GOING GREEN WITH WATER: PERCEPTIONS OF WATER CONSERVATION BY COLLEGE STUDENTS IN THE TEXAS PANHANDLE

by

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A Thesis Submitted in Partial Fulfillment

Of the Requirements for the Degree

MASTER OF ARTS

Major Subject: Communication

West Texas A&M University

Canyon, Texas

July 2018

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ABSTRACT

This thesis explores perceptions of water conservation by college students in the Texas Panhandle. There is a lot of existing research about water conservation, but very few employ a qualitative approach. Most previous studies use surveys to examine what types of water conservation people engage in, measure people's attitudes towards water conservation, and explore how much water can be saved by using more efficient household items and appliances. This type of research is important because groundwater levels specifically in the Ogallala aquifer are decreasing at a faster rate compared to the rates at which water is recharging. Lack of qualitative studies about water conservation inspired the qualitative approach choice of in-depth interviews for this study. Nine participants were interviewed to help provide insight into perceptions college students have about water conservation in the Texas Panhandle. The theoretical framework for this study was the theory of reasoned action which provided components that were vital in creating questions for in-depth interviews. A thematic analysis was used to identify the following themes: important but affordable, a way to save money, connection to the land, motivation from international communities, concern for the future, family, news/electronic media, and classroom. In addition to the themes above, the study concluded not all students had a full understanding of water conservation. Additionally, students knew very little about the water situation and issues in the Texas Panhandle.

ACKNOWLEDGMENTS

I would like to thank the people in my life who have made this thesis possible. First, I need to thank my family. Specifically, my amazing parents Doug and Tammy Eickhoff. I would like to thank you both for the endless love, support, and encouragement you gave me throughout this process. I also would like to thank my brother Sam Eickhoff for always pushing me to be better and achieve more. I can truly say that I would not have made it this far without any of you.

I would also like to thank all my friends who have asked questions about my research and giving me many opportunities to expand my thoughts and ideas through our conversations. In addition, I would also like to thank my WT volleyball family for the encouragement you gave me during my last five years here at West Texas A&M.

I must also thank all students who agreed to participate in my study as well as my thesis committee members, I would like to thank every one of you for the work you put in to help me accomplish this finished product. Dr. Garcia, thank you for pushing me to expand my thinking and writing to places I have never thought possible. Dr. Hanson, I would like to thank you for not only making me feel capable of writing a thesis but keeping me on track the whole time. Dr. Osei-Hwere, thank you for all your help learning how to write a thesis and for always pointing me in the right direction.

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CHAPTER I

INTRODUCTION

The Texas Panhandle today is becoming a drought-stricken region of the United States. According to the National Weather Service and the National Oceanic and Atmospheric Administration (2018) continued long term drought effects are occurring in both the Texas and Oklahoma Panhandles. These drought effects include things like low underground water reservoir levels, dry soil zones, and thinning of grass on rangeland areas (NWS & NOAA, 2018). A major sector of the economy in this region depends on agriculture which uses a great amount of the water remaining in the Texas Panhandle each year (Seo, Segarra, Mitchell, & Leatham, 2007). Additionally, an average of 95% of pumped groundwater is used for agricultural irrigation in this region (Texas Water Development Board, 2018).

Water in this region comes from three primary sources (a) the Ogallala Aquifer, (b) runoff water found in playa lakes, and (c) flowing streams that rise in the area or cross through the area (Templer & Urban, 1997). The Ogallala Aquifer is the most prominent water resource in the Texas Panhandle region. According to the Texas Water Development Board, (2018) there is a maximum thickness in the aquifer of 800 feet. This number is low considering at one point the aquifer had a maximum thickness of over 1000 feet (Texas Water Development Board, 2018). The aquifer itself has declined in certain areas up to 300 feet with the past 50-60 years (Texas Water Development Board,

2018). As water levels continue to decline in the region, the need for water conservation practices increases because they will help preserve the remaining groundwater. Water conservation is important because it has potential to help recharge at a higher rate in an already diminishing aquifer. Water conservation can be practiced through activities including but not limited to (a) purchase of water conservation equipment for domestic irrigation, (b) reduction of shower time, (c) shutting the sink off while brushing one's teeth, (d) washing only full loads of laundry, and (e) repairing leaking faucets (Monin & Nortin, 2003; Tsai, Cohen, &Vogel, 2011; Untaru, Ispas, Candrea, & Luca, 2016).

The purpose of this study is to explore the perceptions of students in the Texas Panhandle regarding water conservation. This study contributes to the understanding of influences that encourage students to participate in such practices. For this study, college students in the Texas Panhandle area were selected. The college in question is located in the Texas Panhandle and has a significant number of in-state students. There were 10,169 students enrolled in the fall of 2017 with 81.64% of themselves identifying as Texas residents (WTAMU, 2017). Since these students constitute a significant portion of future homeowners, employees, and citizens of this area, it is important to understand how they perceive water conservation, because it remains an issue as time continues.

To better understand perceptions of students in the Texas Panhandle regarding water conservation, this thesis was organized into five main parts:

Chapter one identifies the problem and importance of this research while providing a basic introduction to the related literature and method. Chapter one also outlines the remaining thesis chapters.

Chapter two focuses on the literature review and contains an analysis of current literature on the topic of water conservation research as well as the current status of water conservation efforts in the Texas Panhandle. During the review of the literature it became clear that previous studies have primarily focused on locations outside of the United States and in drought-stricken areas like the Texas Panhandle. However, the lack of research about this specific area focusing on domestic water conservation is surprising considering the limited amount of available freshwater in the area. In the following section, I provide an in-depth review of literature including studies within and outside of the United States, as well as providing a thorough description of the problem of water shortage in the Texas Panhandle.

Chapter three represents the method section and showcases a full description of participants and procedure for the thesis. This chapter also explores the different types of instrumentation used to conduct the research. The method that was used for this study is in-depth interviews. Participants also completed demographic questionnaires to help better understand the participants in relation to their age, major, classification, hometown, and gender. Although, this research did not specifically analyze students based on their age, major, classification, and gender this information was beneficial to the analysis and discussion portions of this thesis in chapters four and five.

This research applied the theory of reasoned action to better explain and evaluate how students understand, engage, and practice environmental preservation behaviors and more specifically water conservation. The theory of reasoned action is a three-part theory explaining why people choose to engage in certain behaviors. This study did not test the

theory of reasoned action, but instead used aspects of this theory to create questions for in-depth interviews. This theory was vital to the method used for this research.

Chapter four is dedicated to data analysis by describing how the data was analyzed as well as discuses findings from the research. As each interview was recorded and transcribed, the data analysis consisted of re-reading participant transcripts multiple times, focusing on initial identification of potential trends, then coding for possible themes, and describing each theme in detail using in-depth descriptions of themes found in participant interviews.

Chapter five focuses on results and relevance of findings and how they relate to the two research questions. This section also addresses limitations and future research recommendations.

Rationale

My research explored the perceptions of students in the Texas Panhandle regarding water conservation. With water continuing to become a scarce resource in the Texas Panhandle region, it is necessary to understand how people living in this region perceive conservation of water. As water levels in the Ogallala Aquifer continue to dwindle, water conservation practices provide a chance to prolong the remaining water in the Texas Panhandle. This aquifer is the most prominent in the region, as a result increasing knowledge and awareness of water conservation could have drastic effects in the region. This counters traditional water conservation research and use a qualitative method to explore how college students perceive water conservation in the Texas Panhandle.

Chapter Summary

This study explored how college students in the Texas Panhandle perceive water conservation. This is important because the region of interest continues to experience severe trends of drought and depletion of sources of water which could impact water supply to Texas Panhandle communities. The literature review expands on issues about water conservation, the water problem in the Texas Panhandle, as well as the theoretical element of this study which is the theory of reasoned action. The method section explains the purpose of using in-depth interviews as a way of understanding how students in the Texas Panhandle perceive water conservation and outlines the complete method for this study. Chapter one serves as an introduction of basic elements to be included in the study as well as a brief overview of literature that is more detailed in later chapters.

CHAPTER II

LITERATURE REVIEW

In this chapter literature regarding water conservation practices at the international, national, and local levels are explored. As the research will show, this specific water crisis does not only exist in the Texas Panhandle but in many other locations with similar climates as well. In addition to discussing research about the effects of the water crisis, which this thesis defines and explains how the issue is caused. I also examine a common theory used in environmental communication. Additionally, I explain how this theory has been applied to water conservation research and analyzed to explicate how people typically develop the intent to participate in water conservation.

In the Texas Panhandle, water has become a scarce resource but at the same time is also heavily needed for agriculture. Crop production and agriculture are a significant part of the Texas Panhandle economy. These agriculture practices, specifically crops grown and livestock managed are made possible through the use of irrigation water (Seo, Segarra, Mitchell, & Leatham, 2007) from ground water which lies beneath the surface. In 2010, aquifers provided water for the following primary uses (a) public supply, (b) irrigation, (c) mining, (d) thermoelectric power, (e) industrial, livestock, and (f) domestic uses (Maupin et al., 2014). In the Texas Panhandle, citizens rely primarily on the Ogallala Aquifer for domestic and agriculture water need; this aquifer is a part of the high plains aquifer system (Terrel, Johnson, & Segarra, 2002). The Ogallala Aquifer is depleting at a

quick rate, which could soon lead to a dramatic water crisis in the Texas Panhandle, (Terrel, et al., 2002). The water crisis would include a lack of adequate water supply for irrigation, drinking, domestic uses, and livestock needs in the Texas Panhandle.

There is a large push for agricultural conservation practices in the region. However, domestic water conservation practices are important as well. By playing an active role in conservation practices and preserving what water is left in the Ogallala aquifer residents of the Texas Panhandle could help prolong the existence of available ground water in the region (Ogallala Commons, 2018b). Water conservation practices vary from something as small as shortening the time spent in the shower to insulating your water pipes. Other water conservation practices include monitoring water consumption, regularly checking sinks/toilets for leaks, watering lawns in the morning, and purchasing appliances with the ability to reduce water usage in or around one's home. It is important to recognize that all the citizens in the Texas Panhandle are affected by the water crisis and have potential to play a role in the solution. According to Rothwell, (2015), 42 % of alumni from four-year institutions will remain in the geographical location of their college following graduation. This makes it important to understand how young people, currently enrolled in college feel about big issues since they represent a large segment of the local population in of the future.

