

11-5-2010

Towards Understanding Water Conservation Behavior in Southwest Florida: The Role of Cultural Models

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Towards Understanding Water Conservation Behavior
in Southwest Florida: The Role of Cultural Models

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
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Date of Approval:
November 5, 2010

Keywords: culture, anthropology, environmental, values, policy

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DEDICATION

This dissertation is dedicated to my Dad, Ben Johnson, who always taught me by example that learning is a lifelong pursuit.

ACKNOWLEDGMENTS

The dissertation author wishes to express his gratitude to all the members of his Supervisory Committee, including Dr. Susan D. Greenbaum, Dr. Graham A. Tobin, Dr. S. Elizabeth Bird, Dr. Brent R. Weisman and Dr. Mark Stewart. All offered me encouragement and accessibility when it was needed, and did their best to believe that such a lengthy matriculation was indeed likely to reach maturity.

Thanks is also due to Shawn Landry, my colleague and director at the Florida Center for Community Design and Research, who gently prodded me in his own way to cash in the coin of the realm and finish what I had started. I also wish to thank my wife, Becky, whose patience and support was indispensable to my success.

Most significantly, I owe a sincere debt of gratitude to Dr. Graham Tobin for the special interest he took in my topic and my development. It is doubtful that without his avid and continuing encouragement I would have converted good intentions to good results. It is one thing to believe in yourself, but having someone who truly believes in your success can make all the difference.

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ABSTRACT

This applied anthropology dissertation aims to enhance public policy and best practices for conserving potable water resources, using the Tampa Bay region of southwest Florida as a case study. It addresses not how humans conserve, but why they may or may not choose to do so. To date, a limited anthropological focus on water conservation behavior in western, urban settings has created a gap in the role culture plays in understanding why people conserve.

The research problem is to identify how water conservation behavior in Tampa, Florida can be enhanced through a better understanding of beliefs and values reflected in individual mental models of water users, and subsequent cultural models that emerge. Applied anthropologists are paying increasing attention to "cultural models," those shared, simplified, formal representations of explicit and implicit knowledge, interests, beliefs, and values that help individuals understand the world and their behavior in it. Environmental anthropologists, especially, have recognized the power of this analytic tool to find solutions to complex environmental problems by incorporating cultural and political contexts.

Though Florida's water resources appear abundant, they are highly variable in time and space with a well documented flood and drought recurrence, 90% of the 2007 population of 18.7 million living in coastal areas and most fresh ground water, which 93% of the population relies on for drinking supplies, situated inland. By 2020, Florida's projected total water use will grow from 7.2 to 9.1 billion gallons per day, with public supply the fastest growing use segment. The issue is how to make conservation a more

significant water “source” by overcoming public apathy and better understanding conserving behavior.

The research methodology emphasizes a qualitative approach to address beliefs and values most related to water conservation, and identify cultural models. Key methods employed were: a comprehensive contextual analysis of Florida’s history, environment and water law; use of recent results of a Tampa Bay Water Conservation Public Opinion Survey; and semi-structured interviews with twenty City of Tampa households (half high water users and half low water users) and seven water resource experts. All twenty-seven interviews were recorded and transcribed for textual analysis to reveal mental and cultural models, and let informants speak for themselves to share their beliefs and values. Direct quotations were coded and used to illustrate key points, including the three cultural domains that emerged: 1) Why conserve water?; 2) Sources of conservation values; and 3) Lack of water conservation awareness and involvement.

The primary beliefs and values identified by informants included: 1) the need to **avoid waste and greed** in water use, whether in day to day functions or such societal choices as standards for new development or lawn watering restrictions; 2) the need to **protect existing water supply sources**, both for current benefits and generations to come; and 3) the **perception of fairness among water users**. Both the archival research (past opinion surveys, media coverage) and semi-structured interviews indicate people feel conservation is not being shared fairly among water users. This view is closely linked to waste and greed values, and applies to watering lawns excessively as well as use by other sectors (agriculture, golf courses, businesses, etc.). Informants felt strongly rules are not being enforced equitably. The clear danger is this perception may serve as rationale for non-conserving behavior.

Two other shared beliefs and values were put forward by informants. A significant majority believe existing policy areas of **education, regulation and incentives should be used to achieve water conservation**. Finally, the predominant role of **family as the source of conservation values** was strongly supported.

The specific “cultural model” for water conservation in Tampa would be based in family as a source of conservation values, emphasize avoidance of waste while protecting existing sources and directly address widespread perceptions of inequity among water users.

The theory and methods of anthropology, including cultural models, can contribute to enhancing water conservation. This dissertation is an example of those possibilities, setting the stage for ongoing research, including:

- Refinement of methods specific to the water use culture of the Tampa region.
- Exploring cultural models of diverse sub-cultures such as youth, Hispanics and others to enhance water conservation.
- Overcoming social desirability impacts as part of refining cultural models.

CHAPTER 1: INTRODUCTION TO THE STUDY

The research problem in this dissertation is to identify how water conservation policy and behavior in Tampa, Florida can be enhanced through a better understanding of the beliefs and values reflected in individual mental models of water users, and subsequent cultural models that may emerge. The work suggests that applied anthropologists must recognize research in this area may be most needed in highly developed cultures where profligate use is often the norm.

This study is intended to enhance public policy and best practices related to conservation of potable water resources, using the Tampa Bay region of southwest Florida as a case study. It is aimed not at how humans conserve, but why they may or may not choose to do so. While voluminous analysis has been directed at conservation “hardware” such as low-flow fixtures, irrigation efficiency, etc., significantly less attention has been paid to generating knowledge about why people choose conservation behavior. In effect, a limited focus by anthropologists on water conservation in western, urban settings has created a gap in the role culture can play in understanding why people conserve.

This work confronts that gap through cultural analysis that addresses the important beliefs, values and knowledge domains water conservation triggers, and how similar this sociocultural and environmental knowledge is across differing stakeholder groups. The specific applied anthropological issues to be addressed are: *What beliefs and values are most related to conservation behavior? What specific “cultural models” for water conservation can be identified? How can best practices and public policy be enhanced via applied anthropology?*

The primary intended audience for this work is those who make decisions about water conservation policy and implement programs aimed at improving practices. In the Tampa Bay area, this includes local governments and their water utilities; Tampa Bay Water, the regional water supply authority; and the Southwest Florida Water Management District, one of five regional agencies statewide with the mission to manage and protect water resources, among others. Figure 1 illustrates the water supply relationship of these entities, all of whom are actively involved in water conservation. While these players know water conservation is crucial in a world of finite resources and growing population, their best efforts have yet to produce optimal results. When water conservation has been effective, it has been crisis-driven and usually not sustained.

This study is intended to contribute to the body of knowledge associated with applied anthropology by becoming involved with policy making, and assessing the practices of highly developed western society through the lens of methods used in less developed cultures. So while anthropological study of water conservation in U.S. urban settings has been highly limited, effective public participation via local knowledge remains central to applied anthropology, from international community development models (Goodenough (1963), Murray (1987), Costa et al. (1997), Nazarea et al. (1998) to environmental anthropology and environmental justice (Driscoll (1999), Moberg (2001), Johnston (1994).

It is suggested by the dissertation author that as yet unidentified “cultural models” (Holland and Quinn 1987) represent an effective means to understand conservation behavior better, thus potentially improving related policy and practice. It is through this

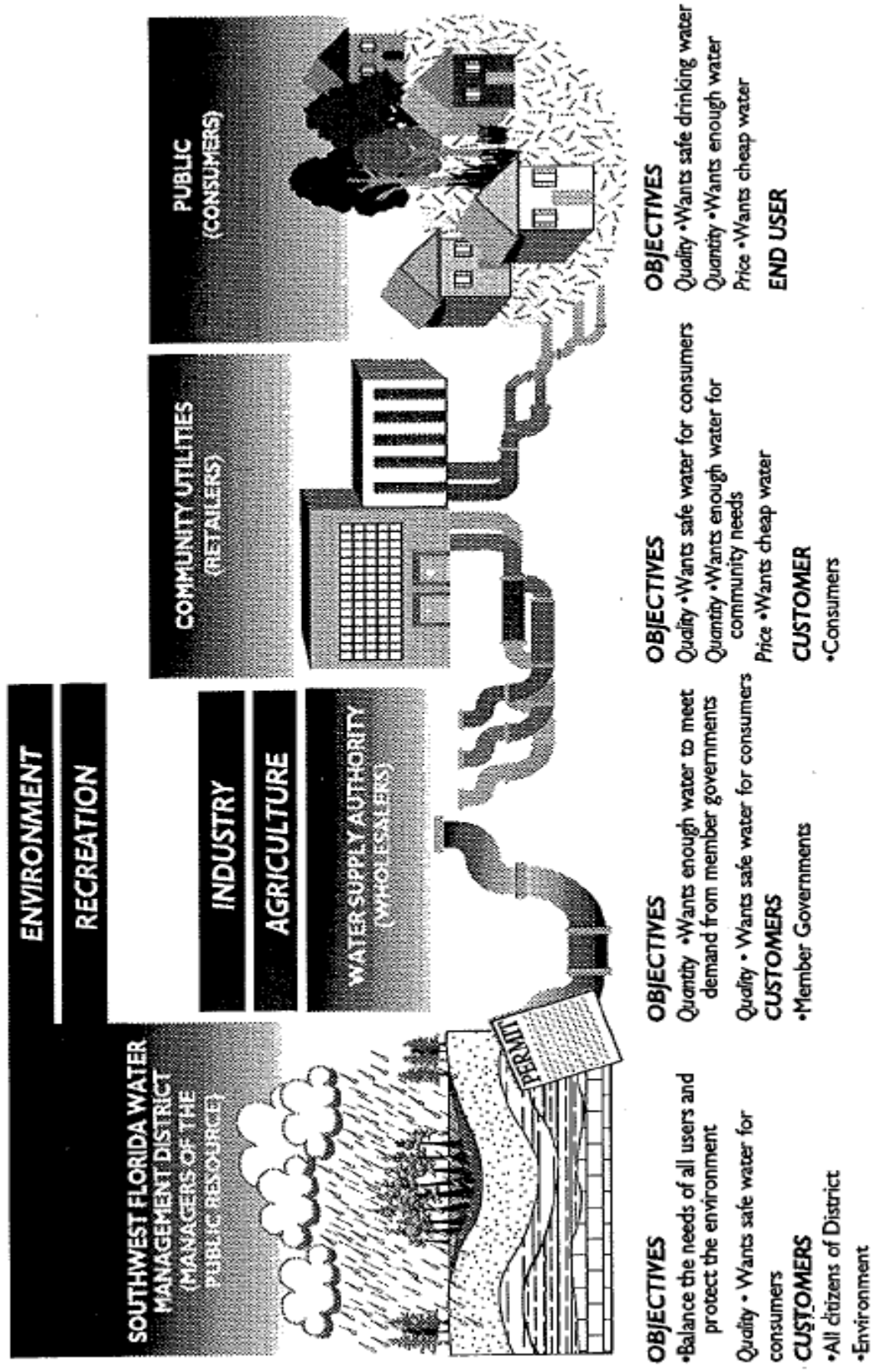


Figure 1 Water Conservation Agencies

approach the author seeks to implement the anthropology of water conservation. The focus is on “Public Supply,” a category that includes water use associated with customers of public and private utilities and domestic self-supply (Southwest Florida Water Management District 2006). This is an important segment of supply in urbanizing Florida since it is growing rapidly and usually reflects water treated to potable quality at some expense to local utilities. It is used to assure public health and safety as well as for less vital uses like yards and landscapes, and is the target of existing water conservation programs at the regional and local levels.

The Tampa Bay area is a suitable social laboratory for several reasons. First, it is a large metropolitan setting of about 2.6 million people in 2007 (Bureau of Economic and Business Research 2008), consisting of three counties (Hillsborough, Pinellas and Pasco) in a water supply partnership to meet daily demands of about 250 million gallons. This collective, known as Tampa Bay Water (TBW), is a wholesale water purveyor that along with its six member governments and the water management district (District) have employed policies resulting in significant alternative source development. New facilities, including the largest seawater desalination plant in North America and a regional surface water reservoir, have been developed to reduce reliance on stressed ground water sources. Tampa Bay is one of the areas in Florida where over-withdrawals for human use have historically resulted in damage to wetlands and lakes, reduced spring and river flows, and caused saltwater intrusion. In response, Florida’s Department of Environmental Protection, the District and local water utilities have promoted water conservation practices in varied forms as part of meeting present and future demands. Finally, Tampa Bay is representative of the larger state context, a

burgeoning, diverse population that is largely coastal, urban and poorly educated about the State's climate and water resources.

The remaining sections of this study make the case for a new ethic in water conservation policy and practice. Chapter 2 recounts the current and historical background of water law and conservation in Florida and elsewhere, and provides a literature review on how anthropologists and others have addressed the topic. This includes significant research on the relationship of water conservation and cultural values, and the role of public participation in water conservation. Chapter 3 provides the research methodology for the analysis, reflecting a mixed method design that primarily uses qualitative approaches to generate its findings and conclusions. Chapter 4 provides the study results, and sets the stage for Chapter 5 which offers discussion and conclusions generated from the research and suggests direction for future study. References cited can be found in Chapter 6.

CHAPTER 2: BACKGROUND / LITERATURE REVIEW

The objectives of this chapter are to set the context of water use and conservation in Florida by briefly tracing the evolution of the State's unique water law, exploring the anthropological and related literature regarding water conservation and cultural values, and examining the role public participation plays in enhancing public policy and practices. At the time of this writing (late in 2010), Florida and the rest of the country remains mired in a major economic recession that has swelled the ranks of unemployment and slowed the State's growth to a crawl. While the ultimate, or even immediate, impacts of these economic conditions on water conservation beliefs and values are unknown, the economic malaise has at least afforded an opportunity to pause and assess where the Tampa Bay region stands in terms of optimizing water conservation (personal correspondence – Tampa Bay Water 8-19-10).

INTRODUCTION

In the Summer of 2001, deep into its worst recorded drought, Florida officials decided to get serious about water conservation. The State Department of Environmental Protection launched the "Florida Water Conservation Initiative," a process that charged 300 participants from government, the private sector, interested citizens and many private associations with identifying and investigating "a variety of technological, *behavioral* (emphasis added), educational, regulatory, and economic methods of improving water use efficiency." The process yielded over fifty priority recommendations, none of which, as of 2009, have become state law with real enforcement. The most significant conclusion: Florida can and must do more to use

water efficiently. Also noted was the need to maintain a long-term focus on water conservation, something that historically has been absent (FDEP 2002).

The very fact that a State agency initiated this effort reflects its importance to water management in Florida, while simultaneously indicating conservation efforts to date have fallen short. Water conservation may be critical to Florida's future, but it is still too often seen as an act of desperation; a last resort attempt to hold on to something too vital to give up. We may conserve what we love (Vickers 2001), but only when we must – or perceive we must. It is the dissertation author's position water conservation in Florida is far from optimal for a variety of reasons, not the least of which is a lack of understanding of rationales for conserving behavior. This position reflects the importance of culture in assessing water conservation, a factor that has not been well studied in the U.S. to date. This dissertation attempts to identify and assess the cultural models that form the basis for such behavior in order to address the research question: How can best practices and public policy for water conservation be enhanced through applied anthropology?

BACKGROUND

Today's Florida is deeply embedded in the history of its water resources. Settlement of the State has been an ongoing story of too much water and how to get rid of it. These attitudes were reflected in how the swampy, overflowed lands of early statehood were dispatched, and in the earliest laws and policies that defined flooding as the enemy of the state. In short, the possibility there could ever be too little water in Florida was unthinkable. Though water resources appear abundant, they are highly variable in time and space with a well documented flood and drought recurrence, 90% of the total population of 18.7 million in 2007 living in coastal areas and most fresh ground water, which 93% of the population rely on for drinking supplies, situated inland (Fernald and

Purdum (1998). The issue is how to make conservation a more significant water “source” by overcoming public apathy and gaining a better understanding of conserving behavior.

Florida’s burgeoning growth is expected to continue straining available supplies. Public supply withdrawals in the State increased by over half a billion gallons per day (bgd) from 1990 to 2000, a 26% increase compared to a 12.5% increase nationally. By 2020, it is projected total water use in Florida will grow from 7.2 bgd to 9.1 bgd, with the public sector the fastest growing use segment (FDEP 2003). State, regional and local entities have all promoted water conservation in varied forms, recognizing that failure to use water efficiently to sustain sources will further jeopardize the State’s valuable natural systems.

But is conservation working in Florida? Average per capita public supply use in the U.S. was 180 gallons per day in 2000 (USGS 2004), while the average use in Florida in the same year was 174 gallons per person per day for public supply systems (USGS 2004). In contrast, daily per capita use was 114 in Canada, 34 in Mexico and 18 in the Netherlands (Salamone 2002). Opportunities to enhance water use efficiency are evident in light of the per capita variability around the State – water users in southwest Florida averaged 139 gallons per day while south Florida users averaged 196 gallons per capita in 2000 (FDEP 2003). In southwest Florida, some local utilities have lowered per capita to less than 100 gallons per day for public supply systems.

The challenge, then, is to identify the role played by culture in bringing about effective water conservation policies and practices in Florida. We know individual water conservation behavior is variable – some seem more likely to conserve than others. A goal of this dissertation is to investigate and advance research undertaken by

anthropologists on “cultural models” (Holland and Quinn 1987), how it relates to values which lead to conserving behavior, and applies to the specific setting of Florida policy and practice. This applied research must consider such issues as: historical context, cultural attitudes, beliefs and values of Floridians, the state of the art in water conservation, the politics of growth management, the role of education, and overcoming the crisis mentality associated with Florida's recurrent droughts and floods that have historically reduced conservation behavior.

Evolution of Florida Water Law

The purpose of this brief background section is to begin to understand Florida's history, people, and politics in order to appreciate the State's unique water law, and lay a foundation for identifying a more effective water conservation culture. The approach is archival – it relies on numerous sources to document factors related to Floridians' perceptions, and how these views translated to today's attitudes toward water. Additional background information on Florida's environment and ecology, and how it relates to water conservation, can be found in the Study Setting section of the Methodology chapter.

Florida History

Florida's history and culture has been documented in hundreds of books since the shipwrecked Spaniard Escalante de Fonteneda wrote his memoirs in the mid-1500s about life in the state (Clark 2000). By 1821, when Spain ceded Florida its freedom to become a U.S. territory, most saw two Floridas, an inviting region in the north and a swampy scourge to mankind in the south. The results of these early attitudes would linger. Humans had to find ways to capitalize on the territory, from drying up lands too

wet to farm in central Florida to taming the mysterious Everglades spanning most of south Florida. Blake (1980:vii-viii) summarizes it well:

Because it is not in the American tradition to leave nature's mistakes uncorrected the Florida settlers began to agitate for two great "internal improvements," as the contemporary phrase expressed it. The first was a cross-peninsula canal to prevent shipwrecks; the second was drainage of the vast swamps to create new farmlands. Both schemes have played a major role in Florida's history.

Understanding the historical development of Florida requires reflection on early federal and state land policy and associated politics. The contrast of low-lying, wetter lands in the central and southern reaches of the State to the more readily developable northern sections created political pressure. Public desires to make use of the massive acreage to the south were not initially matched by governmental financial capabilities to make such improvements. One answer was to offer land as an incentive to private parties who would build canals, railroads, ports and roads, and reclaim wet areas for arable or other productive human uses (Carter 1974). This early form of privatization gradually yielded infrastructure improvements, but was fraught with grandiose schemes, false starts and political corruption. Among the results were swampland sales, State officials mixing public roles with large private gains and ongoing litigation over land claims. How did this all come about?

As Florida achieved statehood in 1845, the U.S. Congress granted 500,000 acres to the State for "internal improvements," a bounty supplemented five years later by an additional 20 million acres of "land unfit for cultivation due to its swampy and overflowed condition" (Purdum 2002:6). The State had authority to dispose of these lands as they saw fit, so long as the proceeds were "applied, exclusively, as far as necessary, to the purpose of reclaiming said lands by means of ...levees and drains" (Blake 1980:36).

Florida eventually received over 24 million acres of federal domain lands (about 65% of all land in the State) under the Swamp Lands Act of 1850 and other statutes, or several million more acres than granted to the largest western states such as California and Montana (Carter 1974).

Long-held dreams of draining the Everglades again moved to the forefront at the start of the 20th century. The Everglades, not at all understood from a broader environmental context, was seen as an impediment to progress. Perceptions of the southern regions of the State as largely uninhabitable were not a problem when population was small, and useful land and water abundant in north Florida. By the time of statehood, however, and for the next 50-75 years, Florida was competing with other "frontier" states to attract people and investment money. The one major asset the State had was land, and it did not hesitate to proffer it. By 1900, Florida had given railroad companies more land than the State actually owned in contemplation of various improvements. The only saving grace was the conditional nature of these grants – absent improvements the lands reverted to the State. Lands deeded to the railroads eventually totaled about 9 million acres or one-quarter of all lands in Florida (Carter 1974).

The folly of attempting to wrest control of the Everglades away from nature became much clearer during the ensuing decades of the thirties, forties and into the 1950s. The area became an environment under stress (Carter 1974), as evidenced not only by a lack of flood control in wet times, but significant overdrainage during several severe droughts from 1931-1945. Placing the Everglades fiasco in context is essential to gleaning its lessons. Carter (1974) has opined that the preoccupation with development in Florida involved making major changes to complex natural systems that were little understood. In addition, the value of wilderness was unthinkable in the early days of

Florida's evolution. Virtually no natural resource limits were recognized. Bird rookeries were decimated for hat plumes and wetlands that provided important ecological functions were indiscriminately drained. In other words:

The general failure to appreciate and better understand Florida's natural environment was in part a reflection of the ethical and esthetic sensibilities of the times, but it was also an indication of the fact that much basic information about the chain of life and complex hydrology of South Florida was then nowhere available. Drainage of the Everglades and dredging and filling in the coastal estuaries would, in time, bring major problems, but of this Florida officials and most citizens had no premonition... (Carter 1974:58).

As Florida continued to grow, demographic shifts occurred. The concentration of population in the northern reaches of the State changed dramatically during the twentieth century. Growth shifted to the central and southern peninsula and became mostly coastal and urban. By 1930, three-quarters of State residents occupied just six percent of the land. Fernald and Purdum (1992) have suggested that while most of north Florida remains lightly populated in spite of its suitability for development, most growth continues to occur in the least environmentally suitable areas. Urban sprawl is the predominant pattern, like most of the United States. Over 90% of Florida's 1990 population lived in 20 metropolitan areas. These land use changes, highly significant from a water supply perspective, had side effects:

...the very pace and scale of population growth threaten to destroy much of Florida's beauty and to impair irreparably the ecology upon which its well-being depends. Excessive drainage of wetlands, construction of miles of artificial waterfront, hazardous waste discharges, and unplanned urban sprawl are manifestations of population growth outrunning orderly, careful accommodation of the special qualities of the Florida environment. By 1990 thirteen million Floridians had a far less stable relationship with the environment than had the Indians of Ponce de Leon's time. (Fernald and Purdum 1992:81)

The numbers and timing associated with Florida's growth are well documented and remarkable: less than two million residents in 1940 to nearly five million twenty years later, and almost 16 million in the 1990 Census. The make-up of the population also changed – in 1990, 86% were white with 14% non-white. The 2000 Census showed these proportions to be 78% and 22%. Of particular note in achieving water conservation is the State's growing Hispanic population, many of Cuban and Latin American origin. Florida also continues to have a sizeable elderly population. In 1990, almost one in five Floridians was over age 65, while in 2000, about 18% of the population fits this age category. In a few counties (Charlotte, Highlands, Pasco, Sarasota and Citrus) those over 65 made up 40% or better of the 1990 total (1990, 2000 U.S. Census).

Two significant implications for water conservation can be found in Florida's unique demographics. First, the massive influx suggests that many new Floridians may not be well informed about water resource limitations and fragility. Florida is next to last among all states in the percentage of current residents born in the State. Less than two of every five residents are native Floridians (2000 Census). New residents also bring water use attitudes from their prior home which may not be inclined to the values of conservation. The states contributing the greatest in-migration to Florida are New York, New Jersey and Georgia (2000 Census). A second point is the need to provide culturally appropriate water conservation messaging and education to an increasingly diverse population in terms of their language, beliefs and natural resource values.

This brief historical analysis suggests that those who gradually populated the State felt they had to do something to capitalize on this territory – to conquer Florida's frontier. The obvious answer was to manipulate the natural environment, to bring the troubling

waters under control. This perceived need to conquer Florida was consistent with attitudes across the American continent in times of manifest destiny. Two symbolic examples of long-lived machinations were the cross-Florida canal idea and draining the Everglades. The canal dream to expedite shipping and avoid the treacherous coastal passage lasted 400 years, ultimately proving unnecessary and environmentally infeasible. Draining the Everglades to create arable land was initially thought to be cheap and easy, but it proved as daunting and difficult as it was ecologically foolhardy (Carter 1974). A growing comprehension of Florida's complex ecology has resulted in the need to "undo" these projects and others, like the Kissimmee River straightening, at great public expense.

In summary, the history of water resources in the State is the history of Florida. Its overabundance has always been part of how Florida could be developed and exploited for human purposes. Water was the common enemy, and it shaped the earliest politics (and related scandals), led to land giveaways in exchange for "internal improvements" and fueled the dreams of speculators from the early Spaniards to post-Civil War and modern day carpetbaggers.

Florida Water Law

The settlement of Florida, as noted, has been a story of too much water and how to get rid of it. The State Legislature even tried to give away all of Florida's submerged, or waterfront, property to adjacent owners in 1857, only to be rebuffed by the Florida Supreme Court applying the public trust doctrine in *State v. Black River Phosphate Company* (Blake 1980). In short, the possibility there could ever be too little water in Florida seemed unimaginable.

A number of developments, beginning with the south Florida hurricanes in 1926 and 1928, unmasked this misperception. Included were major droughts, the Tampa Bay water wars, misguided environmental "improvements" and the profligate development associated with runaway population growth. Before examining the implications of Florida's unique water law and management system, however, it is instructive to provide an overview of how water law has evolved over the millennia.

Public rights to water have been protected since ancient days. The Romans codified such rights as part of their customary law in the Institutes of Justinian:

By the law of nature these things are common to all mankind – the air, running water, the sea, and consequently the shores of the sea.

(Hamann 1998:302)

This approach carried over to English common law where ownership of water was vested in the sovereign, who had the duty to hold it in trust for the public's use and benefit. Judges deciding specific disputes over hundreds of years established the common law as it related to navigation, fishing and who had rights to a watercourse. Of course, when technology and limited needs did not require moving large quantities from one place to another, as is typical today, the common law relative to water was much simpler. It dealt strictly with surface waters and emphasized one user's right to use the resource not interfering with the right of a second user. The common law was mostly common sense.

Key tenets of common law that persist in some form today are riparian rights, the natural flow doctrine and the civil law rule (Hamann 1998). Riparian rights are those occasioned by owning land that borders on a waterbody. Any person thus situated had a limited right of ownership – water could be used as needed. This included consumptive uses,

the ability to build docks or other means to access the water, and the right to a view of the water. The natural flow doctrine gave all riparians these rights, but only if they did not impair water quantity or quality for other users. This doctrine evolved to one of "reasonable use" under the eventual pressures of the Industrial Revolution, where one riparian could not unreasonably interfere with the reasonable use of others (Hamann 1998). Finally, the civil law rule applies to drainage and requires landowners to assume responsibility for the natural amount and rate of flows without increasing the burden downstream. This contrasts with the common enemy doctrine which "allows each landowner to battle surface waters at will, with no liability for damage to neighboring lands" (Hamann 1998:303). All of these elements have found their way into water law in the United States, though in differing forms for Eastern, Western and Florida water law.

Eastern water law, grounded in the greater abundance of the resource than found in the western states, is essentially the riparian system. The landowner along the shore has the right to use water in place (boating, fishing, swimming, etc.) and can withdraw as much water as needed if such use does not interfere with another riparian's reasonable use. Eventually these rights were extended to groundwater for use on the land above a withdrawal. The strength of this system is protection of the resource. Weaknesses include its basic restriction on use by non-riparians with no apparent right to water, the need to adjust to uncertainty as new riparians emerge and the need to resolve disputes on a case by case basis (Hamann 1998).

Western water law is based on scarcity, and relies on the prior appropriation doctrine. Water is a property right created by an historic claim to water. Those who were "first in time" are "first in right." The system originated in the gold mining days when miners diverting water wanted certainty in maintaining their operations. Later, a requirement

that uses be for beneficial purposes was added. A water right (separate from land rights) can be a valuable commodity, whether sold, traded or passed on by a senior appropriator from generation to generation. The real advantage of this system is the certainty of ownership. Disadvantages are the potential for waste, to maintain a claimed quantity, for example, and the lack of available water in a stream for natural systems if all water has been appropriated for humans (Hamann 1998). In some cases, government has had to buy water to preserve the environment.

Hamann (1998) notes the respective weaknesses of both Eastern and Western law led to the development of water resource institutions; administrative agencies whose primary responsibility is to manage the resource. In either system, Hamann says, there is a need to monitor use, continue research aimed at understanding the hydrologic system and its limits, reserve water for environmental, recreational and other instream uses, develop new supplies and promote water conservation. All these notions are reflected in Florida water law, considered by many to combine the best aspects of Eastern and Western law (Purdum 2002).

Florida law makes water a "resource of the state," one that is not owned by anyone. The Florida system uses regional institutions in the form of five water management districts to allocate water use under a permitting system that sees the environment as a rightful user of water by establishing and maintaining "minimum flows and levels." Purdum (2002) notes that water managers must incorporate comprehensive planning and resource development into an allocation system designed to: 1) prevent waste; 2) give certainty to existing users; 3) assure equal rights even among those of unequal economic power; 4) protect the natural environment; and 5) provide for future users. Key permitting tests entail assuring the use is reasonable and beneficial, does not

interfere with existing legal users and is in the public interest. Special provisions are also included for resource management during periods of water shortage. Strengths of the system are noted above, while weaknesses include the difficulty of defining such key terms as the "public interest," "significant harm" and "reasonable and beneficial," especially as it relates to competing water uses.

It is not surprising Florida water law of the early twenty-first century is envied by others.

