Dissertation Proposal

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Chapter 1 Introduction

The numerous issues which confront this world, and perhaps the universe, are often addressed with the mindset of satisfying the needs of the majority. Such a practice is taking the maxim that the needs of the many outweigh the needs of the few, or the one, to an extreme. This has resulted in too many cases where the minority then suffers loss.

Phenomenon:

The regularly occurring droughts of the Southwest United States have an impact on virtually all citizens. Yet it has an elevated impact on a select, minority community. The small agricultural entities operated by families, which generally run on very tight margins, are in a perilous situation if the amount of water they are allotted is reduced.

It can easily be seen that if a lemon or avocado farmer changes watering volume of their respective crops, that the yield from their orchards will be directly proportional to that change.

I grew up in Ojai, California then joined the US Navy which took me to the other side of the world but left me in Virginia. When I finally came back to California I settled in Goleta, a town in Santa Barbara County on the bottom end of the California Central Coast. The area is known for being well suited for agricultural pursuits. However, the year I moved there (2012), a major drought was beginning to impact the area.

As I drove passed the many orchards on my way to and from school, work, shopping or play, I noticed that the various trees were slowly changing color from a luscious green to a brownish hue. In some cases, the proprietors eventually had to cut down their orchards and burn the dead trees.

The town of Goleta is not a large area and the farms and ranches there are small in comparison to those operated by corporate conglomerates in other areas. As I considered the drought and the readily observable local impacts I felt that the effect on my family, as a local residential water customer, was negligible. Even if I had a lawn, I would not have had a problem with it turning brown because of watering restrictions. At the worst the family cars might not be washed as regularly as one my hope

resulting in the paint finish being damaged. Such a loss would pale in comparison to the family means of subsistence being impaired.

It occurred to me that what would be a minor inconvenience to me and my fellow residential water customers could be the death knell to a small family operated farming operation. On top of this would also be the effect on the vendors who provide goods and services to the farming operation as well as the workers who would not have jobs to support their families. In short it appeared that there might be a social injustice underway.

Though the academic community is anticipated to be the immediate recipient of this work it would have a greater impact if presented to those which the power to remedy the situation. In paradigm where the power is in the people, the audience would then be the general population but particularly the voting population.

Though we have had a significant improvement because of storms in early 2017, the drought condition persists. Currently the Goleta Water District GWD is receiving about 40% for its water from Lake Cachuma. This has been the case since about April 1, 2017 (Brooke A. Welch, Senior Water Resources Analyst, GWD, personal communication, June 29, 2017).

The purpose of the research is to determine the real-life consequences of the drought and the water policies on the small-scale crop farmers, particularly those which are family owned and operated.

Research Question:

What stories do small-scale family farmers tell of the challenges, policies, and issues during Goleta's current water shortage (2012-2018).

How would the small-scale farmer describe the impact of applicable policies, as implemented by the Goleta Water District Board, which deal with Goleta's water shortage challenges?

Chapter 2 Literature Review

Previous Research and Writing

Abstract

This study provides evidence and analyses to address the current water crisis in Goleta, California. The data collection is derived from the policies defined by the various levels of government brought to bear on the provision of water to the people of Goleta. The article discusses specific policies and investments which are expressed in budgetary documentation via accounting records, in an attempt to quantify the impact.

Before there were people, there was only water; Sierra Miwok creation story (Fagan, 2003, p. 4). The mention of water as a precursor to life agrees with the Biblical text; "…the Spirit of God moved upon the face of the waters" (Genesis 1:2). These two cultures, half a world away from each other, recognized the value and importance of water.

This study provides high-level analyses that follows the paths taken by humanity from a precarious existence, scrounging in the dirt for whatever may sustain for the moment, to the small-scale crop farmers (USDA-ERS, 2013) of Goleta, California, in their struggle to manage their operations during the current water crisis.

Introduction

It would seem a foregone conclusion that virtually every living thing on earth must have water to live (Woolf, 2015, p. 259). Water is such an important component to sustaining human life that the United Nations has declared it a human right to have access to safe drinking water and sanitation (UN, 2010). Gleick (1996) reports that this same conclusion had been arrived at as early as 1977, when the Mar del Plata conference stated that "...all peoples, whatever stage of development and their social and economic conditions, have the right to have access to water in quantities and of a quality equal to their basic needs". Gleick (1996) further states that the 1992 Earth Summit in Rio De Janeiro strongly reaffirmed this position expanding it to include ecological water needs. Gleick (1996) recommended that a standard of 50 liters per person per day be adopted by all levels of government. This amount would vary depending the factors such as climate or culture.