Water Conservation

Water conservation is one of the most highly researched environmental issues; with research focusing on better understanding water conservation and reasons why people practice water preservation behaviors (Brownlee, Hallo, Moore, Powell, & Wright, 2014; Garcia, Muro, Ribas, Llausas, Jeffrey, & Sauri, 2013; Geller, Erickson, &

Buttram, 1983). A review of the literature showed that most of the studies reviewed were conducted outside the United States.

For the purposes of this thesis water conservation is defined as any intentional action a person undertakes to reduce the amount of water being used in a specific activity, in addition to not wasting available water. Water conservation can include but not limited to practices such as taking shorter showers, using water saving appliances, watering the lawn in the morning, and turning off the sink while washing face/brushing teeth (Russel & Fielding, 2010).

Water conservation-global scale.

Water conservation research often supports the idea that water conservation initiatives are primarily acted on because of an attitude or belief the individual holds. Brownlee, Hallo, Moore, Powell, and Wright (2014) pointed out that individuals with knowledge about the local drought issues and an affinity for the area where they vacation are more likely to take ownership for and practice environmental conservation. In their study investigating vacationers in a drought affected area, researchers created a model of pathways towards water conservation behavior (Brownlee, et al., 2014). Then using their fully mediated model for lake recreationists' attitudes toward water conservation they considered significant in the pathways within the model. The researchers argued the belief of local-level drought was important in the decisions by the vacationers to act in an environmentally responsible way (Brownlee et al., 2014). This study also defends the idea that being aware of local water issues is important for people who participate in water conservation in the region.

Some researchers explored how other factors in one's life contributes to water conservation participation. In order to test how socio-demographic and place-attachment factors effect one's willingness to participate in water conservation a team of researchers administered a survey to nine municipalities surrounding Girona, Spain (Garcia, et al., 2013). The survey they administered examined how participants felt about environmental conservation, and also looked at site specific factors for instance, if they were born in the area (socio-demographics) and how long they have lived in the area (place-attachment) (Garcia et al., 2013). The results revealed there were no strong connections with the idea of place attachment and water conservation, but there was a strong connection with socio-demographic characteristics and water conservation, meaning how long they lived in the area impacted their water conservation behaviors (Garcia et al., 2013). College students in the Texas Panhandle come from many different places and backgrounds. Some of them have lived in the Texas Panhandle all their lives; others have just moved to the area to attend college, these factors have the ability to affect how these students perceive and participate in water conservation (Garcia et al., 2013).

Multiple studies conducted in Australia revealed the importance of studying water conservation in the area as a result of extreme drought patterns and lack of water storage (Willis, Stewart, Panuwanich, Williams, & Hollingsworth, 2011; Graymore &Wallis; 2010). Researchers Willis, Stewart, Panuwatwanich, Williams, and Hollingsworth (2011) aimed to quantify the connection between water conservation attitudes on household water consumption and conservation practices. To accomplish this goal, the researchers administered a survey to 151 households in the geographical area of the study; the survey included demographics, concern for environment, and water conservation awareness and

practices (Willis et al., 2011). The researchers then placed surveys into two clusters based on their level of concern for the environment; results revealed households with higher level of concern for the environment and a positive attitude toward water conservation had significantly lower amounts of water usage in their homes specifically with showering, washing clothes, using the bathtub, and irrigation (Willis et al., 2011). Another Australian study about water conservation was in the form of a case study that used in-depth interviews to explore the understanding of how people in rural areas are use water and of what quantity (Graymore & Wallis, 2010). Graymore and Wallis's (2010) study revealed there are two main factors influencing water usage in a household (a) size of property (b) usefulness of water saving behaviors.

Researchers in China used two surveys to help collect data on water-conservation behavior in Guangzhou. The survey was completed by 237 people and consisted of three parts: background information, water conservation awareness, and behaviors of research participants taking the survey (Xiong, Hao, Liao, & Zeng, 2016). Their results revealed, out of the 237 people who completed the survey 95% indicated they believed water conservation was important, yet only 42% indicated it was urgently needed in the part of the world being studied (Xiong, et al., 2016). The researchers also found the top five places people learned about water-conservation were through television programs, magazines, education in school, personal experience, and community activities (Xiong et al., 2016). Like this study, I evaluated the places where environmental education and conservation are taking place. Understanding where this information is coming from helps show where companies along with governmental programs aimed at encouraging conservation can better reach members of society to potentially increase participation.

In most of the international research reviewed, the foundation of the research questions were developed because of the regions lack of water or decline in water sources. In places like Australia where they are drought stricken, research is done in hopes of finding ways to engage citizens in conservation practices. This type of research could be very beneficial to other parts of the world like the United States. In the next paragraph water conservation research in the United States is discussed.

Water conservation in the United States.

Although the number of studies focused on water conservation in the United States is limited, it is important to identify what research has been done and specifically what areas of the United States are being studied in regard to water conservation. Researchers Monin and Norton (2003) employed a different approach to researching water conservation by taking advantage of a school wide shower ban at Princeton University which was put in place after tropical storm Floyd hit the eastern side of the United States in the fall semester of 1999. The sudden shortage in water caused the university to start asking students about water usage and enforcing the shower ban to limit potential exposure to contaminated water (Monin & Nortin, 2003). The researchers administered a survey to students leaving the dining halls from 6:00 pm to 7:30 pm each night during the ban and continued the survey two days after the ban was lifted with only a few changes to the questions (Monin & Nortin, 2003). The researchers, who were looking at the shower ban from a psychological perspective, found students were more likely to admit to showering more often than they actually showered; this phenomenon was because students cared more about what other people thought of them, specifically other college students. Today's social norms will play a significant role in who decides to

participate in water conserving activities, especially at the primary age of college students who studies show do things to impress their peers (Monin & Nortin, 2003).

In order to better understand how people are relying on the Ipswich watershed in Massachusetts, researchers Tsai, Cohen, and Vogel (2011) assessed four case studies in the area in which four water conservation strategies were implemented. The first of the strategies consisted of installing weather-sensitive irrigation controller switches in residential areas and municipal athletic fields, in other words, athletic fields and homes would no longer be excessively irrigated during the summer months (Tsai et al., 2011). The researchers concluded installation of weather sensitive irrigation systems resulted in much lower water use in the Ipswich watershed region based on the findings (Tsai et al., 2011). The second case study evaluated putting rainwater harvesting systems in residences, to harvest rainwater to storage and then reused later on (Tsai et al., 2011). Findings showed that although the rainwater harvesting program worked, it was not successful on a large enough scale to make the program cost effective (Tsai et al., 2011). The third case study included multiple community outreach programs; the first program supplied free indoor water audits and the second program gave rebates for low-water-demand toilets, this program was overtly successful in reducing water bills in households (Tsai et al., 2011). The final case study consisted of soil amendments designed to improve soils' ability to retain water in certain areas and showed potential to save water specifically in ball fields and other athletic sites (Tsai et al., 2011).

To understand how to best implement water conservation plans as well as promote water conservation at a residential level researchers conducted a survey in Virginia (Geller, Erickson, & Buttram, 1983). In this study 129 homes and families in

Virginia were examined to test three approaches to water conservation promotion strategies: education, behavioral feedback, and an engineering approach. In the study researchers varied the conservation approaches assigned to each household and found that there was an ineffectiveness with education and feedback conservation approach, which Geller et al. (1983) attributed to the fact that in the city of interest there was minimal economic reward for reducing water usage. Geller et al. (1983) also found that implementing the engineering conservation strategies, in which the researchers provided the household with items such as toilet dams and shower flow restrictors did in fact reduce water usage but not nearly to the margin anticipated (Geller et al., 1983).

In the studies reviewed there is a common trend in water conservation research in the United States namely cost effectiveness. In the study conducted by Tsai et al. (2011) certain programs were deemed ineffective because of their lack of cost effectiveness. Geller et al. (1983) came to the conclusion that education and behavioral feedback was not enough to incentivize people to participate in water conservation because of the lack of economic return.

Water conservation in the Texas Panhandle.

Pumphrey, Edwards, and Becker (2008) studied urban and rural opinions on municipal water control. The purpose behind this study was to show that as agricultural industries continue their demand for groundwater there will be a shortage of water in all areas associated with the industry. In the study they assessed eight cities in the Texas Panhandle and distributed a survey asking respondents to share their opinions on government regulation of municipal water. In their findings Pumphrey et al. (2008) found that rural areas were much more opinionated on this topic, and noted that this could be

because urban areas may believe the increases in policy are unrealistic and that urban areas already use less water compared to their rural counterparts. As the groundwater issue in the Texas Panhandle continues, the option for governmental intervention becomes possible, and may include state legislation and water conservation implementation. With this being the only piece of literature found with specific reference to the Texas Panhandle and water conservation there is obviously a need for growth in water conservation research in this particular region.

The minimal research on the domestic side of water conservation in the Texas Panhandle makes it hard to understand exactly how citizens in this region feel towards water conservation, water policy, and the water crisis. Although the issue is primarily a result of agriculture it is important to understand the public understanding of the water crisis, and their attitude towards playing a vital role in conservation practices.