It is a system based on management of watersheds, accompanied by modest but generally adequate taxing authority, with broad, flexible powers that has been able to address issues little imagined in the 1970s (Purdum 2002). But how did Florida, with its penchant for dewatering reality, become a model for others in the effective protection and use of water resources? How could a state so sold on the virtues of growth, so full of powerful development forces, have seen so much success from those concerned about the environment? To answer this, we must digress slightly and examine the era of the late 1960s and early 1970s, both nationally and in Florida, to look at the emerging environmental movement. Florida was part of a national trend during the sixties, one that Blake (1980) has pointed out brought "environmentalists to the rescue."

The new environmentalism of the United States found its voice in Rachel Carson's *Silent Spring* (1962), and its constituency in the youth of the country. Concerns about pesticides, detergents, industrial waste and smokestacks were a reasonable response to industrialized America, especially as advocates turned from shrill cries for preservation of resources to more scientific and sophisticated understanding of ecology. Young people were also learning to question authority in other matters of life and death, including the war in Vietnam and the civil rights movement.

Kempton, et al. (1995) suggest that those affected by *Silent Spring* developed a mental model that was much more than just an assimilation of facts about the perils of DDT. This individual model emphasized the interconnectedness of all species, or what has been called "chain reactions" in nature. When social groups or a culture share mental models they can become cultural models (Holland and Quinn 1987), providing structure for environmental beliefs and values. Further discussion of the work of Kempton, et al. follows shortly.

Dunlap and Van Liere (1978), extending the work of Henderson (1976) and Harman (1977), believe that in the 1970s Americans were developing a "New Environmental Paradigm." It included beliefs about how fragile nature was, the natural limits to growth, and that active environmental protection was essential to achieving what we now call sustainability. These ideas would certainly explain why environmentalism became popular in Florida's post-1970 setting. Existing environmental groups such as Audubon, the Izaak Walton League, Wildlife Society and even the League of Women Voters stepped up to assume leadership in the State, working effectively with both Republican (Claude Kirk) and Democratic (Reuben Askew) governors (Blake 1980). In 1969, many of the environmental groups combined efforts with some key politicians to form "Conservation 70s," and showed surprising clout in getting legislation passed in both the 1970 and 1971 legislative sessions. Blake (1980: 196) provides a summary of the radical cultural shift that these changes reflected and portended:

The environmental movement hit Florida with particular force because it challenged the State's traditional boosterism. For 150 years progress had been measured in the number of new residents, tourists, railroads, highways, houses, condominiums, shopping centers, orange groves, sugar fields, cattle ranches, and phosphate mines. Whatever "developed" the State was good; whatever hindered development was bad. Then development became suspect. ...many Floridians began to believe the State had been growing too rapidly.

Among the legislation with significant impacts on water conservation was the 1972 Water Resources Act, still in force today as Florida's water law in Chapter 373 of the Florida Statutes. The Act's establishment of a regional approach to water management in Florida was based on the fact that there are very real differences among the regions to be managed. Variability in physiographic, hydrologic and even ecologic conditions form the basis for distinct management approaches. One common denominator for effective management, however, is water conservation by all use sectors. In effect, conservation can represent a "source" of water created by enhancing efficiency. This is sound public policy because it protects environmental features, extends available supplies at a favorable cost-benefit ratio, and can create a stronger environmental ethic among users.

From its inception, the Water Resources Act envisioned that water conservation would play a role in assuring public water supplies. Introduction of the key term "reasonable and beneficial use" shows this intent, especially in the role it plays as one prong of the three-part test to receive a water use permit. Water utilities and others seeking to be allowed to use water sources for public supply must demonstrate their use is beneficial to the public and will be accomplished using a reasonable quantity of the resource. Inclusion of this requirement can be viewed as the genesis of water conservation as preferred public policy in a water rich environment.

This brief historical analysis has shown there are both impediments and catalysts to water conservation success in Florida. Among the former is the short tenure of many residents that limits understanding of Florida's water resources and their governance. Absent this knowledge, Floridians maintain perceptions of plenty in water resources, and

are baffled when such beliefs are belied by the limits of available supplies and periodic water shortages. Also serving as an impediment is a continuing form of manifest destiny that allows the destruction of wetlands and encourages development in environmentally unsuitable locations. In contrast to these limitations, the major catalyst to achieving effective water conservation in Florida is the State's unique water law and resource management system that places value on conservation and natural environment protection.

LITERATURE REVIEW

Literature reviewed for this dissertation falls into two primary categories: 1) the cultural values linked to water conservation behavior; and 2) public participation, both as studied by anthropologists and related to water use by Floridians.

Water Conservation and Cultural Values

The purpose of this section is to investigate research done by anthropologists on water resources and cultural models, and how this work relates to values which lead to conserving behavior. It addresses the field of applied environmental anthropology, as well as the anthropological response to the tragedy of the commons.

As in other parts of this analysis, environmentalism is used as a surrogate for water conservation since so little direct anthropological research exists on urban water use. One source forms the backbone of this investigation. *Environmental Values in American Culture* (Kempton et al. 1995) is an important resource and will be addressed in greater depth than the other sources identified. It will be used, as well, from a theoretical and methodological standpoint for this dissertation. A key assumption is that self-identified environmentalists are more likely to demonstrate water conservation behavior.

Throughout, this work must be placed in the context of water resource issues extant in Florida. Among these are maintaining resource sustainability, and rampant growth through in-migration that stresses supplies and creates numerous, diverse "publics," with varying beliefs and values regarding water use. There are many significant threats to Florida's quality of life in 2010, but few more important than the loss of water quantity and quality, and resulting impacts on humans and the State's natural environment. If anthropologists hope to make a difference, they must address the dual role referred to by Bennett (1993). First, we must confront the "ecological transition," conducting "research on the way physical phenomena are absorbed into human systems of needs, wants and profit-seeking," while also recognizing "...the need to raise serious questions about fundamental social and ethical values of the twentieth century – in particular, the dominant theme of self-gratification" (Bennett 1993: 79).

Cultural Models And Water Conservation

Applied anthropologists have paid increasing attention over the last twenty years to "cultural models," those shared, simplified, formal representations of explicit and implicit knowledge, interests, beliefs, and values that help individuals understand the world and their behavior in it (Holland and Quinn 1987). Environmental anthropologists, in particular, have recognized the power of this analytic tool to find solutions to complex environmental problems by incorporating cultural and political contexts. Cultural models are not limited only to those we study – anthropologists, scientists, engineers and other experts all bring their own biases and values to the process.

This latter point was emphasized by Paolisso and Chambers (2001) in their work on "the anthropology of Pfiesteria," and especially the surrounding environmental discourse.

The anthropologists worked as part of an interdisciplinary team and focused on why one

group (farmers) seemed to receive a disproportionate share of blame for fish kills associated with toxic bloom of *Pfiesteria* in tributaries to Maryland estuaries. One key finding: the need for better communication with policy makers regarding the diverse perspectives, beliefs, values and knowledge in seemingly homogenous, competing stakeholders. Anthropologists must help others understand differences in cultural knowledge since "... (doing so) represents an untapped resource for more participatory environmental policies and programs, thus reducing the need for regulatory approaches that create excessive bureaucratic processes and are not well adapted to local environmental and cultural diversity" (Paolisso and Chambers 2001:10). This article provided a strong catalyst to thoughts about what constitutes the anthropology of water conservation.

Nazarea et al. (1998) explore cultural models without emphasizing them per se. Their research addressed growing reliance on mostly one-size-fits-all indicators of sustainability in donor-funded community development projects around the world. Their purpose, aligned with the current research, offers a methodology and case study for measuring what is important to a local population (i.e., reflects their standards) in hopes it will result in long-term sustainable use of natural resources. Conklin's (1954) rediscovered concept of "ethnoecology," or the understanding of local understanding as relates to natural resources is employed. Visual anthropology (Thematic Apperception Tests with local residents) identifies effects of gender, ethnicity and age as statistically significant in terms of the political ecology of cognition related to natural resources. The bottom line of this compelling research is that quantitative, operational indicators usually employed in development planning and implementation are not consistent with measures the local community, and its sub sectors, consider relevant or significant.

Beehler, McGuinness and Vena (2001) used cultural models "to capitalize on the knowledge, attitudes and practices of African American anglers to understand the nature of their fishing practices and risk perception" (2001: 289) related to polluted fish in the Great Lakes. The authors used ethnographic methods to identify sources of knowledge and risk perception for focused educational purposes. Their findings verify the value of an emic, cultural model that is grounded in the subject group's specific folk knowledge.

Several other articles address the importance of understanding the relationship of environmental knowledge and attitudes. Boggs (1990) touts the use of anthropological knowledge under the National Environmental Policy Act (NEPA) since it mandates relevant social and cultural knowledge be made part of policy processes. His view is countered, however, by Rappaport (1994) who questions whether existing evaluative systems like NEPA are adequate to protect human environmental rights. NEPA is deficient, according to Rappaport, because "the definitions of human environment with which they work are impoverished. They are conceived in economic, demographic, and governmental terms. Their social, cultural and psychological qualities and dimensions are rarely taken into consideration" (1994: 160).

One author whose name shows up repeatedly in research correlating environmental attitudes and knowledge is Thomas Arcury (1990; Christianson and Arcury 1992; Arcury et al. 1986). Arcury's work generally reflects that environmental knowledge is consistently and positively related to environmental attitudes, though the relationship is not especially strong. Using tools like the New Environmental Paradigm, however, he finds low levels of environmental knowledge among respondents. This has disturbing implications for environmental policy.

In his work with Christianson (Christianson and Arcury 1992) for the Kentucky River Authority, Arcury cites extensive literature indicating certain sociodemographic factors have a consistent, statistically significant association with environmental attitude. The composite described "indicates that younger, better educated, urban, liberal individuals are more concerned about the environment and have more positive attitudes toward the environmental movement" (1992: 100). Kempton et al. (1995) disagree, as we shall discuss shortly. Arcury and Christianson also explore the "knowledge ceiling" in environmental issues, where knowledgeable individuals stop acquiring new information and less knowledgeable individuals continue to learn, equalizing knowledge of water issues and setting the stage for consensus attitudes and public policy. The important point is policy makers cannot assume commonality or a lack thereof among residents, but must assess knowledge and opinions of the public.

Kottak and Costa (1993) use their extensive, longitudinal research background in Brazil and Madagascar to note conservation efforts must be site-specific, culturally appropriate, and socially sensitive to succeed. They find people will not act to preserve the environment (even if experts tell them they should) if no threats are perceived. Affected parties must be given a good reason (e.g., tax incentive, preserving irrigation water, etc.) for taking action; and the means and power to do so.

Environmental Values in American Culture

Understanding culture is an essential part of understanding environmental problems because human cultures guide their members both when they accelerate environmental destruction and when they slow it down. For everyone – leaders, citizens, and scientists alike – the cultural framework shapes the issues people see as important and affects the way they act on those issues.

(Kempton et al. 1995: 1)

Kempton, Boster and Hartley (1995) began their research with a deceptively simple goal: to analyze the components and causes of popular environmentalism in the United States. They availed themselves of a wealth of statistically valid public opinion surveys, some regularly administered for decades. The 1990 Gallup Survey, for example, documented strong self-professed environmentalism among Americans – 73 percent of respondents considered themselves an environmentalist.

The overall survey results of the U.S. population and other data led the authors to three points: 1) Americans have become much more pro-environmental since the 1960s, and especially since 1980; 2) the environmentalism exhibited goes deeper than just opinion or attitude to core values and fundamental beliefs about the world; and 3) this environmentalism affects market and voting behavior. They also cite several studies, including a comprehensive summary of a large body of literature by Mohai and Twight (1987), to make the point that environmentalism is not just for social elites as many still believe. Environmentalism cuts across all socioeconomic indicators (especially at the grassroots level), with the primary exception since the 80s being age. Young people's greater concern is noted as further evidence of a shift toward a more environmental population.

The researchers cite two camps regarding what an environmentalist is: those who see a single cause for environmentalism versus those who see multiple causes. As anthropologists, the authors evidence an aversion to reductionism, or trying to explain complex phenomena with simple answers. Commoner (1971), in *The Closing Circle*, agrees, stating "...the notion that every effect must have a singular "cause" is conveniently embedded in public awareness of science" (1971: 109). Such oversimplification has led to evasive tactics in avoiding environmental responsibility.

Kempton et al. adhere to the multiple cause explanation, describing Dunlap and Van Liere's (1979) New Environmental Paradigm, enhancement by Milbrath (1984; 1989), the post-industrial worldview of Olsen, Lodwick and Dunlap (1992), and Inglehart's (1977) depiction of environmentalism as part of post-materialist values possible after material wants are satisfied. Kempton et al. (1995) differs from these paradigm shift approaches, preferring to digest the question in more manageable chunks using cultural models to cover a limited, specified domain and a well-defined set of methods to elicit them.

A unique two-stage methodology is employed to provide the "big picture," resulting in "...the most complete and holistic view yet developed of the beliefs, logic, and values embedded in mainstream American environmental thinking" (Kempton et al. 1995: 2). The researchers use cultural anthropology methods as if studying a foreign culture, relying on their informants for topical enlightenment in an initial set of semi-structured ethnographic interviews. They employ a cognitive anthropology approach through two central concepts – that people organize cultural beliefs and values through mental or cultural models, and that agreement or disagreement on these models show clear patterns of variation across groups when analyzed as to the shared beliefs and values.

The direct data generated is used to turn mental models (held by individuals) into cultural models (widely shared mental models) where warranted. The extent to which cultural models are shared is addressed not by a representative national sample in this analysis, but by interviews with a broad range of targeted interest groups in order to probe the structure, limits and variations within U.S. environmentalists. The groups interviewed ranged from Earth First! members to unemployed Oregon sawmill workers, with a middle ground made up of ordinary citizens and employees of polluting industries.

Initial semi-structured interviews were used to design a fixed form survey, reflecting a reliance on what was learned about the respondent's beliefs and values. Beliefs refer to what people think the world is like, while values are guiding principles of what is moral, desirable or just. The distinction is important in defining environmental motivation. Beliefs suggest what issues will be attended to, and policies supported, while values tend to form the basis for action by mitigating the fact that many environmental issues are in the future. Results of the fixed form survey were compared to national opinion surveys to validate results.

This work faced inherent difficulties. Previous research found vast differences among cultural models of laypeople, scientists and administrators. Disconnection between cause and effect must often be overcome to solve environmental problems, usually through individual or group altruism, or government sanctions / regulation. Finally, the research had to confront rational choice. What would motivate people to take action if it did not benefit them directly? Results of this research yielded a diversity of environmental values intertwined with core American values that "... help explain why people who may otherwise be preoccupied with short-term self-interest are now concerned about long-term environmental change" (Kempton et al. 1995: 13).

Kempton et al. (1995) found that American environmental sentiment is not an isolated topic, but is closely linked to such varied elements as religion, parental responsibility, and confidence in government versus industry to solve environmental problems. Understanding these findings requires more depth, from examining the cultural models of nature discovered to the environmental values they reflect, and the implications cited for public policy. Theoretical and methodological lessons can be gleaned as well.

Cultural Models and Values

Three sets of general cultural models of nature were discovered by Kempton et al. One depicts nature as a limited resource upon which humans must rely for health and sustenance. A second sees nature as balanced and interdependent; sometimes unpredictable and capable of "chain reactions" that can ripple across species if humans interfere too much with nature. The third is cultural models of society and nature that reflect the economic market's devaluation of nature, human separation from nature (leading to a failure to appreciate it), and idealization of environmentalism of primitive peoples. All models represent set(s) of pre-existing concepts into which people cognitively assimilate new information about environmental messages, issues and policies.

Models identified by the researchers emerged unsolicited in the course of the semi-structured interviews. This makes elaborate inferences possible about environmental issues, since these models "...are nothing less than this culture's conceptual basis for environmentalism" (1995: 62). Kempton et al. speculate on the origins of these models, citing three likely sources. The models may have been derived relatively recently from scientific studies of biology modified for lay understanding. Another source may be environmental writers such as Rachel Carson and John Muir as their messages have been widely dispersed through public education institutions, television and discussion with friends and interpreting stories (Kempton et al. 1995). For example, the 1911 observation on nature's interdependencies by John Muir remains popular today: When we try to pick out anything by itself, we find it hitched to everything else in the universe. A final derivation for the models may be the messages promoted by the numerous

environmental advocacy organizations to which so many Americans subscribe. So what environmental values are reflected in these models?

The research was designed to go beyond beliefs into the realm of human values in order to better understand motivation for environmental concern and action. Values can work to motivate in conjunction with other motivations such as price signals or political pressure, but can also be a source of action when other solutions are ineffective. Values are also significant in public response to environmental issues because causes of environmental damage (e.g., ozone depletion or species loss) are often disconnected in time and space from those harmed. As a result, environmental values may be the only reason for someone to respond when no economic or political motivations apply.

Kempton et al. (1995) concluded American environmental values derive from three sources:

- 1) Religion – White's (1967) argument that Judeo-Christianity is largely anthropocentric is refuted, with respondent values reflecting a sacredness and spirituality in nature that is grasped even by agnostics and others not connected to formal religious teachings.
- 2) Anthropocentric (human-centered) values – The strongest emotion was vested in concern for one's descendants (see below), but other values included material utility (though nature is seen as serving more than human needs), and aesthetic utility (feeling recreated by being in nature, love for animals, etc.).
- 3) Biocentric (living thing-centered) values – Nature has value and rights of its own, as in Aldo Leopold's "land ethic."

These findings are interpreted by Kempton et al. as consistent with those of other researchers on environmental protection values. Merchant (1992), and Stern and colleagues (1993; 1994), also postulated three bases for environmental values: the self, other people and the biosphere.

Two theoretical issues were raised relative to strongly held public views on the value of descendants. First, the common method of "discounting the future" as a way of minimizing environmental risks runs counter to citizens' desires to pass on environmental quality. The tenure of such discounting, e.g., as practiced by the Bush administration in addressing global warming, is set too short to reflect real risks with the intent of justifying inaction by leveling cost comparisons. The second issue is "intergenerational ethics," or an obligation from one generation to future ones. Kempton et al. find "the desire to protect the environment for our descendants appears to be a nearly universal American value" (1995: 101).

Biocentric values reflect a view that developed due to public awareness of pollution consequences and being able to attribute responsibility for environmental destruction to specific entities / individuals. Three variants discussed suggest the values that humans should not harm nature because they are part of it; all species have a right to exist; and nature has intrinsic rights broader than mere species survival (Kempton et al. 1995).

The strength and diversity of values uncovered in this research suggest environmentalism in modern day America is not likely to be a passing fad. The depth of respondent feelings, continuing emergence of environmental calamities and connections to core American values also suggest that single cause explanations of the cultural basis of environmentalism are off target.

Cultural Models and Policy

The research includes a description of American reasoning about environmental policies from the perspectives of both specialists and laypeople. Specialists tend to function with greater, more accurate information, but the view of laypeople is of special interest

"...because of its practical value in understanding political support for or opposition to, policies that may be publicly debated in the future. Lay policy thinking is also of interest because it provides a window on how people translate their beliefs and values into prescriptions for action" (Kempton et al. 1995: 117). Of course, public preferences may be based on faulty information or cultural models (greed, for example). Lay policies analyzed were both volunteered prior to a factual briefing, and forthcoming thereafter.

One surprising finding was related to lifestyle choices. Anecdotal evidence on Americans (showing relatively profligate energy and resource consumption) suggests complacency, but majorities in all five groups and three-quarters of the public sample indicated a willingness to "force" lifestyle changes on behalf of the environment. This seems to override classic American values of liberty and freedom, and deserves further exploration. Changes to lower consumption lifestyles as one option was contrasted with the alternative of counting on technology for environmental solutions (Kempton et al. 1995).

Another finding, first identified by 1980s researchers, and apparently still around even among environmentalists was the layperson's belief that resource conservation means sacrifice. There is near universal support for efficient use of resources in various polls, but an inability to know what this means or how to think about it. This was evidenced in the Kempton et al. research in a lack of clear understanding among respondents of the role fuel economy standards might play in reducing global warming, and in archival data related to the fate of Clinton's proposed tax on energy inefficiency, or BTU tax.

American policy preferences for resolving environmental problems also depend on views of institutions that may cause, detect or prevent the problems. Most significant among these institutions are science, industry and government. Prior studies show that on

environmental matters the public trusts scientists, government and industry in that order. Kempton et al. discuss the public's rationale for these choices, and the dangers each institution faces in retaining the public's trust.

Implications

Kempton et al. set out to investigate public support for environmental solutions by studying the beliefs and values of the American lay public. Among their findings:

- Informants view nature as a highly interdependent system in balance, but vulnerable to unpredictable "chain reactions" from human disturbance.
- Environmentalism has become integrated with core American values (parental responsibility, obligation to descendants and religious teachings). Biocentrism, or valuing nature for its own sake, is also important to many.
- People use their values and their cultural models in deciding which environmental policies they support.
- Opposition to environmental laws is not due to a lack of environmental values or lack of contact with nature. Rather, opponents are "...overcome by competing models (e.g., believing that environmental concerns are politically exploited) or values (e.g., concern about human suffering, say, from coal workers becoming unemployed)" (1995: 215).
- Most Americans share a common set of environmental beliefs and values, enough so that two-thirds of the laypeople (based on agreement analysis) are indistinguishable from members of a moderate environmental group like the Sierra Club.
- So many Americans claim to be an environmentalist on national polls because they are applying their cultural models of how nature works and how people interact with nature as they exercise their environmental values.

Kempton et al. finds, in contrast to earlier studies which may have assumed a contrarian view, no anti-environmental faction or position that led to consistent answers on their survey. This implies a cultural consensus on environmentalism with only one set of culturally agreed upon answers. It is suggested environmental beliefs and values are somewhat like etiquette rules (one set of norms, neither universally known nor always

followed). Unlike abortion, gun control or other contentious issues, there does not appear to be dual, coherent alternatives on environmental issues.

American cultural models of the environment are generally effective, but are most likely to be workable when the environmental problem is older in public exposure, such as with pollution or insecticides. Such effectiveness is less likely for newer environmental problems such as global climate change and the need for habitat preservation versus saving species one-by-one, where inappropriate cultural models can lead to erroneous conclusions. They also speculate on future concepts and cultural models that might emerge, including long-term sustainability, common assets of humanity, five-hundred-year time scales, intergenerational responsibility, and humanity's global inter-dependency.

Conclusion

Finally, Kempton et al. address a burning question: if American environmental values are so strong and pervasive, why is there not more environmental action? Inaccurate cultural models may lead to support for ineffective policy / solutions, and structural barriers prevent environmental response. Examples of the latter include inadequate transportation alternatives in many areas (bikeways, transit, etc.), and a corporate mindset focused on profits in lieu of lower consumption lifestyles. "In short, for environmentally beneficial actions, environmental beliefs and values are necessary but often not sufficient, given the multiple existing barriers to action" (Kempton et al. 1995: 220).

Kempton et al. offer suggestions on how to use their findings to teachers, communicators to the public, environmental advocates and anyone in the political

sphere. Key ideas include broadening the appeal beyond utilitarian grounds to traditional religious teachings and emerging biocentrism. The researchers were left very hopeful that this work will lead to a brighter environmental future. A positive change in American cultural views relative to the environment has occurred, but we must remember:

The strong endorsement of environmental values by the diverse groups studied in our survey may well reflect a general willingness for the American public to make significant sacrifices for the sake of the environment. However, transforming this stated willingness into coordinated social action will not necessarily be easy. Policies must be crafted and leadership provided to overcome divergent individual and group self-interests.

(Kempton et al. 1995: 212)

Anthropologists On Water

Although water conservation specifically has not been widely studied by anthropologists, other aspects of water resources certainly have. Bennett (1993), for example, has provided a useful overview of anthropological study on water resources and related environmental topics in the context of "human ecology." He defines this term as "the human proclivity to expand the use of physical substances and to convert these substances into resources – to transform Nature into Culture, for better or worse" (1993: 13). It is this relationship of human and nature, and whether effective "socionatural" systems can be created, that dominates Bennett's view. Since humans can choose to both exploit and degrade or conserve and protect, successful stewardship efforts imply enlightened management of nature, not cultural determinism.

The socionatural concept, espoused in numerous other forms such as deep ecology (Naess 1973), natural capitalism (Hawken et al 1999), biophilia (Wilson 1984), eco-economy (Brown 2001), and ecosophy (Drengson 1990) sees humans as embedded in

nature, not outside it exercising dominion. This implies, however, that humans must lower their expectations for resource consumption, a trend seldom present in modern industrial society. Achieving socionatural systems depends on whether prevailing concepts of growth, technological neutrality (confidence in the human ability to solve all problems and to use technology to dominate resources regardless of consequences – Bennett and Dahlberg 1990), and unlimited gratification (greed) continue. Such change runs contrary to the current evolutionary trend of the species, where the satisfaction of not just needs but desires dominates. For Bennett, Hardin's "tragedy of the commons" is an ever present possibility, not the exception. The human relationship with the physical environment, and its correlation to environmental anthropology, are explored further in the next section.

In Bennett's view, anthropologists have studied water resources obliquely, or "as a by-product of their research on cultural history and human subsistence, rather than as a separate topic" (1993:203). Bennett's literature review of anthropological contributions to the cultural ecology and management of water resources suggests six unifying themes. These include resource development in prehistoric cultures, the impacts of "irrigation civilization," consequences of large-scale water development projects in the tropics, and ethnological / applied anthropology on water use in modern tribal societies, as well as two themes most applicable to the current research:

- 1) Problems of water management relative to economic maximization and competitive / cooperative interactions, and
- 2) Cultural implications of water resource development and conservation in North America.

Regarding the former, Bennett (1993) begins with the principle that certain ecological issues associated with water recur in societies at all levels of technology due to the unique flowing quality of the resource. This unbounded characteristic means that using water for agriculture or human consumption tends to automatically surface problems of sharing and questions about ownership (water as property or a "right"). Sharing the resource requires cooperative relationships, but the "forms of sharing will depend on pre-existing legal rules, social relations, and cultural styles" (1993:233). It is important not to assume the innate competitiveness or inherent cooperativeness of humans in research related to water use.

As a strong functionalist, Bennett indicates it is not just values of users that promote cooperation or competition. The assessment of such values must be tempered by the way property institutions and government regulation operate in specific venues, such as in Florida with its unique common property law and policy for water resources. Bennett sees most modern, and probably most ancient, systems of water use as being a mixture of cooperation and competition where some results emanate from the government / institution and others from the mutually beneficial interactions of users. The unconstrained aspect of water resources, and Florida's treatment of water as a resource of the state, suggest the validity of Bennett's view in the current research. Bennett's final theme is the cultural implications of water development and conservation specific to North America.

Bennett sees anthropological study of American cultural attitudes toward resource development as important but neglected. His analysis extended only to about 1990, but remains valid even as a greater degree of applied anthropological research is slowly emerging (see discussion of public participation in environmental decision making

related to the work of Larson et al. (2009) and Casagrande et al. (2007) on lawn preferences in the Phoenix environs, and the prior section on the work of Kempton et al.). The growing urgency of concerns over environmental quality and the need for resource conservation are pervasive in contemporary civilization. Bennett concurs with Glacken (1966) that the issue is anthropocentrism, a value especially pronounced in North America, that makes humans the measure of all things. Both Bennett and Glacken, along with others noted, see this value as the underlying cause of environmental exploitation. Both strongly suggest the need for a more humble position that views humans as one element within a global ecosystem subject to resource limitations.

Bennett frames the needed humility in his concept of "ecophilosophy," or "any frame of reference or set of beliefs that places the value of the physical surround as a phenomenon at least as important as humanity itself, thus implying that humans must be prepared to accept constraints on their freedom of will" (Bennett 1993: 324). He also believes anthropologists may have difficulty finding solutions for environmental problems because they focus on the works of humans (culture) in the Nature / Culture dichotomy. This reinforces the doctrines of humanism (or anthropocentrism) which form the rationale for human dominance of the planet. These include faith in the goodness of human intentions and reason; optimistic assumptions that all problems are solvable; believing all resources can be renewed or improved; that humans will survive no matter what happens in the world; and an abiding faith in industry and science.

These components of humanism are the underlying ideals of Western (and increasingly, worldwide) industrial society. And they are particularly pronounced in contradictory American attitudes toward water. We may deplore the abuse of water commons, but

ignore the need to conserve. Florida's cultural history is replete with unbounded optimism in the resiliency of our water resources, from ongoing destruction of wetlands for development to public policy that mandates water supply availability for all future reasonable and beneficial uses. Dasmann (1966) captured American cultural attitudes toward the processes of nature:

Americans are impatient with the slow processes of nature, with the normal events of biotic succession and change. They prefer the simplicity of a machine to the intricacies of a biota. The day-to-day problems of watershed management seem tiresome, whereas a large dam built to stop floods 'for all time' has popular appeal. Even when we preserve nature we like to get the job over with, and by some spectacular act of Congress decree preservation forever.

(Dasmann 1966:330-31)

So can Floridians learn to control their use of water as a resource of the "commons"?

This is explored further from an anthropological standpoint shortly, but first Bennett's position needs to be summarized. Bennett believes solving resource issues in a culture dominated by an emphasis on individual rights will occur in two stages. The first stage must be the imposition of controls by an external agency. This allows movement to the second stage where local water users' associations take over to maintain the system through imposition of its own rules and penalties. In effect, Bennett supports Garret Hardin's concept of "mutual coercion mutually agreed upon" (1968), though Bennett appears to place much greater faith in the workings of community than did Hardin.

Environmental Anthropology

The current research is within the realm of applied environmental anthropology, so an overview of how anthropologists have addressed the environment is advisable. This will range from current trends in the field to theoretical models, particularly as applied to the

beliefs and values present in American culture. We take the position that those who claim to be environmentalists are more likely to conserve water as one of the behaviors associated with their professed stewardship.

Anthropological views on the human-environment relationship have continued to evolve, reflecting such concepts and theories as possibilism, environmental determinism, cultural ecology, human ecology and ecological anthropology (Kroeber 1939; Stewart 1955; Rappaport 1968; McNetting 1977; Moran 1990; Bennett 1993). Johnston (1995) has defined environmental anthropology simply as the study of human environmental relationships. She addresses a new form of environmental anthropology whose professional objectives "...include expanding available information to encompass sociocultural realities; increasing access to information; enhancing community partnerships in problem definition, decision making, monitoring, and evaluation; and facilitating conflict and crisis resolution" (1995: 29). For Johnston, anthropologists are uniquely situated as social scientists to address complex environmental issues because they are holistic enough to untangle history, culture, political economy and environmental context in solving human problems.

