long shower trying to wash away the day's troubles, forgetting to check that an irrigation system is using as little water as possible, or ignoring the telltale boil of a blown water pipe on the side of the road) lead to tremendous if not catastrophic consequences. Understanding the magnitude of the unconscious choices that lead to two million plastic beverage bottles being used in the US every five minutes clarifies for me that as many people as possible are needed to engage in working towards the moving target of sustainability.

Understanding the interconnectedness of social, economic, and environmental wellbeing may also have a positive impact on pro-environmental behaviors. Perhaps personal stories, art work, or other media could be explored as ways of communicating the connection between individual behavior and collective impacts (see Jordan, 2006, 2008). My current understanding of participants' discussions of water security lead me to see the value in exploring powerful and effective ways to communicate interconnectedness. I think it is vitally important to encourage the evolution of collective

consciousness to fully grasp the connection between ecological wellbeing and personal wellbeing.

Personal responsibility. Based on participants' reluctance to take responsibility for their own contributions to water scarcity, I think it is important to emphasize the need to ask what Jordan (2008) called the "big question" of "how do we change." It takes courage to ask that question and hard, collaborative, and continuous work to strive toward an answer. A trailer for a forthcoming documentary about humans' ecological impacts posed that important question by asking "do we have the courage to face the realities of our time and allow ourselves to feel deeply enough that it transforms us and our future" (Levy, 2012).

It pains me to admit that I am partly responsible for record low groundwater levels in North Central Florida. In order to admit this, I've had to fight the urge to compare my water use to other people or industries or agricultural producers or business, to rationalize and to justify my actions. I think I have identified ways participants have eschewed their responsibility by citing other causes of water scarcity because I see that tendency in myself. I want to list the ways that I conserve water and am mindful about my water use, but first I will confess the ways I am part of the problem.

I do laundry at least once a week in a top-loading washing machine that has no environmentally friendly certification—sometimes as many as four loads when I throw in towels and sheets. Despite purchasing a showerhead shutoff valve to make it easier to turn the water off while I lather, I don't use it all the time—especially when it is cold. I notoriously get new dishes (especially cups) rather than rinsing and reusing the one(s)

that are already out. Then, I rinse my dishes before putting them in the dishwasher. I also have absolutely no idea how much water I use on a daily basis despite carefully checking my utility bill and trying to lower my expenses.

I think it is important to admit how I use water every day and to be able to change. I want to know how much water runs through all of my appliances and how large a water drop I gulp out of the aquifer each day. I don't know how to get more detailed information about my water use even though I want to know more and decrease my water use. That is one example of a structural barrier that disempowers me as a residential homeowner from making water conscious decisions. This physical context literally cements-in residential water use behaviors (Allon & Sofoulis, 2006).

Other structural barriers to my water conservation include every drain in my home (see Allon & Sofoulis, 2006). There is no easy (if possible, let alone legal) way for me to redirect clean water (like the gallons that run down my drain when the shower is warming up) to my lawn, for example. My toilet is flushed with drinking-quality water and I have next to no choice about that. Control over water use has been limited by the structures in residential homes. The structure of our buildings presents barriers to resource conservation and sustainability.

Regardless of the barriers to residential conservation, I believe that individuals are responsible for the miniscule modicum of control we can exert over our own personal water use and our collective water security. I truly believe as the Dalai Lama (1998) articulated, "everything we do has some affect, some impact," (p. 63). He emphasized the simple truth, "if you want to change the world, first try to improve and bring about change within yourself" (Lama & Singh, 1998, p. 63). Mohandas Gandhi's

assertion, “the difference between what we do and what we are capable of doing would suffice to solve most of the world’s problems,” echoes the sentiment that we can all make positive changes. Jordan (2008) said the “big question-- how do we change,” involves taking personal responsibility for the one part of the solution we are in charge of—our own behavior.