Though there is an abundance of water on the planet, there are many who do not have a sufficient supply, or their source is at best questionable and at worst toxic (Gleick 1999). The reasons for this are many, but if we are to survive, we must overcome them to the extent that there is at least the bare minimum to sustain life.

Since 1944 the authorities in Goleta, California have been aware of the prospect of an issue with providing adequate water for their growing community. There have been efforts to engage policies and processes which were intended to meet the needs of flourishing agriculture and industry. However, the results have been less than satisfactory as successive drought events have left the city with a shortage of water (Goleta Water District, 2018).

The current drought condition in Goleta, California should serve as a wakeup call to the rest of humanity. This is not an out of the way location of minimal means and affluence; it is a city in a sought-after location that is well known for the celebrity residents and vacation destination.

The planet earth may well be on an irreversible course to worldwide fresh water scarcity. The forces of nature (solar and cosmic radiation, volcanic action, climate change, et al) combined with human

eco-exploitation has driven the ecological context to a state as yet unseen in the historical and geological record (Craig, 2010, p. 13).

Detailed analysis of the circumstances of the Goleta drought offers lessons that may be applied to other locations.

Human Needs

Water

Gleick

In 1996, Peter Gleick published *Basic Water Requirements for Human Activities: Meeting Basic Needs*, the findings of exhaustive research into the various human uses of water. His results gave exacting details of the several purposes of water, including drinking, food preparation, bathing and waste disposal (Gleick, 1996, p.83-85). At the time of his writing, Gleick stated that there had been no satisfactory analysis of the additional use of water related to the processes of growing food necessary to meet the minimum caloric requirements for human survival (Gleick, 1996, p.86). Hence, the actual value required for this critical function could then only be estimated.

Gleick concluded by stating that there are efforts afoot to address the issue of meeting basic human needs for water (Gleick, 1996, p.88). These included efforts to integrate environmental issues as well as sustainable economic and social development. This produced the concept of "Basic Water Requirement" (BWR) whereby access to at least 50 liters of clean water per person per day (l/p/d) should be considered a fundamental human right (Gleick, 1996, p.90).

In 1999 Gleick published a continuation of the 1996 paper with fresh data and a new title: *The Human Right to Water*. The 1996 data indicated that nearly one billion people lacked access to the standard specified as the BWR (Gleick, 1996, p.88). During the interceding three years that number had exceeded one billion. Gleick further states that almost three billion people do not have access to adequate sanitation facilities. These conditions were believed to lead to substantial, unnecessary human suffering

which was preventable. At the time it was estimated that 14 to 30 thousand people were dying daily because of water-related disease; most of these being the young or elderly (Gleick, 1999, p. 2).

Gleick posits that "in some ways this right to water is even more basic and vital than some of the more explicit human rights already acknowledged by the international community, as can be seen by its recognition in some local customary laws or religious canon" (Gleick, 1999, p. 2). Gleick enumerates various acknowledgements from this body dating as far back as 1948. None specifically speaks to a fundamental human right to access adequate clean water however. Gleick poses the question, "is water so fundamental a resource, like air, that it was thought unnecessary to explicitly include reference to it at the time these agreements were forged?" (Gleick, 1999, p. 4).

Gleick concludes with a formulation which would be suitable as a component of the declarations of human rights extant:

"All human beings have an inherent right to have access to water in quantities and of a quality necessary to meet their basic needs. This right shall be protected by law." (Gleick, 1999, p. 11).

World Health Organization

The World Health Organization (WHO) report on the Ecosystem and Human Well-Being (Corvalan, C. Hales, S., & McMichael, A. 2005) indicates that the WHO assessment team came to essentially the same conclusion as Gleick, stating, "for the human species and all other forms of life. Human biology has a fundamental need for food, water, clean air, shelter and relative climatic constancy" (p.1). Further, the team specified similar values for the minimum amount of clean water for each person.