The Water Problem in the Texas Panhandle

As was indicated in the introduction to this section, the issue of available water in the Texas Panhandle is on the rise due to the depletion of ground water in the Ogallala Aquifer, as well as the limited amount of precipitation in the region (Terrel, et al., 2002; NWS & NOAA, 2018). The issue has become so significant the federal government of the United States assisted researchers in the area by funding the Ogallala Aquifer Program. The program itself aims to find more efficient ways of irrigation water withdrawal, dryland cropping systems, water use policies, and best management practices for alternative crops (Braur, Devlin, Wagner, Ballou, Hawkins & Lascano, 2017). In addition to the federally funded program, there is a nonprofit organization called Ogallala Commons, committed to developing better education and stewardship of communal

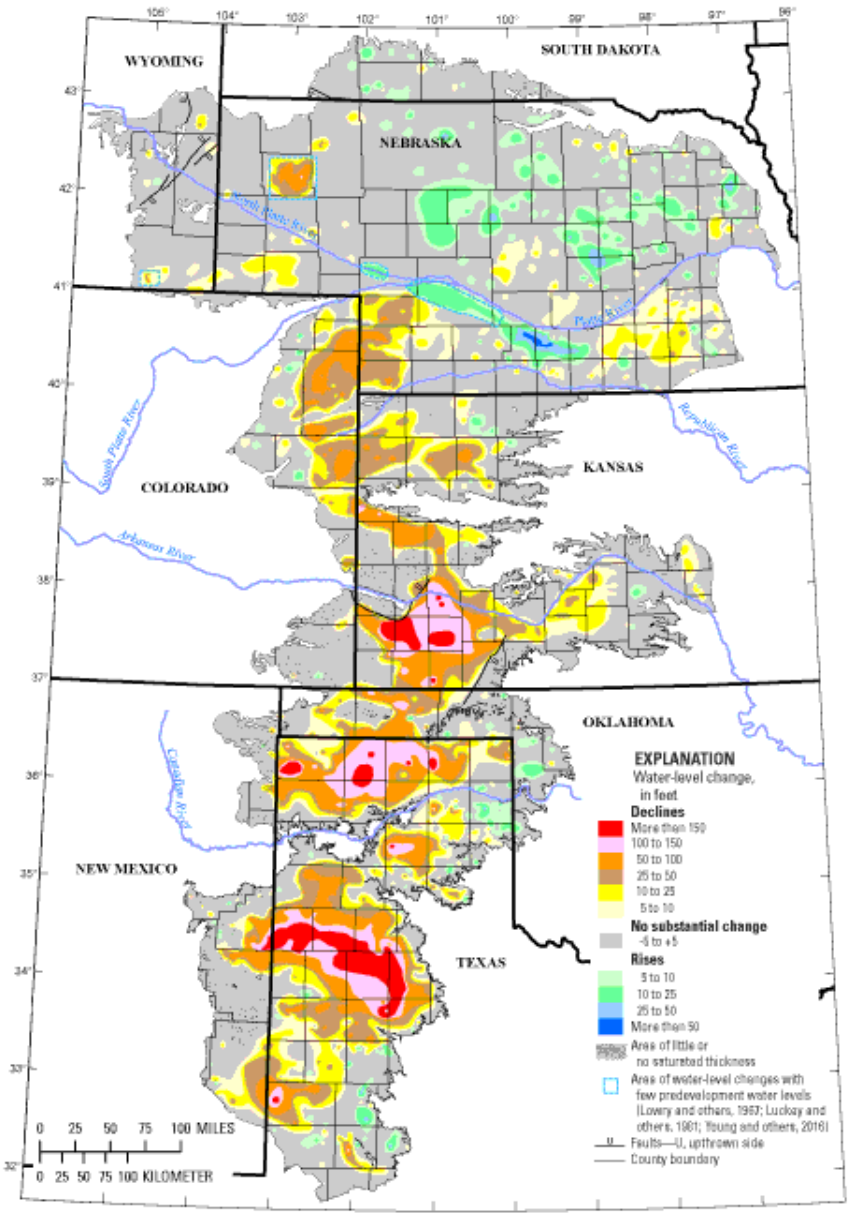
water that is explained in this section (Ogallala Commons, 2018a; Ogallala Commons, 2018b). These two programs are committed to increasing water conservation practices with different approaches. The Ogallala Aquifer Program, focuses only on agriculture and reducing the amount of water used through agricultural practices. Whereas, Ogallala Commons looks into community stewardship and domestic water conservation.

Ogallala Aquifer.

The Ogallala Aquifer, located in the central United States, is the most accessible and most abundant storage of freshwater in the United States and serves the water needs of the Texas Panhandle. The Ogallala Aquifer itself is a large hydrogeological formation spanning eight states: (a) South Dakota, (b) Wyoming, (c) Nebraska, (d) Colorado, (e) Kansas, (f) Oklahoma, (g) New Mexico, and (h) Texas (Peterson, Marsh, & Williams, 2003; Brauer et al., 2017).

At the end of WWII technology advanced to a point where pumping water out of the aquifer to irrigate crops was financially feasible for most farmers (Peterson et al., 2003). This low cost allowed farmers to go from producing 150 million bushels of feed grain in 1950, to more than 1250 million bushels of feed grain by 1980 (Emerson, 1984). As time went on, farmers continued to increase the amount of pumping in addition to increases in urban development and continued growth in population in this region. Figure oen shows changes in the water level in the aquifer between 1950 and 2015. Clearly, there are areas in the Texas Panhandle where water levels have decreased greater than 150 feet (Mcguire, 2017).

Figure 1 The Ogallala Aquifer water level changes 1950-2015



(McGuire, 2017)

The specific geology of this aquifer is what makes it so unique. Unlike many aquifers, the Ogallala no longer has a connection to any other form of water, like rivers and streams, as a result the Ogallala is only able to recharge through percolation of

rainwater through the soil profile (Brauer, et al., 2017). As of 2012, the groundwater depletion taking place in the Texas High Plains and the California Central Valley aquifers account for 50% of the groundwater depletion in the United States (Scanlon et al., 2012). Comparatively, the overall groundwater depletion in the world is about 10%, so the issue lies at a local level in the Texas Panhandle (Scanlon et al., 2012). To be more specific the overall depletion in the Ogallala Aquifer has been about 10%, but that is not an equal representation for the amount of depletion across all states (McGuire, 2011; Gollehon, Winton, 2013). When measuring the changes in water storage in the aquifer from predevelopment to 2009, McGuire (2011) found that while all states had a decline in million acre-feet of water storage, Texas had the greatest decrease in storage losing 144.5 million acre-feet of water.

The Ogallala Aquifer provides water to people in eight states. Although there is some recharge the high levels of evaporation in the region due to sunlight, as well as current drought situations creates low water levels in the portion of the Ogallala Aquifer that lies in the Texas Panhandle. Although, the Texas Panhandle has yet to completely run out of accessible water, researchers are already analyzing and creating map systems predicting continued depletion of the Ogallala Aquifer.

Ogallala Commons.

Ogallala Commons is a nonprofit organization that was established in an effort to better distribute and efficiently use resources that are provided by the Ogallala Aquifer (Ogallala Commons, 2018b). This organization is composed of members from six states who use the Ogallala Aquifer as a primary source for groundwater (Ogallala Commons, 2018b). The program itself uses the idea of commonwealth to better utilize the region's

communal resource groundwater (Ogallala Commons, 2018a). The organization accomplishes this mission in four main ways: (1) diverse partnerships from members in different locations throughout the Ogallala region, (2) education including water conservation and renewable energy, (3) creating a sense of belonging to produce better stewardship of the land, (4) using commonwealth principles to sustain residents and the land (Ogallala Commons, 2018a). Ogallala Commons is an important program because it provides education and community programs to residents of areas served by the Ogallala Aquifer as well as implement processes to protect the resources that still remain in the aquifer system.

Drought and climate.

The Texas Panhandle is classified by the Texas Water Development Board (2012) as having a climate of continental steppe or semi-arid savanna. This type of climate is not as extreme as the desert climate but is still one that is defined by minimal precipitation (Mishra, & Singh, 2010). The Texas Panhandle has an average annual precipitation between the range of 251-500mm (Venkataraman, Tummuri, Medina, & Perry, 2016).

Mishra and Singh described droughts, (2010) as a natural hazard created by two factors (1) climatological parameters and (2) hydrological parameters. Essentially a region is experiencing a drought when there is a less than average amount of precipitation over an extended period of time (Mishra, & Singh, 2010). Droughts have been increasing in the United States significantly during the last two decades (Mishra, & Singh, 2010). Texas as a whole has also experienced increasing amounts of droughts including the second worst drought on record from August 2010- October 2014 (Texas Water Development Board, 2017). As water in the Texas Panhandle region becomes more

scarce precipitation is vital to replenishing the aquifer as well as providing another source of water for Texas Panhandle citizens. The increasing numbers of droughts and decreasing rainfall levels add to the water crisis in the Texas Panhandle. The current period of drought combined with the climate of the Texas Panhandle contribute to the slow recharge rates of the Ogallala aquifer.

Panhandle economy due to water.

Citizens of the Texas High Plains rely heavily on groundwater for irrigation in agricultural practices. Seo, Segarra, Mitchell, and Leatham (2007) calculated a potential new option for a cotton irrigation system which would use much less energy and also use less ground water. The researchers calculated the only level the system would turn profit is if the cotton price is about $1.59/kg which would not be low enough to entice farmers to consider the switch to a more energy and water efficient system (Seo et al., 2007). A significant concern with many water conservation practices is deciding if the cost is worth the reward. This can also be attributed to the loose restrictions and minimal water policies that allowed citizens using the Ogallala Aquifer for economic gain to continue to pump freely year after year (Peterson et al., 2003).

Terrel, Johnson, and Segarra (2002) observed how depletion in the Ogallala Aquifer would impact the economy of the south plains region, which is located in the Texas Panhandle. The researchers used a linear programming model to predict economic losses from the initial measurements taken in 2001 to the estimated levels in 2025. The researchers found the saturated thickness of the groundwater would see a 22.1% decrease thus creating a 43.55% decrease in gross pumping capacity in the region (Terrel et al. 2002). These statistics also revealed a gradual decline in production value of crops after

the year 2005 (Terrel et al. 2002). As many families and individuals in the Texas Panhandle make a living off of agricultural activities it is important to understand how the Texas Panhandle economy will be affected by the depletion of groundwater resources specifically in the Ogallala Aquifer.

Theoretical Framework

A common theory used in environmental communication research to understand the intent of the environmental action is the theory of reasoned action or the theory of planned behavior (Carmi, Arnon, & Orion, 2015; Goldenhar & Connel, 1993; Yazdanpanah, Hayati, Hoschrainer-Stigler, & Zamani, 2014). The theory of reasoned action states that people's behavior is best explained by three factors: (a) individuals perception of behavior, (b) subjective norms, and (c) behavioral control (Ajzen, 2012).