I am at a stage where I think I have developed ways of gathering information about what is going on in the watershed. My ways of doing that are to go to the river and listen. The river speaks through the flight of an osprey holding a heavy fish high above the river on the way to a dinner perch, through the shimmering arc of a brazen freshwater mullet leaping out of the water off the bow of my kayak, through the colors of the water and the line where clear spring water meets river tea. Through those messages I have learned to sense what is happening with the river; I see and feel and hear that large fish are supporting birds of prey and being supported by the river and the river is relatively low but could be lower. Through the turtles and smaller fishes in the water, the birds and blossoms on the banks I am reminded of the abundant diversity of this ecosystem. Through the sparse aquatic vegetation and slippery brown slime coating barren blue-green spring runs, I am reminded how devastated I feel about the uncertain future of the springs.

Residential landscape diversity and biodiversity. I think part of a cultural shift towards lower impact residential landscapes will involve people developing a greater appreciation for diversity in their neighborhood landscapes. To paraphrase one focus group participant, biodiversity in residential landscapes means a hardier yard. When the resilience to droughts and pests of landscape ecosystem is appreciated as more

beautiful than a landscape that requires significant amounts of water and chemical inputs, residential landscapes will not impact water security as they do now.

At this point, I'd like to share that during the process of this thesis I have expanded the mulched bed island in the middle of my front yard to the curb and I still don't irrigate my landscape. My alternative yard can serve as an example of a less manicured, alternative, low-impact landscape. While it is individuals' responsibility to conserve, that line does not stop at the residential lawn. I also feel a responsibility to figure out what is going on with local systems (see Armstrong, 2005).

Opportunity to engage others to conserve. Literally every person impacts water security and in order to work towards water security and sustainability more broadly, as AtKisson (2013) declared, "sustainability must be pursued as a team sport" (p. 2). He wrote, "sustainability requires knowing a lot... about a lot.... From climate change to human rights to resource management to new economics, these topics span the full range of human challenges. No one can truly know it all" (AtKisson, 2013, p. 2).

Inherent in taking responsibility for our own actions, therefore, is building understanding of the challenges with others (see AtKisson, 2011, 2013). AtKisson behooves us to engage with other people to think about what is happening with social, economic, and environmental issues and wellbeing. We can move into thinking about how we know what is happening. Far from the 'looting and polluting' eco-villains of the Captain Planet cartoon show of my childhood (see Sturgeon, 2004), no one wants water scarcity and ecological destruction to happen. Open dialogue about our individual and collective impact on future water security is tremendously important as humans evolve

to work with instead of against the nature of which we depend and of which we are indeed a part (see Capra, 2005).

Efforts by high water users. It is vital that large users of water also strive to conserve. Agriculture, industry, business, and energy can all strive to consume less water. Where there are large amounts of water used, there is also a large opportunity to conserve. In order to take advantage of those opportunities, leaders are needed to forge creative partnerships to invest in water saving technologies, retrofit factories and buildings, and communicate large-scale efforts to conserve to the general public. By taking responsibility for resource conservation and communicating those efforts to residential consumers, residential homeowners might feel more inclined to make personal conservation choices. Governments can also serve a valuable leadership role by maintaining government-owned landscapes according to best management practices. Making good faith efforts to conserve can influence others to conserve as well.

Personal reflections on this project. I realize now this project was a process of self-discovery. Through discussing with other people, I have developed a better understanding of myself. I recognize I have transformed from a child who loved to play in springs to an adult who recognizes the value of springs as fountains of human and ecological wellbeing. My experiences with North Florida springs since I was very young have provided me snapshots of how they are changing over time. Having seen and felt springs in their striking, crisp beauty has been a powerful motivator for me to conserve water and to conduct this research that may help others conserve. I have been

impressed that other people are worried by the changes they have seen over time and care about future water security.

I see this project as adding another voice to an ongoing conversation about conservation, sustainability, and ultimately, about living well. Like water, my thoughts will change as the situation changes. Still, I hope others will be inspired to think critically, add to this conversation, and to act. I think we are all changing the world by everything we think and do; I hope we change it for the better.