United Nations

The efforts of Gleick, et al, contributed to the United Nations' eventual passage of resolution A/RES/64/292, The human right to water and sanitation on August 3, 2010 (UN, 2010, p. 1). The resolution acknowledged the import of equal access to clean water and sanitation as a fundamental

element of basic human rights. It further affirmed the duty of governments to promote and protect this right. To that end a commitment was made by the signatory states to achieve the requirements of the Millennium Development Goals; to reduce the number of people who do not have access to safe water to half the value by 2015 (UN, 2010, p. 2). In October of the following year the UN Human Rights Council passed A/HRC/RES/18/1, The human right to safe drinking water and sanitation.

Perhaps with these standards in mind, the state and local government of Goleta and federal government of California have made efforts to provide governance over the watershed which supplies the Goleta area.

Food

At least since the beginning of the current inter-glacial period, human need for a regular supply of specific nutrients can be seen in various forms. The analysis of hair samples from ancient human populations compared to those of present day indicate little change in the chemical makeup. (Macko, et al, 1999, p. 65). Bone fragments tell a similar story (Richards, 2002, p. 3).

This data stands in stark contrast to the ancient ancestors of humanity. Evidence for that period mainly is in the form of the stone tools used for food preparation (ca 300,000 – 500,000 years old). These artifacts indicate a focus on animal proteins (Richards, 2002, p. 4). Prior to this age the dietary regimen was primarily plant based (Konner & Eaton, 2010), Thus, this period would indicate transition from pure gathering/foraging to hunting; that is, from herbivore to carnivore/omnivore.

Hunter-Gatherer, Farmer-Rancher Transition

The Paleolithic age, ranging from 2.6 million years ago, to 10,000 years ago, mark the drastic change in hominid existence (Richards, 2002, p. 4). The hardy souls that emerged from the last major glacial period discovered that the hard, indigestible objects in the foraged crops, would miraculously sprout into plants, producing the same fruit or vegetable; thus, they became farmers and ranchers (Cleveland 2014, P. 23 & 51). What drove each tribal unit at the various geographically dispersed population of what would one day be Europe, to adopt, first, a simple, primitive form of agriculture, and

then to add various species to the menu, is still debated (Price, 2007, pp. 100-103). For the California Paleo-Indian groups, the conversion is thought to have followed the extinction of large animals). This was likely a result of a combination of both climate change as well as excessive hunting by humans (Fagan, 2003, p. 59).

As late as the fourteenth century CE, the Californian central coast inhabitants were still exhibiting the practices of hunter-gatherers, mainly with respect to the use of seafood (Moratto, 1984, pp. 247-248). This appears to have been a practice continued from the mid Neolithic age, where the Channel Islands were a base of operation with easy access. At the time the sea level was such that the coastline extended out approximately an additional 20 miles, making the islands a mere 6 miles away (Fagan, 2003, p. 102). As the sea level rose and stabilized, the distance from island to shore resulted in permanent settlements. Middens found on the islands indicate either long term habitability or a short-term camp for specialized processing of various sea life intended for sustenance (Moratto, 1984, p. 247).

In either case, the littoral seafaring method provided a significant portion provisions of seafood of those who would become the Chumash tribe. This process would be employed form the middle of the Neolithic age (Moratto, 1984, p. 247) to the centuries immediately prior to the European invasion (Moratto, 1984, pp. 247-248).

Late in the Neolithic age, climate change impacted the fauna such that dependence on foraged plants became the norm; one of the main staples was the acorn (Fagan, 2003, p.25). The fifteen species of oak, that flourish in California could be expected to provide a generous yield each autumn. Though the humble acorn was not a panacea, it was at least an abundant and easily stored commodity (Fagan, 2003, p.29).

The full picture of the transition from basic hunter-gathers to rancher-farmers, along with much of the past of California, is clouded by archeological data mangled by the so-called “progress of man” (Fagan, 2003, p. ix) and a historical record that tends to paint the European invaders as saviors for the indigenous tribes; in the location of concern, that would be mainly the Chumash tribe. The enslavement and attempt to enculturate the Chumash to European social norms (Fagan, 2003, p. 10).

By the time of the European invasion the Chumash had a well-developed process for tending the native flora of the California Central Coast. The recurring weather variations, having been noted over the years, were used as a timetable for various tasks to maximize utilization of the respective resource (Anderson, 2005, p. 51). What, in the mind of the ill-informed European appeared to be foraging, was a well-defined and calculated process, scheduled to coincide with specific weather changes (Anderson, 2005, p. 53). That the produce was foreign to the conquistadores perhaps led them to believe these "Indians" were ignorant savages?