The first factor of the theory is the individual's perception of the behavior or their attitude towards the behavior, which analyzes whether the individual has a positive or negative view of the behavior in question (Ajzen, 2012). Ajzen (2012) indicates, the second factor in the theory of reasoned action is the subjective norms, or how an individual's belief lines up with what is normalized within their groups. Ajzen (2012) also indicates in the theory of reasoned action that it is believed an individual can have beliefs which comply with multiple groups. The third factor, which is the main premise in the theory of planned behavior, is behavioral control, or the individual's perceived ability to perform a behavior (Ajzen, 2012; Carmi, et al, 2015). I first researched how this theory has been applied to research into general environmental behaviors, and then narrowed it down to explore how this theory has been applied to water conservation research.

The first variable to be examined is perceptions/attitude towards behavior. Perceptions/attitudes toward behavior refer to an individual's positive or negative view of a behavior (Ajzen, 2012). Other researchers have expanded this idea to mean whether or not the behavior is smart/foolish, good/bad, and beneficial/not beneficial (Goldenhar & Connell, 1993).Yazdanpanah et al. (2014) expanded this concept to add attitude during specific times of the year. In this study perceptions/attitude towards behavior is defined as the positive or negative view students in the Texas Panhandle have regarding (1) the importance and (2) the necessity of water conservation.

The second variable to be explained for the current study is subjective norms. Subjective norms are frequently referred to as how normalized this behavior or action is amongst those in the group of the individual (Ajzen, 2012). The group can be referred to as someone's family or friends or a specific group an individual chooses to identify with such as a club or extracurricular activity. In their questionnaire Goldenhar and Connel (1993) associated this term with how family members or friends would react towards this behavior and if it would be seen in a positive or negative way. In this study social norms will be addressed as the way an individuals' family members or peers would react to their participation in water conservation activities, as well as how often the individual's family members and peers participate in water conservation activities themselves.

Behavioral control is an individual's ability to perform the behavior or activity (Ajzen, 2012). In the questionnaire developed by Yazdanpanah et al. (2014), behavioral control was measured in the following ways: how easy the behavior was perceived by the individual, how much control the individual had in choosing to participate in activities, the perceived difficulty of the behavior, whether or not individual's feels they will have

the right tools to complete the behavior, and whether or not the individual thinks they will be successful if they engage in the behavior. Similar to Yazdanpanah et al. (2014), the questionnaire for this current thesis evaluated the perceived difficulty level of the water conservation behaviors, the perceived success of the water conservation behaviors, and how equipped an individual feels to perform water conservation behaviors.

Theory of reasoned action – nonspecific environmental activities.

Using the theory of planned behavior researchers Carmi, et al. (2015), administered a questionnaire examining viewpoints of five different environmental behavioral domains including energy conservation, water conservation, purchasing of green products, littering, and recycling. The researchers took these domains and analyzed what factors of the theory of planned behavior would serve as the greatest influence in participating in the environmental conservation behaviors. The researchers found that the theory's element of attitude towards behavior was the primary element affecting their participants environmental behaviors followed by perceived behavioral control (Carmi et al., 2015). This study helps explain which aspects of the theory of planned behavior play a large role in environmental activism.

Goldenhar and Connell (1993) used the theory of reasoned action to help understand how recycling attitudes and beliefs were aligned with the recycling behavior. The researchers administered questionnaires to students living on campus in a residence hall. Their research revealed subjective norms held the greatest influence on recycling behavior for females (Goldenhar and Connell, 1993). Attitudes toward behavior held the greatest influence for males recycling behavior (Goldenhar and Connell, 1993).

Theory of reasoned action – water conservation.

Similar to the studies done on non-specific environmental behaviors Untaru, Ispas, Candrea, Luca, Epuran (2016) used questionnaires to determine the intent of people in a lodging context referring to when people stay in hotels. Their addition to the theory was to look at those who participated in water conservation activities in everyday life and determine whether or not participation in water conservation at a domestic level had an effect on their participation in water conservation in a lodging context (Untaru et al., 2016). Their results showed attitude, subjective norms, and participating in everyday water conservation influenced participant's intention to save water in a lodging context (Untaru et al., 2016).

Researchers in Iran decided to use a case study to determine the effectiveness of the theory of planned behavior and the theory of reasoned action. The multi-method study had researchers conducting interviews with farmers who resided in a semi-arid and drought prone area in Iran and used in depth interviews to create a survey to be administered throughout the region (Yazdanpanah, et al., 2014). The questionnaire had questions aligned with the three factors making up the theory of planned behavior and were categorized as such. Their results revealed factors such as subjective norms and attitudes towards behavior played the greatest influence on participation in water conservation activities, and not behavioral control (Yazdanpanah, et al., 2014). The researchers indicated their results could not prove the theory of planned behavior framework as valid and that their results aligned more towards the theory of reasoned action (Yazdanpanah, et al., 2014).

Chapter Summary

After reviewing the literature, it is evident there is a limited amount of literature concerning the public's views towards water conservation in the United States as well as in the Texas Panhandle. The majority of research regarding the public's view towards water were conducted in areas outside the United States and focused specifically on drought-affected areas. As the Texas Panhandle becomes a drought-stricken area it is beneficial to understand how members of this region perceive water conservation. Agriculture is the primary reason for this crisis and although some steps have been taken to reduce water waste and over expenditure of water for irrigation, limited efforts have been applied to understanding this issue on a domestic level which is why this thesis is important. In addition to this the theory of reasoned action was used to create questions to be used in the in-depth interviews.

CHAPTER III

METHOD

As explained in previous sections of this thesis, there is a decreasing amount of available freshwater in the Texas Panhandle region. Agriculture and domestic water use in this region have caused a drastic decline in available fresh water in the Texas Panhandle. Many other regions of the world have adapted water conservation practices as a way to increase the longevity of their underground water storage, and there is enough evidence to support the need for having these practices implemented in the Texas Panhandle. There is evidence to show that by having these practices implemented, the region could benefit significantly from conservation efforts from the agricultural side of water usage as well as the residential-domestic side. This thesis is designed to explore the perceptions of students in the Texas Panhandle regarding water conservation. While the theory of reasoned action has been used as a guide in the development of questions to ask during the in- depth interviews, it is important to note that this study does not seek to test the theory. The rest of this chapter includes a description of the specific population of interest, sampling procedures used to obtain participation, a detailed description of the procedural method, and a section detailing the data analysis, which explains how the participants' responses will be analyzed and coded. The research questions developed for this study are:

RQ1: How do college students in the Texas Panhandle perceive water conservation?

RQ2: How do college students obtain knowledge about water issues and water conservation strategies used in the Texas Panhandle?

Study Design

For this thesis, I used in-depth interviews. By using this qualitative method, I believe I was able to receive more in-depth responses as to how students perceive water conservation in the Texas Panhandle. Traditional methods of research regarding water conservation involve the use of surveys and quantitative analysis. By using in-depth interviews, I was able to get a greater understanding of how students perceive water conservation, as well as learn where their knowledge of water conservation was coming from. In order to accomplish the above, I was required to seek institutional review board approval before beginning data collection.

Participants

Participants for this study were students currently enrolled in an undergraduate or graduate program at a public college located specifically in the Texas Panhandle. The college studied had an enrollment of approximately 10,000 students in 2017 (WTAMU, 2018). Although, there was no expectation to gain insights from all of these students, it was important the researcher did an efficient job in ensuring a diverse group of students were given the opportunity to participate in the study. Participants included people of different ethnicities, from different college programs, with different academic classifications within the university to ensure more inclusive responses about college students' thoughts on water conservation in the Texas Panhandle. As indicated previously nine students participated in the study. The goal for this study was to have a total of six to ten participants which was accomplished with a total of nine participants voluntarily

signing on. Of the nine students six participants were female and three were males. Participants ranged in academic classification from freshman to one graduate student. Out of the nine participants a total of seven academic majors were represented.

Sampling.

Using criterion sampling described in Creswell (2013) all participants had to meet certain criteria dictated and outlined by the researcher. For this study, participants must be full time students at the university and must attend classes on the college campus to participate. As this research investigates how college students perceive water conservation in the Texas Panhandle, it was crucial that only students who attend classes on the college campus were included. To recruit for this study, an email blast was sent out to students informing them about the study and encouraging their participation. As a former orientation leader for the university under investigation, I could access my students email list to send a call for participants. In addition to the email, a Facebook post was used to reach potential participants as well. After the first few participants meeting the criteria were selected, snowball sampling was used to identify the remaining participants for the study. Snowball sampling is when people who meet the criteria to participate in your study, identify and recommend other participants they know fit the research criteria (Creswell, 2013). Snowball sampling allowed the researcher to find additional participants to help create a better representation of the university's student population. Through snowball sampling an additional four participants were added to the study.

Procedure

For the purposes of this study, qualitative research methods were used to explore more detailed accounts of how college students in the Texas Panhandle perceive water conservation. Most previous research reviewed for this thesis employed quantitative studies as the traditional approach for this type of research. Using a different method for this thesis presents a unique opportunity to thoroughly explore this topic on a new level. For this thesis, I focused on in-depth interviews to help obtain specific individual accounts on how these students perceive water conservation. According to Dukes (1984) an appropriate number of individuals for this type of study is anywhere from three to ten participants. Based on the above, I decided on a target number of individuals being six to ten participants. Before the interviews participants completed a short demographics questionnaire where they answered questions regarding background information such as college major, current classification, year they were born, hometown, age, and gender. Observations on participant behavior were analyzed during the in-depth interviews through field notes.

All in-depth interviews took place in a location on the college campus to help ensure a safe common ground for the researcher and participants. These locations included offices, classrooms, and public spaces around the university. As the primary researcher, I played a very active role in the data collection process, because I was the one conducting the interviews as well as analyzing the data. Prior to each interview taking place a consent form was completed asking participants if they were comfortable being recorded throughout the duration of the interview. All nine participants selected yes and therefore were recorded during interviews. All interviews were recorded on a

password protected recording device. I went through and listened to all recordings and transcribed them. During interviews participants were asked a series of open ended questions, to help the researcher better understand the topic.