Limitations

As with every research project, this thesis had limitations. This research could have benefitted from asking questions more explicitly designed to address relationships between concepts identified in previous research on pro-environmental behaviors. The accuracy of interpretation could have been buttressed by member-checking the findings with research participants to ensure they made sense to them (see Richards, 2009). Understanding relationships between participant perceptions and their behaviors was also limited because only self-reported behavioral data was available. These self-reported behaviors could have been influenced by participants desiring to be seen as environmentally responsible to researchers and to their neighbors in the case of the focus groups.

Sampling. One limitation of the study pertains to the sampling method employed. Researchers used a criterion-based convenience sample (Flick, 2009) and as with every ethical study, participants ultimately self-selected to attend. This meant researchers solicited focus group participation based on certain criteria (neighborhoods within the Santa Fe River Springshed in Western Alachua County with large yards and groups varying by home owner association status, water source, and degree of water

ordinance compliance perceived by regulators) but within those criteria people chose to attend. The participants in this study, therefore, could be categorically different from the people who elected not to participate. The perceptions of these study participants, therefore, may not apply to other people within the study area or people in other contexts throughout Florida and beyond.

Fairness. Participants of this study represent only a small selection of voices about water conservation within this study area. There was an effort to speak from high water users in the focus groups and the participants seemed to be relatively wealthy. Information that could help researchers support the apparent high socio-economic status of these participants was not collected from participants, however. While the focus group participants all lived in typically affluent neighborhoods, no income information was collected to help buttress that observation. Similarly, information on participant race was not collected and the intersection of class, race, and conservation has not been analyzed. This research has not addressed issues of privilege related to water conservation in this Southeastern United States city.

Representativeness. This research was not a necessarily fair picture of water use perspectives in the springshed/study area. Even among the participants of this study, there were some participants that have been quoted more frequently than others. That was due in some cases to certain participants speaking less colorfully or descriptively. Other times, certain participants simply said more during the focus groups than others despite moderator efforts to invite quiet participants to speak. Participants were invited to speak, explain, and expand on their answers. While people were encouraged to participate, some participants did not speak often. Dominant talkers had

more content from which to understand their perspective and share their words in this thesis. While the author tried to include many different voices within this work, some have probably been overrepresented while others have likely been underrepresented to some degree.

Within-group differences. More than the representativeness of perspectives within each focus group, the choice of focus groups as a data collection method put boundaries on the analysis methods. Understanding individual differences among participants of the focus groups was not possible; the social nature of the focus group meant that each participant was influenced by the other participants of the group. While there appeared to be some divergence observed by researchers among focus group participants within a given group, aggregate opinions or similarities between participants in each group were the only conclusions that could have been drawn from the socially constructed unit of data—the focus group. Assessing individual differences among participants of a given focus group, therefore, was not within the scope of this study.

Generalizability. To many post-modern academics, “qualitative” has meant ‘subjective,’ ‘relative,’ and ‘not generalizable’ (Crotty, 1998). As argued in chapter three of this thesis, all research suffers and benefits from ‘prejudice’ or pre-understanding that guides even the most objectivist enquiry (Christopher, Richardson, & Christopher, 2003; Gadamer, 1975, 1989). Insight generated by this research is not totally relative, but has been limited by the boundaries of the study context. What this study lacked in generalizability it has traded for deep and rich understanding of the study context and participants’ perspectives (Christopher et al., 2003; Richards, 2009). As discussed in previous chapters, the results of analysis have been generalized *within* the sample, and

the trustworthiness and transferability of these context-based findings have been presented for the reader to assess (Guba, 1989; Lincoln & Guba, 1985).