Johnston's views are consistent with those espoused by the Society for Applied Anthropology (SfAA), where environmental anthropology is capable of assisting policy making and program planning through combining ecology with an understanding of community social and cultural dynamics. The result can be enhanced resource management by and for those affected by policy development. The SfAA is also a sponsor for the Environmental Anthropology Project (EAP), along with the U.S. Environmental Protection Agency. The goal of this cooperative arrangement is to increase community and policy maker access to the social science expertise

anthropologists and others can bring to the solution of environmental problems (SfAA 2003). A continuing focus of the Project is developing successful community participation strategies, where community is defined as “persons who not only share place and interests, but who also act collectively to further those interests” (Society for Applied Anthropology 2001).

The EAP has generated some timely and pertinent research specific to water resources. Wingard (2000) explored the community dynamics of source water protection from a sole source aquifer in the Memphis (Tennessee) metropolitan area. His holistic approach combined a sound understanding of the scientific aspects of aquifer recharge and water quality with ethnographic methods focused on three points of view involved in source water protection – politicians (elected officials and bureaucrats), scientist / engineers, and environmentalists. His study of community structure showed an apparent high level of consensus was in fact subject to varied beliefs and values that could undermine attempts to protect the water supply. Politicians were focused on short term problems and trade-offs, while the scientists took a technical position that could be either short or long term, and the environmentalists saw ground water issues linked to quality of life, often espousing ethical positions that left little room for compromise. Wingard's work is significant to this research in exploring cultural models for water use and conservation.

Other EAP results included Scrol's work (2000) on overcoming the cultural disconnects of the Lower Elwha Klallam Tribe's efforts to protect the water resources within their territory; Ogden's (1997) paper on anthropology's contribution to building a social science action plan as part of South Florida Ecosystem restoration efforts (especially as to incorporating "local knowledge"), and Cartledge's (1998) exploration of

anthropological perspectives on quality of life analysis in environmental issue identification and assessment in Hamilton County, Ohio.

Ervin (2000) has addressed recent trends in applying environmental anthropology, including research into disaster and involuntary migration, environmental risk assessment, and the use of political ecology in human rights advocacy. He uses the work of Fitchen (1988) as a case study of how anthropology can expand the problem of ground water contamination beyond technical boundaries into the cultural milieu. The emphasis is multi-disciplinary and addressed in a processual and interactive framework that views a major role for the affected community as essential. Fitchen's work in the mid-1980s in New York State illustrates that in environmental issues technical complexity is often compounded by institutional complexity (such as overlapping authority, legal constraints, varied mandates and even territoriality among responsible agencies). Realizing water conservation in Florida is no exception. A key part of the author's research must be to enhance the institutional response, creating clearer, smoother interactions among agencies and the affected public through strategies, recommendations and tools aimed at achieving efficient use of limited water supplies.

Ervin's (2000) discussion of political ecology notes the combining of anthropology, biology and other social disciplines with the field of political economy. Such a blending extends the reach of the political economy approach to environmental crises that are increasingly universal, from deforestation to over-fishing and water pollution. Increasing water supply scarcity can certainly be added to this list. Johnston (1994) is cited for her United Nations work designing a new charter of environmental rights. Johnston addresses the need for American culture to question the excess of its prosperity when such largess negatively impacts natural resources and marginalized people, noting:

...if the price of our consuming culture is environmental degradation and the deterioration of human health, the benefits, as well as the burdens, are not shared equitably. My ability to survive and thrive depends upon the restriction of other peoples' rights to a healthy life.

(Johnston 1994: 5)

Ervin (2000) closes by noting there are many other possible roles for anthropologists, including active involvement in policy development. Related to this dissertation research are development of collaborative compilations of local environmental knowledge, such as ways to save water, for educational purposes, and the design of effective co-management schemes for community water conservation among institutional players, and between citizens and their institutions.

What is an Environmentalist?

Arcury (1995) points out that although concern about environmental problems is widespread, public knowledge about the environment, ecology and solutions is not. This suggests the need for environmental education, according to Arcury, for three main reasons. First, environmental justice depends on a knowledgeable public, especially in cases where a community must protect itself against assaults on its environment. Second, an informed public will support sound environmental policy in terms of both exercising personal responsibility (recycling, not polluting, conserving water, etc.), and holding government and corporations accountable for their actions. Finally, environmental acumen is a prerequisite for environmental health, both among poor and wealthier families in a day to day world that encompasses a growing number of environmental threats.

The history of American environmentalism has been well chronicled by Riley Dunlap and Angela Mertig (1992) in documenting a 1990 symposium of the American Association for the Advancement of Science. Though they focus on the "Earth Day" period of 1970-1990, their research finds the organizational and ideological roots of contemporary environmentalism in the Progressive conservation movement of the late nineteenth century that was a reaction to exploitation of American natural resources. The efforts of Teddy Roosevelt, Gifford Pinchot, John Muir and others resulted in the national park system and the Forest Service, and spawned key organizations such as the Sierra Club and National Audubon Society. Significantly, these beginnings also resulted in a cultural dichotomy that persists today among environmentalists – some want wise management of natural resources for continued human use while others argue for preservation for its own sake.

Environmentalism was deflected by the two world wars, but following each a new wave arose. The first of these, in the 1930s and 40s, emphasized mitigating such calamities as the Dust Bowl (Jacks and Whyte 1939) and flooding while developing resources to stimulate economic recovery. The emphasis of the next wave in the 1950s was on preservation of natural beauty and wilderness for public enjoyment, typified by the campaign to save the Grand Canyon and spurred by concerns for overpopulation and water / air quality. Rachel Carson's *Silent Spring* (1962) provided the impetus for modern environmentalism by illustrating the complexity and insidious nature of some new technologies, and their consequences for human health and well-being. The initial Earth Day (1970), with its 20 million participants to a national celebration, showed environmentalism was for real.

Hays' (1987) analysis of the emergence of environmentalism suggests a number of likely causes important to consider. The 1960s had given rise to an activist culture desirous of solving society's problems directly. In addition, scientific knowledge and media exposure for environmental problems had grown, widespread affluence was allowing more people to recreate outdoors in nature, and concerns over quality of life emerged as basic human needs of many were met. Finally, and perhaps most importantly, given the shape of environmentalism in the new millennium, many existing conservation organizations broadened their focus to include a wider range of environmental issues, creating a whole new vehicle for mobilizing public opinion and affecting public policy and programs. "In short, by the early 1970s, society had accepted environmentalists' view of environmental quality as a social problem" (Dunlap and Mertig 1992: 3).

Dunlap and Mertig (1992) also explore environmentalism as a social movement from both the sociological and political science perspectives. The environmental movement, in these contexts would usually fall victim at some point to either the "natural history" model (Mauss 1975), or the "natural decay" model (Sabatier and Mazmanian 1980). In the former, a societal problem gains support from the public, media, funding sources and ultimately policymakers. The movement then becomes institutionalized through responsive regulations of government and others, its leaders become part of the system and the public assumes the problematic conditions are being taken care of, though this usually is not the case. Attempts to revitalize the cause fail as the movement runs the course of its natural history.

The political scientist model has the same result, but focuses on the policy development and implementation stages. There are two main factors that lead to the natural decay of social movements. First, interest groups (the offshoot of successful social movements at

institutionalization) are co-opted by symbolic victories in the legislative forum. Second, agencies focusing on the problem are typically captured by the interests they were to regulate.

So if social movements are usually transitory and subject to a natural (often fairly rapid) decline, should we expect the demise of the environmental movement? In tracking modern environmentalism Dunlap and Mertig (1992) say no, and offer evidence that "a substantial degree of ecological consciousness has become a permanent part of the American value system" (1992:5). Kempton et al. (1995) concur in *Environmental Values in American Culture*, noting that Americans have become significantly more pro-environmental since the 1960s and particularly since 1980:

We find that American perspectives on global environmental change are based on fundamental moral and religious views on the relationship between nature and humanity, other species' rights, humanity's right to change or manage nature, and our society's responsibility to future generations. American environmental views are thus enmeshed in a core set of cultural beliefs and values. (1996: 2-3)

If the question of what an environmentalist is has yet to be answered, it may be because "by the end of the 1980s. environmentalism meant many different things to different groups and movements" (Gottlieb 1990: 42). Dunlap and Mertig (1992) believe the movement has persisted at least in part because it has undergone a major change, a vast increase in diversity. The environmentalist may belong to a large environmental organization that lobbies in Washington; be part of a grassroots group fighting for environmental justice in their community; or be a radical drawing inspiration from Deep Ecology (Naess 1973) as they spike trees to stop logging. Whatever their differences, environmentalists share a recognition our environment is deteriorating, a desire to stop such deterioration, and an opposition to those who cause such destruction. One of the

more remarkable findings of the work of Kempton et al. (1995) is not just that three-quarters of all Americans consider themselves environmentalists, but that the cultural values represented span the political spectrum, from radical "Earth First!" members to out of work sawmill workers in Oregon.

A final word on environmentalism must reflect the preference for behavior over talk, whether in conserving resources like potable water or working for equity in the placement of locally unwanted land uses. A degree of public participation in institutional decision making is implied, but may be undermined by a lack of trust in government. A healthy skepticism for scientific experts is warranted, as is recognition that knowledge of the environment and how it works will always be imperfect. Finally, the environmentalist must vote with his/her spending patterns. If the environmentalist can meet needs without replacing them with wants, the result may be a sustainable existence, one that includes more conservative use of limited water resources.

The Tragedy Of The Commons

The "commons" refers to any resource shared by a group of people. Water and air are obvious examples, but in parts of the world where private property is less emphasized or non-existent, new farming or grazing land, fish from the sea, and wood for fuel and housing are also treated as commons (Harding 1997).

Water in Florida is a classic common resource due to the state's unique law which makes water a resource of the state, one belonging to all citizens but owned by none. This institutional manifestation reflects the values of its framers: "Through their cultural assumptions, people seek desirable outcomes in their interactions with each other, their environment, and their technology. People are guided in these formulations by their

culture, and policy statements are themselves cultural products” (Ervin 2000: 43).

Whether water in Florida becomes sustainable or a “tragedy” rests in part on how well policy depicts culture and culture informs policy.

Garret Hardin’s seminal essay was intended as a rebuttal to Adam Smith’s “invisible hand” theory. Smith’s argument in The Wealth of Nations (1776) was that an individual who “intends only his own gain” is “led by an invisible hand to promote.... the public interest.” Using individual herdsmen sharing a common pasture Hardin argues it is to the individual’s advantage to optimize his share of the common resource, even if ultimately to the detriment of all.

Each man is locked into a system that compels him to increase his herd without limit - in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all. (1968: 1244)

Hardin sets out to explore the class of human issues called “no technical solutions problems,” those that cannot be solved only via changes in the techniques of the natural sciences, but that demand a “change in human values or ideas of morality.” He notes education can help, but is constantly in need of refreshing. And he answers his own question on how to legislate temperance, denouncing the absolutes of ancient codifiers of ethics as unworkable. Such encomiums, he proclaims, are “poorly suited to governing a complex, crowded, changeable world.” Hardin does see a role for personal responsibility, though only as defined by philosopher Charles Frankel as the product of definite social arrangements.

Hardin shows a strong preference for institutional solutions such as private property rights and administrative law to maintain societal order. He supports “mutual coercion

mutually agreed upon,” but fails to recognize the demonstrated potential of perceived community in avoiding the tragedy. We are left to wonder why social contracts for resource sustainability between individual and communal access have worked in some cases but not in others. Or, as relates to water conservation in the Tampa Bay area, why citizens will respond in a crisis but fail to sustain conserving behavior in the longer term.

The View of Others

Numerous anthropologists have responded to Hardin’s theoretical approach to common property resources. Most see Hardin’s position as overly simplistic and not reflective of the broader human dynamics at work. There are, however, valuable lessons for water conservation efficacy in understanding the issue. For example, there is the “tragedy of open access” where all users are forced to capture as much of the resource as possible before others do (Bromley and Cernea 1989). This concept of perceived fairness among varied water use groups in southwest Florida has surfaced repeatedly in terms of allocated quantities and water conservation efforts.

The tragedy of the commons has consistently been associated with natural resources, and particularly their decline. This reflects the need for humans to share the world’s shrinking supply of life’s essential elements as population expands. McCay and Jentoft (1998) see an added cause. Due to its built-in expediency for political action, the “tragedy” model has played a key role in research and management as global ecological crises spread. In settings from Maine to Botswana the simple answer is to enclose the commons, preferably through privatization, using government imposed regulatory constraints.

The common property concept may actually be helpful in solving natural resource problems. Ciriacy-Wantrup and Bishop (1975) cite the example of groundwater depletion in California and resulting application of the Correlative Rights Doctrine. This Doctrine is regarded as a direct descendant of riparian law based on the common property concept. Groundwater users within a basin are considered co-equal in right, and allotted quantities within safe yield proportional to their historical use. This implies that the tragedy may be avoided with non-draconian measures, given accurate information and equitable sharing of a limited resource.

The tragedy of the commons model may also serve as a barrier to such self-directed solutions. Like much modern resource management thinking, it reflects Western ethnocentrism, emphasizes competition over cooperation, and assumes the supremacy of individualism over communitarianism (Berkes and Farvar 1989). This can lead to overemphasis on privatization and central administrative controls at the expense of local level controls and self-management. The authors cite Iran's locally managed qanats, underground networks of galleries tapping subsurface water, to make a key point: "The truth is that traditional systems... have been the main means by which societies have managed their natural resources over millennia on a sustainable basis. It is only as a result of this that we have any resources today to speak about" (1989: 6). Communal cooperation benefits are not limited to far-away, low-tech places, as shown by U.S., British and Canadian commercial fisheries using similar methods today.

We can learn from the ecosystem approach of traditional common property systems. Resource users in such systems "still act as if the Earth's resources were given to them for use with care, not to do as they please under the forces of market economies or state production quotas. The ecological wisdom of ... (such) systems emphasize respect,

responsibility and stewardship..." (Naess 1973: 96). Traditional systems promote resource conservation by taking only what is needed, with social sanctions against those who would gain at the community's expense.

Liquid Tragedy?

Water resources serve as an appropriate symbol for both the tragedy and its avoidance worldwide. It is all too easy to take this precious fluid for granted, at least in places where a turn of the tap is always productive and the cost of a thousand gallons of water is less than a gallon of gasoline or milk. This largesse is hardly universal - worldwide about 2.6 billion people were without access to sanitation in 1990, while nearly 1.3 billion were without clean drinking water (Gleick 1998). But problems have arisen even in locales where water once seemed plentiful. Overuse of aquifers and surface water, pollution and wasteful practices, along with population growth have resulted in water shortages, even in "wet" places like southwest Florida.

On a global basis it is possible that future conflicts will be over water rights rather than oil reserves or territories. Gleick has documented over 220 river basins shared by two or more nations, and as supplies tighten relative to population the tragedy of the commons may take on a whole new dimension. Even within countries, user competition for water resources (whether agriculture vs. industry, or majority vs. minority groups) has led to significant conflict. Other examples exist, however, where resource management systems have evolved efficient, rational use of scarce supplies.

Perhaps the most highly developed examples of common-property regimes are found in irrigation, where effective water management depends on the interrelated actions of a unified set of water users. (Gibbs and Bromley 1989) This is illustrated by the Water

Code of the Philippines, an institutional device that addresses the twin concerns of water use efficiency and equity. This system is like Florida water law in defining diversion rights through water use permits. It is quite distinct from Florida's approach in treating water as both a common resource subject to state control, if from a natural source, and a commodity "below" the source, or post-diversion. A basic tenet of both systems is the underlying principle that 'all waters belong to the state' and water cannot be acquired. (Cruz 1989).

The Water Code, promulgated in 1976, formalizes documented cases of water sharing in the Philippines as far back as the eighteenth century, notably the Zanjeras of the northern Ilocos provinces. Zanjeras are generally small irrigation societies built and managed by a community. Cruz (1989) suggests the Zanjeras have benefited from the Water Code in the affirmation of their rights, but there has been some erosion in traditional water sharing values. This connects to the Florida experience in that existing and potential policy approaches should protect resources through institutional means, but allow for and respect the role users play in achieving sustainable supplies.

Community

Last, but far from least in the critiques of Hardin's work, is the role of "community" in overcoming the tragedy of the commons. Community is defined in this sense as a group of users who share a common resource, often guided by sets of social values, norms and expectations that dictate responsible use. As McCay and Jentoft (1998) state: "...community exists, it counts, and it shapes the nature and outcomes of commons problems" (McCay and Jentoft 1998: 23). They argue for an ethnographic perspective that focuses on "community failure" versus "market failure" as the cause of environmental problems. When resource users feel disconnected from each other, their

community and the resources in question, they do not act in the best interest of the community. This raises questions about how markets, states and other factors affect the capacity of user groups to effectively respond to environmental change. In their words:

...the social conditions required for tragedies of the commons may result from situations where resource users find themselves without the social bonds that connect them to each other and to their communities and where responsibilities and tools for resource management are absent, perhaps because of “dis-embedding” processes... (McCay and Jentoft 1998: 25)

Management of natural resources, like economic systems, must be seen as “embedded” in the larger social context. The meaning of the commons as a social institution can only be penetrated by taking into account the specific political, economic, and cultural factors associated with a given scenario. It is an error to suppose that individual calculus can explain a commons system - rather, one has to understand the socially and politically embedded commons to explain the individual calculus. Simmons and Schwartz-Shea (1993) agree, questioning the assumption of Hardin’s model that sees humans as “rational, narrowly self-interested, myopic maximizers.”

Ostrom, Walker and Gardner (1993) concede the state can play a legitimate steering role in the design, implementation and enforcement of resource regulation (as Florida’s water management districts do). But they also believe bureaucratic involvement in resource management may erode conditions conducive to social actions by those involved (e.g. solidarity, trust and equality). Or as some anthropologists have pointed out, there are not only ‘tragedies of the commons’ but also ‘tragedies of the commoners’, where inequities and losses occur with resource privatization (Grima and Berkes 1989).

McCay and Jentoft (1998) urge that social research be directed at the potential of co-management institutions which emphasize inclusion of user-knowledge in resource management as a way of re-embedding responsibilities within the local community.

Similar efforts have occurred in Florida water management via area- or resource-specific work groups recommending strategies and policy for sustainable use of an overtaxed resource like groundwater in the Tampa Bay area. Implementation typically follows using a cooperative funding scenario to develop alternative supply sources, including water conservation.

Clearly, coordinated expectations for a particular physical and social environment can help common property approaches succeed. Individual resource users are willing to accept less if they feel all are being treated fairly. This has been echoed repeatedly, affirmatively and negatively, in geographically widespread letters to the editor and via other media during southwest Florida droughts. The typical letter to the editor regarding water conservation in the Tampa Bay area, for example, asks why I should conserve when local government continues to permit new development tapping into a limited supply. This “newcomer syndrome” is often coupled with a lack of understanding of how Florida’s climate and natural water cycle operate.

Or as Runge (1992) states: “By institutionalizing a degree of fairness in the face of random allocation (e.g., rainfall), common-use rights may contribute to social stability at the same time that they promote efficient adaptation to changing resource availability” (1992: 33). Finally, if we are to move beyond Hardin’s pessimism, we need to “begin to specify the conditions that are conducive to the emergence of coordinated, rather than independent actions by the individual users of a common pool resource” (Ostrom 1992: 297). This means giving participants full and accurate information about 1) the physical structure of the resource, 2) past actions of other appropriators, 3) the relationship of demand to yield, 4) benefits and costs of various outcomes on different individuals and firms, and 5) the likelihood other participants will keep their promises. In doing so, we

can rediscover how humans can anticipate tragedy and organize to prevent it, especially when resource scarcity is pervasive and they must adapt or face extinction (Simmons and Schwartz-Shea 1993).

Public Participation in Water Conservation

The purpose of this section is to examine the role of public participation, defined as whether water users make efficient use of potable water resources, as it relates to enhancing public policy and best practices in water conservation. The approach is to document anthropological and other sources relative to public participation, assess public attitudes toward water conservation, and identify specific Florida issues that act as incentives or disincentives to efficient water use. Florida's water use and the state of the art in water conservation are also addressed as part of an overview of cultural trends in water use.

Public participation as studied by anthropologists and related to water use by Floridians begins by recognizing that anthropological study specific to water conservation has been highly limited in western, urban settings. Such work is consistent, however, with various undertakings of the Environmental Anthropology section of the Society for Applied Anthropology (SfAA), in particular the "...need to develop mechanisms that facilitate the delivery of anthropological research results, methods and techniques and expertise to communities and policy makers in ways that assist in the identification, analysis and solution of environmental problems" (<http://www.sfaa.net/eap/cooptext.html> accessed 1-6-2004). Most recently, anthropologists (Casagrande et al. 2007; Larson et al. 2009) have analyzed water use behavior in the cultural context of the American southwest and its desert environment.

The inability to achieve water conservation's potential to extend available supplies, protect water quality and natural systems, and achieve resource sustainability is a serious environmental problem in a burgeoning state like Florida. So while Florida's water use history reflects the profligacy common to natural resource use in capitalistic societies, it's water policy "champions" conservation. This dichotomy is not so unusual, as many individuals say one thing but do another. This is why the current research is focused on a simple approach to public participation – do water users and their communities use water efficiently? The key is not whether they attend public meetings or write letters to the editor, but what their water use behavior is in their homes and landscapes, and the mental models that occasion it.

Two key topics to get at conservation-oriented behavior and what engenders it are examined:

- 1) Public participation in environmental decision making – How have anthropologists and others addressed public participation? Is public involvement in American civic life on the wane?
- 2) Public attitudes toward water conservation – What beliefs and values typify public views about conserving?

Public Participation In Environmental Decision Making

A basic tenet of American political culture is the need for citizens to actively participate in institutional decisions affecting them. Park (1997) has referred to this as the "dialectical logic of democracy," where democracy makes participation possible, but participation is essential to democracy. Park's work in participatory research includes examples such as Montana farmers banding together to create sustainable, alternative ways of farming

that rely on organic methods, and impoverished Appalachians who confront and work to correct inequities in local tax systems. The prototype of such participation is highly localized, such as at the neighborhood scale where specific issues of limited scope geographically and substantively are addressed. Such involvement transcends democratic systems – it has been the basis for cultural adaptation by humans as they individually and collectively faced the challenges of life over the ages.

Social marketing has been defined as “...the systematic application of marketing, along with other concepts and techniques, to achieve specific behavioral goals for a social good” (National Social Marketing Centre 2006). It has assumed a growing role in the application of anthropology, as in cases where needed medical intervention is not sought due to cultural differences (see discussion of Brown 1997 below). An important offshoot as it relates to environmental sustainability and public involvement is Community-Based Social Marketing (CBSM). This approach draws heavily from social psychology and operates on the premise that promoting behavior change is usually most effective when it is carried out at the community level in direct contact with people.

Community-Based Social Marketing addresses the critical question of why some people adopt sustainable activities like water conservation and others do not, suggesting three explanations: 1) people do not know about the activity or its benefits; 2) people know about the activity but perceive significant difficulties or barriers associated with it; and 3) people may feel there are no barriers but believe they benefit most from continuing their present behavior. This idea of benefits and barriers is highly specific to communities and cultures, and requires careful investigation. The payoff can be behavioral change if three key ideas are considered. First, people will naturally gravitate to actions that have high benefits and few barriers. Second, perceived barriers and benefits vary

dramatically among individuals, and third, behavior competes with behavior (i.e. there are many choices between behaviors and adopting one frequently means rejecting another) (McKenzie-Mohr and Smith 1999). Finally, Community-Based Social Marketing eschews the idea that economic self-interest is the motivation for behavioral change, noting such reductionism overlooks "...the rich mixture of cultural practices, social interactions, and human feelings that influence the behavior of individuals, social groups, and institutions" (McKenzie-Mohr and Smith 1999:13).

The centrality of public participation to applied anthropology is further illustrated by international community development models. Ervin (2000) cites Goodenough's *Cooperation in Change* (1963) as the most influential anthropological overview of development because it emphasized the necessity to comprehend wants and needs as perceived by local people. Though community development has fallen out of favor in recent times, many examples exist where anthropologists enhanced opportunities for success by implementing greater involvement by the affected culture. Included are Murray's (1987) work on the domestication of wood; the Costa et al. (1997) field work in Brazil that found participation works best when based in rather than opposed to existing non-governmental organizations; and Nazarea et al. (1998) focusing on success indicators for natural resource sustainability that made sense to indigenous populations through use of applied ethnoecology. These works encourage anthropologists to be part of developing policy-oriented solutions, and have real depth in deconstructing not just the usually touted "local knowledge," but its diverse subcomponents. This latter point is especially applicable to Florida given its lack of homogeneity and shifting cultural mosaic.

Involvement as necessity has continued to grow in the U.S. as applied anthropologists have worked to contextualize the fishing practices of African American anglers catching polluted fish (Beehler et al. 2001); supported environmental justice in diverse settings (Moberg 2001; Driscoll 1999; Alley et al. 1995); and explored cultural models (Quinn and Holland 1987) to better understand the cultural, political and health consequences of environmental problems (Paolisso and Chambers 2001; Boggs 1990; Arcury 1990; Christianson and Arcury 1992).

The Environmental Anthropologist can play a key applied role in enhancing public participation. They act as cultural brokers, educators, community organizers and informal mediators, refining and incorporating sociocultural realities (Johnston 1995). Their efforts reinforce the idea that no matter how technical or complex community development issues are, they remain social issues that benefit from affected party involvement. Community advancement in such cases is supplemented by personal development benefits, as reflected in Susan Stonich's work suggesting that "sometimes the greatest measure of a project's success is not the end product, but the process – coming together, creating relationships, struggling, learning, and growing" (1995: 14).

The value of anthropology in enhancing public participation lies in its holistic perspective toward creating voluntary behavioral change. This is illustrated by two diverse perspectives from the U.S. (Brown 1997) and Brazil (Costa et al. 1997). Brown points out that change in behavior is a function of two factors, environment and the individual's desire to change. His work in the medical field emphasizes the power of social marketing, and is applicable to water conservation in its emphasis on how knowledge, beliefs, attitudes and values determine behavior. Brown also talks about the powerful motivating or de-motivating role that cultural models play in people's behavior. Two

models he explores that bear on public participation are individuals seeing themselves as weak or failing when they must reach out to government for help, and loss of faith in government's ability to provide useful solutions.

The fieldwork of Costa et al. in Brazil also suggests some key lessons for what works and does not. For example, the value of non-governmental organizations (NGOs) as important social change enablers and conduits for resources is stressed. The anthropologists also identified three culturally specific obstacles to participatory development: 1) undeveloped civic consciousness due to a pervasive patron-client system; 2) inexperience with associations and communal activities; and 3) individualism. The last of these may be most applicable for Florida. Costa found what motivated most people to join in was "pragmatic individualism – the possibility of immediate personal advantage, rather than the idea of the community as a basic, active, agent" (Costa et al. 1997: 142). Another key finding was the fear and distrust of new neighbors undermining existing reciprocal relationships. Again, this may have significant implications for Florida, where in-migration is a major factor in community profiles, and identity with place is tempered by a lack of tenure. Conversely, Americans move so often that such fears and mistrust may be mitigated.

An inherent difficulty in any research initiative is identifying the most applicable comparables. How applicable are the experiences of community activists in Brazil or tree farmers in Haiti to enhancing water conservation in urbanized Florida communities? Certainly there are theoretical aspects and common methods that emerge in more distant, culturally diverse models, but there is nothing like a close to home case to learn from directly. Driscoll's work in the Model City community of Miami (Driscoll 1999) done as part of his dissertation for the USF Anthropology Department is a case in point.

Driscoll's work was part of SfAA's Environmental Anthropology Fellowship Program, and was directed at humanizing environmental risk decision making and enabling local residents to diagnose and map out solutions to brownfield remediation and redevelopment. His methodology was classic applied anthropology. It began with archival research, and moved to ethnographic methods that included structured observation of local behavior and residence patterns, individual and group interviews with residents. Data generated were used to create specific outreach messages to encourage the specific behavior of participation in the public process. Driscoll employed emic as well as etic perspectives, rapid assessment procedures, social marketing principles, and the Social and Cultural Profiling Guide of the EPA's Office of Sustainable Ecosystems and Communities. This latter tool is designed to understand a community's culture through comprehending underlying attitudes, values and life assumptions. It typically investigates up to 18 different community characteristics, with which are most significant dependent on the specific research objectives. EPA has recently updated this tool, now referring to this activity as a community cultural assessment in its 2002 publication *Community Culture and the Environment: A Guide to Understanding a Sense of Place*.

There are a number of lessons for my own research that arise from Driscoll's work. The scale of his research suggests one key to making water conservation "real" is to devolve it to a lower common denominator, i.e. the neighborhood or community of interest. Another similarity is Florida laws that require public participation in both Brownfield remediation and water management, but do not specify how to accomplish it beyond the minimum.

Driscoll provides an excellent, focused overview of social marketing and its elements of consumer orientation, audience segmentation, use of exchange theory and placement of the outreach message. Applying this to public participation in water conservation, particularly at a more devolved level than the city, county, or region as a whole, is an exciting possibility. The concept of social change as a process of exchange whereby citizens and their groups voluntarily change behavior and are more involved in water conservation merits further study.

Driscoll also calls into question the basic assumption "that local residents have the ability to listen, communicate, and cooperate about controversial issues on a practical and pragmatic basis" (Driscoll 1999: 139). This failure among his subjects was largely due to the predisposition of those who have experienced long periods of racial injustice, and the failure to better define participatory goals and outcomes. Relating this finding to other causes like resistance to conservation behavior can help in designing methods that overcome such objections. Driscoll's ultimate contribution is recognizing the need for more active outreach strategies. Or as Bhattacharyya (1995: 62) has pointed out, those who do not take advantage of public participation opportunities run the risk of abdicating "the agency-giving powers of being able to define what the problems are, how they are caused and what needs to be done with them.... To use a community development expression, the ownership of the problem slips away from the people to the researcher, the expert, or the developer."