Informed consent.

Since this research involved human subjects it was necessary to provide an institutional review board approved consent form prior to any participation in the demographic questionnaire or in-depth interview. The consent form was approved by the institutional review board and provided all of the details of the study to participants prior to the study. Participants were not allowed to participate in the study until the informed consent waiver was completed. If the individual indicated they no longer wanted to be included in the study upon completing the informed consent waiver, they received no penalty. A copy of the consent for is found in Appendix A.

Demographic questionnaire.

The demographic questionnaire was handed out to participants immediately following the completion of consent forms. A copy of the demographic questionnaire is found in Appendix B. For the demographics questionnaire, students were asked to write in or circle a response to questions regarding age, gender, college major, and where they grew up. This questionnaire was used to better understand the participants. Identifying results from the demographics questionnaire will not be revealed in this study. However, non-identifying relevant results are presented in the participant profiles featured in Chapter Four of this thesis. A summary of selected responses is included below in table one. The last two items on table one is whether participants were raised in urban areas or

rural areas. This question was not asked in the demographics questionnaire. After this information was deemed relevant to the study emails were sent out to participants asking them whether or not they were raised in urban or rural areas.

Table 1 selected responses of demographics questionnaire

Participant Response	n	%
Gender (female)	6	66
Gender (male)	3	33
Classification (freshman)	3	33
Classification (sophomore)	0	0
Classification (junior)	1	11
Classification (senior)	4	44
Classification (graduate student)	1	11
Hometown (urban)	5	56
Hometown (rural)	4	44

In-depth interviews.

Following the demographic questionnaire, the in-depth interview process began. A copy of questions asked during the interviews can be found in Appendix C. At this point the researcher turned on the recording device and begin the recording. For each interview, hand written notes were taken as a backup in case the recording failed and also used to document behaviors the researcher was observing. As indicated in Boyce and Neale (2006) there should be no more than 15 open-ended questions in the interview. For this study nine open ended interview questions were selected to help the researcher answer the two research questions for this thesis. Throughout the interview member checking was used as validation and a way to ensure the researcher was understanding

what the participants were saying. Each interview ran between 25-30 minutes. Following the interviews each recording was then transcribed. After all interviews were transcribed the data analysis portion of the study began.

Data Analysis

The goal of this study is to understand perceptions of water conservation in the Texas Panhandle. Through this research a better understanding of where the knowledge of water conservation comes from as well as examining what factors influence students' participation in water conservation practices. In analyzing the data, the researcher used nine transcripts from the in-depth interviews along with field notes collected by the researcher during interviews. As all nine participants indicated they were comfortable with recording on the consent form, each in-depth interview was recorded and then transcribed. During the analysis process, the researcher went through and read over the transcripts multiple times to create a general understanding of students' attitudes and perceptions towards water conservation. A thematic analysis was used to create general themes that were recurring in the data. The first step in this process was the coding. Main ideas and consistently used phrases were marked and put into general categories. Once categories were analyzed, collected ideas that showed up multiple times created the themes. These themes are further discussed and explained in Chapter Four.

Chapter Summary

The method that was used to complete this study allowed the researcher to better understand water conservation attitudes and participation by college students in the Texas Panhandle. A demographic questionnaire was used to better understand the participants and allow for a more detailed discussion in the conclusion of this study. The open-ended

questions used during the in-depth interviews helped the researcher obtain more detailed and specific information regarding students' perceptions of water conservation in the Texas Panhandle, compared to the traditional methods which use quantitative analysis of surveys.

CHAPTER IV

DATA ANALYSIS/RESULTS

The purpose of this study is to explore how college students in the Texas Panhandle perceive water conservation. To create this understanding, I developed two research questions. The first research question evaluates how students perceive water conservation in general. The second research question investigates where students are gaining knowledge on water issues and water conservation strategies.

All nine of the interviews were recorded and then transcribed. Transcriptions were coded. Once coded and compared, then emerging themes were further analyzed revealing common themes among the transcripts. These themes included: important but affordable, a way to save money, connection to the land, motivation from international communities, concern for the future, family, news/media, and classroom. These themes allowed the researcher to answer the study's two research questions.

The research questions were created to explore how college students perceive water conservation in the Texas Panhandle and to identify how they obtain this knowledge. These questions were created using the theory of reasoned action. The three elements of the theory namely attitude/perception of behavior, social norms, and behavioral control were used to develop questions focused on overall perception and knowledge accumulation about water conservation. All themes found during in-depth interviews revealed a clearer understanding of how participating college students experience water conservation daily and how their past experiences impact their current

views on issues regarding water conservation in the Texas Panhandle. These themes are discussed subsequent sections using descriptions from participants.

Participant Profiles

To help understand who the participants were, I have created a table of participant profiles detailing basic information as well as providing a general description of each participant. Pseudonyms were created for participants to help maintain confidentiality throughout the research.

Table 2 Participant Profiles

Pseudonym	Gender	Age	Description
ABY	F	20	Junior psychology major who has lived in the Texas Panhandle her whole life
BEL	F	23	Senior environmental science/biology major and very passionate about all forms of conservation
CAM	M	19	Freshman engineering technology major who is an avid gardener and is not originally from the Texas Panhandle but has close ties to the area
DEE	F	19	Freshman Biology major who is also a student athlete and lives in another Semi-Arid region of the US
ELI	M	23	Senior broadcasting and electronic media major who received a scholarship for writing an essay over water conservation, and a lifelong Panhandle resident
FLO	F	21	Senior broadcast journalism major who has a dog and is very concerned for our future generations
GUY	M	25	Senior broadcasting and electronic media major who has previously worked as a ranch hand and has only been attending the university for two and a half years
HIL	F	18	Freshman broadcast journalism major who grew up in the Texas Panhandle and currently lives on campus
IVY	F	22	Graduate student studying animal science and business lived in the Texas Panhandle for four years and just bought a new house

RQ1: How do college students in the Texas Panhandle perceive water conservation?

During interviews, participants spoke about many topics regarding water conservation and how their lives have been impacted and how they see it as important. The themes emerging regarding research question one were: (a) important but affordable, (b) a way to save money, (c) direct connection to the land, (d) motivation from international communities, and (e) concern for the future.

Important but Affordable

Participants mentioned a multitude of factors that influence their decision to participate in water conservation practices. The common theme among them was they indicated the things they were willing to do did not cost them a lot of money which was important to them. BEL (personal communication, April 17, 2018) said, "I feel like other types of water conservation you need money for, and I don't have enough money for that."

Students identified other conservation strategies they engage in. The top strategies included shorter showers, shutting the faucet off while brushing their teeth, and monitoring sprinkler systems to avoid wasting water. One student said she practices water conservation by taking water bottles containing remnants of water in the bottom and pouring it in the dog's bowl or on plants, "It's not negatively impacting my life by taking a water bottle and dumping it in the dog bowl. There is no reason not to do it" (FLO, personal communication, May 8, 2018).

Shorter showers to reduce water.

Reducing the amount of shower time was mentioned by six of the nine participants. Generally, participants mentioned doing this because it was an easy way they could reduce the amount of water they used without spending a lot of money. When asked what type of water conservation practices she engages in BEL said (personal communication, April 17, 2018)

> Uh, this is kind of gross, but not showering more than once a day, I feel like that is excessive sometimes it's necessary like if you have worked out and you're nasty but like on days where you haven't done anything I feel like you need to conserve the water and not use it.

For this student showering was a necessity and not a luxury. It was important she only showered when she absolutely needed to. This was very common for students. One student, who lived on campus, indicated she would go into the residence hall bathroom and turn off the showers other students left running (HIL, personal communication, May 8, 2018). Reducing shower time was the most common way students responded when asked how they choose to practice water conservation. This method of water conservation was described as an affordable way to conserve water for students who live on and off campus.

Flushing toilets less.

Although, not as common among participants, it was a response that showed up in multiple transcripts with students indicating they felt like toilets used a lot of water and had the potential to serve as a source for water conservation. DEE (personal

communication, May 7, 2018) who having just come to the Texas Panhandle from out of state and only spending minimal time in the area stated:

> If I knew we were running out of water I wouldn't take long showers and I wouldn't flush the toilet as much. That's a real thing, in my 7th grade class, the biology teacher said that if it's not brown don't flush it down, unfortunately I can't do that here as most of the toilets are automatic.

This student was from another drought-stricken region of the United States and indicated if she was more aware of local water issues reducing the amount of flushes would be one of the primary ways she would choose to save water.

Another student indicated by purchasing a toilet flush regulator she was able to conserve a lot of water (FLO, personal communication, May 8, 2018). When talking about the toilet flush regulator FLO (personal communication, May 8, 2018) found she could afford to spend ten dollars on something saving her more money in the long run. Although reducing the amount of water used while flushing the toilet is not the most socially acceptable thing to discuss some of the students interviewed felt it was important to mention because it was simple and something everyone could afford to do (FLO, personal communication, May 8, 2018). This trend was common among participants making it one of the five themes used to discuss how students perceive water conservation. As mentioned earlier students found water conservation important but felt they were limited to only affordable options in their efforts to conserve water.

A Way to Save Money

Water conservation was mentioned by participants as a way of reducing the amount they spent on water bills. A total of eight participants mentioned water

conservation as a way to save money and felt like this was one of the major things motivating them to participate in water conservation practices. A participant indicated water conservation was important because alternatives could be expensive. CAM (personal communication, May 1, 2018) specifically stated:

> It's about the money too, you know economically. You can always get water. You can go down to the ocean and go through the desalinization process to get fresh water…but that also requires a desalinization plant which costs millions and millions of dollars, and it takes money to transport that as well. If you can conserve the water in your area it is cheaper for you.

He identified another way to retriving water beyond the resources mentioned in the literature review. However, this method of retrieving freshwater is not yet being used in the Texas Panhandle. Along the same lines another participant (DEE, personal communication, May 7, 2018) said "we are going to use it one day, all of it and it will be really expensive and hard to find other water."