Suggestion for Future Research

Future social research for water conservation could strive to troubleshoot some of the problematic aspects of this work that resulted in limitations. Researchers would do well to be well versed in previous literature about theories of environmental behavior and the research inspired by those theories. Future research could capture demographic information from participants that this research did not, including income and race data. Examining how the participant perspectives found in this research compare to other groups of participants including more economically and racially diverse participants could generate new insights that could lead to effectively promoting water conservation behaviors. Expanding qualitative research to capture watershed scale residential perspectives of water conservation could be another valuable line of inquiry.

Conducting a meta-analysis of qualitative research for resource conservation could also prove exceedingly important for directing future research and informing residential water management decision-making. A meta-analysis could be particularly helpful since there have been an increasing number of qualitative studies of residential perceptions pertaining to landscaping and water conservation especially in Florida and Australia (see Askew & McGuirk, 2004; DeLorme et al., 2003; Johnson, 2010; Mustafa et al., 2010).

Experimental research could assess the relationship between specific water use information and residential water conservation. Does knowing the amount of water used per person per day or per appliance increase water conservation? Do people conserve

water differently under drought and non-drought conditions? What information pushes people from being concerned to changing their behavior?

Communications and marketing research is needed to assess strategies for best communicating collective interests to conserve water resources. Further examining gender differences could also help better communicate targeted information at different groups of people. Who needs to be shown why water conservation is an urgent problem worth attention and action? Who needs more information on specific behaviors they can perform to reduce their use? Which audiences can be receptive to messages encouraging social strategies (such as communicating with your neighbors about irrigation savings) for water conservation? Who would be most responsive to information about water-saving irrigation technologies? All of these questions and more can be addressed by future marketing research for resource conservation.

Future research can also investigate what messages, images, stories, testimonials, and/or educational information can overcome the KAB gap (see Thomson & Barton, 1994). Methods for evaluating the impact of environmental behavior change campaigns on peoples' behavior as well as the quality of ecological resources would be helpful for sustaining resources. Are certain people motivated to behave in pro-environmental ways more by appeals to their intellect? Do some audiences conserve more when they hear emotional appeals for them to do so? Can we communicate the importance of personal and collective action for sustainability more effectively through storytelling? Exploring these social questions may provide valuable insight as the conversation on conservation continues.

Aside from social science research, physical science research could help further develop water conservation innovations such as cisterns for collecting rainwater, industrial and residential greywater systems, and other reclaimed water systems. Policy analysis is needed to assess the potential impact of those water conservation technologies. Quantitative research, to further explore concepts identified as important by this thesis and relationships between them, could be used to assess the breadth and generalizability of the perspectives to complement the depth of this information.

Implications for Water Managers

Communicate using relative impact frame. Relative impact was a concept many of the focus groups participants discussed. It seems that there is a gap between how water managers conceptualize 'homeowner' use and how individual homeowners perceive their impact. Individuals don't think about the aggregate impact of their behaviors combined with those of all other homeowners in their neighborhood let alone a whole county, water management district, or state. While homeowner use of water represents the second highest use of water in Florida, individual homeowners are a miniscule fraction of the aggregate used by all homeowners.

The way participants discussed water security and their water use in this study suggests that at least these individual people compare their individual use to larger categories of users. Water bottlers, the policy makers that allow bottling withdraws, agriculture, and Florida's increasing population were the categories of users these participants described as dwarfing their individual use. While it may be convenient in some ways for water managers to calculate "residential use" as a user category, it is important to remember that residential users are incredibly diverse in their behaviors, norms, beliefs, and values.

Irrigation savings. One of the major themes discussed by all focus groups was irrigation waste from in-ground systems. Outdoor water use is visible and could be a valuable place to make significant inroads towards reducing residential water use. Based on literature about residential yards being venues for showing respect for your neighbors, a conservation campaign might want to encourage residents to respect their neighbors and their community by alerting their neighbors when their irrigation systems are wasting water. Residents could also be encouraged to turn their automatic irrigation systems off and irrigate only when their yard shows signs of need. People could also be encouraged to be what Rogers (2003) called a 'champion' for conservation and set a good example for their neighbors by irrigating according to best management practices. This could include turning their irrigation system on manually each time they irrigate, watching their system while it runs, and periodically having the system adjusted to spray only on the yard (but not the sidewalk, street, or driveway).