The Threat of Civic Disengagement

If public participation is the *raison d'être* for democratic cultures, and a critical component in sustainable development, there may be reason for concern in modern day America. Putnam (2000), and Skocpol (2003), in well researched analysis, have both

concluded there has been serious erosion in the types of civic culture that have heretofore been the hallmark of American culture. Many of the findings ring disturbingly true to the social researcher or engaged citizen. Each author's work is summarized below in recognition that if the community is to contribute to achieving a high degree of water conservation in Florida, this dearth of public participation must be overcome.

Putnam (2000) documents in laborious, detailed research the demise of civic engagement in American society over the past century. He uses the concept of "social capital" to address varied forms of citizen participation (political, civic, religious, workplace, social, etc.), lamenting the breakdown of "...connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them" (Putnam 2000: 19). These connections are important to the fully realized individual, and even more significant collectively since their demise is antithetical to education and children's welfare, safe and productive neighborhoods, economic prosperity, health and happiness, and especially effective democracy. Putnam distinguishes two types of social capital: 1) bonding, typified by exclusive associations like country clubs or fraternities that undergird specific reciprocity and mobilize solidarity, and 2) bridging, which reflects more inclusive connections like the Civil Rights movement or open religious organizations that are better for linkage to external assets and information diffusion.

Putnam (2000) examines the causes of this malaise, from time/money pressures to mobility/ sprawl, and technology/mass media to generational differences. His "Guesstimated Explanation for Civic Disengagement, 1965-2000" chart (Putnam 2000: 284) reflects generational change (primary at 50%), electronic entertainment (mostly TV and the generations raised on it at 35-40%), urbanization-suburbanization-commuting-

sprawl (10%) and pressures of time/money (10%). There is some discussion of environmental organizations as an apparent outlier to the trend of disengagement that may be applicable to environmentalism as a surrogate for water conserving behavior.

Of particular concern is how a democratic society, dependent on the active participation of its members in governance, will endure if the trends documented continue. Putnam sees hope in recounting an historical analogy to the Gilded Age / Progressive era of the U.S. circa 1900 as an object lesson for American response to societal ills, and offers six spheres that deserve special attention from aspiring social capitalists: youth and schools, the workplace, urban and metropolitan design, religion, arts and culture, and politics and government. Of course, Putnam's prescription will only work if we accept the diagnosis. It is interesting that his summary of the situation is a water-based analogy:

The dominant theme is simple: For the first two-thirds of the twentieth century a powerful tide bore Americans into ever deeper engagement in the life of their communities, but a few decades ago – silently, without warning – that tide reversed and we were overtaken by a treacherous rip current. Without at first noticing, we have been pulled apart from one another and from our communities over the last third of the century. (Putnam 2000: 27)

Skocpol offers her own explanation (referencing those of numerous others) of why civic disengagement has become so pronounced in modern America. She traces the historical development and democratic influence of voluntary associations that at some point represented at least one percent of the population. These groups had numerous advantages at promoting civic involvement:

- 1) They afforded cross-class opportunities for Americans to connect (though historically excluding some);
- 2) They built political interest and capacity by mimicking federated government in their own operation and provided a source of local / state / national politicians;

- 3) They allowed people to be locally involved and translocally connected to the issues of the day; and
- 4) They had a holistic (rather than endlessly splintered) approach to the common good (e.g. as translated to the GI Bill).

A new approach emerged as the activist decades of the 60s and 70s created issues and constituencies that bypassed most large voluntary associations: management by increasingly bifurcated, professional advocacy organizations (foundations, think tanks, Common Cause, etc.) without real members (Skocpol 2003). Americans gave their money but not their time. Media access, with messages carefully designed by experts for slices of the public proliferated, and trivial contention replaced productive discourse. The agenda tilts toward the elite's issues and voluntarism becomes misplaced. There are some exceptions, including environmental groups and the Christian right who use specialized advocacy groups but also still have membership locally and beyond.

Skocpol, in the final analysis, also remains optimistic that solutions can be found:

Since the 1960s many good things have happened in America. New voices are heard, and there have been invaluable gains in equality and liberty. But vital links in the nation's associational life have frayed, and we need to find creative ways to repair those links if America is to avoid becoming a country of managers and manipulated spectators rather than a national community of fellow democratic citizens. (2003: 292)

Public Attitudes Toward Water Conservation

Why does one person conserve while another does not? Does the family budget limit a water user to only what is needed? Does being an environmentalist cause conserving behavior? What beliefs lead to conserving water and other resources when it is so easy to let the water run or leave the light on? Which mental models predispose one to see conservation as the most appropriate choice? Is it to leave something for our children

(and if so, why would anyone without them participate)? Is it an evangelical notion related to dominion over our resources? Or do we just insist on doing the right thing as we perceive it? Many of these questions are addressed in the earlier section on how cultural models help us identify "values" related to water conserving behavior. In this section, we look at cultural factors that affect public conservation attitudes.

In Florida, public attitudes are a moving target. So many people migrate to Florida from elsewhere (top in-migration sources are New York, New Jersey and Georgia according to the 2000 Census), and water appears so abundant in our lakes, rivers, gulf and oceans, how can we expect people to perceive water conservation as a necessity for the State's sustainable future? The influx brings citizens who are full of the water use beliefs of their origins. It will be difficult to motivate positive action for water resources amid such diversity and affluence.

Historic Environmental Beliefs and Values

Florida's historical land and water culture reflects environmental values that are not those of an enlightened resident and visitor population. Florida's sub-tropical setting has been more about fear and frontier than respect and adaptation. From the earliest days of European conquest to modern day destruction of wetlands as part of doing business, Floridians have placed their needs above those of sustainability (Fernald and Purdum 1992). Resources are not used as "natural capital" (Hawken et al. 1999), but as an endless stream of raw material to feed the production requirements of a profligate marketplace. Swamps and overflowed lands needed to be drained, canals cut to facilitate drainage and transport, and works constructed to hold back flood waters. The assimilative capacity of surface waters were viewed as unlimited and the idea of the State ever having too little water was beyond comprehension. Many of these attitudes

persist, particularly among new Floridians, for to look at Florida, especially from the air, is to wonder how this place could ever run out of water?

Such attitudes do not typically promote conservation of resources. Historic resource losses in Florida have been well documented, from beneficial wetlands and coastal estuaries to riverine floodplains and biodiversity. Learning from our history to achieve optimal water conservation requires taking a fresh look at what sustainability means:

People have been interacting with and modifying Florida's ecosystems for at least 10,000 years. Over most of this time their use of natural resources was sustainable. Their activities did not cause any significant decrease in the ability of the environment to maintain clean air and water, as well as productive, biologically diverse ecosystems. However, the massive human uses of Florida's natural environment in the twentieth century are clearly unsustainable. Deforestation in the north, wetland drainage in the south, agriculture in the center, and creeping urbanization everywhere have caused massive losses of natural ecosystem diversity and productivity. Perhaps the major challenge of the next century is to create an environmentally, as well as economically, sustainable way of living.

(Fernald and Purdum 1992:66)

Present Beliefs and Values

This section briefly explores current attitudes, including public opinion surveys, public resistance to energy conservation, the hydro-illogical cycle, and how the icon known as the American lawn came to occupy such a prominent place in wasteful use of water resources.

Florida Public Opinion – Water Conservation

A comprehensive collection, analysis and assessment of valid public opinion surveying over the last 10-15 years in Florida is an important element to understanding public

attitudes and behavior towards water conservation. Unfortunately, such surveying, especially at the statewide level, is largely non-existent. This is true in spite of what one study (including surveys of both emic and etic perspectives) on Florida's needs for environmental education found: water resource issues are the most important and salient environmental concern to Floridians (Duda 1998).

We can turn to the Tampa Bay area and other parts of southwest Florida where nine surveys including sections on water conservation were done between 1991 and 2007. The Tampa Bay water wars; the evolution of the regional water utility (Tampa Bay Water); and the need to develop alternatives to ground water for future water supplies have all been fertile ground for testing public support. Water conservation awareness, attitudes and self-reported behavior have been a key component of nearly all of these surveys. Trending from these surveys is problematic, however, since there is little standard protocol or attempt to connect the surveys as a means of tracking changes in public attitudes. Such trending remains a potentially valuable source of data statewide, regionally and locally in Florida. The ability to measure non-quantifiable elements of water conservation among residents and visitors (e.g., efficacy of educational programs, and water conservation ad campaigns), and implementing accountability mechanisms for how well conservation programs are succeeding, would benefit from such surveying.

The most significant archival survey data collected and analyzed to date were those nine random sample, statistically valid surveys specific to the Tampa Bay area conducted between 1991 and 2007. They focused on water conservation and alternative sources in terms of the public's attitudes, knowledge and practices. A few of the major findings of the two most recent surveys completed for Tampa Bay Water (2005; 2007) are representative, and are significant to the achievement of efficient water use.

First, almost all respondents (typically over 90%) agree that more should be done to conserve water. The irony here is that "most residents of the Tampa Bay region contend they are doing everything they can to conserve water – and that most of their neighbors are not" (Heller 2001). This in spite of the fact that only 11% of respondents say they have participated in a water conservation program sponsored by their utility or local extension service.

Secondly, most survey respondents are willing to pay more for water (up to 16% more), and about seven of ten would participate in any of a wide range of water conservation options (from landscaping to toilet rebates, etc.). Finally, better than three of every four would support water restrictions that force people to use less in order to conserve the supply for everyone, while most believe the current water use rules are equitable. The bottom line of this work strongly suggests there is a perceived public need for further water conservation efforts of all kinds.

The most recent work completed on this topic is Tampa Bay Water's Water Conservation Public Opinion Survey (2009), which is used as an important component of the methodology for this research. The survey and its role is discussed more fully in Chapters 3 and 4.

Resistance to Energy Conservation

One might think with the progress made in reducing individual fuel use during the energy crisis of the 1970s that energy conservation offers a positive object lesson for water conservation. According to Berke (2001), one would be wrong. In fact, "the U.S. psyche has never been oriented toward efficiency. The average American uses nearly twice as much energy as the average European..." (2001: 1-D). A large percentage of

Americans may express concern about the environment, but most do not want their freedom constrained by the cost of energy.

Americans have been accustomed to cheap, abundant natural resources for generations. This creates a problem for the conservation ethic since absent a crisis, they are not receiving the political or economic signals to rein in their profligacy. Add to this the rational choice model of what is in it for me, and the perception that reducing energy or water use is likely to involve a painful sacrifice, and we have a formula for inaction. Current public policy eschews more stringent fuel economy standards (as of 2001 we had slipped back to 1980 levels), and all too often offers no reasonable choices in public transport, making it clear to citizens that they can do what is right for them.

Finally, we have the rhetoric that obfuscates the relationship of resource conservation and what's good for the economy or bad for democracy. A presidential press secretary declares energy use is a reflection of our economy's strength and we have a bounty of resources. Conservative think-tanker Myron Ebell sees an opportunity to discredit political opponents because "there is something fundamentally anti-consumer and undemocratic about Democratic coercion to force people to change their lifestyle. The effect of their policies would be to lower the American standard of living" (Berke 2001: 6D). These attitudes and approaches to the world's finite natural resources, especially when emanating from governmental leadership, will be difficult to overcome, just like the resistance to conservation they engender.

The Hydro-Illogical Cycle

Florida's unique climate has an impact on conservation behavior. Its extremes of flood and drought are more than an annoyance to residents and visitors, or a shifting actuarial

to insurance providers. They have significant implications for sustaining water supplies since they affect the way users perceive the environment. One example is the hydro-illogical cycle.

The cycle begins with growing concern over dry conditions, then escalates to panic as drought deepens. Rainfall brings apathy to the populace and the cycle is primed to begin again. Superficially, this public reaction might seem an impetus to water conservation, but it tends to undermine conservation attitudes in two important ways. First, it imparts the impression water conservation is a part-time thing, grounded in drought but unnecessary when wetter conditions prevail. Second, it deflects public perception to surface water conditions when about 90% of Florida's drinking water is supplied from ground water resources. Effective water conservation strategies and policies must take the illogical into consideration.

The American Lawn

One perplexing, and deeply embedded, cultural tradition is the American lawn. In Florida, up to half a typical household's potable water use is poured on the grass to make it grow so we can cut it, water it and mow it again. Goodman (2002) has called it a bizarre drama, noting that "in one year we spend \$25 billion on 20 million acres of a crop that we can't eat, wear or sell. We use 32 million pounds of pesticides, 580 million gallons of gasoline and more water than we shower on ourselves in order to color and keep the grass green" (2002: A-12). Many of Florida's residential subdivisions have deed restrictions requiring thirsty turfs such as St. Augustine, which must be kept green and well groomed year round. This obsession with the verdant lawn has included installing Astroturf as an alternative in Colorado, Arizona and California communities in response to drought conditions (Wheeler 2003).

The anthropological view of this phenomena is offered by Schroeder (1993). He sets out to describe "... the historical evolution of the general type of American front yard, that is, the domestic landscape design that makes a place recognizably "American"... the essence of the front yard is the unfenced lawn that serves as a public ornament. As a positive aesthetic, it developed in Toledo, Ohio, and the necessary technology in its evolution is the lawn mower" (1993: 2). Jenkins (1994) opines that the father of the lawn was a mid-18th century British landscaper Lancelot Brown, known as "Capability" for describing all country estates as capable of improvement.

Schroeder believes the origin of the American front yard (firmly established by the 1880s) was the elite English landscape garden tradition. It was further ingrained ("nature methodized") by lawns of the U.S. Capitol, cemeteries and large parks designed by Frederick Law Olmstead and Calvert Vaux. The English concept was "Americanized" by A.J. Downing, but "democratized" by Frank Jesup Scott of Toledo, a real estate man who brought landscape design to a smaller single family scale lot than before considered. Schroeder (1993) discusses how such ideas are spread by piecemeal adaptation and diffusion of innovations.

Schroeder notes cultural pressure to conform with lawns, including social tyranny and maintenance tyranny, lamenting them as "expensive, unused ornamental spaces that need to be kept tidy for the sake of appearances only. They are redundant, irritating, ecologically suspect, and possibly dangerous to personal security" (Schroeder 1993:136). And, likely here to stay. The lawn is a lowest common denominator, relatively cheap and easy to maintain and part of a long entrenched housing style. Unless we change street patterns, redraw property lines and move houses on their lots, this underlying design will continue to support lawns. Finally, Schroeder cites Hall's

Hidden Dimension (1966) on proxemics (psychological perceptions of space deeply embedded by our culture), noting "in-turning vision" and "miniaturization of vista" as functions of the front yard, and whether it will persist.

The water districts and local utilities in Florida have tried various educational and horticultural programs, from Florida Friendly (native plant emphasis) landscaping to promotion of Xeriscape. Reclaimed water for lawns, golf courses, cemeteries, parks, etc. has also been an emphasis in parts of the State. Finding ways to lessen outdoor water demands, however, will apparently have to go through the front yard.

Water Use In Florida And Beyond

Water use in Florida results from a complex set of factors, some within the control of users and some not. Included are population (both permanent and seasonal), climate (precipitation and temperature), economics (income, make-up of the economy, market availability), water cost (capital infrastructure, production, treatment, distribution), and regulations (water availability, permitting, water use restrictions). These factors vary in effect due to scale (local, regional, national) and tenure (short term or long lasting) (Fernald and Purdum 1998).

Growing concerns related to worldwide water issues set the global context for reducing water use in Florida and beyond:

- increasing per capita water demands and declining per capita water availability based on population growth and economic development trends
- increases in water borne diseases, especially in areas lacking basic sanitation services (about half the world's people) and potable drinking supplies (more than a billion people)

- escalating competition for water resources, sometimes between use sectors such as agriculture and urban, but also in the form of conflicts among countries with shared resources
- water-related ecological disasters, from the Aral Sea and Lake Victoria to the loss of fish species and other biodiversity
- the overdrafting of groundwater resources, an unsustainable practice, that has occurred on every continent but Antarctica (Gleick 1998)

On a global scale, two-thirds of all water withdrawn from surface and groundwater sources is used for agriculture. Postel (1992) estimates overall efficiency of this use is about forty percent, meaning more than half the water used for farming never produces food. Measuring and improving the efficiency of water use, whether in plant uptake or per capita rates for urban users, is an important aspect of water conservation. Knowing what is used is a prerequisite to setting goals and assessing progress in using less.

Gleick (1998) has identified three major drivers in the significant expansion of worldwide water use in the 20th century: population growth, industrial development and expansion of irrigated agriculture. Water supply planning during the same period has relied on future projections (of population, per capita demand, agricultural production, economic productivity, etc.) always assumed to be rising.

As a result, traditional water planning regularly concludes that future water demands will exceed actual water supplies. The water-management problem then becomes an exercise in coming up with ways of bridging this anticipated gap. Prior to the 1980s, these exercises led planners to focus on supply-side solutions: they assumed that projected shortfalls would be met by taming more of the natural hydrologic cycle through construction of more physical infrastructure, usually reservoirs for water storage and new aqueducts and pipelines for inter-basin transfers. (Gleick 1998:6)

Providing infrastructure in the U.S. has proven expensive, especially in developing the arid West. During the 20th century, it has been mostly the federal government through the Army Corps of Engineers, and U.S. Bureau of Reclamation that has invested about \$400 billion in over 80,000 dams and reservoirs, creating about 90,000 megawatts of hydroelectric capacity, and helping construct more than 15,000 municipal wastewater treatment plants (Gleick 1998). There have been side effects. During the same period, more than sixty percent of the inland wetlands in the U.S. were lost, half of our stream miles were significantly polluted and major fish runs were decimated or destroyed (Rogers 1993).

As total and per capita water withdrawals globally rose through the 20th century, an anomaly surfaced in the United States. Water use trends in the mid-80s and early 90s declined despite continued increases in population and economic wealth. By 1995, water withdrawals had dropped by nearly ten percent, while per capita withdrawals fell 20 percent. This efficiency occurred in the two largest use sectors, agriculture and thermoelectric cooling, along with a sizeable reduction in industrial use, based on technological enhancements such as drip irrigation and better management practices. Significant to the focus of this research, urban water use, or public supply withdrawals, continued to increase. This use represents only 10% of total U.S. withdrawals but is an important source to conserve based on the higher costs of treating potable water and what it is used for (public health and safety as well as less vital options like yards and landscapes).

Turning to Florida, a good deal of data on water use is available from the U.S Geological Survey (USGS), working in cooperation with the State Department of Environmental Protection and the five water management districts. The USGS data are considered the

best available for water withdrawn from ground and surface water sources, reported by month, by county and by water management district, but are often estimates. This is because so many uses (and especially the largest water user – agriculture) are self-supplied and not fully metered. This lack of reliable measurement is not exclusive to Florida, but it can make realizing conservation problematic in some use sectors. Generally speaking, most public supply use is metered since utilities need accurate means to bill their customers. This means important data on per capita and total use levels is usually available for analysis.

Since this research is focused on public supply water use, the forty percent of withdrawals that are freshwater are of greatest interest. This amounted to about 7.2 billion gallons per day (bgd) in 1995, most of which (about 60%) was fresh groundwater. Florida is the largest user of groundwater east of the Mississippi River, ranking fifth nationally in such withdrawals (Solley et al. 1998). Groundwater withdrawals in the State increased by 230 percent between 1955 and 1995, but fell by 5 percent from 1990-1995. Freshwater use in Florida (1995) reflects agriculture (at 45%) as the primary component of withdrawals, with public supply (the fastest growing use) second (29% or 2.1 bgd) (Solley et al. 1998). This research is focused on water provided to the public by utilities, but is also applicable to domestic self-supplied uses, such as individual well owners who would benefit from conservation practices. About 868,000 households relied on their own well in 1995, withdrawing 297 mgd at a rate of about 340 gallons per household per day (Fernald and Purdum 1998).

Nearly 90 percent of the 2.1 bgd of public supply withdrawals in 1995 came from groundwater. This is an increase of 135 percent over 1970, but only about a 7 percent rise since 1990. Over 86 percent of permanent residents (12.2 million people) got their

water from one of the 2,141 public supply systems in the State in 1995. Surface water was the public supply source for about one million residents – just one percent of the utilities relied on surface water as their primary source. About half of these public systems supply more than 99 percent of the water used. Public supply per capita use (gpcd) for Florida in 1995 was 169 gallons per day, below the national average of 179. Per capita usage in Florida has stayed between 160 and 170 gpcd except during 1980 when a statewide drought pushed it to 181 gpcd (Fernald and Purdum 1998). Florida's per capita use, like that of the overall U.S. is relatively high. Per capita use in Canada is 114 gpcd, in Mexico 34 gpcd, and 18 gpcd in both India and the Netherlands (Salamone 2002).

Another way of looking at Florida's water withdrawals is through the lens of the State's five water districts. The districts are configured largely on the basis of surface water hydrology. Generally speaking, the water (rain) that falls on a district stays in that district. This regional, watershed-based management of a State resource has proven effective in allowing a scientifically based system to operate in addressing water supply, flood protection, water quality and natural systems, the districts' four areas of responsibility.

Freshwater withdrawals by WMD for the period 1975-1995 reveal that in 1995 the South Florida Water Management District (SFWMD) had almost half of all withdrawals in the State (about 3.6 bgd). This part of the State was home to about 40% of Florida's 1995 population. Population percentages for the other districts are about 25% each in the SWFWMD and St. Johns River Water Management districts (SJRWMD), 8% in the Northwest District (NFWMD), and 1.5% in the Suwannee River District (SRWMD). Also of note, all WMDs other than the SFWMD had withdrawals remain constant or

decrease slightly, while the South Florida district had a substantial increase for the period. This resulted from increases in both population and irrigated acreage (Fernald and Purdum 1998). The rise in SFWMD public supply water withdrawals and uses, though directly tied to population growth, is problematic in terms of water conservation. Per capita levels for public supply at all five districts for 2000 show that conservation achievement in the SFWMD is lagging.

Vickers (2001) has estimated combined indoor and outdoor water use in a single family, American household averages about 101 gallons per capita per day. About 70% is directed to indoor uses, primarily for cleaning and sanitation, with the bathroom (and especially toilet flushing) the predominant single use within the home. The remaining 30% of water use is outdoors for turf and landscape irrigation and other purposes (pools, car washing, etc.). The amount of water typically used, and especially its split between indoor and outdoor applications is highly variable by region, climate and weather, socioeconomic factors and other customer characteristics.

In Florida, the indoor / outdoor water use relationship has been estimated as high as 50 percent for each (SFWMD 2000; Salamone 2002) based on a year-round growing climate and significant inefficiency in lawn irrigation systems. This penchant for green lawns is a cultural phenomena discussed further in the section on public attitudes toward water conservation. This is highly treated drinking water being applied to lawn and landscapes.

In Florida, when addressing the public supply sector, it is important to describe one other water source: the "reuse" of reclaimed wastewater. Reuse water must be adequately treated for the intended purposes, which can include irrigation of lawns, landscapes and certain crops, industrial production, aquifer recharge, aesthetic uses like ponds and

fountains and even to supplement potable supplies. Gleick (1998) notes the vast majority of urban water is used only once, flows through treatment processes and is disposed of in a waterbody. He points to a number of success stories, however, that reflect a growing trend toward reuse. These include agricultural use of 70 percent of Israel's wastewater, and several examples in California, from growing walnuts in Visalia to replumbing a major refinery in the East Bay Municipal Utilities District.

Florida has become a leader in reuse of reclaimed water over the last twenty years. In 1996, the Florida DEP identified 416 reuse systems with a total capacity of 826 mgd throughout the State. At that time, about 402 mgd or 40 percent was being used. The greatest amount of reuse water was applied as irrigation for agriculture (24 percent of the total available) and public areas landscaping, including lawns, parks, golf courses, etc. (40 percent) (York 1998). Reuse is especially important in Florida where discharges of wastewater to slow-moving streams and other shallow waterbodies is being reduced to the maximum extent possible.

The water districts have helped promote reuse in many locales by requiring feasibility analyses of new permittees, conditioning Water Use Permit quantities on availability of reclaimed water for appropriate uses, and even co-funding the expensive infrastructure needed (pipes, pumps, storage). A number of success stories exist in Florida, including the City of St. Petersburg in Pinellas County where saving potable water through reuse has protected natural resources, preserved water quality and forestalled the need for major public investments, making those funds available for other public benefits (York 1998). St. Petersburg has met succeeding increments of public water demand over a 30-year period with this "resource," allowing the deferral of new water and sewage treatment plants that saved taxpayers hundreds of millions of dollars. And all because of

conserving water instead of treating it as waste. The district (SFWMD) with the largest overall and public supply water use has the lowest percentage of reuse. Conversely, the district with the lowest public supply per capita in 2002 (SWFWMD) has the greatest amount of reuse.

Alternative Sources

Heavy reliance on groundwater for public supply and other uses has come at a price that includes externalities. Public utilities prefer groundwater because it is inexpensive to develop and typically of good quality requiring minimal treatment. The prolific Floridan Aquifer, if used sustainably, will continue to fill a good portion of Florida's growing freshwater needs. Regional impacts from excessive withdrawals have surfaced, however, during the past 10-15 years in several parts of the State.

Perhaps the most mentioned area of concern has been the Tampa Bay vicinity. Tampa Bay's "water wars" go back to the 1930s when densely populated St. Petersburg acquired lands and transported water from Hillsborough and Pasco counties to meet its public supply needs. This situation arose as a result of saltwater intrusion in the aquifers beneath Pinellas County brought about by overpumping. The legislature enabled the creation of a 3-county water supply authority in the 1970s, but disputes continued well into the 1990s. By the early nineties, SWFWMD had sufficient evidence that overpumping of groundwater in the area was causing environmental damage to lakes and wetlands. The solution, crafted over several years of litigation, was the Tampa Bay Partnership Agreement between the District and the six member governments of the newly formed regional utility, Tampa Bay Water (Tampa, St. Pete, New Port Richey and the counties of Hillsborough, Pasco and Pinellas). The linchpin of the Agreement was \$272 million in matching District funds over a 10-year period to aid in cooperatively

developing alternatives to the traditional use of groundwater (SWFWMD 2000).

Alternatives eligible for funding included water conservation, reuse, desalination, environmentally sustainable surface water uses (including a regional reservoir to capture high wet season flows) and innovative storage options like aquifer storage and recovery.

The Tampa Bay scenario is the most advanced at this writing, but is by no means the only area in the State with similar difficulties. Other groundwater withdrawal problems have occurred in the Panhandle (in coastal Walton, Okaloosa and Santa Rosa counties in the Northwest Florida Water Management District), and in the South Florida Water Management District areas served by the Biscayne Aquifer. Potentially unacceptable environmental impacts are predicted for a large region in east-central Florida within the St. Johns district by no later than 2010 given current use patterns. Four of the five districts (excluding only the Suwannee River Water Management District) have designated Water Resource Caution Areas, a State water policy designation required for areas where water supplies are, or are expected to be, critical within a 20-year timeframe.

Water Conservation – The State Of The Art

Water utilities and their customers throughout the U.S. increasingly see conservation as more than just a response to crisis-driven supply shortfalls. Water conservation can be a “source” of water created by enhancing efficiency. This is sound public policy because it protects environmental features, extends available supplies at a favorable cost-benefit ratio, and creates a stronger environmental ethic among users.

Water conservation has been applied to all use sectors (e.g. agriculture, domestic, industry, recreation, etc.) with varied success. Here we emphasize conservation in

“public supply,” or those who receive water supplies from a public or private utility.

Agriculture is the primary water user worldwide, but focusing on public supply emphasizes the fastest growing use sector in Florida, and narrows the current discussion.

Water conservation can be looked at in a number of different ways. It can be: 1) mandatory or voluntary, 2) based on incentives (such as rebate programs) or disincentives (e.g., pricing structures or use restrictions), 3) for indoor versus outdoor water use, and 4) proactive or retroactive (building conservation into new construction or “retrofitting” existing structures). Finally, conservation can relate to “hardware” or “software”. Hardware includes the devices (faucet aerators, low volume toilets, rain shut-off devices on irrigation systems, etc.), while software is the education of users intended to modify non-conserving behavior.

Many conservation programs stress a combination of behavior-driven and device approaches, but “conservation hardware and technology measures are considered more reliable in terms of long-term water savings because they usually need to be installed only once and do not require ongoing efforts to maintain efficient water use.” (Vickers 1996: 9) The installation of a single, low-volume 1.6 gallon per flush toilet replacing a leaky, 5-gallon per flush fixture, for example, has a useful life of about 20 years, and can save nearly 150,000 gallons of water. Training people to change landscape irrigation and maintenance practices, conversely, typically requires specialized training, a dedicated subject and years of reminders to achieve efficient landscape practices.

Well-designed conservation programs make strategic use of both technological improvements and the power of an informed user group. A 1994 experiment in South Africa’s arid Kruger National Park that relied on simple, unsophisticated technologies,

along with education and metered charges, saved 74 percent of the water and 52 percent of the electricity compared with standard approaches to technology, no education and a flat rate. This finding was interesting in that providing only written educational materials in the absence of better technology or more aggressive price signals actually led to a slight increase in water use (Hawken 1999).

One of the great conservation success stories of the 1990s was the California experience. The severe drought of the 1980s left the state searching for new answers to recurring water shortages. A consortium of 120 groups representing water agencies, environmental organizations and other interested parties set out to validate the California State Water Resources Control Board's assumption that conservation could reduce urban water use by one million acre-feet annually (about 326 billion gallons). At the heart of the effort was voluntary implementation of sixteen best management practices chosen on the basis of historical use, public acceptance and measurability. These techniques included a diverse mix of incentives and disincentives, ranging from water waste prohibitions, water use audits and leak repairs to public education programs and rebates (Shuitt 1999).

By 1999, the Los Angeles Times reported water conservation efforts were beginning to pay off (Shuitt 1999). Despite a Los Angeles population increase of nearly one million since 1970, residential and business customers of the Department of Water and Power used virtually the same amount of water they had 29 years before. "With the humble ultra-low-flush toilet emerging as the symbol of maturing water conservation practices that began tentatively in the early 1990s, Los Angeles water planners say that they can meet the city's needs over the next 20 years simply by making better use of the water

they now have.” Or as a public official put it: “The huge new source of water for the City of Los Angeles was the water we were wasting” (Shuitt 1999).

In all, 825,000 toilets were distributed via a rebate program between 1992 and 1999.

The program wisely mobilized community groups such as the Mothers of East Los Angeles to help distribute over 65,000 toilets in their area. Funds earned by the neighborhood group paid for scholarships and playground equipment, and provided jobs for dozens of residents. Conservation's remaining potential is obvious when we consider results as of 1999 represent only about 40 percent of L.A. homes (Shuitt 1999).