Students equate saving water with saving money. "The money you put into an investment is important, so then coming back you know you are going to save so much money on water, from a financial standpoint it makes sense to conserve" (FLO, personal communication, May 8, 2018) describes her opinions on using water to save money. This was especially true for students who just began to live off campus. One student was talking about bills and said, "I like to keep money and we have an electric water heater so ya know, it's like the sooner I'm out of the shower the less that water has to heat up and the lower my bill will be" (GUY, personal communication, May 8, 2018).

Multiple participants indicated this issue was something they remember from their childhood, recalling constant reminders from their parents to turn the water off while playing outside and while showering (GUY, personal communication, May 8, 2018; ABY, personal communication, April 17, 2018). GUY (personal communication, May 8, 2018) recalled a memory from his childhood as follows:

> We still liked to play out of the house and stuff with water, playing water basketball and getting pelted with a basketball soaked on water was a lot of fun…we had to keep those games to a certain time limit, so we didn't cause our parents water bill to go through the roof.

Some participants indicated they conserved water because of their water bill, their parents water bill growing up, and a potential cost risk for the future. For a participant who lived off the campus, IVY became very cautious as to how much water she used after receiving her water bill (IVY, personal communication, May 15, 2018). Others learned this as a child with constant reminders from mom and dad. Students who are in fear of increased water costs in the future felt like alternative sources of water could be expensive causing water to become a very expensive resource in the region (CAM, personal communication, May 1, 2018).

Connection to the Land

Participants who revealed a direct connection to the land showed an overall greater concern and understanding of water conservation in the Texas Panhandle. What is unique in this theme is it varied from participant to participant. For one student his experiences working as a ranch hand throughout high school gave him a greater understanding of water costs and encouraged him to conserve water (GUY, personal

communication, May 8, 2018). IVY (personal communication, May 15, 2018) mentioned her connection to the land as becoming a homeowner in the Texas Panhandle, and how becoming a homeowner led her to gain more knowledge on city water ordinances. For her, purchasing a house made her feel more connected to the area and increased her desire for knowledge on water conservation and on the future availability of water in the area (IVY, personal communication, May 15, 2018).

A third student, CAM (personal communication, May 1, 2018) has a direct connection to the land by becoming very active in gardening. This has not only allowed him to develop a greater concern for the area but also put him in a place where people are constantly talking about local water issues and water conservation. CAM, who did not spend his whole life living in the Panhandle, talks about his beginning experience with gardening stating, "I worked in a community garden, we had a lot of irrigation issues and at that time we were learning about it the area was in a drought" (personal communication, May 1, 2018). He describes his gardening experience in the Panhandle as a great way to get to know people and learn about new things and said:

> My neighbor right next to me does a lot of planting and he researches into plants that would work in a drought area and we have both talked about changing the grass we use to a native grass. There is a grass called buffalo grass that will stay very green and is very drought resistant and sun resistant, so we have talked about planting buffalo grass instead of having our regular Bermuda grass. (KAM, personal communication, May 1, 2018).

Having a direct connection to the land is a factor greatly affecting how college students perceive water conservation. These individuals with direct connection to the land

found reasons to seek out more information on water conservation strategies, expressed greater motivation to participate in water conservation practices, and found water conservation important for very specific reasons.

Motivation from International Communities

Another theme very common amongst participants was gaining motivation from international communities. When asked why water conservation was important GUY (personal communication, May 8, 2018) stated:

> I know some people other than us here in America are a little less fortunate and do not have the type of water supply that we have here. I mean when you look at our water supply compared to other people, some people don't even have drinking water, and this is not to rub our face in anybody's but here in America we not only have drinking water, we play in it.

Two other students had a similar outlook on why water conservation is important, they both spoke about how Americans take for granted the availability of freshwater and the need for them to conserve current resources because they may not always be available (ELI, personal communication, May 8, 2018; HIL, personal communication, May 8, 2018).

One student was particularly impacted by another nation struggling with a water crisis because she visited South Africa. IVY (personal communication, May 15, 2018) described this experience in great detail and was able to make parallels between the water crisis in the Texas Panhandle.

> Water conservation hasn't really been on my radar until I travelled to South Africa earlier in the semester and the water crisis down there really made me

> aware of how much water I use….the water crisis in South Africa has to deal with them not having rain for however many years, that's part of the problem but it's really not any different than the water crisis here.

For this student experiencing a water crisis first hand was very impactful. Seeing the issues rise from not having a needed resource like water allowed her to make changes in her own daily life.

Although not all participants were able to visit another country to experience first-hand what a region severely lacking water looks like they still felt motivated by these communities to conserve water. The idea and concept of someone out there being less fortunate and having less available water allows these students to be more appreciative of the water they do have readily available to them.

Concern for the Future

Nearly all participants mentioned they had concerns for the future in the Texas Panhandle with the consistent drought conditions in the area. Students talked about this in many ways. Some participants mentioned their concern for local farmers during the times of drought (BEL, personal communication, April 17, 2018). IVY (personal communication, May 15, 2018) said, "In agriculture it is seasonal and generational and multiple poor seasons in a row can destroy a family and they will go out of business." Other participants discussed concerns for increased prices of water for household use in the future as well (GUY, personal communication May 8, 2018; ABY personal communication April 17, 2018).

BEL, an environmental science/biology major felt very passionate about the importance of water conservation. She stated:

> Water is life, water has so much quality for life, your body is full of 80% of water. We cannot function without water. Biologically, scientific processes your cells can not function without water…and if you don't have water in the future you know. Where there is no water there is no life. Where there is no water you can't grow crops especially out here in the Panhandle where there is a lot of farming communities. You aren't going to have anything to support your livestock more the less yourself. (personal communication; April, 17, 2018).

This student went beyond factors mentioned by other participants, going in to depth about ways all individuals, farmers, and livestock could potentially suffer in the future if water continues to be a lacking resource in the area.

There was one quote that appeared in five of the nine transcripts, "Pray for rain" (ABY personal communication, April 17, 2018; BEL April 17, 2018, DEE May 7, 2018; GUY, May 8, 2018; ELI, May 8, 2018). For college students this common phrase serves as a reminder about how important water is to this area. Another participant was motivated to conserve water as a way of protecting the earth for future generations FLO (personal communication, May 8, 2018) said,

> We need to leave the environment at least decent for our next generation, I don't feel like that was done as much in the past and I think we should while we still have one to protect and it's still in relatively decent shape, and I mean we see a lot of ecosystems where animals are dying off and fish numbers are going down, and those populations go down because there is not enough fish to go around.

She showed a great concern for animals as well as future generations. This follows a similar trend from the quote from BEL (personal communication, April 17, 2018) who

stated earlier, “where there is no water there is no life.” This quote, so powerful, fully articulates how college aged students in the Texas Panhandle fear the idea of not having water in the future.

RQ2: How do college students obtain knowledge about water issues and water conservation strategies used in the Texas Panhandle?

In assessing how college students perceive water conservation in the Texas Panhandle, it became of interest to understand where this knowledge was coming from. Research Question two looks at how students obtain this knowledge and opinions about water conservation in the Texas Panhandle. I identified three themes about where students gained knowledge about water conservation. The three themes discussed in this section are: (a) family, (b) news/media, and (c) classroom.

Family

The first theme to emerge about where students obtain knowledge of water conservation and water issues in the Texas Panhandle was family. Participants who mentioned family as a primary way they learned about water conservation spoke specifically on how family members stressed the importance of not wasting water. ABY, who is local to the Texas Panhandle area said, “my aunt is a wildlife biologist at Buffalo Lake…and we have discussions about the importance of water conservation” (personal communication, April 17, 2018). For this student her aunt’s profession made her a trustworthy resource for learning about water conservation. CAM had similar experiences with someone he would call family, “My church dad was a fire fighter and he would tell us that if water gets down too much it is going to be hard for us to put fires out…he said it is really important to make sure you are water conservation minded” (personal

communication, May 1, 2018). For both participants, their understanding of water conservation was developed through their interactions with family members with specific careers that advocate for water conservation.

Other participants had a different experience with their family members. One participant said he was taught about water conservation at a young age by his parents who were trying to save money on their water bill (GUY, personal communication, May 8, 2018). FLO (personal communication, May 8, 2018) who is not native to the Texas Panhandle indicated she learned a lot through observation and watching her family members deal with a water crisis of their own:

> My grandma's lake that she lives on was down at least 50ft. literally. The water used to be next to her house and now you have to go down in a golf cart. Now it's coming back up is taking forever. I've seen what a drought and not having water really does to a community for short term.

When answering the question, where does most of your knowledge on water conservation come from? The same participant said it was because of situations like the one mentioned above, "I've seen a lot of it first hand and had some other family members having issues as well…they have told me a lot about it [water conservation]" (FLO, personal communication, May 8, 2018).

Although their experiences were different, these participants' family members made an impact on how they learned about and understood water conservation and the water situation in the Texas Panhandle. For some participants it was their family members careers that made them experts on the topic, and for others personal experiences allowed them to educate students about water conservation.

News/ Electronic Media

Four of the nine participants mentioned the news or another form of electronic media as sources for their knowledge about water conservation and current water issues. In speaking about news media sources participants identified mediums like the television news, newspapers, and social media. For this study when news is mentioned I will be referring to these specific mediums that the participants discussed. Participants mentioning the news spoke about how it was a good way to stay in tune with local water issues. When asked where knowledge of water issues and water conservation comes from HIL (personal communication, May 8, 2018) said, "the news ya know to keep up with what is going on in the area. It's always good to know." For this participant the news served as a primary way to stay in the know and up to date on local water issues. Another participant identifying the news as a way to get information on local water issues talked about using the news as a way to keep up with climate and day to day changes with water and precipitation (HIL, personal communication, May 8, 2018).

Another participant who mentioned the news media indicated as the water situation got worse in the area the media became a potential threat to helping address the issues, she specifically stated, "I think the media plays a huge part in blowing things out of proportion…and people love a good crisis" (IVY, personal communication, May 15, 2018). It is important to note that this student was talking about a potential concern and did indicate she did not think this was already going on in the Texas Panhandle.