Another way to conserve irrigation water would be to invest in an irrigation system audit or maintenance programs that could be inexpensive or free for residents. Economic and policy analysis could investigate the viability of funding a free irrigation audit program with fees charged to residents using water in top tiers of municipal water use categories or taxes on irrigation system equipment, for example.

Norms of conservation. Communication campaigns could inform participants that their irrigation behaviors provide an example and contribute to water use norms to their neighbors. Conservation-minded homeowners can provide examples of pro-environmental landscaping behaviors for their neighbors. While landscaping norms varied depending on which neighborhood they were from, these data showed some

participants felt pressure from neighbors to maintain their landscape to certain expectations. Saving water as opposed to maintaining a certain landscape aesthetic could be seen as a way of respecting neighbors.

Feedback as information for conservation. Providing residents with more information about their water use may be a powerful way of helping participants conserve. If all new construction was required to install irrigation meters so people, regardless of being on well or municipally supplied water, could know how much water they use on their landscape, perhaps people would be more empowered and motivated to reduce that use. Structurally, there are many barriers to conserving water both indoors and outdoors (Allon & Sofoulis, 2006; McKenzie-Mohr, 2011). Water meters for individual appliances could provide information to homeowners to help them identify where they have the largest opportunities to conserve water. Moving water meters indoors could provide homeowners with a significant amount of information about their personal use (see Meadows, 2008). Following the lead of western states and providing daily water table information to Florida residents could also provide people with information that encourages them to conserve water.

Information during recreation. Several participants indicated their appreciation for signage at springs managed by the state and county park system. Signage explicitly providing information about the connection between residential water use in the springshed and spring water levels and quality could be a valuable information tool. Providing people with specific conservation behaviors they can perform at home in order to protect the resource when they leave could be influential. Participants of FG2

who were the newest group to Florida spoke about this perhaps more than any other group.

Lifestyle changes as leverage points. These data support DeLorme et al.'s (2003) assertion that new residents are less likely to be aware of the status of local water and less likely to perceive the urgency to conserve water. When people make a life change like moving to a new state or a new house, many of their behaviors will change. At these points, people may be more open to learning about local customs, social landscaping norms, and how to behave in environmentally responsible ways. Landscaping best management practices, information about Florida-Friendly Landscaping, the watershed, hydrogeology, and ecology of the local area can be given to new homeowners when they purchase a home. They also may be more open to retrofitting their new homes with water-efficient innovations. Since they may already be making changes, information about the long-term benefits of water conserving appliances, landscapes, and behaviors may be received with open arms at this leverage point of lifestyle change.

Asking participants how long they have lived in Florida revealed something potentially useful for water managers and agencies working towards water conservation. The focus group with the lowest average time spent in the area was also the most open to learning new information about specific behaviors they can perform to conserve water. Learning how to behave in pro-environmental ways is something these new-to-Florida residents wanted to know more about. It is likely these participants who self-selected to speak with researchers about their landscaping and the environment

would be more enthusiastic than the general population of residents, but new residents could be a valuable target audience.

Final Thoughts

Water security is a problem of increasing magnitude. Springs are an indicator of water quantity and quality in North Central Florida. Examining residential perceptions of water security, the connection between their landscaping practices, and responsibility for water security is important. As part of a project to inform public outreach and increase water conservation, data on specific groups of residents' perceptions were collected in the forms of five focus groups and fifteen phone interviews. Using hermeneutical theory, the data was analyzed in two rounds. This thesis provides evidence that qualitative social research examining participants' perspectives can provide insights applicable to increasing water resource conservation.