Florida's water management institutions, including water management districts, regional water suppliers, local utilities and others, have had successes in achieving water conservation. Results around the State have been uneven, however, even among the water districts, which are required "to prevent and reduce wasteful, uneconomical, impractical or unreasonable use of water resources ... unless not economically, environmentally or technically feasible" (DEP 2004). The clear leader in catalyzing conservation among public supply utilities has been the Southwest District, in good part due to its Basin Board structure which provides a portion of the District's overall budget to match local funding for water projects. The seven Basin boards have focused on water supply projects (primarily water conservation and development of reuse systems) since the inception of the "Cooperative Funding" program in 1988, investing about \$150 million in matching funds through 2003. SWFWMD is also the only WMD to use a per capita standard (150 gpcd) for both water use planning and permitting purposes. To date, there remains no statewide standard for water conservation, making effective evaluation and accountability problematic.

Outdoor water use, primarily for irrigation of public or residential landscapes, is an area of tremendous potential savings. In southwest Florida, such use can comprise 50 percent or more of the total demand placed on a water supply utility (SWFWMD 2000). Vickers (1991) has noted a 1985 study by the North Marin Water District (California) that documented average water savings of 54 percent for sample households.

Environmental benefits and economic savings go hand in hand here, since water conservation results in reduced use of fertilizer, fuel, herbicides and labor.

Xeriscape, or water conservation through creative landscaping, is receiving lots of attention nationwide. Florida enacted a statewide Xeriscape bill in the early 1990s which requires the water districts to develop incentive programs for municipalities to adopt ordinances requiring such landscaping. The State has since adopted "Florida Friendly" landscaping that reflects similar principles for lawn and landscape water conservation. Reducing water use in the landscape, however, will be challenging because of deeply embedded Western cultural values that go back to English gardens of centuries ago, and "envy over the carpets of green laid in parks and planned communities designed by Frederick Law Olmstead, the premier American landscape architect of the 19th century" (Egan 2001).

Unrealized Potential

Not everyone agrees that the progress made to date is acceptable. Two Rocky Mountain Institute researchers (Pinkham and Chaplain 1997) believe the typical 10-20 percent reduction target for water demands is woefully inadequate. They see opportunity for radical improvements in water efficiency that will result in long-term declines in total water use in the U.S. and throughout the world. Current efforts, they claim, fall short for three reasons. First, decision makers do not have a clear sense of

the technical potential of conservation. Nobody really knows what can be accomplished - fifty percent savings? Seventy percent? Second, nobody is fully accounting for all the economic benefits of being more water-efficient (e.g., avoidance of large capital projects like deferred water and sewer plants, energy savings, and waste-treatment costs avoided when aquatic ecosystems get enough water to perform their ecological functions). Finally, they see a glaring lack of existing policies to encourage investments in water efficiency.

Enhanced potential for water conservation is consistent with an emerging paradigm the Rocky Mountain Institute calls the “soft path” for water management. No community or nation has fully realized this approach, but the benefits are becoming clear. The concept borrows from the energy soft path foreseen by Rocky Mountain Institute co-founder Amory Lovins in 1977, characterized by highly efficient end-use technologies and widespread use of small-scale renewable energy sources (photovoltaics, wind power, biogas, etc.) instead of dependence on large, centralized plants that rely on nuclear or fossil fuels. The soft path for water also relies on diverse, often decentralized systems.

Water supply, treatment, sanitation, and runoff management systems would be situation-dependent, but in general would be highly integrated physically and institutionally. They would take much greater advantage of local hydrologic resources (e.g. urban rainwater/stormwater harvesting and aquifer storage recovery systems versus distant surface supply and storage facilities); use the treatment capacities of urban watershed soils and vegetation to much greater stormwater management effect (“green infrastructure”); utilize all manner of wastewater treatment and reclamation systems (including “new” technologies such as sand filter systems and robust constructed ecological systems such as treatment wetlands and Living Machines); and incorporate a high degree of reuse. (The water soft path can be summed up as) a combination of end-use efficiency, system efficiency, stormwater harvesting, storage innovations, and reuse strategies (that) would reduce water demand (measured most importantly as water withdrawals from the environment for human use) to

levels far below most recent projections, and conceivably well below current demand. (Rocky Mountain Institute 2000).

This brief overview shows best practices in water conservation have yet to realize their potential. Efficient water use depends not just on technology or institutional oversight, but on motivating individuals and communities of users through education, incentives and stewardship. In turn, the ability to motivate depends on a clear understanding of operative cultural models related to water conservation.

CHAPTER 3: METHODOLOGY

INTRODUCTION

This chapter describes the study setting, conceptual framework and anthropological methods used for this dissertation. It is a goal of this work to investigate and advance research done by anthropologists on cultural models and how they relate to values and beliefs which lead to water-conserving behavior. This can be thought of as a cognitive approach to environmental anthropology. Results are meant to be applied to the specific policy and practice context of the Tampa Bay area in southwest Florida. Of particular note from a methods standpoint is *Environmental Values in American Culture* (Kempton, et al.1995), a significant analysis of the cultural components and causes of popular environmentalism that is highly transferrable to the field of water conservation, and has served as a capable surrogate to the limited research in potable water conservation by anthropologists to date.

The research problem is to identify how water conservation behavior in Tampa, Florida can be enhanced through a better understanding of the beliefs and values reflected in individual mental models of water users, and subsequent cultural models that may emerge. Addressing this problem requires the design of a data collection plan that emphasizes a qualitative data approach.

In essence, this research explores the anthropology of water conservation. In doing so, it must be holistic, cultural and applied. Achieving holism means maintaining a broad research focus that encompasses a range of historical, cultural, political and ecological analyses. Cultural exploration must include the relationship of humans to their environment, investigate cultural models (Holland and Quinn 1987) that lead to

discernable behavior patterns, and incorporate political factors that can help or hinder water conservation. Finally, the applied component reflects water conservation as an emerging need in western societies where profligate resource use is often the norm.

Applied research can improve the relationship between science and decision making by involving anthropologists in policymaking. To do water conservation anthropology requires entering into what Milton (1993) calls environmental discourse, the process through which an environmental issue becomes constituted, objectified or given sociocultural reality via the organization and communication of knowledge. This approach is critical to avoiding reductionism, while looking at water conservation from multiple dimensions and viewpoints. Evaluating sustainable water use in this research will require making use of local knowledge about water conservation by tapping into individual mental models that collectively may become explanatory cultural models to guide policy making.

The existence of specific cultural models for water conservation is potentially significant not only because they can be used to design policy and practice, but because cognitive assimilation of new environmental messages such as water conservation campaigns and education, issues and policies are filtered through these basic models (Kempton et al. 1995). Theoretically, this work can be seen as human ecology, or the study of how humans relate to their ecosystems. At the same time, in some ways it is an expansion of cultural ecology (Stewart 1955, Bennett 1993), defined as the “culture core” (or subsistence patterns) evolving in response to relevant parts of the “effective environment” exploited and thereby shaping other cultural features such as social organization.

The next section on the study setting begins at the macro scale, briefly describing the physical environment of Florida as it relates to key factors that affect perceptions about water conservation. This is followed by an explanation for the selection of the City of Tampa as the specific setting for the analysis before moving into the specific methods used in the research.

STUDY SETTING

The setting for this dissertation begins at the broad scale of Florida's environment and ecology in order to provide a basic understanding of the role played by weather and climate, water resources and ecosystems in both promoting and achieving water conservation. Additional background information on Florida's history and the evolution of the State's unique water law was addressed in Chapter 2. Both of these aspects are essential to a holistic approach to this research.

Florida's Environment

Most know Florida as the Sunshine State, and rightfully so. For many years a St. Petersburg newspaper gave away its evening edition on sunless days. But Florida might just as well be called the Water State. The State is surrounded on three sides by the sea, is perched on a water-filled limestone landmass and receives as much rainfall annually (about 53 inches on average) as any state in the U.S. This abundance is apparent on Florida's surface, but the underground aquifer is also a prolific source (Fernald and Purdum 1992).

Surface waters include lakes, rivers, springs, bays and wetlands. Florida contains 33 of the United States' 84 first magnitude springs (those discharging at 100 cubic feet per second or more, or 64.6 million gallons a day), more than any other single state. It also

has over 10,000 miles of rivers and streams, and 7,800 lakes of ten acres or greater (Kautz, et al 1998).

Florida's underground water amounts to a huge subterranean reservoir. It is estimated a quadrillion gallons of groundwater is available – an amount equivalent to 100 times what is in Lake Meade on the Colorado River, or 30,000 times the daily flow of Florida's 13 major rivers (Conover 1973). No state has more available water in its aquifers.

Putting this apparent abundance in perspective is critical to understanding how it can at times fall short of meeting water needs of natural and anthropogenic systems. Such an understanding implies awareness and appreciation of Florida's water cycle, weather and climate, the interaction of water sources, the needs of its ecosystems and other factors.

The Water Cycle

While the global water cycle contains about the same amount of water at all times, the Florida water system is more of an open system. Surface and ground water from Georgia and Alabama flow into northern Florida, and water flows out into both the Atlantic Ocean and Gulf of Mexico, maintaining a balance which is essentially Florida's "water budget" (Betz 1984). One other important factor is Florida's hydrologic divide. First delineated by hydrologist Garald Parker, the divide is a line snaking across the State from Cedar Key to New Smyrna Beach across which neither surface nor ground water crosses. South of the divide, Florida is an island in terms of fresh water, dependent on rainfall for replenishment (including recharge to aquifers). North of the divide, water is received from outside the State. This is significant because only 44% of the State's rainfall occurs in the south, while 78% of the State's population and 75% of its total water use occurs south of the divide (Betz 1984).

Weather and Climate

Florida's climate has made it famous, attracting millions of tourists and residents. The historical assessment reflects the earliest tourists were often attracted by the purported curative powers of Florida's sunshine, air and water, in short, by its favorable climate (Blake 1980).

The variability of Florida's rainfall cannot be overemphasized. Rainfall varies from season to season, year to year and place to place. Fernald and Purdum (1992) have noted this variability can result in severe water supply problems, especially in south Florida. Rainfall records are extreme – five Florida stations have had more than 100 inches in a calendar year, while twelve locales have recorded a single year with less than 30 inches. Key West had just 20 inches in 1974, the record low for the State (Fernald and Purdum 1992).

Perhaps the most predictable thing about Florida's weather is its unpredictability, as demonstrated by the potential for hurricanes and tropical storms. Though Florida's average annual rainfall is 53 inches, in most parts of the State about two-thirds occurs between mid-June and the end of September. Moreover, the State periodically suffers through extended periods of drought as it did in the southwest portion of the State in the late 1980s, mid-1990s, in 2000-2001 and again in 2008-2009. These extremes have significant implications for sustaining water supplies, especially in the near term, and affect the way water users perceive the environment. The State's settlement pattern does not adequately respond to the drought and flood cycle, allowing population in places that flood naturally and concentrating growth in coastal areas without sufficient local water supplies (Fernald and Purdum 1992).

Thunderstorms can be as deadly as hurricanes. Florida's peninsular shape and position relative to sea breezes and high pressure systems creates a spawning ground that results in its title as the thunderstorm capital of North America. Again, these storm events contribute to a public perception of plenty that can at times make water conservation seem counter intuitive.

Water Resources

The abundance of Florida's surface and ground water resources is apparent. The complex relationships that exist between water above and below the Earth's surface is not. Fernald and Purdum (1998) note that virtually every surface water feature in the State, from lakes and rivers to wetlands and estuaries, interacts with nearby ground water. Lakes and wetlands can be directly connected to subsurface water levels, as they often are in the Tampa Bay area, where excessive groundwater withdrawals for public water supplies historically damaged surface waters and habitat they support. This explains why Fernald and Purdum insist that "as land and water resource development increases in the State, it is becoming readily apparent that groundwater and surface water interaction must be considered in establishing water management policies" (1998:55).

Wetlands represent a symbolic resource that depicts human manipulation of Florida's environment. Periodically covered by fresh or salt water, they are essentially transitional features (and ecosystems) between land and water. The desire to develop Florida's coastal and other waterfronts depicts wetlands as lands waiting to be "reclaimed" for human habitation and commerce. Herbaceous wetlands, for example, declined 51% between 1936 and 1995, with over 700,000 acres lost in the Everglades alone. Forested wetlands were reduced by 17% from 1970 to 1987 despite aggressive wetlands

protection programs (Kautz 1993). Many floodplain wetlands and coastal marshes that remain are threatened by development (Fernald and Purdum 1998).

Ground water takes on added significance in Florida where its volume and quality make it the predominant water supply source. Potable quality water from aquifers is available throughout the State. Nearly 93% of the State's population depends on groundwater for its drinking water. Florida was fifth in the nation in 1995 in the use of fresh groundwater. Public supply, domestic (rural) and industrial users all have groundwater as their primary source (Fernald and Purdum 1998). Over-reliance on ground water has been documented during the final decades of the twentieth century, with lowered water levels in the Floridan aquifer in several parts of the State, including the Panhandle, northeastern and southwestern sections, and into coastal Georgia (Berndt, et al 1998). This raises the question of its sustainable limits, particularly in localized areas, and reflects the value of conserving potable supplies, as well as protecting the limited areas where rainfall effectively replenishes the aquifer.

One final element of ground water has potential significance in creating a better cultural comprehension of the role of water conservation – springs. Springs have been called a "window" into the aquifer (Purdum 2002). The cultural significance of Florida's springs varies, from use by early native Americans to Spanish exploration for a fountain of youth, and from use by the State's earliest tourists to the public preference for bottled water. Many of Florida's largest springs are part of State parks today (e.g., Silver, Manatee, Homosassa, Wakulla and Ichetucknee). Citizens and institutions responsible for water management, (including the Florida Department of Environmental Protection, the State's five water management districts, and local governments), have expressed concerns over growing nitrate levels, and spring withdrawals for bottled water, though it represents a

tiny fraction of ground water use in Florida (Purdum 2002). Public concern over Florida's springs offers significant opportunities to recognize water conservation as a means to achieve both water quality and quantity objectives while protecting important natural resources.

Florida's Ecosystems

Ecosystems have been described as "place and life functioning together" (Purdum 2002:65). These interactions include abiotic (non-living) factors such as soils, water, nutrients and climate; biotic or living elements such as plants, animals and bacteria; and chemical processes like fire, floods, drought, energy flow and water acidification. In Florida, ecosystems represent a delicate mosaic of uplands and lowlands. Though only a few inches in elevation may separate the two, the higher lands (pinelands, scrub, dry prairies and hardwood hammocks) are critical to maintaining healthy aquatic systems in the lower lying swamps (river and cypress), marshes (fresh and salt water) and lakes, rivers and coastal systems (seagrass beds, mangroves and coral reefs). Since development is usually focused on the uplands it is a major challenge to assure the continued natural functioning of Florida's ecosystems (Purdum 2002).

Fernald and Purdum (1992) have noted that even after intensive development Florida remains a biological wonderland and global hotspot for biological diversity, a mixture of species derived from north and south of the State. Biologists have estimated the State has 300 native tree species, 3,500 species of vascular plants, 150 native species of reptiles and amphibians, 200 native species of freshwater fish and over 425 species of birds (about half the total for the U.S.). Many of the species of plants and animals found in Florida are present nowhere else on the planet.

Accommodating the burgeoning population, most of the natural landscape has been converted to urban, agricultural, mining and other human uses. One bright note is the State's prescient land acquisition program. Initiated in the 1980s, lands protected by public ownership now include about 22 percent of the State's ecosystems, with more being acquired each year (Fernald and Purdum 1998). There is some irony in the State buying lands (many of them low-lying) that they historically had trouble giving away.

Tampa as Research Setting

The initial focus on the setting for this dissertation was the Tampa Bay area of southwest Florida. As noted in the Introduction to this study, this three-county area (Hillsborough, Pinellas and Pasco) is a suitable social laboratory for studying water use and conservation for several reasons. Included are its unique water supply partnership (Tampa Bay Water), its spatial and demographic characteristics which are highly representative of the State as a whole, i.e., a large, growing and diverse coastal-based population using about 250 million gallons per day in 2008 and its ongoing policy framework that promotes major investment in water conservation as one of several alternative supply sources. This mix of factors relative to public supply water use makes Tampa Bay both typical of other major metropolitan areas in the State, and the leading edge in creating and implementing water conservation policy and solutions.

Another key factor in favor of a research focus on Tampa Bay Water was the recent completion of its *Water Conservation Public Opinion Survey* (2009) by the Florida Center for Community Design and Research (FCCDR) at the University of South Florida. I served as project manager on this quantitative effort and as a result had access to significant, timely data for use in this research. The Survey results are described in more detail in the next chapter on study results. Notable here from a methodological

perspective, the *Opinion Survey* was a statistically valid instrument that generated results from an overall standpoint for the 3-county area as well as individually for each of TBW's six member governments (Tampa, St. Petersburg and New Port Richey in addition to the three counties). The overall goal of the Survey was to assess available water efficiency potential and help articulate and validate a long-term demand planning and management strategy for Tampa Bay Water and its members. It collected data on demographics, including gender, household size, age, income, home ownership status and tenure in Florida, prior participation patterns in local water conservation program offerings and the degree of willingness to participate in additional conservation programs, such as replacing clothes washers or installing irrigation shutoff devices, etc. The survey instrument, reflecting the City of Tampa results, is included in Appendix A.

It is significant to note that while Tampa Bay Water is involved in water conservation planning and strategy, it is the individual local governments that implement such programs in their own jurisdictions. This fact proved fortuitous in terms of trying to assure meaningful research results. Concerns over such matters as water use elasticity (e.g., Tampa's relatively low water rates compared to Hillsborough County's), sample size, optimizing respondent diversity, incorporating key informant (expert) opinion and how to control for the effects of variability in household water use scenarios could all best be addressed by limiting the number of local utilities involved. Based on this premise, it was decided the sample of interviewees should be from only one utility in order to control for the cost variable and the impacts it might have on water use / conservation attitudes and behavior. The preferred utility was the City of Tampa, at least in part because of the somewhat greater diversity among potential respondents within the City.

Specific aspects of Census data relative to the City of Tampa that correspond to informant interviews will be discussed later, but a few facts about the City's water utility are in order. The Tampa Water Department treats and delivers drinking water to a service population of about 652,000 people in the Tampa Bay area, and is responsible for water conservation efforts citywide to help manage local water demands. The City's water conservation program was initiated in 1989 when per capita demands were about 120 gallons per person per day. The service area for the utility is about 211 square miles, and includes over 148,000 customer accounts. Per capita water use in 2009 was 101 gallons per day (personal correspondence, and http://www.tampagov.net/dept_water/ accessed 8-16-10).

Concerns over household water use scenarios, and the likelihood they might result in inequitable comparisons, were typified as follows: What if a household had several children, or a large yard and pool, or any other individualized reason for high water use? How might we normalize such factors? It was decided there was a need to control for several variables to try to narrow the elements in play and get to beliefs and values on a more level playing field. By focusing on those interviewed in the City of Tampa portion of the TBW survey, and identifying standard criteria to be met by households to be interviewed, it would be possible to control key variables such as home ownership, household size, tenure, etc. The actual criteria applied are discussed in the Study Methods section below.

STUDY METHODS

The design of the research methodology for this dissertation began with the research questions to be answered, including what beliefs and values are most related to water conservation, and what cultural models might be identified. Also recognized as

significant to obtaining a good result was the principle of triangulation. Such an approach reinforces the rationale for combining quantitative and qualitative methods in the context of cultural knowledge of the population under study (Ervin 2000). In the present case, this includes the opinion survey noted above, archival research, census indicators, water use information, semi-structured interviewing of individual heads of household and use of key informants.

The specific qualitative data collection methods used in this research were adapted from Kempton, et al. (1995) and focused on identification of mental and cultural models specific to water conservation. These methods were essentially those developed by cultural anthropologists to understand foreign cultures. This was done by design as a means to limit research assumptions. It was considered advisable to capture informants thinking first by asking them what is important and not assuming we know the answers. This is consistent with how people use their cultural models to process scientific information, i.e., "...one cannot understand laypeople's views of environmental problems, and presumably of other issues in science and technology, without first discovering the cultural models that underlie their views" (Kempton et al. 1995: 218). Since I have spent a considerable portion of my career in the field of water management, this approach had the added benefit of reducing bias that might accompany a more researcher-driven approach. The author's biases are discussed further below.

The following represents the step by step process employed in the methodology for this dissertation.

- Complete contextual analysis, including background on Florida's history and water law, and conduct a comprehensive search to identify mental

and cultural models associated with water conservation in anthropological and other literature.

- Develop initial domains and sub-domains to guide data collection and aid in protocol development.
- Evaluate the *Water Conservation Public Opinion Survey* (2009) developed for Tampa Bay Water, as the latest view of public attitudes relative to water conservation in the Tampa Bay area. The survey provided statistically valid quantitative data that complemented qualitative data collected and aided in development of the semi-structured protocol. The results of the survey also served as a substantial database for demographic, spatial and attitudinal information.
- Extract City of Tampa results from the Public Opinion Survey (n=204). This approach supported the focus on a single utility for analysis by providing complete data results from the survey for all 204 households queried, including the data needed to “control” for selected variables (see below).
- Obtain monthly water use database for 2007-2009 for all Tampa informants. This provided an important, independent source of information for comparison to the espoused water conservation beliefs and values of those interviewed. Just as significant, it enabled the establishment of separate groups of high and low water users for use in comparative analysis of water conservation beliefs and values.

- Develop the semi-structured interview protocol for qualitative research based on the Kempton et al. instrument and the research results from this study, e.g., the anthropological literature review. The protocol is reproduced in its entirety in Appendix B.
- Draw sample (n=20) of Tampa households for semi-structured interviews from the full set of 204 interviews conducted as part of the Public Opinion Survey. A total of 53 households were initially identified that met the criteria to control for key variables. The concept was to build in a degree of representativeness that otherwise would not have been possible in such a limited set of respondents, while minimizing factors that had the potential to bias respondent water use behavior and their resulting mental models for water conservation.

The key variables to be controlled to attempt to enhance demographic and spatial representation among the highly limited sample (n=20) were:

Household water use (either high or low)

Household size (limited to 3 persons or less)

Gender (male and female respondents approximately equally represented)

Homeownership (all respondents)

Zip Codes (spatial variability throughout the City – see Figure 2 in Study Results chapter)

- Draw sample (n=7) of key informants, or water conservation experts, for interviewing with same protocol as water users. Selection of experts was based on their extensive professional experience in water management in the Tampa Bay area. The intent was to compare and contrast the beliefs and values of water supply experts with the views of lay public informants.
- Pre-test interview protocol with a key informant and a lay water user, respectively, to validate the instrument and make any necessary changes. As a result, minor changes were made to enhance clarity, and an additional question was added regarding the source of informants' environmental values if applicable.
- Conduct key informant interviews in person with all seven informants between May 7 and June 25, 2010. Key informants preferred to meet in their offices during business hours. All interviews were conducted by the dissertation author and recorded for later transcription. The make-up of this group, like that of the lay groups, is described in the next chapter.
- Conduct lay water user interviews with 20 informants between May 26 and June 25, 2010. The original design approach was to conduct interviews in the homes of informants to allow observation of the setting relative to water conservation (lawn size, outdoor water features, etc.), but this proved impractical based on early informant responses to such meetings. As a result, 19 of the 20 interviews were conducted and recorded over the phone. One respondent preferred to meet in person at a local country club, where that interview was recorded. A total of 48 phone contacts were made to complete the planned 20 interviews (or a

return rate of about 42%, reflecting a strong interest in the topic). Of the 20 informants interviewed, half were classified as low water users (average monthly use of 7,500 gallons or less for the period from 2007 through 2009), and half were classified as high water users (averaging 8,000 gallons or more per month) for use in later analysis. The concept was that the high and low users would demonstrate differing beliefs and values based on their disparate water use behavior.

- Transcribe all interviews for textual analysis – The dissertation author completed the first transcription and enlisted assistance from Anthropology students for the other 26 interviews. All transcriptions were reviewed and approved by the author to assure quality control. The transcriptions totaled 303 pages of text for further analysis.
- Analyze all survey results and prepare a summary of the results for each of the three informant groups (low, high, experts), as well as a separate comparison among groups.
- Identify similarities and differences between and among groups based on espoused beliefs and values. This step was intended to initiate assessment of individual mental models, that despite the limited sample size, might begin to coalesce into cultural models.
- Re-evaluate domains and sub-domains, or patterns, in the interview data to create a framework for classifying the beliefs and values of informants. Domains and sub-domains had actually been drafted early in the design of the methodology to conceptualize the collection and coding of data and

guide development of the interview protocol. Periodic evaluation of domains and sub-domains allowed ongoing refinement of the research process.

- Extract key quotes and views related to each of the three domains identified to allow informants to speak in their own words, and for use in depicting mental models and potential cultural models.

The Semi-Structured Water Conservation Interview Process

The primary qualitative method employed in this research was the semi-structured ethnographic interview and the resulting textual analysis of the interview transcripts. Using this approach essentially allowed informants to talk about water conservation in their own terms. In doing so it gave the researcher a better understanding of the richness of these perspectives, while also focusing on the types of information that relate to values and beliefs. In this context, beliefs are defined as what people think the world is like, and values as people's guiding principles of what is moral, desirable or just (Kempton et al. 1995: 12). Talking about water conservation with water users (laypeople) revealed language and concepts different from the experts, not necessarily because such views were incomplete or uninformed, but because these informants were communicating their own problem definitions and mental models to make sense of water use issues. It is these voices, values and beliefs that are relied upon to communicate the mental and cultural models that emerged from this research – real water users describing their own views on water conservation behavior and that of others in their community. This is the researcher's attempt to let the data speak.

Getting to cultural models via blending individual mental models is both scientific and artful. It requires a well-constructed protocol, a willingness to listen to informants and limit research assumptions, and carefully discerning similarities and differences among varied informant groups. In the current case, the respondents were classified into three distinct groups: low water users, high water users and key informants (water management experts). This section provides specific background information on the make-up of each of the three groups and the protocol as a precursor to summary results of their respective responses in the next chapter.

The most basic division, between low and high water users, was determined by examining the average monthly water use (January 2007 – December 2009) of the City of Tampa water customers included as respondents in the TBW Public Opinion Survey (n=204). This equated to about 7,100 gallons per month. This water use was validated as a reasonable quantity to consider by examining the City's reported daily per capita of 101 gallons per person times an average household size for homeowners of 2.5 (American Community Survey 2008) times thirty days in a month. This returned an estimate of 7,575 gallons used per month. Based on these calculations, the low water use group was defined as using 7,500 gallons or less per month, and the high user group as 8,000 per month or more. The actual monthly averages varied significantly from these criteria, with low users at 4,134 gallons and high users at 13,470 gallons.

Basic information about the individual lay informants in the semi-structured interviews can be found in the Study Results chapter. The chart offers a quick summary of the attributes of the varied respondents. Equally valuable is the following information on the make-up of each of the three sub-groups.

The Low Water Users Group – Who Are They?

- Ten head of households interviewed between May 26 and June 24, 2010
- Five males ranging in age from 43-82 (Mean age 63) and five females ranging from 33-82 (Mean age 51).
- Nine White, one Hispanic.
- Four are retired – remaining six are an accountant, a high school teacher, an Information Technology manager, a marketing executive, a health insurance salesperson and a homemaker.
- One holds a Masters degree, four have Bachelors degrees, two have some college, two have high school diplomas and one has completed the 10th grade.
- Average annual income (n=7): \$69,071.
- Average monthly water use (2007-2009) (n=10): 4,134 gallons per month.
- Average tenure in Florida of 16.4 years, including three natives of the State.
- See Figure 2 for a map of the spatial distribution of all low and high users interviewed by zip code (8 zip codes represented).

The High Water Users Group – Who Are They?

- Ten heads of household interviewed between June 8 and June 22, 2010.
- Five males ranging in age from 26-64 (Mean age 47) and five females ranging from 33-75 (Mean age 58)
- Eight White, one Asian, one Hispanic.
- Half (five) are retired – remaining five are a software engineer, post office employee, a clerk of the court, realtor and stay at home Mom.
- Four hold Masters degrees, one has a Bachelors, two have some college, one has some law school and two have high school diplomas.
- Average annual income (n=9): \$118,000.
- Average monthly water use (2007-2009) (n=10): 13,470 gallons per month.
- Average tenure in Florida of 14.8 years, including three natives of the State

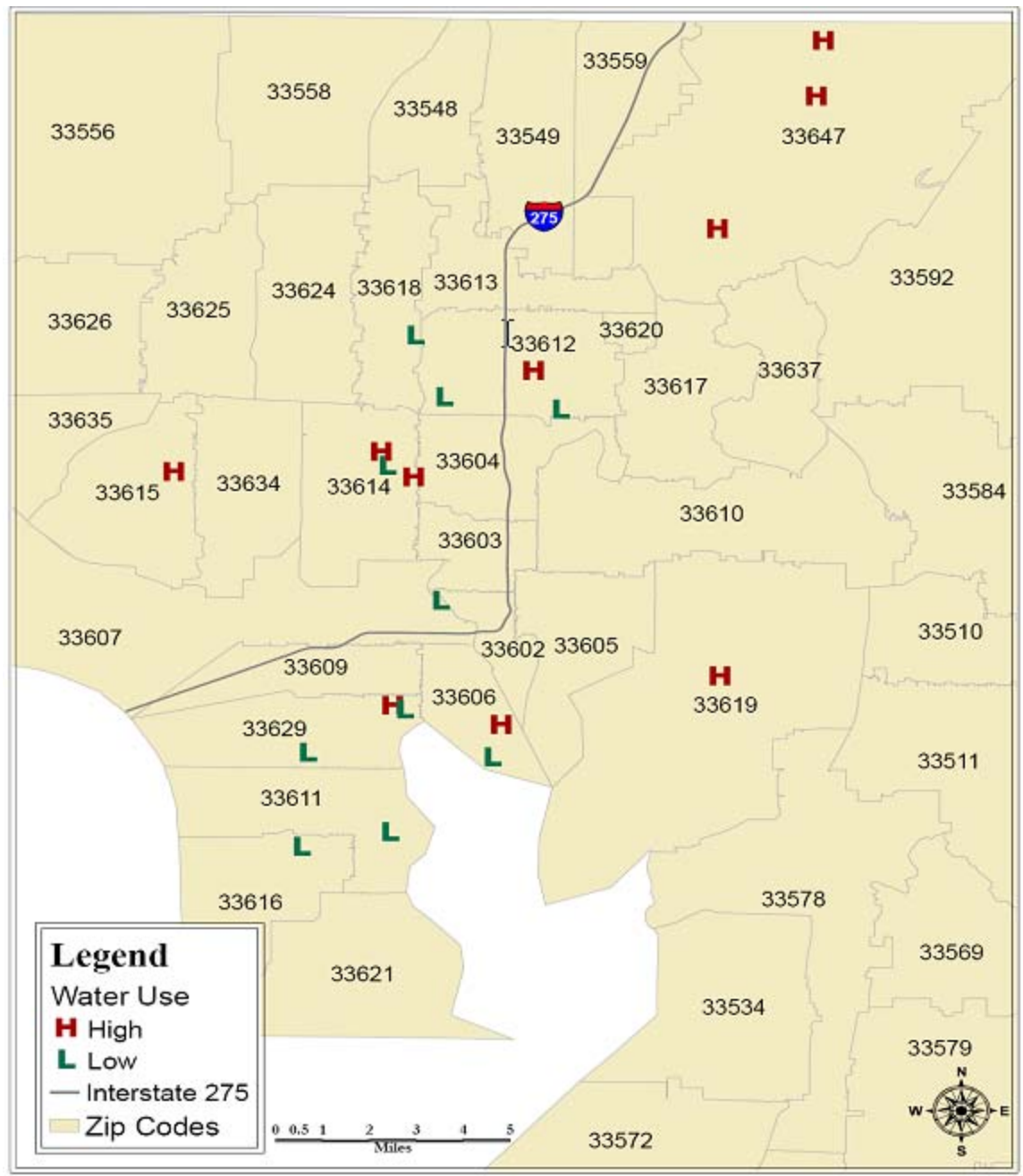


Figure 2 Spatial Distribution of Respondents by Zip Codes

The Key Informants – Who Are They?