In addition to news media FLO (personal communication, May 8, 2018) identified social media as a way she gained knowledge on water conservation, stating she gained information through social media specifically Facebook videos. She also argued social

media would be a great way to continue educating college students on water issues and water conservation practices (FLO, personal communication, May 8, 2018). Participants shared that news and electronic media play a huge role in how students are exposed to water issues in the Texas Panhandle.

Classroom

The classroom was the most common way students found information about water conservation and the current water situation in the Texas Panhandle. Seven of the nine participants mentioned this theme. participants did however receive this knowledge at different levels of their education. The two classroom settings the participants mentioned having the greatest impact on their water conservation education were pre-college and college classrooms.

Pre-college classroom.

Participants who mentioned gaining their water conservation knowledge in classes they attended before coming to college ranged anywhere from grade five all the way to senior level in high school. The classes participants referenced were primarily science classes with one participant specifically mentioning geography class. GUY (personal communication, May 8, 2018) indicated most of his water conservation education took place in elementary school and indicated he learned about water conservation in classes mentioning how water moved through ecosystems in addition to the water cycle. Another participant said her knowledge came in the seventh grade while learning about renewable vs. nonrenewable resources (DEE, personal communication, May 7, 2018). DEE (personal communication, May 7, 2018) went on to say she thinks

water conservation would be most effective if taught at the fourth-grade level. She described her opinions by saying,

> Fourth grade is that area in between oh I'm a big kid and oh I still listen to mom/dad, and my teachers. So, if the teacher says hey recycle and stuff the kids will be more likely to do so (DEE, personal communication, May 7, 2018).

Although this student did not personally experience education on water conservation in the fourth grade she feels fourth grade students would be more likely to participate in these practices if taught at a young age.

A very interesting finding was that both participants who did not indicate the classroom in any form as a mode of receiving knowledge on water conservation spent their whole lives living in the Texas Panhandle. One student from the Texas Panhandle who did mention the classroom as a mode of learning about water conservation and she described her experience in fifth grade science class as, "fifth grade is when we talked about it the most…I think there was a whole week where they just told us about it and we had to do our own little practice of saving water" (ABY, personal communication, April 17, 2018).

College classroom.

Four participants specifically mentioned the college classroom as the moment of education on water conservation. DEE (personal communication, May 7, 2018) described a simple experience learning about water conservation during her freshman level biology course learning about slow recharge rates of the Ogallala Aquifer. For two other students their experiences were specific encounters with different aspects of the current water situation in the Texas Panhandle and water conservation. One of them was an

environmental science and biology major. BEL (personal communication, April 17, 2018) indicated she gained most of her knowledge in basic and upper level geology classes in addition to some of her early biology classes. The quality and quantity of knowledge this student received regarding water issues in the Texas Panhandle was the most compared to any other participant.

The other student who had a different experience but still gained extensive knowledge on water conservation in the Texas Panhandle while in the college classroom was an animal science major, which is housed in the agriculture department. IVY (personal communication, May 15, 2018) stated she took two or three agriculture classes that focused heavily on how the water crisis effected agriculture in the area, and how it could continue to have an effect. When asked how her classes approached water conservation she proceeded to say:

> From the perspective of agriculture and with a chip on their shoulder that farmers are the ones being, I don't want to say being treated poorly which is true to a certain extent. But this is what bothers me, when people in agriculture have a chip on their shoulder about it or get defensive when people who don't understand the industry start asking questions (IVY, personal communication, May 15, 2018).

For this student most of the education she received regarding water conservation was based on what she learned in her college classes. In the case of these two students with an extensive knowledge about water conservation in the Texas Panhandle, their classroom learning experiences were very different.

Chapter Summary

In conclusion, Chapter Four discusses the themes found during the analysis portion of the thesis. This study primarily focused on two research questions. The first research question was geared towards understanding how college students perceive water conservation and the current water situation in the Texas Panhandle. For this research question five themes were identified as follows: important but affordable, a way to save water, direct connection to the land, motivation from international communities, and concern for the future. The second research question sought to understand where these students obtain knowledge of water conservation and the current water situation in the Texas Panhandle. For this research question there were three themes namely: family, news/electronic media, and classroom. These themes are further explored as to explain how they relate to the research questions in Chapter Five.

CHAPTER V

DISCUSSION AND CONCLUSION

Discussion

In Chapter Five I discuss the results of my analysis of transcripts from interviews I conducted to assess the knowledge participants had regarding water conservation in the Texas Panhandle and where their knowledge comes from. I discuss the answers to both research questions, explore misunderstandings about water conservation I uncovered, and explain the limitations of my study and share how the findings contribute to the body of knowledge about water conservation practices in the Texas Panhandle.

RQ1: How do college students in the Texas Panhandle perceive water conservation?

The first research question sought to examine how college students in the Texas Panhandle perceive water conservation. The results included factors which motivated students and what impacts the way they view water conservation. During the interviews, participants identified one significant factor that influences their perception and efforts at water conservation namely money saving. Consequently, the majority of water conservation practices students mentioned and participated in, were ones they could participate in at no additional cost to them. They also preferred conservation practices that would save them money with their water bills. College students expressed multiple times how costly it could become to engage in water conservation on higher levels such as installing new shower heads and changing their sprinkler systems, an alternative these

students engaged in practices such as taking shorter showers, with one participant opting to shutting the sprinkler system off completely. Educating college students about other affordable water conservation practices, could result in increased participation in water conservation activities. Geller et al. (1983) came to a similar conclusion, the researchers concluded that without significant economic return people would not be motivated to practice water conservation.

Students who had a direct connection to the land also had an increased knowledge and motivation to participate in water conservation strategies. For students who participated in the study activities like working on a farm, being active in gardening, and for one student purchasing a house contributed to their desire and decision to participate in water conservation activities. For these students, their connection to the land encouraged them to be more conscious of their use of water as a resource. This contrasts results from Garcia et. al (2013) concerning the concept of place attachment. Garcia et. al, (2013) talked about how there was no connection between place attachment and participation in water conservation. The results from this study are the opposite, and shows there is a positive correlation with participants' connection to the land and their choice to acquire water conservation knowledge and participate in water conservation efforts.

There were two primary factors motivating participating college students to conserve water. The first being international communities. Seeing struggles and crises involving water shortages occurring in other countries allowed students to empathize with the lack of water in these international locations and motivated them to conserve the water they had access to. One participant who visited one such international community

was a highly motivated participant in water conservation as a direct response to her experience. This student was significantly affected by this experience and as a result changed many aspects of her daily life to conserve water. Having exposure to what can happen when water is depleted, encourages college students to participate in water conservation. Another way students were motivated to conserve water was because of their concerns for the future. Students were afraid of what would happen without water. They were concerned for agriculture, animals, and families who live in the Texas Panhandle. These along with water crisis experiences in international communities, instilled serious concern in college students concerning what the Texas Panhandle will become without enough water.

RQ2: How do college students obtain knowledge about water issues and water conservation strategies used in the Texas Panhandle?

There were three primary ways college students in the Texas Panhandle acquired knowledge about water issues and water conservation strategies. College students learned about water issues and water conservation strategies from their family members. College students who received knowledge about water issues and water conservation strategies through their families were most often students who had a family member working in a profession that relied on water conservation. These findings vary slightly from what was found by Xiong et al. (2016), who indicated television programs, magazines, education in schools, personal experiences, and community activities.

College students also gained knowledge about water conservation through news/and electronic media. College students watched the television news to receive updates and stay current on local water issues on local news stations. Television news

was the most common medium referenced by students who grew up in the Texas Panhandle. Other news media students used to learn about water conservation strategies were social media sites, specifically Facebook. Facebook was used as a way to obtain knowledge on water conservation strategies and products but not necessarily limited to local water issues.

The primary source of information about water conservation strategies for the college students was the classroom. Some students were educated on water conservation in classrooms prior to college in science and geography classes. The lowest grade one participant could recall being educated about water conservation was the 5th grade. College students who learned about water conservation in the classrooms prior to college indicated it was less about water issues and more about the water cycle and how to conserve water. Students who learned about water conservation in college classrooms learned about water conservation in geology, biology, and agriculture classes. Participating students learned a lot about local water issues as well as ways to conserve water. The college classroom was the first exposure some students had to the water crisis in the Texas Panhandle. However, not all students were required to take courses that included course content about water conservation practices or issues. Something interesting to note is two of the three participants who grew up in the Texas Panhandle did not mention the classroom as a source of information about water conservation strategies or local water issues.

Minor Misunderstandings

In identifying how students obtained knowledge about water conservation issues, it was important to mention the quality of understanding these participants had regarding

water conservation. Each participant demonstrated a general understanding of what water conservation was and clearly articulated ways they personally conserve water. However, three of the participants identified reusing and recycling as water conservation methods (BELL, personal communication, April 17, 2018; DEE, personal communication, May 7, 2018; HIL personal communication, May 8, 2018). Specifically mentioning using reusing water bottles, instead of drinking out of plastic water bottles. This was a common misunderstanding amongst participants when asked specifically what type of water conservation practices do you engage in?

Another misunderstanding of water conservation involved the confusion of water quality and water conservation (ELI, personal communication, May 8, 2018; FLO, personal communication, May 8, 2018). Two students identified ways they ensured they had clean water as modes to conserve water. As mentioned earlier participating students were still able to demonstrate a clear understanding of what water conservation was and provide examples of conservation activities. However, it was also important to identify important to identify common misunderstandings college students had before explaining how these students perceive water conservation in the Texas Panhandle.

In addition to misunderstandings students have about water conservation there is also a lack of knowledge regarding the full extent of the water issue in the Texas Panhandle. There were only three students who identified the Ogallala aquifer in their interviews. Of the three participants, only two had more in-depth information regarding the water issue in the Texas Panhandle. BEL (personal communication, April 17, 2018) said, “The Ogallala, it has a slow recharge rate so you have to conserve as much as you can, you don’t wat to waste water on something silly when you might need the resource

for a bigger impact in the future." In addition to what BEL said, DEE (personal communication, May 7, 2018) stated, "in biology we learned that we get our water from the Ogallala aquifer and it has a very very slow recharge rate and we are taking water from it at a high rate." Other than the above quotes from the two students and another student briefly identifying the Ogallala as a main water source, college students in the Texas Panhandle did not have a clear understanding of where exactly their water comes from, and how much of this resource is left.