Findings of the study included:

- Participants thought the general public would be motivated to conserve water by being aware of the resource and the personal cost associated with degraded water resources.
- Concern about water security was related to perceptions of water scarcity described as changes over time or knowledge of scarcity elsewhere.
- Norms of landscaping aesthetics, behavior, and neighbor communication about landscaping varied by neighborhood.
- Most participants knew behaviors they currently perform or could adopt to conserve water.
- Participants did not feel they made major contributions to water scarcity.
- Participants expressed feeling they had little control over water security by citing political issues, the responsibility of other groups of water users to conserve, and suggesting education and information campaigns to educate other people.

Based on these findings, recognizing the aggregate impact of all residential homeowners is important. To conserve water is an ethical choice we can make with every action we do. Assuming our own responsibility for water conservation is a necessary starting point. AtKisson (2011) stated:

Caring is the first step. Caring is not just a feeling: it is a move towards commitment, born out of values and ethical principles. We care about a problem because we believe it to be both real and important we act to solve a problem when we believe we must. When we truly care about something, we overcome any Hamlet-like hesitation, or any selfish desire to avoid our responsibilities. The word 'duty' begins to feel less like a burden, and more like a calling. (p. 16)

Once we have developed good practices ourselves, we can work to influence others. We can serve as examples of water conserving citizens; the change we make can diffuse to others (see Rogers, 2003). We can help people gain perspective about changes having taken place over time that evidence the urgency of water conservation or knowledge of specific behaviors they can perform to conserve water. We can recognize that we all benefit when each one of us conserves water and we are all responsible for water security now and in the future. We can strive to sustain water resources that our children can drink but also in which they can swim and play. What will our legacy be to our children who will inherit this, our tiny blue dot?

APPENDIX A
BACKGROUND INFORMATION SHEET

The following information will help the research team get to know you better. Your responding is completely voluntary. Your personal information will be kept confidential. **At no time will your name be associated with your responses in a written report.**

Frist Name _____ Age _____

1. What is your occupation? _____

2. In the Gainesville area? _____ Years

3. In your current home? _____ Years

4. Please list any clubs or organizations to which you belong:

5. When you want to enjoy nature here in Gainesville, where do you go?

6. Do you have an in-ground irrigation system? (Please circle) **YES** **NO**

7. On average, how many days per week is your yard watered (Please circle one)?

Don't know **Only when it rains** **1** **2** **3** **4** **5** **6** **7**

8. Do you hire a landscape contractor to do the following? (Circle all that apply):

Apply fertilizer, **apply pesticides,** **apply herbicides,** **mowing,**
trimming trees/bushes, Other: _____

9. On average, how many times per year do you or your landscape contractor fertilize your yard? (Please circle one):

Don't know **Never** **<1** **1** **2** **3** **4** **>4**

10. Do you have a well (please circle) **YES** **NO**

11. If you have a well, do you use it for just irrigating your yard (please circle)

YES **NO**

APPENDIX B FOCUS GROUP GUIDE

Good evening and welcome to this focus group. Thank you for taking the time to join the discussion about landscaping alternatives. My name is _____ and I am from the University of Florida. Our purpose today is to learn more about your opinions about springs and landscaping practices. We have only invited people who live in your neighborhood (or area) to this focus group. We are conducting several other focus groups with other neighborhoods and area residents, though.

Your opinions are very important to us. The information gathered in today's discussion will help guide us in the creation of programs that will be administered within the Santa Fe River watershed and help us connect the needs of homeowners with the needs of the local ecosystem.

Before we begin, I would like to propose some suggestions that will make this discussion productive. Please speak loudly and clearly—only one person should talk at a time and other group members should let them finish their thoughts before interjecting. We are recording this session because we do not want to miss any of your comments.

My role here is to ask questions and listen—and get through in a timely manner. I will not interject my feelings into the conversation, but I want you to feel free to talk with one another. It is important for us to hear from each and every one of you because you all have different and valuable experiences. Your thoughts and ideas are important tools to help us communicate effectively. All comments are valuable and we learn just as much from negative comments as positive comments.