The key informants selected to supplement and create a comparative basis for the water use groups is made up of long-tenured water resource experts in the Tampa Bay area. The four females and three males represent regional and local water management agencies, water utilities, water resource consultants and a major environmental organization. Collectively they have well over 150 years of experience in water management. In all, seven semi-structured interviews with these informants were conducted between May 7 and June 25, 2010.

The initial key informant and water user interviews were used to pretest the interview protocol, resulting in minor changes to the instrument used in ethnographic data collection for all 27 respondents (ten low users, ten high users and the seven experts). Subjecting the experts to the identical protocol allowed documentation of expert beliefs and values about water conservation which could then be evaluated relative to beliefs and values of lay water users. Identifying the degree of consistency or divergence between expert and user responses in this case offers a form of “adaptive experimentation” (Casagrande, et al. 2007) that situates urban water conservation behavior within the context of problem definition in water management policy. In other words, the basis for how we define cultural models for water conservation expands to include the varied knowledge, perceptions and attitudes of the affected public in policymaking. This is a domain typically occupied and controlled by the public official and resource expert, but one that can be enriched by a more inclusive arrangement.

It is important to offer a disclaimer here. While the key informants were subjected to the same protocol as the user group, no effort was made to collect demographic and other explanatory data for them (e.g., water use levels, income, etc.) since the intent was to

use their views in a limited comparative manner. This is due in part to a lack of survey results from the Public Opinion Survey related to the experts and in part to maintain the focus on the lay water users and their cultural models in the current work. It is conceivable that future study in this area could incorporate a more complete array of such data for key informants as part of a research design.

We can think of these experts as “specialists” in the sense described by Kempton, et al (1995:164) in making the case for their inclusion in this analysis. Such specialists are the closest thing we have to those who will make society’s decisions on water conservation policy. They provide the research and policy support for decision makers, making themselves a powerful force for what gets implemented. They are also typically well informed on the ramifications and policy implications of scientific knowledge in the field. They often serve as gatekeepers to defining the problem in terms of how inclusive the process is, which projects and programs get funded and what is provided to the media. In sum, the inclusion of the water resources experts in this effort adds to the cultural model framework we seek. And lest we assume these specialists have strictly mercenary intentions, consider the following from one of them in response to the question why conserve?

I guess I just feel real strongly about leaving Florida, the world, for future generations. Leaving it the way we were presented with it. We are only borrowing it so whether its water conservation or recycling, all those things that we should do just to leave a footprint and nothing more.

KS (expert)

The protocol is reproduced in its entirety in Appendix B, but a brief overview is instructive as to its approach and intent. The introduction garners the respondent’s permission to

participate and allow tape recording, guaranteeing anonymity and assuring researcher interest in their opinions of why people conserve water. The instrument consists of two main parts, Part I. which focuses on the participants' current model of beliefs and values, and Part II. which briefly describes the elements of current water conservation policy in Tampa and the surrounding area, and asks for reactions to each briefing. Part III. gathered background information on the informants.

Part I. consists of 15 open-ended questions focused on beliefs and values related to water conservation. A reminder – in this context, a belief is defined as what people think the world is like, while values are guiding principles of what is moral, desirable or just (Kempton et al. 1995). While some of the queries are quite simple in their construction, nearly all resulted in probing that yielded additional qualitative data in the form of the rationales for informant positions. An interesting example that became quite prominent in the analysis extended question I.C to include the genesis of conservation values informants claimed to have. Summarizing Part I, respondents were asked:

- About the importance of conservation, whether they have conservation values and why people conserve;
- Whether water users have a responsibility to conserve and if conserving is being shared fairly;
- Their own water use and any barriers or pain associated with conserving;
- How good a job their utility is doing in promoting conservation (including the messages used), and what message(s) they believe would cause more conservation;
- Whether a strong sense of community contributes to conservation behavior; and
- What the role of incentives should be in achieving conservation.

The policy briefing and reactions (Part II.) described conservation strategies already in play in Tampa and the region, including A) Conserving Water Through Education; B) Regulatory Programs; and C) Financial Incentives. One final open-ended question allowed participants to offer any other ideas of their own to enhance water conservation policy and/or behavior.

Part III. provided useful demographic data, some of which was not included in the TBW survey (e.g., occupation, education levels, number and age of children, and race / ethnicity). It was also possible to fill in some previously missing income data during the process. While over 40 percent of the Tampa Bay Water survey respondents declined to provide their household income, the semi-structured interviews had only 20percent who refused.

THE AUTHOR'S BIASES

The author can be considered an “insider” to the field of water management after working for 16 years in the planning arena for the Southwest Florida Water Management District. This predisposes him to the institutional or functionalist view where solving resource issues in a culture dominated by individual rights requires both an institutional role and reliance on users associations to assure resource viability. And while this researcher may benefit from the potential to understand both an emic and etic viewpoint, it is hard to ignore the positive accomplishments of the agency considered a leader in water resource management within Florida, in the U.S. and beyond. Conversely, the insiders view offers insight into policy issues not available to most academics. This collaboration of policy and anthropology skills lends credence to the study.

For example, from 1989 – 2005, a surge of incremental legislative changes to Florida water resource law took place. A sampling of these, most of which saw the researcher actively involved in implementing as an incipient policy maker, include comprehensive plans for regional water management, enhancement of water supplies (including growing recognition of water conservation as a new source), establishment of minimum flows and levels for environmental protection, and development of WMD performance measures aimed at assuring accountability. Essentially, Florida water resource law has undergone years of incremental changes, and has not been comprehensively assessed as to the impacts these changes may have had on its original intent, including the stated policy to conserve water resources. This makes realizing water conservation as a potential supply source, and the cultural change it will require in water users, an intriguing challenge for an anthropological researcher. This is especially true as it relates to maintaining water conservation beyond an immediate crisis into common practice.

One thing that has not changed, based on my experience is the highly limited degree to which the public involves itself in environmental management as practiced by water agencies. Why this is true, and especially whether the structural components of Florida water law and its bureaucratic practice cause this, or are its victim, has been one focus of my research.

Finally, the researcher came into the applied anthropology doctoral program with a background in environmental planning and management that has been multi-disciplinary, and anthropological in nature. The consistent use of ethnographic interviewing and key informants, emphasis on holism and multi-cultural perspectives, and regular use of quantitative methods have all contributed to the transition from bureaucrat to anthropologist. This experience has only strengthened the belief that applied

anthropologists need to delve deeply into policy as a means of solving human problems. In spite of the noted biases, it is in this regard the researcher may realize the anthropological difference.

CHAPTER 4: STUDY RESULTS

INTRODUCTION

This section summarizes the results of the primary quantitative and qualitative methods employed in this dissertation. The emphasis has been on qualitative approaches that get at the value of an emic, cultural model that is grounded in the subject group's specific folk knowledge (Beehler, McGuinness and Vena 2001). The intent is to learn from water users in Tampa, Florida how their own water conservation behavior can be optimized. In doing so, the emergence of individual mental models may lead to broader cultural models for water conservation, which in turn can result in enhanced policy and practice.

The primary quantitative tool used was the *Water Conservation Public Opinion Survey* (2009), and its specific sub-component for the City of Tampa. The results of each are summarized below, with primary attention focused on the Tampa results since this is the locale for the qualitative interviewing conducted. Results of the semi-structured interviewing process are reported for three separate groups: low water users, high water users and key informants or water experts.

DISCOVERING DOMAINS

Unlike quantitative analysis with its more mathematical and computer-driven approach, qualitative research can be daunting as the researcher faces stacks of unanalyzed data. In the current case, the 27 ethnographic interviews yielded over 15 hours of audio tapes that were transcribed into more than 300 pages of data to be analyzed. When coupled with the Tampa Bay Water survey results, water use data for 204 households and voluminous archival data, the task became even more complex. Realistically, the

analysis of this type of information had to begin early in the data collection process, using the basic research questions that guided the work, and reflecting an iterative process of analysis.

The approach was to organize, sort, code, and reduce the data so that patterns could emerge. Essentially, the intent is to organize related items into higher-order “cultural domains / subdomains” that allow structural analysis to find consistent patterns among the data (LeCompte and Schensul 1999). The primary domains became the vehicle for organizing and coding the data. In this case, the objective was to let the informants speak for themselves where possible as a way of sharing their beliefs and values, and allowing potential cultural models to surface. Accordingly, direct quotations from the interviews were coded and used to illustrate key points. The three domains that emerged from this research, and are discussed further in the final chapter, were: 1) Why conserve water?; 2) Sources of conservation values; and 3) Lack of water conservation awareness and involvement.

THE WATER CONSERVATION PUBLIC OPINION SURVEY

The Tampa Bay Water study played two important roles in the current research. First, it was the latest public opinion survey on water conservation in the Tampa Bay region, and as such served as an important quantitative foundation for the largely qualitative approach to cultural models related to water conservation. Although the qualitative research of this dissertation is focused on the City of Tampa, it also benefits from a broader perspective on water conservation opinions and programs explored for the three-county area of Tampa Bay Water. Secondly, the survey allowed specific analysis of a single water provider’s customers (the City of Tampa Water Department) from among the TBW member governments, including the availability of significant

demographic, attitudinal and behavioral data results for comparative purposes. The member governments that make up Tampa Bay Water and their coding on the survey, in addition to Tampa (TAM) are St. Petersburg (STP), New Port Richey (NPR), Hillsborough County (HC), Pinellas County (PIN) and Pasco County (PAS).

The Opinion Survey, consisting of a total of 1,205 telephone interviews of single family residences, was conducted from November 8 - 23, 2009 by Decision Strategies Group, a Tampa market research firm. Its goal was to conduct a survey-based assessment of public opinion on the market and behavioral factors underlying water usage / conservation trends among the residential sectors within the six-member government areas for use in the Tampa Bay Water Demand Management Plan. Related objectives were: 1) to identify the prevailing degrees of efficient water practices and conserving attitudes; 2) to reveal sociodemographic factors that can affect participation in demand management programs; and 3) to generate estimates of market saturation of water end users. In essence, results were meant to assist Tampa Bay Water in its water conservation planning and advisory role to its six member governments, i.e. what types of incentives and other techniques would likely result in the most effective demand management? While Tampa Bay Water has conducted several public opinion surveys over the last decade (1999; 2001; 2003; 2005; 2007 – see discussion under *Florida Public Opinion – Water Conservation* in Chapter 2), the 2009 effort was distinct and not highly comparable due to its specific focus, making trend analysis impractical.

At the regional scale of the survey we can examine some basic research results related to water conservation. For example, the degree of participation in water conservation programs offered by local water utilities, the nature of such programs, and why people did or did not participate is depicted in the data below.

Q1--PARTICIPATION IN CONSERVATION PROGRAMS OFFERED BY WATER UTILITY/LOCAL EXTENSION OFFICES HAS BEEN LOW, RANGING FROM 5% IN PASCO COUNTY TO 12% IN ST. PETERSBURG.

Participated in conservation program by your water utility or local extension office?	HC	TAM	PAS	NPR	PIN	STP	All
Yes	8%	10%	5%	8%	11%	12%	9%
No	88%	85%	88%	85%	80%	81%	85%
Don't Know	4%	5%	7%	6%	9%	7%	6%
N=	228	205	195	171	218	188	1205

Q2--RECLAIMED WATER AND REBATE PROGRAMS FOR LOW FLOW TOILETS WERE THE TWO MOST OFTEN CITED CONSERVATION PROGRAMS RESPONDENTS SAID THEY PARTICIPATED IN FROM THEIR WATER UTILITY OR LOCAL EXTENSION SERVICE.

What types of programs were they?	HC	TAM	PAS	NPR	PIN	STP	All
Cistern/rain barrel development	0%	10%	0%	29%	0%	5%	6%
Reclaimed water	32%	43%	20%	21%	26%	23%	28%
Irrigation system evaluations	16%	0%	10%	0%	9%	5%	6%
Landscape/Florida Friendly yard eval.	0%	0%	20%	0%	4%	9%	5%
Retrofit kit giveaways	11%	10%	0%	7%	9%	23%	11%
Rebate program for high eff. washers	0%	0%	0%	0%	13%	0%	3%
Rebate for rain shutoff devices	0%	0%	0%	0%	0%	0%	0%
Rebate program for low flow toilets	11%	24%	10%	7%	22%	23%	17%
Horticulture/landscape education/design	11%	0%	10%	0%	0%	5%	4%
Other	21%	14%	30%	36%	17%	9%	19%
N=	19	21	11	14	23	22	109

Q3--LACK OF KNOWLEDGE ABOUT THE CONSERVATION PROGRAM OR BELIEF THAT THE PROGRAM WASN'T OFFERED WERE THE LEADING REASONS GIVEN FOR WHY RESPONDENTS DIDN'T PARTICIPATE IN THEM AND ARE INDICATIVE OF A LACK OF MARKETING AND IMPLEMENTATION SUCCESS BY LOCAL WATER UTILITIES.

Why haven't you participated?	HC	TAM	PAS	NPR	PIN	STP	All
Didn't know program existed	54%	47%	40%	39%	46%	45%	46%
Programs were not offered	38%	37%	46%	50%	38%	39%	41%
Don't think it's important	1%	2%	2%	0%	2%	3%	2%
Too much trouble	1%	1%	2%	1%	1%	3%	2%
Didn't know who to contact	0%	1%	2%	0%	1%	0%	1%
Didn't qualify	1%	0%	0%	0%	0%	0%	0%
Out of pocket cost too high	0%	0%	0%	0%	1%	0%	0%
Other/Don't know	6%	12%	8%	10%	11%	11%	10%
N=	208	176	172	146	175	153	1021

Q4--BEING GOOD FOR THE ENVIRONMENT, PROTECTING THE WATER SUPPLY AND SAVING MONEY WERE THE THREE MOST FREQUENTLY CITED REASONS RESPONDENTS GAVE FOR PARTICIPATING IN THESE CONSERVATION PROGRAMS MARKETED BY TAMPA BAY WATER AND OFFERED BY THEIR LOCAL WATER UTILITY OR EXTENSION SERVICE.

Primary reason for participating?	HC	TAM	PAS	NPR	PIN	STP	All
Good for the environment	32%	24%	20%	57%	44%	24%	33%
It was free	16%	19%	20%	7%	4%	10%	12%
It will save me money	21%	10%	20%	0%	13%	19%	14%
It will save government money	0%	0%	0%	0%	0%	0%	0%
Protects existing water supplies	26%	33%	10%	14%	39%	43%	31%
Defers need for future supplies	0%	0%	0%	7%	0%	0%	1%
Other	5%	14%	30%	14%	0%	5%	9%
N=	19	21	10	14	23	21	108

The areawide data shows that citizen participation in publicly sponsored water conservation programs, many of which are either free (e.g. retrofit kits, irrigation evaluations, etc.) or offer a significant subsidy (low flow toilet rebates, rain barrels), remains very low. On average, only about one in ten households have participated.

Those not involved cite a lack of knowledge about the program's existence, or believe it

was not offered to them. Nearly two-thirds (64 percent) of those who have participated give an environmental reason for doing so. It should be noted these responses came from respondents unprompted by the interviewer. Overall, the irony of these findings is that in previous Tampa Bay Water opinion surveys (TBW 2005; 2007) most residents contend they are doing everything they can to conserve water.

The City of Tampa

The Tampa subsample made up 204 of the total 1,205 surveys completed, and had a sampling error rate of +/- 5% based on the single family population size as defined by the 2008 U.S. Census update. Of the 70 interviews conducted in Spanish regionally, 32 or nearly half were with single family households in Tampa, reflecting the City's diversity. Standard statistical evaluations were conducted to reconcile the data for accuracy, with gender and other demographic factors comprising the grouping variables. Tests were also conducted for statistically significant differences in willingness to participate in water conservation programs across the combined data set, and driver analysis of the key outcomes was performed to see what water issues best predicted them. A key caveat in assessing the uses of the opinion survey is its strong focus on how people conserve versus the dissertation emphasis on why they do.

Among the data available for analysis from the 204 Tampa households interviewed for Tampa Bay Water were gender, age, income, household size, homeownership, tenure in Florida, zip codes, addresses and phone numbers. All of this information was further supplemented by a database of monthly water use data for each household for the three-year period from January 2007 – December 2009. This was important information not only for comparison to what respondents said about their water use habits, but because it allowed identification of two main groups (high and low water users) for semi-

structured interviewing and related analysis. Ultimately a total of 20 Tampa households were selected from the 204 respondents to the Opinion Survey and agreed to be interviewed (see results of this process below).

Key results of survey, confined largely to the Tampa subset here, can be identified, and were used in constructing the semi-structured interview protocol. These included:

- The two most often cited conservation programs Tampa respondents have participated in are reclaimed water and the low-flow toilet rebate program.
- Lack of knowledge about the conservation program, or belief that the program was not offered, were the leading reasons given for why respondents did not participate, explaining 84 percent of Tampa's recalcitrance, and indicating an apparent lack of marketing and implementation success by the local water utility.
- In Tampa, 60 percent of respondents are familiar with what is meant by "Florida Friendly" landscaping.
- Statistical analysis indicates gender is not a significant factor in how likely respondents are to adopt water saving features for their homes.
- The vast majority of Tampa respondents (75 percent) have lived in Florida for over 18 years. Though this factor came close, it was not found to be statistically significant in terms of participants' willingness to participate in water conservation programs.
- The demographics tested that had the largest effects on how likely a respondent would be to participate in water conservation programs, in order, were income, number of people living in the home and age. Wealthy income groups were significantly more likely to participate; households of 3-4 people were more likely than larger or smaller ones; and the youngest age group (18-25)

was consistently most likely to participate in a program offering cash or financial incentives.

The Opinion Survey offered a summary and modest set of recommendations. Of note is that “across all water efficiency programs tested... there are slightly more people who are either not willing or only slightly willing to participate... than those who are moderately or very willing to participate in them. The severe drop in real estate values and problems with the economy are likely at the root of this pessimistic response” (Water Conservation Public Opinion Survey 2009:23). For those who are inclined to act, outdoor water use offers the most potential based on respondent familiarity with Florida Friendly landscaping, and the more than half of the respondents who have landscapes made up of mostly grass and use tap water to irrigate it. Current landscape irrigation practices, as reported by participants, should also be examined cautiously because there is a high likelihood that social desirability may have affected respondents since fairly severe water restrictions and fines are in place and Tampa Bay Water was defined as the sponsor at the beginning of the survey.

THE SEMI-STRUCTURED WATER CONSERVATION INTERVIEW RESULTS

This section summarizes the collective responses of the low and high water use groups in order to draw out the similarities and differences between them. The format follows that of the protocol, drawing in direct quotations from the respondents as appropriate. The direct comparison of the lay groups is followed by an interpretation of the expert or key informant group as it relates to the combined user results. It is important to remember that this is a study of people’s perceptions of water conservation – one that is meant to find out why people conserve rather than how they do. The lay informants interviewed are detailed in Figure 3.

TABLE 1 LAY INFORMANTS IN THE SEMI-STRUCTURED INTERVIEWS

Name	Group	Sex	Age	Education	HH Income	Occupation; Race/Ethnicity; Tenure; Interview#
Angela	HU	F	56-64	12+	\$150K	Realtor; White; 18+; 13
Bill	HU	M	56-64	MA	51-75K	Musician (retired); White; 8-12; 5
Busaba	HU	F	43-55	HS	100K	Post Office; Asian; 4-7; 8
Carol	HU	F	65-74	HS	60K	Retired; White; 18+ 17
David	LU	M	43-55	BS	Declined	IT Manager; White; 18+; 16
Don	HU	M	33-42	MS	151-200K	Software Engineer; White; 18+; 3
Edward	LU	M	82	HS	100K	Retired; Hispanic; 18+; 4
Elizabeth	LU	F	82	HS	15-25K	Post office (retired); White; 18+; 4
Jerr	LU	M	75	BS	Declined	Teacher (retired); White; 18+; 2
Joe	HU	M	56-64	MS	100K	Retired (Disability); White; 18+; 6
Julie	LU	F	33-42	BS	Declined	Marketing; White; 8-12; 19
Kelly	LU	F	33-42	12+	51-75K	Sales/Marketing; White; 18+; 20
Mark	LU	M	43-55	MS	75-100K	High School Teacher; White; 8-12; 14
Nancy	LU	F	56-64	15.5	\$50-75K	Accountant; White; 18+; 7

Table 1 (Continued)

Name	Group	Sex	Age	Education	HH Income	Occupation	Race/Ethnicity	Tenure	Interview#
Patrick	HU	M	43-55	14	76-100K	Utility Worker (retired)	White	18+	9
Patty	HU	F	75+	LAW	200K	Clerk of Court	White	18+	11
Phil	LU	M	56-64	BA	76-100K	Retired	White	18+	12
Richard	HU	M	26-32	MS	Declined	Accountant	White	4-7	15
Sabrina	LU	F	33-42	10	51-75K	Homemaker	White	18+	21
Yani	HU	F	33-42	BS	101-150K	Stay at home Mom	Hispanic	18+	18

Part I. Current Model of Beliefs and Values (High and Low Water Users)

What's the first thing that comes to mind when you hear the words "water conservation?"

A strong consensus (65% of responses) emerged from both groups around two specific ideas: Avoiding waste and greed while protecting existing sources. A modest surprise is the lack of emphasis (only one respondent) on economic reasons to conserve, even given the opportunity to save money in the face of the current economic malaise.

We'll never get any more water than what's in this wide world right now. And, if some of us don't conserve to make up for those who are so wasteful, our well are going to go dry. Our source of water like, Lithia Springs, the Hillsborough River— in our dry season, we're going to be on worse water restrictions than we're on now. You just can't waste and have sufficient.

(Elizabeth – low user)

Because it's just really immoral to sit out and just water water water your lawn, just for a lawn. I've always thought that way since I moved to Florida. In New York we didn't have to worry about that type of thing but through reading and just staying current, there's just not enough water on the earth and a lot of people don't have enough and in the future a lot of us may not have enough to exist.

(Bill – high user)

I don't know why—what has necessarily caused it—but our aquifers are not what they used to be.

(Kelly – low user)

Would you say that conserving water is important? Why or why not?

The two groups were unanimous in recognizing the importance of conserving. Their rationale was to conserve for future generations while protecting existing sources (13 of 20 respondents). Again there was no economic imperative. This supports Kempton et

al. in the finding that “the desire to protect the environment for our descendants appears to be a nearly universal American value” (1995:101).

I just know we need to do what we can now to save everything the best we can with whatever knowledge we get and have water and else for down the road for our kids, our grandkids.

(Sabrina – low user)

Do you personally have conservation values (values = people’s guiding principles of what is moral, desirable or just)? How would you describe those values relative to water use? What would you say is the source of these values?

Every respondent expressed a strong sense of conservation values, values that played out in the form of various best practices to save water both indoors and out. This question was supplemented early in the data collection process by asking respondents where these values came from in their case. The primary source of these values among the combined groups was the influence of family (55%), with the experience of having survived scarcity in life a strong secondary reason (30%). As informants put it:

To be perfectly honest, it’s family. My mother was a big advocate of any type of conservation, whether it was water, electric, food, anything. She was big into all of that so it kind of got instilled into me.

Kelly (low user)

Probably I’d say my grandparents because when I lived with them, they were really poor. It’s kind of embarrassing to say that back then, with me being pre-teen time, I was lucky to get a bath every three to four days and when I got the water and heated it up on the stove and stuff, I learned then how important these things are and not to take advantage of them. So that I learned the hard way. So everything from that point on and as I got into an adult, I have really, don’t take for granted what you have.

(Sabrina – low user)

I got my values of it was, I spent 20 years in the military and the basically two, three years that I spent in foreign countries... I learned an appreciation for water during the Korean War.

(Jerr – low user)

Why do you think people conserve water? Why do you (if so)?

The two questions were combined for evaluation purposes – numerous respondents saw the reason they conserved as representative of why others might. Overall responses were fairly evenly split among protecting sources (21%), economic reasons (17%) and good for the environment (17%), with avoiding waste at 13%. This can be interpreted as reflecting multiple reasons for conserving behavior (or a lack of reductionism), especially given the high total number of responses (n=47).

High users' opinions diverged somewhat from their low using counterparts on this question. High users offered numerous non-resource based reasons for why people conserve, including the effects of public marketing campaigns, media attention, adoption of city ordinances such as for watering restrictions and the way such behavior had become "fashionable". In contrast, low users emphasized the condition of the resource and the need to sustain it. The high users view may represent a form of denial relative to resource limits, or it may reflect the exercise of selfish motives.

Well I think some people conserve water because they are forced to, by you know the city ordinances. And I think some people conserve because of the cost of water, because that has certainly gone up dramatically. And then I think most people, given half a chance, I think they are sensible and they realize that if we don't do something about it, if we don't start doing something about it, then there will come a day when you turn your tap on and their won't be any water.

(Angela – high user)

Is it fair to ask everyone to conserve?

Again, the response was unanimous in the positive across both groups. High users felt, however, that one should be allowed to use more if willing to pay. At the same time, informants admitted some do not conserve and act selfishly, when what is needed today is more sacrifice among water users. Too much development was also cited as a factor. Low users felt there is always a problem when some do not conserve and posed the poignant question: Who would we allow to not conserve?

I keep hearing how bad things are with water and yet it doesn't seem to reflect in the price I am paying for this water. And if its costing us, the public as a whole, then charge me for it, then make it expensive. You know that's fine, I will find ways to conserve. And everyone can do their part to conserve.

(Don- high user)

Do water users have a responsibility to conserve? Why or why not?

Nineteen out of twenty respondents agreed with the notion of conservation as a responsibility. Their emphasis in explaining why was on what is good for the environment (30%), avoiding waste (25%) and protecting sources (20%). The outlier expressed a strong case throughout the interview for allowing the marketplace and pricing signals to govern behavior:

I think when you are starting to get into morality levels, you are starting to worry. I think it needs to be a dollar value. It's the easiest way, just price it appropriately and take morality out of it.

Don (high user)

Well I think it's the general need to preserve Florida. I think we know we live on an island and salt water intrusion is always a concern. People pumping is not good. We've already seen the destruction of many mangroves. We've seen extreme pumping is altering the

constitution of the environment. I think the public is more and more aware all the time of these things happening.

(Patty – high user)

Is conservation being shared fairly by water users?

Fifteen of twenty respondents (75%) believe conservation is not being shared fairly among water users. This perception is even more pronounced by user groups – nine of ten low users concur while six of ten high users agree. Perceived fairness has long been an issue in the high growth environment of Tampa Bay, where ongoing development approvals clash with the need for water users to conserve at the same time. Waste and greed continue to be cited as a major issue by more than half the respondents, whether in the form of not following watering rules, pouring drinking water on lawns, greedy developers or wealthy abusers. Numerous participants cited the Winter 2010 fiasco where strawberry growers caused sinkholes while pumping groundwater for freeze protection.

No, no, no. These people that have lawns on Davis Island , my son lives on Davis Island, they come around Ybor City and West Tampa and if you're washing your car a little bit or something like that and they'll give you a ticket. My son lives on Davis Island and they can water all they want. It's the government that doesn't take care of it 100%.

(Edward – low user)

There are those who still seem to waste water freely. The fairness of that is hard to determine, again they are willing to pay for it. The issue of irrigation, farming properties and agriculture in Florida, where agriculture can use vast amounts of water without necessarily the best conservation activities, that cuts the levels available for residential communities.

(Joe – high user)

How much water do you use on an average day? Could you use less?

Remarkably, none of the 20 respondents knows how much water they are using daily. Some indicated they could probably figure it out from their water bill, others measure the acceptability of their use level by the monthly cost / bill they pay. Beyond the Alice in Wonderland warning that “if you don’t know where you are going any road will take you there,” this finding reveals a basic fact. Neither the City of Tampa or the State of Florida have a clearly stated water use goal, such as a desired per capita target communicated to water users.

About two-thirds of the total respondents felt they could use less water (with 8 of 10 high users agreeing), a proposition that seems less likely to be realized given the absence of knowledge on current use levels.

I wish I knew what he paid either for gallon or thousand gallons, however they charge, then I'd probably get a better idea how much more I need to cut back. I just know it's 50 dollars or so and it seems like that's kind of high but I don't know where else I can cut back.

(Sabrina – low user)

I don't think I've ever looked at that. I know we don't pay much for water so that must be a good thing.