Impediments

The difficulties endured by our ancestors entailed issues that present day citizens of developed nations could hardly comprehend. When a natural disaster occurs, such as a hurricane, wild fire, flood or earth quake, we, the privileged of the first world, feel a very slight level of that stress.

This authors wife was born and raised in the Cordillera Mountains on the island of Luzon, in the Philippines. Her family were (and are) subsistence farmers. While she was growing up the closest electricity was a several kilometers walk through the woods on a footpath, since there were no roads. Ignoring the recommendations of her family to quit wasting time with school, she moved to a location where she was able to finish secondary education and then to the provincial capital to complete a bachelor's in elementary education.

The description she gives of the arduous days, sleeping in a small hut (parents, three brothers and four sisters) and cooking and heating water over an open pit fire, while trying to grow sufficient food for the family using only rudimentary hand tools is very much like that described by Fagan (2003, p. 297) and Moratto (1984, p. 360) for the early inhabitants of the California Central Coast as they strove to survive natures obstacles.

The Western Pacific Ocean, famous for unleashing a dozen or more typhoons on the Philippines, would regularly destroy crops, and their simple, primitive homes. The droughts, wild fires and subsequent floods seen on the other side of the Pacific, would pummel the central coast of California, impacting the various tribal units with equal devastation (Fagan, 2003, p. 21, 26, 32).

With any circumstance of want there would invariably be the prospect of those who have not envying and in some cases, attacking those who had stocks of food sources. Details in the archeological record are only vague for these conflicts just showing evidence that the strife had ended (Fagan, 2003, p. 341).

Knowledge of the prospect of drought and/or famine, led to development of storage systems (Anderson, 2005, p. 53). Granaries were erected to store seeds of various sizes and provided a certain level of water resistance. Keeping grains dry was particularly important, since even a little moisture could allow bacteria or fungi to grow and spread, leaving the contents inedible (Anderson, 2005, p. 53). In addition, certain plants were used to line the structure, acting as an insect repellant. The outer walls were tightly assembled to minimize the possibility of entry by vermin.

Coincident with the difficult times were the rise of chieftains; "Big Men", as Fagan calls them, or aggrandizers. These exercised leadership skills to coordinate with the various "triblets" (a term coined by Alfred Kroeber, Fagan, 2003, p. 147), to form alliances to share resources. While this effort can be seen to have minimized violence, the "Big Men" would also take advantage of the power to improve their lot above that of the rest of the people; hence, the moniker, aggrandizer (Fagan, 2003, p. 32). The definition of classes within the society invariably produced nepotistic elevation of leaders. Such that, wealth, as well as the influence that goes with it, would pass within a family or a circle of friends (Fagan, 2003, p. 149).

The implementation of what is essentially a natural system model, would present an additional impediment to the production and distribution of food (Scott & Davis, 2006, p. 30). That being the potential that a succeeding generation in a dynasty might be, and occasionally was, incompetent to the task of leading (Fagan, 2003, p. 150). And as with any form of social caste system there will always be those who are treated better than other. Thus, social injustice became a stowaway on the ship of state that was the Chumash tribal system (Fagan, 2003, p. 151).

In the end human ingenuity is thought to be driven by the varying climate and increasing population to invent the various processes and implements used in providing food (Glassow, et al, 2010, p. 203)

Net Impacts

The impediments to food production through the ages have not changed much. In our location of focus (California Central Coast, in general, and the city of Goleta, in particular) though there is no intertribal warfare, the issues of social standing can impact the ability for a specific operation or group to produce sufficient crops to be financially solvent. In the end it is the access to an adequate water source that determines whether there will be success or failure. This has ever been the driving force in agriculture; as some bumper stickers intone, "where water flows, food grows". Water is the "life blood" of all living entities on planet Earth as well as all those species which have been long extinct (Ash, Hanson & Norman, 2002, p. 6).

Droughts bring death to humanity at various levels. First there is the obvious dehydration. There is also the famine that follows that brings death by starvation. Leadership may provide guidance that manages the various factors impacted by these cascading natural disasters. However, with the unpredictable nature of climate change, the complexities of this sequence can exceed even the best laid plans (Devereux, 2000, p. 4).