We will not include your name in our final reports. By assuring this anonymity, we are hoping that you will speak openly. If anyone would like to withdraw, you may do so now.

This session will last about two hours today. I may interject at times to keep us on track and make sure we finish on time. We ask that you please turn your cell phone ringers off at this point, and if you need to answer a call, please step out of the room to do so and return as soon as you can.

We have placed name cards to assist with remembering the names of one another. To facilitate the transcribing of our audio recording, please state your name first before you speak.

We will start by going in a circle and having each of you tell us your first name, how long you have lived in this area, and what you like best about living here. (Name) let's start with you.

...

Now that we know each other a little better, let me ask you...

1. Do you ever worry that we won't have as much water as we do now? What makes you say that?
2. Do you know where Gainesville gets its water supply?
3. Do you feel a need to conserve water? What makes you feel that way? What steps do you take?
4. Do you know approximately how many gallons of water your household uses per month? Do you think that is average?
5. Let's change topics a little and discuss the springs in this area. Which springs have you visited in the area? How often do you go?
6. Do you have any memorable experiences involving these springs that you would like to share?
7. Do you think the springs are threatened in any way?
8. What is happening to cause these problems?
9. Even though the springs are more than 20 miles away, do you believe there are things you or your neighbors do that may have an effect on the health of the springs?
 - a. What about fertilizers? Do you think they impact the springs? How?
10. Do you think you and your neighbors would use less water if everyone realized that they were using the same water that the springs rely on to keep flowing?

The last thing we want to do is show you a short video about the springs and then ask you some questions afterward.

11. After watching this video, what is your reaction to it?
12. Does the video motivate you to do something about protecting the springs?
13. What do you think could be done to protect the springs?
14. Now we are going to quickly review some of the major themes you brought up- please tell us if we wrote down the correct information or if you want to add something.
15. As we work on springs protection programs may I contact you in the future if we need additional feedback from citizens?
16. Do you have any questions for us about our springs?

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BIOGRAPHICAL SKETCH

Before attending graduate school Emily Ott's educational background included double majoring in peace & conflict studies and psychology with a concentration (minor) in sports administration from Guilford College in Greensboro, North Carolina. She combined those three seemingly divergent educational areas through writing an undergraduate thesis on student athlete integration within the broader student bodies of small division three colleges. After graduating with high honors she moved back to her home town, Gainesville, Florida where she worked part-time to support her coaching soccer at Eastside high school, her alma matter. During one of her three successful coaching years, Emily attended the University of Florida's Natural Resource Leadership Institute (NRLI), a professional development program focusing conflict management and natural resource issues of contention throughout the state of Florida.

Through her NRLI participation, Emily developed an awareness of environmental problems as social issues and solidified her commitment to help solve environmental problems through social research, facilitating group decision-making, managing conflict, and building community. The University of Florida College of Agricultural and Life Sciences Agricultural Education and Communication Department proved to be an ideal context in which she has built her facilitation, community-building, data management, research methods, program development, and program evaluation skills.

When not working as a research assistant helping coordinate Community-based social marketing campaigns related broadly to water conservation and completing graduate coursework, she has enjoyed serving on the officer team of the Agricultural Education and Communication Department Graduate Student Association. Emily has also enjoyed working with the United Church of Gainesville Middle School Group as a

continuity Person. During her free time Emily has loved spending time kayaking, hiking, bike riding, playing soccer, Frisbee, Ping-Pong, pool, and volleyball with friends. She has also appreciated local culture including farmers' markets, restaurants, live music, performances, sampling craft beers, and dancing with friends in downtown Gainesville.

Emily graduated with her M.S. from the University of Florida's Agricultural Education and Communication Department in the Spring of 2013. After graduation she has continued to kayak on the Santa Fe River and to diffuse water conservation and stewardship messages. In the future, Emily hopes to continue to focus on social issues pertaining to natural resource conservation in Gainesville and beyond.