(Yani – high user)

What barriers limit your ability to conserve water?

A large majority (17 of 20) were adamant that barriers are minimal – some even stressed how easy it is to conserve. Though not widely noted as a barrier, availability of reclaimed water for lawn irrigation was favored by many, including those who saw maintaining the quality of their lawn as a potential barrier. The predominant view was

perhaps best summed up by one respondent who noted *“there are no barriers other than what’s in my head.”*

Do you believe it is painful to have to conserve water?

Again, 17 out of 20 respondents (including all 10 low users) deny the concept, emphasizing once you start it becomes a habit. The only potential pain cited by a small minority is the potential loss of one’s landscaping and need to replace it. This question was included because of the Kempton, et al concept that being environmental is perceived as painful by the public, a finding obviously not supported here. One low users’ (Julie) sardonic comment: “... we’re a spoiled culture.”

...most people are self centered and selfish and they want it without taking care of the conservation and that their own personal behaviors may not support what they spout.

(Richard – high user)

No, I don’t subscribe to the theory that water conservation is painful. It may at times be inconvenient but it certainly is not painful.

(Richard – high user)

Is your water provider doing a good job of promoting water conservation? What message(s) are they using?

Though evenly split overall (9 yes, 9 no and 2 don’t know), satisfaction is inverse among low and high users. Six of ten high users say their utility is doing a good job in this regard, while six of ten low users feel just the opposite. Messages used were not well received in general with emphasis on lawn watering restrictions most prevalent. Several mention bill stuffers but pay little attention to them. One respondent worries going

paperless will have a negative impact. These findings are interesting in light of the Tampa Bay Water survey results that report only one in ten households has participated in a utility offered water conservation program, and that the large majority of those who have not state either they did not know the programs existed or that they were not offered to them.

You know for several years it was conserve, conserve, conserve, we're dry, we're not getting much rain and you know, you hear about that on the news day after day after day and we got a week of rain and all of the sudden all of these restrictions were lifted. Why? It was a week of rain. That did not fix the issue and why not keep them conserving and keep them on that level for as long as you can? You know, I thought it was ridiculous that they cut that after just a week of rain.

(Kelly – low user)

What message would be most likely to cause water users to conserve?

Given their own option to set the message, the clear majority of the joint group was payday or doomsday. The best way to get people's attention was through their pocketbook, or by "scaring the hell out of them". Emphasizing a crisis or disaster (33%) and economic approaches (24%) represented the best options to our informants.

I think the main thing is not because they try to save the world but to try to save their own pay check. That's the main thing. You hear the main thing is love thy neighbor but nobody love the neighbor. You love yourself first. Then you reach out and help your neighbor.

(Busaba – high user)

Well you have to scare people sometimes or threaten them with disaster. ...to really make a big dent, people have to be scared, they have to have a real reason to limit themselves to washing their clothes in an energy efficient machine or that kind of thing.

(Bill – high user)

Does having a strong sense of community contribute to conserving behavior? Why or why not?

Yes – 11 No – 3 Don't Know / not sure – 6. Our informants maintained some confidence in community, noting how it emphasizes people working together. Several indicated we as a society have lost our sense of community. Seven out of ten high users do see community playing a role in conserving behavior. Consider the dichotomy:

I just think if you have a strong sense of community then you're not just doing it for yourself, you're doing it for people that you care about and friends and you don't want them to think poorly of you and we're all in this together and let's all pull together.

Mark (low user)

I don't think we have a strong sense of community anymore. I think if we did, yes it would (help). But I don't think we have it. I think we lost that. That's one thing I've seen we've lost as the communities grow. We used to have it. We don't have it anymore.

Angela (high user)

Should water providers give incentives to achieve conservation? Why or why not?

A full 80% of informants definitely feel incentives are appropriate (including nine out of ten high users). They also believe such incentives should be economic in nature, perhaps reflecting the tough economic times. Results from the Tampa Bay Water survey indicate three of our respondents (2 low users and 1 high user) have participated in a utility-sponsored water conservation program. Although the Tampa Bay Water survey results suggest the age group most likely to take advantage of economic incentives is 18-25, the age of our interview respondents did not include any informants of that age.

What do you believe would be the best incentive to get you to conserve?

Three-quarters of the 20 respondents would prefer an economic incentive, while a solid minority feel conservation is its own reward.

The incentives for me already occur. I'm sorry, I'm not very (laughs) not very informative on this because the incentive to me is that... I'm not taking more than my share, that I'm not (pause) destroying the Earth, that I'm not sucking up all the water for my own use, or being an idiot and not thinking about things, or—sort of an integrity issue.

(Nancy – low user)

Part II. Policy Briefing and Reactions

Next I am going to briefly describe the elements of current water conservation policy in Tampa and the surrounding area, and I'd like your reaction to each.

Conserving Water Through Education includes youth / in-school education programs and materials; targeted adult education via bill stuffers, multi-media presentation (including those that are visitor-focused); and specific attention to outdoor water use such as use of Florida Friendly plant material requiring less water.

What do you think about that approach?

There was strong support (85%) for education in varied forms, though in-school and educating kids was favored over visitor education.

Any time you can teach youth that conservation is necessary, that's a very positive thing because they are our future and their families on down the line—pretty much I think that if the parent has a conservation note to their everyday life, I believe that children are going to kind of follow in that footpath and if you don't they're going to follow the waste footpath...

(Phil – low user)

The first thing that comes to mind is the lack of awareness in Florida, with the citizens of Florida regarding water conservation.

(Julie – low user)

Regulatory Programs that require efficient water use of utilities and their customers. Typically involves a per person limit on water use, prescribes lawn watering restrictions, water saving rate structures, plumbing codes, etc.

What do you think about that approach?

A full 76% supported this policy approach, emphasizing its importance on new construction standards, that lawn care limits are most important and that regulation has the ability to address the uneducated masses. The minority with concerns felt there was already too much government, that we should not be limiting people's right to use the resource and it would be difficult to regulate indoor use.

When we require that everybody who builds a new home and a new subdivision out in the county has turf as a requirement, that, in this day and age is absurd.

(Patty – high user)

Financial Incentives to save water through such means as high efficiency fixture retrofits, public awareness programs, research funding for enhanced technology and behavioral analysis; and landscape / irrigation evaluation, etc. This policy may also include disincentives such as higher water costs to encourage conservation.

What do you think of that approach?

Incentives were favored by 78% of the respondents, though a significant minority were concerned about the equity of disincentives (higher water cost) on the financially limited.

Among those favoring this policy approach, foci included support for research, tax breaks for upgrading to Florida Friendly landscapes, support for tiered rates (especially for mega-mansions) and limiting lawn watering.

I wouldn't raise the price of water because there's too many of us who are not in the income bracket, you know, that could afford a lot higher bills than we already have. You know a lot of retired folks are having a hard time right now and I wouldn't recommend that they raise the price of water

(Elizabeth – low user)

Would you like to add any ideas of your own to enhance water conservation policy and/or behavior?

Expansion of reclaimed water is favored, as is the desire for technological solutions, from the lowly rain barrel to high tech irrigation detectors.

I think they're on the right track in Tampa and Hillsborough County is if they could do more reclaimed water and make the investment in that because that is really a winning proposition.

(David – low user)

THE KEY INFORMANT PERSPECTIVE

Water management experts (key informants) occupy a unique niche in Florida's water supply system. They operate within a one of a kind water law and policy arena. This system has been described more fully in Chapter 2 of this dissertation, but at its heart is the concept of water as a "resource of the state," one that is owned by no one yet belongs to all the people of Florida. This public ownership and the water management district system it engenders have placed a keen emphasis on avoiding waste, protecting the natural environment and assuring adequate supplies for both humans and the ecology of the State. One of the major tools capable of accomplishing all these elements is water conservation.

The approach taken to this challenging task is to use the perspective of typical water users, in this case some are low users of water and some are high users. The cultural models, or explanatory beliefs and values, that guide the decisions people make in their use or saving of water is what we seek. In the previous section, the user groups' responses have been assessed and compared to a standard protocol as a way of getting at similarities and differences among them. The next step is to compare the user results to the views of experts.

Subjecting the experts to the identical protocol has allowed the documenting of expert beliefs and values about water conservation relative to the beliefs and values of lay water users. Identifying the degree of consistency or differences between expert and user responses will enhance our interpretation of cultural models of water conservation in southwest Florida. In sum, the inclusion of the water resources experts in this effort adds to the cultural model framework sought.

An analysis of the interview protocols completed for key informants relative to those of the user groups reveal that citizen respondents share many viewpoints with the experts, but also have areas of divergence. For example, we find consensus on such matters as the importance of water conservation, the existence of conservation values and their sources, and whether it is fair to ask everyone to conserve. Similarly, there is basic agreement on whether users have a responsibility to conserve, and on the lack of barriers or pain associated with conserving. There is also a fairly strong policy concurrence between the groups, whether related to education, regulation or incentives (though the experts, as expected, offer more specific approaches such as a targeted per capita) that will be discussed below in a broader context.

The areas of divergence between the lay informants and experts, especially as it might relate to values and beliefs that would contribute to the identification of cultural models, include: 1) perceptions of fairness in conserving; 2) knowledge about their own water use; 3) the job utilities are doing to promote water conservation; 4) more sophisticated messages to cause water conservation; and 5) a much more bullish view on the role of community. We will return to each of these shortly, but first some overall ideas about the relationship between the two sets of interviews.

The key informants began by defining their terms with a heavy dose of their own terminology. Water conservation is making do with less without compromising quality of life. It is viewed as a key component in sustainability, a term heavily used in modern bureaucracies, and one used by the experts as a synonym for the lay respondents' rationales of source protection and conserving for future generations.

...whether its water conservation or other types of environmental or ecological ethics I think people need to understand the interrelationship between quality of life here and how we use or abuse what's available and the sustainability of the water resource.

(PH – expert)

At the same time, water conservation is viewed by the key informants as a vital source of supply, in fact, the next cheapest unit of water that also protects the environment.

The cheapest, next unit of water is conservation. Only now are people starting to pay the true cost of water. Its been historically something that has been undervalued.

(ND – expert)

The way the experts see it, citizens must exercise their responsibility to conserve, especially given the shared resource concept, as a way of playing their role in sustainability. In turn, these actions avoid waste and help cement the link between quality of life and water resources. As noted in Chapter 2, Florida's water resources are its defining characteristic and are vital to maintaining quality of life for its citizens and visitors.

I really do worry about excessive use of water and just wasting things. Even if we can afford to buy it, I think that there's some sort of moral belief system that should prevent us from being wasteful.

(BG – expert)

The source of conservation values is nearly identical between the groups. Family represents about 50% and exposure to scarcity an additional 30% for both experts and citizen users. The concurrence between the two groups suggests these sources may

represent significant values in a cultural model for water conservation. In terms of why people conserve, the experts lean much more heavily than citizens on the notion of multiple reasons, avoiding reductionism.

Well, people are motivated for different reasons. I think some people are motivated like I am because they think it's morally right and it's better for nature, it's better for the balance of nature. But I think some people are motivated from an economic standpoint. And then some people can really get into a competition of I can do it better than you can. There's different motivating factors.

BG (expert)

An additional overall idea that emerges from the analysis of expert opinion is the significance of connecting water users to the “source” of their water as a way of increasing resource ownership. This idea fits well with the strong position citizens have taken in this analysis regarding source protection. According to our experts, however, this is not an area that water users are well versed in in general:

I still don't think the average person understands where their water comes from. They think it just magically appears – comes out of the faucet. Somebody needs to go trace it back to Pasco County or northwest Hillsborough County wherever the case may be – that there is this cause and effect relationship.

PH (expert)

We noted earlier five areas of divergence between the lay informants and experts, especially as it might relate to values and beliefs that could contribute to the identification of cultural models. First among these was perceptions of fairness in conserving. The user group felt very strongly about this issue, with 75% of all respondents (and 90% of low users) indicating conservation was not being fairly shared, particularly as it related to lawn irrigation. Waste and greed, including wealthy abusers,

accounted for over half the issue, and the recent spate of sinkholes related to groundwater drawdowns for freeze protection for strawberry growers was also cited multiple times. The experts were about evenly split on the fairness issue, a position that comes from their greater knowledge of the specific water conservation requirements placed on such use groups as industry, golf courses and agriculture. It is clear, however, that perception is reality for water users who continue to hear about the exceptions in the media, and must respond regularly to climatic or other reasons to conserve.

In most of the surveys that I've seen related to that, yes, everyone thinks that they're the only one who is being asked to conserve and that someone other group or party is getting some sort of allowances and when you look at it very closely and examine it, many of those opinions are not well informed about what those other groups are doing.

(PM – expert)

The second area of divergence between users and experts is knowledge about one's own water use. A majority of the experts were able to cite specific estimates of their average daily use, a clear prerequisite to potentially reducing such use. Conversely, none of the 20 user group respondents knew how much water they were using on a daily basis. And while 65% of the users (and 8 of 10 high users) admit they could use less, their absence of a baseline to measure progress in this regard calls into question just how serious they are about enhancing their conservation. It should also be noted that the water management district has a regulatory requirement on all utilities in their purview to achieve 150 gallons per capita – a target that could be used as a source of awareness and involvement for water users.

...they've actually gone in and looked at the specific demographics of each community, the makeup and what not and they've kind of tailored these programs, including incentive programs. And when you look at the cost per thousand gallons saved, I think that should be a real motivator for utilities to do all sorts of conservation programs, including incentive programs.

(PH – expert)

The next area is the job utilities are doing to promote water conservation. Water users were evenly split on this, including at the level of high versus low users. Six of ten low users felt the utility was not performing, while six of ten high users felt they were. None of the respondents felt the messages used (mostly reminders of water restrictions) were particularly compelling. The experts on the other hand were nearly unanimous in feeling utilities were doing a good job. They noted comparative billing, seasonal rates, toilet rebates, landscape water audits, use of government television and other techniques currently offered. This dichotomy can almost certainly be explained by the broader knowledge of water managers about such promotion, but we must consider the medium as well as the message. Are water users being reached by their utility? Based on the comments of users, and the results of the TBW survey, this appears to remain an area of marketing failure for the local utility.

The fourth area of divergence between users and experts is the more sophisticated messages offered by the latter to cause water conservation. Given the opportunity to suggest the message(s) that might work, users settled on payday and doomsday, or getting people's attention through their pocketbook or by "scaring the hell out of them". Likely tied to their expertise and experience, key informants suggested the use of multiple approaches or messages to reach users. These could include connecting water use to environmental impacts, relying on conserving hardware to do the work, offering

ways to be efficient in daily use and promoting the significance of our water resources to life. The experts put it well:

I think there are people on one end of the bell curve who are always going to conserve no matter what. I think there are people over here on the other end of the bell curve who are never going to conserve. ...and I think the focus to effect conservation behavior is then in that middle part. Because those are the people, and again, I think they're moving from one end to the other the majority of the time based on what's going on in their life.

PM (expert)

...take advantage of this movement of people going green. It's out there and hopefully it's going to continue to be pushed, and water conservation, the environmental ethic all ought to be wrapped up in it.

(PH – expert)

The final area to be considered is the much more bullish view on the role of community held by the key informants. It is surprising that bureaucratic water managers would reflect a stronger sense of community than water users, but experts are also water users and citizens. Moreover, the water agencies represented by these experts are generally involved in funding and other cooperative programs that emphasize the role community can play in sound resource stewardship (e.g., neighborhood scale education grants, landscape demonstration projects, etc.). So while water users still show some confidence in community, a full 30% of them fear we have lost our sense of community. On the other hand, key informants were unanimous in agreeing that community can contribute to conserving behavior. For them, community is very responsible and satisfying, matches well with a “public resource” such as water, promotes accountability, “glues people together” and promotes a sense of place that can lead to conserving behavior.

I'm a geographer and sense of geography, a sense of place is a really complex topic that, it's a very difficult thing to discern what then leads to behavior. But I think that a sense of place leads to more of a sense of taking care of something and a sense of taking care of something might lead people to be conservation minded. And we have a hard time developing a sense of place here.

(PD – expert)

So I think, going forward, that the conservation community as a whole needs to try to bring more people in to help them frame their ideas and approaches. You have to look at it from a sociological standpoint, you have to look at it from a psychological standpoint, you have to look at it from an economical standpoint and you need to consider all those factors.

(PM – expert)

...summarize by saying specifically in this area that water conservation practitioners as a whole are not maturing their approaches and they're investing heavily in technology, acknowledging the need for behavioral change but not fully embracing and tackling that.

(PM – expert)

SUMMARY

This chapter has attempted to provide the results of the research tools and techniques employed as a way of deciphering what can be learned about water conservation behavior from water users and resource experts. It is about the role culture can play in understanding why people conserve. The success of this effort is based on how well this cultural analysis addresses the important beliefs, values and knowledge domains water conservation triggers, and how similar this sociocultural and environmental knowledge is across differing stakeholder groups. The clear focus has been on a qualitative approach to the research, and allowing informants to speak for themselves.

The final chapter on discussion and conclusions will draw together all aspects of the analysis in attempting to address three specific anthropological issues that have guided all the prior research of this dissertation: *What beliefs and values are most related to conservation behavior? What specific “cultural models” for water conservation can be identified? How can best practices and public policy be enhanced via applied anthropology?*

CHAPTER 5: DISCUSSION AND CONCLUSIONS

INTRODUCTION

This research focused on anthropologically-based cultural models and water conservation values. The results are conflicting, demonstrating under the limited conditions of this work the cultural models may not explain all views on water use. While some differences did appear, these were not necessarily of sufficient explanatory value to distinguish high from low water users. Under different experimental conditions it is possible, as shown below, that a broader sample may elicit cultural models that do reflect water use concerns.

This study has examined cultural models and how they may or may not influence water conservation values. The model that emerged for the study area reflects the priority values of the informants interviewed:

The outline of a cultural model of water conservation for Tampa, Florida reflects family as the source of conservation values and emphasizes avoidance of waste and greed, while protecting existing sources and directly addressing the widespread perception of inequity among water users.

This dissertation set out to answer three key questions addressed in this final chapter in bringing all aspects of the research into an understandable whole:

- 1) What beliefs and values are most related to conservation behavior?
- 2) What specific cultural models for water conservation can be identified?
- 3) How can best practices and public policy be enhanced via applied anthropology?

While the Tampa cultural model above emerged from this study, so have other critical questions about the efficacy of cultural models as a tool to understand water conservation behavior. The balance of this chapter explores these questions by examining the representativeness of the research sample, summarizing what has been discovered from the comparative cultural analysis of three informant groups (low water users, high water users and water management experts), and by reviewing the cultural domains and sub-domains that evolved. Public policy implications and contributions to the anthropological literature are also addressed. The words of informants continue to be used to understand better the values, beliefs and individual mental models espoused, and to test cultural models for water conservation.

CULTURAL MODELS

Cultural models cannot be understood without first defining the application of culture itself. Culture has been described in hundreds of ways and so it is important to limit or bound the concept. Milton's key features of culture relative to environmentalism offer background for what might be included in a water conservation culture:

First, culture exists in people's minds and is expressed through what they say and do. Second, culture consists of perceptions and interpretations. Together, these encompass the full range of emotions, assumptions, values, facts, ideas, norms, theories and so on, through which people make sense of their experience. Third, culture is the mechanism through which human beings interact with their environments.

Milton 1996:66

This approach is significant for sharing an understanding of cultural knowledge that contributes to environmental protection and improvement. The culture of water

conservation, as defined for this dissertation, is the knowledge, experience and values that water users have, share and apply in using water efficiently.

Holland and Quinn (1987) offer the preeminent definition of cultural models, noting they are "...presupposed, taken-for-granted models of the world that are widely shared (although not necessarily to the exclusion of other, alternative models) by the members of a society and that play an enormous role in their understanding of that world and their behavior in it" (1987:4). Kempton et al. (1995) applied this definition to American environmentalism to analyze its components and causes, just as this dissertation did for water conservation in the Tampa Bay area. The aim was to use two central concepts of cognitive anthropology: 1) that people organize their beliefs and values into mental or cultural models; and 2) that the viability of cultural models is related to which beliefs and values are shared across which groups in society (1995:10).

Although this work was undertaken on a considerably smaller scale than Kempton's, it is conceptually consistent. Direct data (the semi-structured interview results) reveal the mental models of individuals, and when widely shared they inform cultural models. As such they represent opportunities to identify fresh approaches to policy and practice in the water conservation arena.

REPRESENTATIVENESS

One question not yet addressed is whether my sample is representative of the City of Tampa as a whole. Or, for that matter, whether it was intended to be. The 20 households selected to participate in the semi-structured interviews on water conservation beliefs and values were drawn from the 204-household Tampa Bay Water Public Opinion Survey results for the City of Tampa. This approach had significant

benefits in terms of the data available to support analyses. The 204-household sample results were determined to be statistically valid for the City by the study author, Decision Strategies Group (Tampa Bay Water 2009). So we can say the 20 household sample was derived from a representative sampling of Tampa's population.

This is not the same, however, as claiming the informants interviewed are representative of the City as a whole. There was less emphasis on trying to make such a small sample broadly representative than on controlling key variables that might affect water use and related attitudes (read beliefs and values). This is discussed more fully in the previous section on Study Methods in the context of controlling key variables to enhance demographic and spatial representation. For example, controlling household size, average monthly water use, homeownership and informant distribution among city zip codes was considered more important than matching income or ages of informants to citywide averages. In essence, this strategy purposely created a homogenous sample with regard to those variables as a way to minimize factors that had the potential to bias informant water use behavior and resulting mental models for water conservation. It was an attempt to make water use levels the key variable to be interpreted in the research.

The question remains, however – how does the 20 household sample compare with basic demographic data for the City of Tampa as a whole? Table 2 offers a limited comparison. It shows that the informants in the dissertation research are generally older, wealthier and more educated than the Tampa population as a whole. There is also a purposeful emphasis on homeownership, with all informants owning their homes. Like other variables, homeownership was controlled to emphasize feedback from those who are responsible for water use and conservation improvements in the household.

Table 2. Comparison of Demographics Among Interview Informants and the City of Tampa

<u>VARIABLE</u>	<u>TAMPA*</u>	<u>INFORMANTS</u>
Gender	Male 49.4%	Male 50%
	Female 50.6%	Female 50%
Median Age	35.6 Years	55.5 Years
Median Household		
Income	\$52,985	\$88,000
Average Household		
Size	2.52	2.35
% HS Grad or Higher	83%	95%
% Bachelors or Higher	31%	55%
Homeownership	57%	100%

*Source: U.S. Census Bureau, 2006-2008 American Community Survey

The age of informants in the interviews (median of 55) was considerably higher than the City's median age of about 36 years. This was something of a residual effect of surveying adult heads of household in the Tampa Bay Water work, as well as the preponderance of retired individuals willing to be interviewed for that survey. Moreover, the Tampa median age from the Census Bureau is based on all ages, including non-adults. As of 2008, those 19 years of age or older make up about 73% of Tampa's total population. If we consider only those over 19, the revised median for the City would be about one-quarter higher or approximately 45 years of age.

In terms of race and ethnic diversity, the sample did not replicate what typifies the City of Tampa. Among the 20 respondents, there were only two Hispanics (one male, one female – 10% of the total sample), and a single Asian female included. This compares to a City population that reflects about 26% African Americans, 22% Hispanic and 3 percent Asian (American Community Survey 2008). In the final analysis, the 20-household sample of informants interviewed cannot be viewed as representative of the City of Tampa as a whole. It bears repeating – this lack of ethnic diversity in the current research was intentional and purposeful, as it limited the variables that might influence responses and allowed for greater control of the research environment. At the same time, however, it suggests the need to consider greater diversity (ethnicity, age and other demographics, etc.) as variables to be more thoroughly tested in future research on cultural models.

INFORMANT DIFFERENCES AND SIMILARITIES

Three sets of informants were utilized in the research effort; high water users, low water users and key informants (or experts). The differences and similarities of these groups, all having responded to an identical protocol, were detailed in Chapter 4. A summary of

those results is offered here to set the stage for a discussion of the domains or patterns discovered, and how they relate to cultural models for water conservation.

The first comparison was the high users group versus the low users group (see Figure 3). This analysis began with the assumption that based on average monthly water use variation (low users average: 4,134 gallons – high users 13,470 gallons) one would expect some differences in water conservation values and beliefs. This assumption was further supported by income, which also varied. Table 3 (A Comparison of Low and High Users – Income vs. Water Use) illustrates the point. In all but one case in the analysis, high income coincided with high water use, and low income linked to low water use.

Assessing the overall comparison of low and high water use groups, the most significant similarities identified were:

- a) a strong desire to protect existing water supply sources;
- b) the family as the source of conservation values;
- c) a perceived lack of fairness in sharing water conservation among users; and
- d) a lack of water use knowledge.

The most significant differences were the previously noted income / water use pattern between the groups, and high users' greater perception of a sense of community as contributing to water conservation efficacy.

Similarities

- Strong consensus (65%) that water conservation means avoiding waste / greed, and protecting existing sources
- Unanimous responses re: water conservation is important; have conservation values; fair for all to conserve; daily water use unknown
- Conserve now for future generations (supports Kempton) and protect sources (65%)
- Source of conservation values: Family @ 55% - Surviving scarcity @ 30%
- A responsibility to conserve (19 of 20) – Why? Good for environment (30%); Avoid waste (25%); Protect sources (20%)
- Large majority (75%) feel conservation not being shared fairly, including 9 of 10 low users – main problem: waste / greed (50%+)
- 17 of 20 see no real barriers, nor find water conservation painful (refutes Kempton re: environmentalism)
- Messages to promote water conservation: “doomsday” (crisis / disaster @ 33%) or “payday” (economic @ 24%)
- 80% support for incentives to achieve water conservation (including 9 of 10 high users) – best incentive is economic
- Solid majorities across the groups for all 3 policy areas

Differences

- Why people conserve – High users offered several non-resource reasons (e.g., marketing, ordinances, media attention) – low users focused on condition / need to sustain resource
- High users – OK to use more if willing to pay
- Low users – Who should be allowed not to conserve?
- Water provider doing good job promoting water conservation? 6 of 10 high users – yes; 6 of 10 low users – no (inconsistent with TBW survey results)
- 7 of 10 high users laud role of sense of community – only 4 of 10 low users do
- Some concern about equity of disincentives (higher water costs) among low users

Figure 3. High Users vs. Low Users – Similarities and Differences

Table 3. A Comparison of Low and High Users – Income vs. Water Use

<u>Low Users</u>		<u>High Users</u>	
INCOME	WATER USE*	INCOME	WATER USE*
N/A	2,762	\$151-200K	18,500
\$100K	1,436	51-75K	8,000
50-75K	1,771	100K	12,724
15-25K	1,408	100K	10,611
76-100K	6,581	76-100K	11,415
75-100K	7,232	200K+	21,740
N/A	4,299	150K+	16,927
51-75K	3,163	N/A	12,502
N/A	7,221	60K	8,360
51-75K	5,466	101-150K	13,923
Average:			
\$69,071	4,134	\$117,944	13,470
*Average gallons per month (Jan. 2007 – Dec. 2009)			

In the final analysis, the initial assumption was not upheld. Similarities between the two groups were far more prevalent than differences. It is suggested here that the Kempton et al. (1995) finding of a cultural consensus for environmentalism may apply to water conservation. In brief, no anti-conservation faction or position led to consistent answers among the interviews conducted. The implication is there may be only one set of culturally agreed upon answers. Unlike gun control, immigration or other contentious issues, there does not appear to be coherent, contrarian alternatives regarding water conservation. All informants had similar cultural values and beliefs in this respect.

A second possibility is that the lack of significant differences between high and low users may be the result of a failure of the cultural model in terms of a social desirability reaction within the sample. This is one of the inherent weaknesses of relying on human cognitive processes as in cultural models – people often say one thing but do another. This is discussed further below.

The second comparison summarized is between the water users (combined high and low groups) and key informants. The initial assumption is that experts would have superior knowledge and information about water resources, their management and use, resulting in significant differences in beliefs and values from the user group. Figure 4 summarizes the differences and similarities, and suggests the assumption is upheld in a limited fashion. Key informants do show a more informed and nuanced set of responses overall to the protocol. The beliefs and values reflected by the key informants, however, are relatively consistent with those of the water users. As a single example, when asked why people conserve water, the users cited numerous individual reasons including the protection of sources (21%), economic reasons (17%), good for the environment (17%)

Similarities

- Unanimous / consensus on importance of water conservation, conservation values and their source, fair to ask all to conserve
- Strong policy concurrence for all areas (education, regulation, incentives)
- Source of water conservation values nearly identical to water users (50% Family and 30% surviving scarcity)
- Coinciding of citizen position on source protection with expert concept of connecting water users with source of supply

Differences

- Perceptions of fairness in conserving – all uses regulated but user perception = reality
- Water use knowledge – baseline for users missing, while water management district has 150 gallon per capita limit in planning and regulation
- Water provider doing good job promoting conservation? Experts near unanimous in approval, but users may not be reached
- Messages to cause water conservation – much more realistic, sophisticated from experts
- Role of the community in water conservation – experts unanimous on positive contribution
- Why people conserve – Emphasis of experts “multiple reasons” – a refutation of reductionism

Figure 4. Water Users vs. Key Informants – Similarities and Differences

and avoiding waste and greed (13%). Conversely, the experts consistently noted that “multiple reasons” (including most of those that the users’ noted) were in play, clearly refuting reductionism in a more complex model of beliefs and values.

The most significant similarities were a nearly identical source of conservation values (50% from family and 30% from surviving scarcity), and strong policy concurrence between the users and key informants. The most significant differences include water use knowledge, the role a sense of community can play in realizing water conservation, and the perception of fairness in sharing the conservation role (which the experts did not see as a major issue).

DOMAINS AND SUB-DOMAINS

As discussed in Chapter 4 on the study results, the discovery of domains and their subcomponents was a significant element in organizing the qualitative data generated throughout this analysis. Use of this approach began with the research questions that guided the work and iteratively focused on sorting, coding and reducing the data to meaningful patterns. Ultimately, the three primary domains and their sub-elements became the vehicle for allowing informants to speak for themselves, as well as the framework for identifying mental and cultural models. Noted below are the three cultural domains and related subdomains that emerged from the research, with a brief description of the most important finding in each domain. A single, representative informant quote is provided for each domain’s priority message to supplement the numerous informant statements previously included.

DOMAIN: Why conserve water?