Global

Climate change is complicit in bringing about food shortages. Specific events include extremes in weather; heatwaves, droughts and floods. This is particularly an issue in developing countries as well as impoverished regions of developed nations (Pagdham, 2009, p. xvi). Combined with potential financial crises these climate driven events will have an elevated negative impact (Alwang & Norton, 2011, p. S140). These realities have a particular impact on the small-scale/smallholder farmers. With little or no governmental or collective supports the prospect of a cascading family catastrophe are very real (Alwang & Norton, 2011, p. S139).

These issues prevail in virtually every part of the globe. Efforts are underway in some nations to minimize these impacts by way of price controls. Nations of note include the Americas, Ethiopia, Egypt, Indonesia, Mexico and Morocco (Alwang & Norton, 2011, p. S141). In Mexico, the rural poor farmers are eligible for cash pay outs if their children will stay in school. In addition to the general support of the

small-scale family farmers, there is the added benefit (and perhaps more important) that increasing school attendance, which enhances the possibility of the next generation rising out of poverty (Alwang & Norton, 2011, p. S144).

Since water scarcity plays a prominent roll in agricultural production it therefore has a significant negative impact on any farming operation. (Roco, et al, 2015, p. 958). The global nature of this scarcity is expected to become worse in the coming years (Sheffield, Wood & Roderick, 2012, p. 435). Water consumption by agricultural efforts tend to utilize most of water supply of any locality (Roco, et al, 2015, p. 969). It stands to reason that continued pace of climate change driven weather anomalies will affect the small-scale farmer at an increasing rate.

Local

As with water scarcity issues from around the globe, the circumstance in the Central Coast of California has been (Fagan, 2003, p30-31) and is (Hundley, 1992, p. 400-401) essentially the same. The early inhabitants, mainly the Chumash tribe, contended with droughts regularly from the age of hunter-gatherers to the eventual farmers of the acorn (Gamble, 2005, p. 93).

Despite the droughts, the acorn was an ever-present asset, due to the variety of oak species and abundance of natural groves (Fagan, 2003, p30-31). In addition, the El Niño-Niña cycle only marginally impacted the supply of seafood, thus providing sufficient sustenance for the tribe (Fagan, 2003, p32-33). Still, the relative lean times required agricultural and fishing processes to be well organized to ensure equitable distribution of food. In times of abundance the tribe operated in an egalitarian mode with little need for direction from the elders. As supplies lessened stricter organization was implemented by those known as the "Big Men" (Fagan, 2003, p178).

Today, the subsistence of the agricultural community is subject to the potential of the same natural disasters experienced by their predecessors (Solomon, 2010, p. 12). And, not unlike those "Big Men" aggrandizers of old, there are those who attempt to, and occasionally successfully, corner the water market through affluent connections, thus short changing the current small-scale farmer, who's voice is too small to have any impact (Zenovich, 2017).

With public policy (regarding water scarcity) requiring the reduction in water use to all users, agriculture cannot continue to irrigate as they would during periods of normal water availability (Bachman, 2011). Without additional water from precipitation or private well, Goleta small-scale farmers are guaranteed to have lower crop yields (Steduto, et al, 2012, p.1).

During the current drought conditions, the per capita water use in California, at large, fell from 178 gallons per day to 130 (Mount & Hanak, 2016). With agricultural water use constituting 80% of all water use in the state, crop yields for farmers who rely solely on public utilities for irrigation, will have suffered to some extent. Fortunately, for the farmers sake, crop yield has improved in the decades since the late 19th century, because of greater scientific knowledge and application as well as advances in technology (Hanak, 2011, p.171).

Since small-scale family farms constitute 87% of crop production, the loss is no small issue (MacDonald, Korb, & Hoppe, 2013, p. iv). Analyses of small-scale farmers are few and far between. Jara-Rojas, et al (2012) speak to the improvements observed in those of Central Chile because of implementing water conservation practices. Amsalu (2006) addresses the use of stone terraces in Ethiopia and Sidibé restoration of degraded soils in Burkina Faso (2005).

Though these studies are valuable in that they discuss different methods for improving any farming operation, they make no effort to express the human toll when even the best systems are employed during a condition of water scarcity.

Believers

Whether there is a transcendent reality beyond the empirical will not be debated nor resolved here. However, it is certain that, as the Chumash relied on ʔIwhi–nmuʔu to bind them together for the common purpose of survival (Greenberg & Greenberg, 2013, p. 33) the organization of human effort should be oriented to a collective of common intent for the benefit of all. To the Chumash it was not a person so much as a personification of a sacred place (Loeb, 1926).