Theory of Reasoned Action

The theory of reasoned action was the theoretical framework for the study. As the theory states, there are three primary factors going into people's willingness to participate in an action (Ajzen, 2012). The first of these factors is the individual's perception or attitude toward the behavior (Ajzen, 2012). This was in line with my study. Each participant indicated they found water conservation important and necessary during interviews, which inspired their willingness to participate in water conservation activities.

The second factor influencing people's willingness to participate in a specific behavior is subjective norms according to the theory (Ajzen, 2012). This idea relates to the theme of family as a source of knowledge on water conservation. Participants who mentioned family as a source of information they learned about water conservation or mentioned their family members practicing water conservation were much more active in their engagement in water conservation compared to those who did not. Interestingly, none of the participants mentioned learning about water conservation or having conversations about local water issues with their friends. This idea counters Monin and

Nortin (2003), who found that college students acted in a way that was pleasing to their peers.

The final factor in the theory of reasoned action according to Ajzen (2012) is behavioral control, and whether or not people's actions make an impact. This is congruent with the themes regarding money. Students believed they were in control of their water bill when they conserved water, and this perceived control motivated them to increase their participation in specfic water conservation efforts.

Limitations

The study had some major limitations. The first limitation was with the participants and the second limitation involving the time of year chosen for the study. Regarding participants in the study, there was limited diversity with ethnicity and academic major. There were six female participants and three male participants in this study. This is not consistent with the university's demographics of the number of male to female students. Four participants had very similar academic majors in the broadcasting area. In relation to ethnicity, I interviewed seven Caucasian participants and two Hispanic participants. This is very close to the universities ethnic makeup among the student body. However, this study could have benefitted from a more diverse group of academic major/field of study to ensure a better representation of the student population on campus at the university.

The second limitation to my study was the time of year the study was conducted. Interviews were conducted at the end of the spring semester, as a result potential participants were lost to other activities like graduation and final exams and chose not to participate in the study. I believe conducting the study at a different time of the year,

perhaps in the beginning of the semester would have compelled more students to participate and would have created a better opportunity reach and recruiting a more diverse group of participants.

Lastly, having only nine participants in the study can be considered a limitation. As mentioned in the methodology section, nine was within the goal number of participants anticipated, to feasibly conduct qualitative interviews, transcribe, and analyze the thesis data. Additionally, nine participants represents a small segment of the complete student population. However, it was important to gain an in-depth understanding of how college students perceive water conservation on a deeper level using a qualitative method to explore beyond the realms of what types of water conservation participants engage in as well as understand why people engage in water conservation.

It is also important to consider the current drought conditions in the Texas Panhandle. The current conditions are some the most severe droughts in the history of this region. Although, participants did not articulate the increased participation in water conservation specifically because of the current drought conditions, three participants mentioned increasing water conservation efforts after learning about the water regulations and burn bans within city limits and restrictions on lawn maintenance, which are primarily in place because of current drought conditions.

Conclusion

This study sought to explore perceptions college students in the Texas Panhandle concerning water conservation. Using the qualitative process of in-depth interviews, nine participants were interviewed. All nine of the interviews were recorded, after receiving approval from the university's IRB and also receiving participant consent. Then

interviews were transcribed, and each transcript was coded and analyzed revealing common themes among respondents.

Results showed college students in the Texas Panhandle perceive water conservation as important but the water conservation practices they participate in must be at little to no cost to them. Students also revealed water conservation was effective in helping them save money on their water bills. Students who had a direct connection to the land had more knowledge about water conservation and were therefore motivated to participate in water conservation. Students showed great concern for international communities and the future of the Texas Panhandle regarding the continued availability of water. The results also showed there were three primary sources from which students gained knowledge about water issues and conservation strategies: (a) family, (b) news/electronic media, and (c) the classroom.

Recommendations

After reflecting on the study there are many recommendations for educating and promoting water conservation in communities with severe water shortage and drought issues like those in the Texas Panhandle.

Using this research as a foundation, schools can create classroom curriculum at different levels of education from elementary through college to teach students about water conservation strategies. Such classroom curriculum can also help students become more familiar and knowledgeable about sources of water in the Panhandle and the significant depletion of water sources in the region. This education will help create a culture of conservation in upcoming generations from the region to safe guard and conserve what is left of the important resource of water.

At the elementary school level for example, there could be curriculum designed to educate young students about what the water cycle is and how it works. The curriculum could also teach young students about water conservation issues. At the high school level curriculum could be developed to educate students about sources of freshwater in the Texas Panhandle and also teach them about current water crises in the area and their potential impact on the future of the region. At the college level, curriculum could be included in freshman level classes encouraging students to expand their thinking concerning water conservation, perhaps employ water crises in other countries as case studies for teaching about drought conditions in the area and water conservation practices.

This thesis shows that media have the potential to influence and educate the public in the Texas Panhandle about water shortages and levels of depletion in the aquifer that serves our regions. By incorporating educational programs that teach people about water conservation strategies, in addition to reporting water crises in a more pressing manner, media can help citizens of the Texas Panhandle gain greater understanding of water needs and issues which will in turn potentially create opportunities for more citizen involvement in water conservation activities by citizens in the region.

Future Research

There are several different approaches to explore for future research on this subject. Researching college student's perceptions about water conservation in the Texas Panhandle is a great starting point for this type of research. For example, this study could be expanded to explore perception of water conservation by homeowners in the Texas Panhandle. By exploring perceptions of water conservation by homeowners could bring a

greater understanding to how people who live in the Texas Panhandle practice water conservation.

To continue exploring the theme of college students, researchers could examine how college students specifically in the department of agriculture perceive water conservation. This research would be very important because this population of students could be significantly impacted by declining water levels in the Texas Panhandle. Understanding how these young people value water conservation activities could reveal their plans to prepare for the future.

The major theme for research question two indicated college students obtain knowledge about water conservation and local water issues in the classroom. I would like to see this research take place in the classroom by evaluating elementary and high school aged students on their perceptions of water conservation in the Texas Panhandle. This research could help aid in curriculum planning and generating ideas to better equip young people in the Texas Panhandle with knowledge to help them conserve water in their Texas Panhandle communities.

Lastly, since this research was very different from traditional water conservation research, it could serve as a template for conducting qualitative research on water conservation in other drought-stricken regions. This template could provide communities experiencing drought conditions and water shortage with information they need to know about local citizens and their preparedness to conserve water. In addition to drought-stricken regions, this study could serve as a useful tool in times of crisis as a result of continued drops in water levels or consistent natural disasters leaving global communities without access to potable water.

Chapter Summary

Chapter Five addresses results and discussion of results of the study. This chapter also compares findings from this study to past studies and explains how this study aligned with the theory of reasoned action. Chapter five also explores common misunderstandings college students have with water conservation in the Texas Panhandle. Limitations of the study and options for future research are also included.

"Water is life's matter and matrix, mother and medium. There is no life without water."

(Szent-Gyorgyi, 1971).

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APPENDICIES

Appendix A: Informed Consent

IRB Consent Form

Title of Research: "GOING GREEN WITH WATER: COLLEGE STUDENTS OF THE TEXAS PANHANDLE PERCEPTIONS OF WATER CONSERVATION"

Thank you for your participation in this study. Your participation is completely voluntary. Refusal to participate will involve no penalty, and the participant may discontinue participation at any time without penalty or loss of benefits, to which the participant is otherwise entitled. Your responses herein will remain completely confidential, and will only be analyzed in the aggregate for academic research purposes.

The purpose of this study is to explore the perceptions of students in the Texas Panhandle regarding water conservation. As college students in this region are likely to continue their lives in this area it is important to understand how they view something like water conservation.

In participating in this interview, you acknowledge that you are at least 18 years of age and wish to participate in this study conducted by Emma Eickhoff. The expected duration of this interview is 30 to 45 minutes, and you may discontinue participation at any time during the interview process. The information collected will be stored on a secure server and destroyed appropriately to protect participants. If participants answers reveal a misunderstanding of the questions the researcher may terminate their participation in the study.

Results of this study will be made available to the participants only if specifically requested after participation in the study. If you are interested in receiving the results of the study notify the researcher directly via email.

This research has been approved by the Institutional Review Board at West Texas A&M University. If you have any concerns about this study or your rights, you can contact the dean of the graduate school and research at 806.651.2730.

- ☐ I agree to participate in this study and have my interview recorded on a secure audio device
- ☐ I agree to participate in this study and DO NOT wish to be recorded
- ☐ I do not wish to participate in this study

_____	_____	_____
Participant Signature	Participant name (print)	Date

For any pertinent questions regarding this research or research subjects rights please contact:
Emma Eickhoff
785-304-4433
eeickhoff@wtamu.edu

Appendix B: Demographic Questionnaire

Demographic Questionnaire

How long have you lives in the Texas Panhandle? (write in response)

How long have you been attending WTAMU? (write in response)

What is your academic classification in school? (circle response)

-Freshman

-Sophomore

-Junior

-Senior

-Graduate Student

What is your major? (write in response)

What is your age? (write in response)

What is your gender? (circle response)

-female

-male

Appendix C: Interview Questions

Questions for In-depth Interviews

1) Do you believe in water conservation? If response is No
    a. Why do you chose not to engage in water conservation practices?
2) Do you believe in water conservation? If response is Yes
    a. What types of water conservation practices do you engage in?
3) What motivates you to engage?
4) Why do you think water conservation is important/not important? Depending on response to Question 1
5) What are your opinions about the current water situation in the Texas panhandle?
6) Do you think learning about or being aware of local water issues is essential? Explain
7) How does your knowledge of local water issues relate to your participation in water conservation practices?
8) Where do you think most of your knowledge about water conservation comes from?
9) Is there anything else you would like to add regarding water conservation or the current drought in the Texas Panhandle?