SUBDOMAINS: Economic reasons
Good for environment
Protect existing sources
For future generations
Avoid waste / greed
Multiple reasons
Mitigate drought
Incentive provided

This domain reflects several primary beliefs about why people conserve water, but the clear priority among informants was to avoid waste and greed. As one informant put it:

...any form of conservation, I am a hundred percent backer of. I think that it's necessary in all facets of life. It's like, waste is a negative thing and it's just not a necessary thing in lots of cases and people just don't even think about it. To them, leaving a tap run or leaving a faucet leak any type of thing like that is just—to me it's close to a sin.

(Phil – low user)

DOMAIN: Sources of conservation values

SUBDOMAINS: Family
Experienced scarcity
Environmental movement
Love of Nature
Education
Sense of community

This domain reflects several informant views about whether they have conservation values, and the source of such values. The majority of informants cited family as implied by the following:

Background of family farm, where you shepherd your resources, because you're going to be on that same piece of land tomorrow.

(Joe – high user)

DOMAIN: Lack of awareness and involvement

SUBDOMAINS: Apathy
Limited knowledge of water use
Low water cost
Painful to conserve
Lost sense of community
Perceived lack of fairness in sharing conservation
Poor job by utility promoting conservation

The most compelling subdomain for informants was a perceived lack of fairness in sharing the responsibility to conserve. Or as angrily expressed by one informant:

You can go to the wealthier side of town and see the sprinklers going in the rain. And they probably don't need it. They could care less. It's just always going to be there for them. So I don't think its done fairly, no.

(Carol – high user)

CONCLUSIONS

Providing conclusions in this research must ultimately return to the three basic issues that have guided the overall effort: beliefs and values most related to conservation behavior; cultural models for water conservation; and enhancement of best practices and public policy via applied anthropology.

In terms of beliefs and values that informants reflected in their involvement in the research, several key points can be identified. All beliefs and values noted here reflect in excess of a majority opinion among the water use informants. First and foremost is the need to avoid waste and greed in the use of water, whether in one's day to day functions or in such societal choices as standards for new development or lawn watering restrictions.

A second set of beliefs and values that emerged was the need to protect existing water supply sources, both for current benefits and to save something for generations to come. A third set of values revolves around the perception of fairness among water users. Both the archival research (past opinion surveys, media coverage) and the semi-structured interviews (with 75% of informants agreeing) indicate that people do not feel that conservation is being shared fairly by water users. This view is closely linked to the waste and greed value recognized in the research, and applies to those watering their lawns excessively as well as water use by other sectors (agriculture, golf courses, businesses, etc.). Informants feel strongly the rules are for everybody but are not being enforced accordingly. The clear danger of this perception is that it can be used as a rationale for non-conserving behavior by those who would otherwise adhere to the rules.

Two final shared beliefs and values were put forward by the informants. A significant majority of all informants (including the experts) believe that existing policy areas of education, regulation and incentives should be used to achieve water conservation. Finally, the predominant role of family as the source of conservation values was strongly supported. Each of these findings may have future policy implications.

The Tampa cultural model that opened this chapter resulted from assimilation of informant beliefs and values identified in qualitative analysis. Following the Kempton et al. (1995) view, because models identified in this research emerged unsolicited in the course of semi-structured interviews they represent the culture's conceptual basis for water conservation. Identification of such models is particularly important because they become the filter through which cognitive assimilation of new environmental messages occur (Kempton, et al. 1995). The small sample size in this dissertation research suggests what has been discovered is an outline of a model based on the beliefs and values noted above, as well as identification of fertile ground for further research. The most powerful factors making up a cultural model for water conservation in Tampa, Florida are family as a source of conservation values, emphasizing avoidance of waste while protecting existing sources and directly addressing the widespread perception of inequity among water users.

The lack of significant differences between the high and low water use groups from the interview process cannot be ignored. Water users espousing virtually the same support and rationale for conserving water while one uses 20,000 gallons a month and the other is using 2,000 gallons a month suggests a failure of the cultural model in the present research. This may be the result of informants responding to social desirability (saying what they believe we want to hear), it could be a case of finding a cultural consensus for

water conservation like Kempton, et al. did for environmentalism, or it could be a result of minimizing the diversity of informants. In any case, what has been found is a disconnect between perception and behavior, the replacement by some informants of their actual water use with their perceived water use. These findings are not unusual, as noted by Holland and Quinn, anthropologists observe people do not always do what would seem to be entailed by the cultural beliefs they enunciate (1987:5). The work of Robbins and Sharp (2003); Casagrande et al. (2007) and Larson et al. (2009) also support water use behavior in urban landscapes that is inconsistent with what water users know is prudent use. What is clearly needed are more diverse studies to determine if there is a greater connection between cultural models and behavior.

So if the beliefs and values are so similar, what could explain the significant difference in water use? It will be necessary either to improve the application of cultural models, perhaps through better protocols or stronger connection to quantitative analysis, or incorporation of other approaches such as the socioeconomic model that relies on structural variables like economic costs and regulation. A greater emphasis on asking about behavior, as opposed to just attitudes, might also be helpful. This will involve continuing research beyond this dissertation as described below.

The research findings can also be assessed relative to the three cultural models Kempton et al. (1995) uncovered for environmentalism. The first general cultural model viewed nature as a limited resource upon which humans must rely for health and sustenance. This model was strongly supported in terms of responses from my research about drought, the distinct possibility that Tampa and Florida could one day run out of drinking water despite apparent plentitude, growing impacts on water quality with

attendant effects on nature (e.g., the Hillsborough River, the Everglades) and the strong emphasis on protecting existing supplies.

Kempton's second model was of nature as balanced and interdependent – unpredictable, capable of chain reactions if man interferes too much. This model was also supported with informants citing the recent freeze protection fiasco for strawberry growers that resulted in sinkholes causing damage to public and private property, complaints about over-development and flooding caused by allowing development in, and destruction of, wetlands.

The third model reflected the economic devaluation of nature, human separation from nature (leading to a failure to appreciate it), and idealization of environmentalism of “primitive” people. This model was only partially supported by our results in terms of economic devaluation. Numerous informants emphasized the under-valuing of water, with its low cost resulting in overuse and other abuses.

In summary, my research found that cultural models for water conservation: 1) exist and are context-specific; 2) have definite barriers to matching the beliefs and values of water users with their behavior (e.g. strong conservation values but high use, desire to conserve but a total lack of knowledge on how much water used); and 3) high and low water users share many similar beliefs and values. These results can be translated to both policy implications and how we might realize the anthropological difference.

Public Policy Enhancement

The water conservation family, if you will, hasn't fully tackled the need to create behavioral change. I think they've tackled water conservation through technology and we've talked about needing to create behavioral change but I don't think we have fully tackled it and I think I know why. I think it's because it's tough to do. It's tough to do, it's tough to measure and it's like a twenty-year commitment. And most of the utilities and

most of the governments involved work on an annual budget, very unwilling to commit to a twenty-year project. I also think that many of the people involved truly don't have an understanding of how people adopt new technology and new practices and new behaviors. I don't think they have an understanding of the research that shows how that progresses and what's involved and I see them frequently talking to the wrong audiences, or using the wrong media.

(PM – expert)

This research has used a qualitative data approach to achieve a better understanding of the water conservation policy and practice conditions extant in a single public water utility, the City of Tampa Water Department, through an anthropological lens. This understanding has focused on the perspectives of water users, and to a lesser extent on the views of key informants in the water management field. This approach is valuable because it surfaces policy implications from both what water use informants do or know, and what they do not. Moreover, people use their values and cultural models in deciding which environmental policies they support (Kempton et al. 1995). A good example with policy implications is knowledge of water use.

Results from the semi-structured interviewing process indicate that not one of the 20 households queried knew how much water they used on an average day. This was all the more surprising when 65% of those households indicated they could use less water, an intention that without baseline metric means nothing. From a policy standpoint, it is clear the utility must overcome the lack of connection users have with the resource. This could be accomplished technologically by providing water users with real-time, in-home meters similar to those currently available for electricity usage. Simplification of water bills with a focus on information users need to conserve would also be advisable.

This could logically be extended to recognition and protection of the natural resource base the water supply emanates from, in this case, the Hillsborough River. This source knowledge could then be coupled with a goal or target for water conservation (say 90 gallons per person or less), a missing element in most water utilities in the Tampa Bay area. Any method or policy that makes users more aware of their own use levels (and associated impacts on water sources) will be beneficial to water conservation behavior in the long run.

While the Southwest Florida Water Management District has a requirement for water supply utilities to achieve 150 gallons per person per day, this use level has already been surpassed by local utilities such as Tampa, St. Petersburg, Pinellas and Hillsborough counties, and should be revisited for potential further savings. Part of any process aimed at adjusting this requirement should be involvement of a broad-based stakeholder group addressing the preferred level of water conservation to be achieved.

Another policy implication, addressed in the passage that opened this section, is the behavioral research opportunity that exists for social marketing - defined here as "...the systematic application of marketing, along with other concepts and techniques, to achieve specific behavioral goals for a social good" (National Social Marketing Centre 2006). This will require thinking long-term about changing public perceptions regarding the value of the resource. It can be seen as an investment in creating stewardship, a necessary step to identifying barriers and changing behavior. One viable model for replication in the Tampa area is Community-Based Social Marketing (CBSM).

CBSM draws heavily from social psychology and operates on the premise that promoting behavior change is usually most effective when it is carried out at the community level in direct contact with people. It addresses the critical question of why

some people adopt sustainable activities like water conservation and others do not, suggesting three explanations: 1) people do not know about the activity or its benefits; 2) people know about the activity but perceive significant difficulties or barriers associated with it; and 3) people may feel there are no barriers but believe they benefit most from continuing their present behavior. This idea of benefits and barriers is highly specific to communities and cultures, and requires careful investigation. The payoff can be behavioral change if three key ideas are considered. First, people will naturally gravitate to actions that have high benefits and few barriers. Second, perceived barriers and benefits vary dramatically among individuals, and third, behavior competes with behavior (i.e. there are many choices between behaviors and adopting one frequently means rejecting another) (McKenzie-Mohr and Smith 1999). Finally, Community-Based Social Marketing eschews the idea that economic self-interest is the motivation for behavioral change, noting such reductionism overlooks "...the rich mixture of cultural practices, social interactions, and human feelings that influence the behavior of individuals, social groups, and institutions" (McKenzie-Mohr and Smith 1999:13).

Summarizing, the applied anthropology-based public policy implications evident from the current research include:

- Conducting and committing to long-range behavioral research in water conservation, e.g. as has been successfully done with anti-smoking and drunk driving campaigns.
- Applying more targeted use of social marketing techniques to realize the public good of water conservation, including, for example, working with homeowners associations that require year-round green lawns, continuing to incentivize and

implement Florida Friendly landscapes, and adjusting rate structures to reflect a higher cost for lawn and landscape watering practices.

- Identifying and utilizing specific messages and education that provide more information to users on their use levels, the source of their water and natural system impacts of water use.
- Recognizing and responding to the diverse “publics” among water users in both policy and practice (e.g. by age groups, ethnic groups and socioeconomic strata).
- Committing to the use of technology applications such as point in time metering now employed for electricity use to raise consumer awareness and promote successful water conservation.

The Anthropological Difference

Referring to the anthropological difference implies recognition that applied anthropology brings a unique methodology and set of skills to research in human social issues. Such work, and our approach to it, must be holistic, cultural and applied. The current research has focused on the anthropology of water conservation, and one primary qualitative research tool, the cultural model, in an attempt to enhance policy and practice. The cultural model identified for Tampa Florida has been beneficial in identifying shared cultural beliefs and values for the homogenous group used in the survey, and could inform policy directions, but the model may have limitations when applied to a broader population. Further research should now be conducted to determine the role of cultural models in other more diverse populations.

One lesson from this research is that the cultural model approach can and must be improved in future research in terms of the disconnect between what some water users

say and how they act. An important part of this future research is a focus on the cultural uses of water of the group being studied. For example, having a refined understanding of lawn watering as a social norm may better explain water use levels in a specific cultural setting. Another set of values to be explored more fully relate to economics or the income factor and how it affects water use, particularly at higher levels where excessive use is likely for non-essential purposes. Fortunately, the cultural model is designed for this type of in-depth, qualitative data collection, and can be combined with other, quantitative techniques to enhance reliability.

So, while we have focused on the 40 percent of informants in the sample (i.e. eight of ten high users) who had water use behavior that did not match their espoused beliefs and values for water conservation, it is significant to note the 60 percent whose behavior did match their rhetoric. All ten low users and two marginally high water users had three years of average monthly water use that was near or below the threshold of 8,000 gallons / month used as the dividing line between high and low use. In fact, low users had a monthly average water use of 4,134 gallons for the period from January 2007 through December 2009, a modest quantity that equates to about 66 gallons per person per day, and that was consistent with their stated water conservation values.

This suggests the cultural model tool remains a viable option for testing the connection of informant beliefs and values with related behavior. The eight high users who exhibited contradictory results between what they said and did averaged about 14,800 gallons / month over the same period while apparently viewing themselves as water conserving citizens. My research suggests, however, it is possible to refine the protocol and methodology for cultural modeling to identify ways of coalescing behavior and stated

beliefs and values. This will take additional research like that noted below, with a specific emphasis on quantitative methods more closely tied to the qualitative results.

The current research provides two primary contributions to the anthropological literature, each of which also implies the need for continuing research. First, it advances qualitative research in general, and cultural models in particular, as useful tools in understanding water conservation (and potentially other natural resource usage) behavior. Second, it allows us to recognize the importance of turning our gaze inward to our own culture / world as it relates to the example we are setting through profligate resource use, and the resulting need for greater policy involvement by anthropologists.

Ultimately, the theory and methods of applied anthropology, including cultural models, have much to contribute to achieving optimal water conservation. Haenn and Casagrande (2007), for example, have noted the increasing role anthropologists are playing as cultural brokers who must navigate public advocacy, multidisciplinary research and collaborations with environmental managers, natural resource exploiters, or government agencies. Additional research opportunities should be ample, and will benefit greatly from the holistic, applied and cultural aspects of the field. This dissertation is intended to serve as an example of those possibilities and to set the stage for continuing research.

Future research direction, reflecting the power of the anthropological perspective should include:

- Continued refinement of cultural models, particularly as relates to overcoming social desirability impacts.

- Further studies utilizing the methodological approach of Kempton et al. (1995) specific to the water use culture of Tampa and the southwest Florida region. While the present research generally followed the Kempton model, the availability of resources prevented full use of the methodology.
- Continuing use of qualitative research results to enhance quantitative studies like those conducted for Tampa Bay Water. Ethnographic and other qualitative research methods complement quantitative approaches by adding depth to the results (from case studies to the voices of informants).
- Exploring culturally appropriate messaging and education through comparisons of beliefs and values of diverse sub-cultures such as youth, Hispanics and others to enhance water conservation. This is particularly important in Florida given its in-migration patterns.
- Further integration of cultural models for ongoing sustainability research initiatives. Kempton et al. (1995) have speculated on future concepts and cultural models that might emerge, including long-term sustainability, common assets of humanity, five-hundred year time scales, intergenerational responsibility, and humanity's global interdependency.

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APPENDICES

Appendix A

Tampa Bay Water Residential Water Use Survey –Tampa

Hello, my name is _____, and I'm calling on behalf of Tampa Bay Water, the organization that brings water to the Tampa Bay area. May I speak to the head of your household please?

We are contacting Bay area residents to get their opinions on water conservation and water issues that affect us all. You have been selected at part of a scientific sample of residents whose opinions will be used to help Tampa Bay Water serve the area's water needs better. Your participation is **completely voluntary** and there will be no problems should you decide not to participate. This survey will only last 7 minutes and will be very helpful to Tampa Bay Water.

Let me begin by confirming that you are a Tampa Bay area resident at least 18 years of age or older. Is that correct?

YES (Continue)	NO (Ask for the an adult)
	39% 62%
Gender [DO NOT ASK]	MALE FEMALE

1. Have you ever participated in a conservation program sponsored by your water utility or local extension office in this area?

- 10%** a. Yes (**Continue**)
- 85%** b. No (**Skip to #3**)
- 5%** c. Don't Know (**Skip to #5**)

2. If yes, what type(s) of programs were they? (**Indicate all that apply DO NOT READ ANSWERS!**)

- 10%** a. Cistern/rain barrel development
- 43%** b. Reclaimed water
- 0%** c. Irrigation system evaluations
- 0%** d. Landscape/Florida Friendly Yard evaluations
- 10%** e. Retrofit kit giveaways

- 0% *f. Rebate program for high efficiency clothes washers*
- 0% *g. Rebate for rain shutoff devices*
- 24% *h. Rebate program for low flow or water efficient toilets*
- 0% *i. Horticulture/landscape education or design*
- 14% *j. Other*

3. If no: Why have you never participated in a conservation program? **(Indicate all that apply DO NOT READ ANSWERS!)**

- 47% *a. Didn't know program existed*
- 37% *b. Programs were not offered*
- 2% *c. Don't think it's important*
- 1% *d. Too much trouble*
- 1% *e. Did not know who to contact*
- 0% *f. Didn't qualify*
- 0% *g. Out of pocket cost was too high*
- 12% *h. Other/Don't Know*

4. What was your **primary** reason for participating in the utility sponsored conservation program? **(DO NOT READ ANSWERS!)**

- 24% *a. Good for the environment*
- 19% *b. It was free*
- 10% *c. It will save me money*
- 0% *d. It will save the government money*
- 33% *e. Protects existing water supplies*
- 0% *f. Defers the need for future supplies*
- 14% *g. Other*

5. Are you familiar with the term “Florida Friendly Landscape”?

60% Yes (if yes proceed to Q6)

41% No (if no, define first as follows)

A Florida-friendly landscape is one where the right plants are in the right place, watering is done efficiently, fertilizing is done appropriately, mulch is used, and its pleasing to look at.

6. Please tell me whether you would be very willing, moderately willing, slightly willing, or not at all willing to participate in a program that offers cash or financial incentives for planting Florida friendly landscapes. **M=2.72**

44%	26%	20%	10%
<i>Very willing</i>	<i>Moderately willing</i>	<i>Slightly willing</i>	<i>Not at all willing</i>

Now, I would like to read you a list of other potential conservation programs that may be offered by your water utility. For each program, please tell me whether you would be very willing, moderately willing, slightly willing, or not at all willing to participate.

7. Cash or financial incentives for replacing toilets with water efficient toilets. **M=2.46**

22%	14%	5%	23%	37%
<i>Very willing</i>	<i>Moderately willing</i>	<i>Slightly willing</i>	<i>Not at all willing</i>	<i>Have</i>

8. Cash or financial incentives for installing irrigation shutoff devices (such as rain or soil moisture sensors). **M=3.07**

19%	7%	7%	51%	16%
<i>Very willing</i>	<i>Moderately willing</i>	<i>Slightly willing</i>	<i>Not at all willing</i>	<i>Have</i>

9. Cash or financial incentives for replacing clothes washers with high efficiency clothes washers. **M=2.64**

22%	14%	7%	31%	26%
<i>Very willing</i>	<i>Moderately willing</i>	<i>Slightly willing</i>	<i>Not at all willing</i>	<i>Have</i>

10. Cash or financial incentives for putting in shallow irrigation wells. **M=3.41**

13%	4%	10%	70%	2%
<i>Very willing</i>	<i>Moderately willing</i>	<i>Slightly willing</i>	<i>Not at all willing</i>	<i>Have</i>

11. Evaluation and technical assistance for improving the efficiency of your existing irrigation system or practices. **M=3.19**

18%	9%	7%	63%	3%
<i>Very willing</i>	<i>Moderately willing</i>	<i>Slightly willing</i>	<i>Not at all willing</i>	<i>Have</i>

Water End Use Profile--We want to ask you some questions concerning your indoor water usage pertaining to water fixtures and appliances.

12. How many toilets do you have in your home?

21% a. 1

50% b. 2

23% c. 3

6% d. 4 or more

13. Since 1994, have you replaced any of your toilets?

67%

YES (Continue)

33%

NO (SKIP TO # 15)

14. If yes, how many? **(DO NOT READ ANSWERS!)**

39% a. 1

46% b. 2

11% c. 3

4% d. 4 or more

15. How many showers do you have in your home? **(DO NOT READ ANSWERS!)**

3% a. 0 **(SKIP to #19)**

26% b. 1

53% c. 2

16% d. 3

2% e. 4 or more

16. How many of your showers have multiple showerheads? **(DO NOT READ ANSWERS!)**

75% a. 0

15% b. 1

9% c. 2

0% d. 3

0% e. 4 or more

17. Since 1994, have you replaced any of your showerheads?

81%	19%
YES (CONTINUE)	NO (SKIP TO #19)

18. If yes, how many? (DO NOT READ ANSWERS!)

0%	a. 0
38%	b. 1
46%	c. 2
14%	d. 3
2%	e. 4 or more

19. Do you have a washing machine in your home?

97%	3%
YES (CONTINUE)	NO (SKIP TO # 22)

20. If yes, how old is it?

14%	34%	26%	16%	11%
< 1 year	1-3 years	4-7 years	8-11 years	> 11 years

21. If yes, is your washing machine a top-loading washer or a washing machine that loads from the front?

72%	28%
TOP LOADER	FRONT LOADER

22. Do you have a dishwasher in your home?

70%	30%
YES (CONTINUE)	NO (SKIP TO #24)

23. If yes, how old is it?

11%	29%	29%	20%	11%
< 1 year	1-3 years	4-7 years	8-11 years	> 11 years

We want to ask you some questions about your outdoor water using fixtures and practices.

24. Who is responsible for maintaining your yard? **(DO NOT READ ANSWERS!)**

- 73%** a. You or another family member
- 2%** b. Neighbor
- 22%** c. Professional lawn service
- 1%** d. Other _____
- 2%** e. Don't have a yard **(Skip to 35)**

25. Please describe whether your yard is:

- 44%** a. Mostly grass (70% or more grass)
- 43%** b. Mixture of grass and plant beds (shrubs, trees, flowers, and other ground cover)
- 14%** c. Mostly plant beds with limited grass (30% or less in grass)
- 0%** d. Don't know

26. How many days per month do you water your lawn during the dry season (October-May)? **(DO NOT READ ANSWERS!)**

40% a. Don't water lawn (**Skip to 35**)

22% b. 1-3 days

36% c. 4-6 days

2% d. 7-9 days

0% e. 10-12 days

1% f. More than 12 days

27. How many days per month do you usually water your lawn during the summer or wet season (June-September)? **(DO NOT READ ANSWERS!)**

69% a. Don't water lawn

18% b. 1-3 days

12% c. 4-6 days

1% d. 7-9 days

0% e. 10-12 days

0% f. More than 12 days

28. What kind of water do you use to irrigate?

71% a. Tap water

15% b. Reclaimed

11% c. Shallow Well

3% d. Don't know

29. Do you have an in-ground irrigation or sprinkling system to water your yard?

69%

YES (CONTINUE)

31%

NO (SKIP TO #32)

30. Who maintains the timer on your irrigation system?

83% a. Self or someone living in the home

15% b. A professional lawn service

2% c. A friend or neighbor

31. Do you have a rain sensor that automatically turns the system off when it rains? (generally located on the gutter or eave of the house)

53%

YES

47%

NO

32. If you do not use an in-ground irrigation system, how do you water your yard?

58% a. Hand watering using hose

42% b. Sprinkler attached to hose

0% c. Other _____

0% d. I don't water

33. How willing would you be to spend money to improve the efficiency of your irrigation system if the reduction in your water bills offset the cost of (or paid you back for) these improvements. **M=3.10**

22%

Very willing

10%

Moderately willing

6%

Slightly willing

63%

Not at all willing

34. How long would you be willing to wait to recover these costs? **(DO NOT READ ANSWERS!)**

- 47% a. 1 year
- 27% b. 2 years
- 18% c. 3 years
- 0% d. 4 years
- 2% e. 5 year or more
- 7% f. Don't know

35. Do you have a swimming pool?

25%	75%
YES (CONTINUE)	NO (SKIP TO #38)

36. Is your swimming pool above-ground or in-ground

2%	98%
ABOVE GROUND	In-GROUND

37. Do you use a solar cover?

12%	88%
YES	NO

38. Do you have a hot-tub or outdoor spa?

9%	91%
YES	NO

39. Do you have any other outdoor water features, such as a fountain or water fall?

9%	91%
YES	NO

STATISTICAL PURPOSES ONLY

40. Do you rent or own your home?

92% a. Own
6% b. Rent
2% c. Don't Know

41. Do you belong to a Home Owner's Association?

30% a. Yes
66% b. No
4% c. Don't Know

42. Including yourself, how many people live in your household most of the year?
(DO NOT READ ANSWERS!)

20% a. Just me
45% b. 2
17% c. 3
13% d. 4
4% e. 5 or more

43. Which of the following best represents your age category? **(DO NOT READ ANSWERS!)**

- 1% a. 18-25
- 4% b. 26-32
- 13% c. 33-42
- 29% d. 43-55
- 24% e. 56-64
- 17% f. 65-74
- 13% g. Over 75
- 0% h. No answer

44. How long have you lived in Florida? **(DO NOT READ ANSWERS!)**

- 1% a. Less than 1 year
- 3% b. 1-3 years
- 6% c. 4-7 years
- 7% d. 8-12 years
- 8% e. 13-18 years
- 75% f. Over 18 years

45. I am going to read you several household income categories, please tell me which one best represents your household income.

- 8% a. Less than \$15,000
- 7% b. \$15,000 to \$25,000
- 8% c. \$26,000 to \$50,000
- 11% d. \$51,000 to \$75,000
- 10% e. \$76,000 to \$100,000
- 6% f. \$101,000 to \$150,000
- 5% g. \$151,000 to \$200,000
- 2% h. Greater than \$200,000
- 42% i. Refused to answer

On behalf of Tampa Bay Water, thank you very much for participating in this survey

Appendix B

Semi-Structured Interview Protocol

Towards Understanding Water Conservation Behavior In Southwest Florida: The Role Of Cultural Models

May 2010

Introduction and Permission

My name is Terry Johnson, and I am doing a study about people's opinions on water conservation. I am from the University of South Florida. Thank you for agreeing to be interviewed. Most people say they find the interview interesting. It typically takes about 45 minutes, but you can choose to stop at any time.

This is a study of people's perceptions of water conservation. It is primarily meant to find out **why** people conserve rather than **how** they do. I am interviewing professionals dealing with this topic as well as ordinary citizens. The questions concern your own personal opinions, and there are no right or wrong answers.

This survey is anonymous, and your answers will be held in confidence. Please do not mention your name during the interview so we can keep the results anonymous. It is faster if I tape, because I don't have to write everything down as I go. Do you mind if I use the tape recorder?

Part I. Current Model of Beliefs and Values

I.A What's the first thing that comes to mind when you hear the words "water conservation?"

I.B Would you say that conserving water is important? Why or why not?

- I.C Do you personally have conservation values (values = people's guiding principles of what is moral, desirable or just)? How would you describe those values relative to water use?
- I.D Why do you think people conserve water? Why do you (if so)?
- I.E Is it fair to ask everyone to conserve?
- I.F Do water users have a responsibility to conserve? Why or why not?
- I.G Is conservation being shared fairly by water users?
- I.H How much water do you use on an average day? Could you use less?
- I.I What barriers limit your ability to conserve water?
- I.J Do you believe it is painful to have to conserve water?
- I.K Is your water provider doing a good job of promoting water conservation? What message(s) are they using?
- I.L What message would be most likely to cause water users to conserve?
- I.M Does having a strong sense of community contribute to conserving behavior? Why or why not?
- I.N Should water providers give incentives to achieve conservation? Why or why not?
- I.O What do you believe would be the best incentive to get you to conserve?

Part II. Policy Briefing and Reactions

Next I am going to briefly describe the elements of current water conservation policy in Tampa and the surrounding area, and I'd like your reaction to each.

II.A **Conserving Water Through Education** includes youth / in-school education programs and materials; targeted adult education via bill stuffers, multi-media presentation (including those that are visitor-focused); and specific attention to outdoor water use such as use of Florida Friendly plant material requiring less water.

What do you think about that approach?

II.B **Regulatory Programs** that require efficient water use of utilities and their customers. Typically involves a per person limit on water use, prescribes lawn watering restrictions, water saving rate structures, plumbing codes, etc.

What do you think about that approach?

II.C **Financial Incentives** to save water through such means as high efficiency fixture retrofits, public awareness programs, research funding for enhanced technology and behavioral analysis; and landscape / irrigation evaluation, etc. This policy may also include disincentives such as higher water costs to encourage conservation.

What do you think of that approach?

II.D Would you like to add any ideas of your own to enhance water conservation policy and/or behavior?

Part III. Background Information

Finally, I'd like to ask some background questions so we understand who is in our sample. If there are any questions you would prefer not to answer, just say so.

- How many children; age of oldest and youngest
- Last year of school completed (if > 12years: What did you study?)
- Occupation

Interviewer to silently record:

- M/F
- Race / Ethnicity
- How sampled
- Date, time, length of interview
- Where interview done
- Demeanor, dress, other observations (e.g. lawn size or other water use factors)

ABOUT THE AUTHOR

B. Terry Johnson has worked for over 30 years in the urban planning arena at the local, regional and statewide level. His educational background includes a B.A. in Social Sciences from Ohio University, a Masters in Urban / Regional Planning from the University of Arizona (with a specialization in environmental planning) and his PhD in Applied Anthropology at the University of South Florida in Tampa.

During his career, Johnson has worked as a planner and supervisor for the Tampa Bureau of City Planning, Special Services Manager for the Tampa Parks Department, Director of Planning for Design Consortium, Ltd. (a private design firm), Planning Manager for the Southwest Florida Water Management District and as a faculty member of the Florida Center for Community Design and Research (Florida Center) at the University of South Florida.

As Faculty at the Florida Center, Johnson's work has focused on the urban environment, including the use of information technology and other innovative approaches to assist citizens and local governments in making informed decisions related to planning and growth management. His areas of specialization include water conservation, local comprehensive planning, strategic planning, public and stakeholder involvement, environmental and neighborhood planning, performance measurement and community indicators. Since coming to the Florida Center, Mr. Johnson has been Program Coordinator for the Community Atlas initiative. The Community Atlas (www.hillsborough.communityatlas.org) is a dynamic tool that makes it easy for citizens to find and use data and information specific to their community.