Conclusion

This miniscule monograph is certainly insufficient to the task of fully addressing the issues endured by the local small-scale farmers of Goleta, California. However, at least two things can bee seen from this study, which are immutable; though humanity has certainly had an impact, the elements of this universe, especially our planet, mostly behave without any consideration for our benefit and the rudimentary animal nature of humanity tends to be self-serving.

The value of the small-scale farmer is not well understood by the general populace (Stumbos, 1993). Too often it is stated that, in California, agriculture uses 80% of the water but only contributes 2% of the gross product (Mount & Hanak, 2016). This comparison is the classic "apples and oranges" paradigm. According to the most recent data reported by the Bureau of Economic Analysis, the industries of Information Educational services, health care, and social assistance, Finance, insurance, real estate, rental, and leasing Government, Professional and business services, constitute a total of 62% of California GDP (U.S. Department of Commerce, 2018). Yet these industries clearly do not require water as a major contributor to their production whereas without water there would be no agriculture.

Water scarcity can be expected to be a consistent issue for the foreseeable future (Ingram & Malamud-Roam,2013, p. 8). Water shortage began to be an issue of concern for about 2% of the world population in the year 1900. By 2005 that number had increased such that 35% of the world population was under a chronic water shortage condition (Kummu, et al, 2010, p. 1).

Ice core data indicates that during the last deglaciation (aka interglacial period) both global temperature and atmospheric carbon dioxide concentration of the plant increase significantly just before the onset of the last glacial epoch (Shakun, et al, 2012). Since our current period is essentially an interglacial period, it can be assumed that this behavior will be replicated.

With the continuing global drought, the state of California in general, and the city of Goleta have continued to experience a general state of water supply emergency (Goleta Water District, 2018). The

requirements established by the Goleta Water District Board of directors stipulates certain reductions in water use by all users connected to the district supply system (Goleta Water District, 2017).

Though all are impacted by these restrictions, residential connections, the main users in the community (of which the author is a member), are not affected in a manner that would be a general danger to their lives or health. The primary issue to deal with is that of landscaping on personal property (Goleta Water District, 2014). However, in addition to the reduction in water availability from the Goleta Water District the sinking water table makes the natural subsurface supply harder to reach (Glazer, & Likens, 2012, p. 657). Thus, the implementation of drought regulations only exacerbates the problems experienced by the agriculture community. An ideal policy might consider the human value impacts rather than simple arbitrary percentages for reduction and set time-frames for watering allowance.

Unique Policy Perspectives

Introduction

According to Murtinho, et al (2013) water scarcity can be defined as a period when water requirements exceeds water availability and people find that their lives and livelihoods are constrained by water shortages (Murtinho, 2013, P. 668). An important point to note, in this definition, is that water scarcity, or a drought, is not necessarily a meteorological condition where there is little or no precipitation. Each discreet paradigm can present a set of issues which are wholly their own. Thus, each may require a different set of methods to ensure adequate water of a necessary quality to be useful to humanity.

Sao Paulo, Brazil

Since 1934 the authorities in Sao Paulo, Brazil have been aware of the prospect of an issue with providing adequate water for their growing metropolis. There have been efforts to engage policies and processes which were intended to meet the needs of flourishing agriculture

and industry. However, the results have been less than satisfactory as three drought events have each left the city with a temporary shortage of water (Johnsson and Kemper, 2005, P. 13).

Drummond and Barros-Platiau (2006) each collected and analyzed data from selected environmental laws and policies enacted by the federal government of Brazil from 1934 to 2002. The results of their work were originally published as a master thesis (1998) and doctoral dissertation (2000), respectively. The paper published by the Baldy Center for Law and Social Policy combined and refined the findings of Drummond and Barros-Platiau highlighting the significant efforts regarding water management.

The "Water and Mines Code" (a popular name for Presidential Decree 24.643) was enacted in July of 1934. In conjunction with this, the forest management code was also decreed. These decrees were a milestone in Brazilian environmental law, the main effect of which was to place all public lands under the control of federal agencies. Up to this time these resources had been under the control of private interests. This system was not unlike the "law of the jungle" in that the most powerful entity exercised control over as much land and its resources as possible. Through a concession system, established under the Water and Mines Code, companies were licensed to use the land resources. Private, state-owned and hybrid entities developed hydroelectric systems and expanded agricultural use (Drummond & Barros-Platiau 2006, P. 87).

The "Forest Code", enacted in January of the same year, mainly dealt with control of logging. However, there was some provision for protecting some classes of forest land. Unfortunately, the sections that provided protection of the watershed were not included among those granted "permanent protection". The enforcement of this "protection" was only lightly implemented, and then only where there was easy access to the area and the inspection effort was

less difficult. Though the initiative was groundbreaking, in practice the 1934 decrees lacked specific attention to the problem of providing a domestic water supply (Drummond & Barros-Platiau 2006, P. 89).

The next significant effort came because of the "Land Statute", enacted in November of 1964. The intervening years saw little additional movement toward management of natural resources due to a global depression and World War II. A 1964 military coup, that ousted the civilian government, enacted a progressive land reform law, which made it legal for the government to seize private land deemed to have "full social function". This revolutionary concept made wasteful land use illegal, while making protection of the environment public policy (Drummond & Barros-Platiau 2006, P. 89).

Despite all these efforts, a specific provision of adequate clean water for the general population was still not considered a point of necessity. In fact, these decrees appeared to primarily benefit wealthy individuals and corporate interests.

In June of 2005 Rosa Maria Formiga Johnsson and Karin Erika Kemper completed research, funded by the World Bank. The working title of their paper was "*Integrated River Basin Management and the Principle of Managing Water Resources at the Lowest Appropriate Level – When and Why Does It (Not) Work in Practice?*". The research findings were published as *a World Bank Policy Research Working Paper* entitled *Institutional and policy analysis of river basin management: The Alto-Tiete river basin, Sao Paulo, Brazil*.

Johnsson and Kemper (2005) state that Brazil had begun to define and implement water resource management systems earlier than other countries. The resource management system put into practice was based on the principles espoused by various prominent global charters. A major

element of these principles embraced the concept of localized policies and decentralization of authority regarding the management of water resources.

In 1991 Sao Paulo was the first state to codify these principles (Johnsson and Kemper, 2005, P. 4). Johnsson and Kemper (2005, P. 4) opine that São Paulo state would be expected to achieve advances in decentralized water resources management. Being the richest and best-equipped as well as having the most-experienced water management institutions, the state of Sao Paulo was able to take the first steps towards implementation with no federal assistance. However, the process of increasing the scale of implementation was more difficult. Due to the excessive amount of industrial development and the increase in the urban population (in the focus area of the 2005 study) the execution of localized control was hampered (Johnsson and Kemper, 2005, P. 5). It was determined that the tactics employed must consider the hydrology, socio-economic, cultural and historical aspects of the indigenousness population of the local area (Johnsson, et al, 2005, P. 5).

Johnsson and Kemper (2005, P. 5) introduce the term “basin-level” to describe the context of the local area. This is a reference to the specific region that was the focus of their research, The Alto-Tietê River Basin, in São Paulo, Brazil. However, the term is appropriate for virtually any other locality since the supply of water to most regions will generally equate to a river basin.

Johnsson and Kemper (2005, P. 5-6) further define the specific attributes to consider when engaging the process of decentralization:

- Economic development of the nation;
- Economic development of the basin area;

- Initial distribution of resources among basin stakeholders; and
- Class, religious, or other social/cultural distinctions among basin stakeholders.

(Johnsson and Kemper, 2005, P. 5-6).

The case of the Alto-Tietê River Basin, and therefore that of the São Paulo metropolitan area, historically had positive marks for the first two elements. However, the third had only included industrial and large agricultural entities without consideration for small farms or the general population. In addition, there is no indication that the fourth marks were factors considered in the early efforts to implement water management processes. The exceptions would be that the upper class might have benefited from the industrial and major agricultural uses. By the time of the research of Johnsson and Kemper, the provision to the urban population had finally become a concern and was therefore an additional consideration in the process of water management (Johnsson and Kemper, 2005, P. 9).

An issue which arose was because of urban sprawl being unregulated (Johnsson and Kemper 2005, P. 8, 11-12). This lead to a condition where the use of ground water resources was out of control (Johnsson and Kemper, 2005, P. 11). This was exacerbated by the continued hegemony of the influential hydropower sector conflicting with the need of drinking water for the Sao Paulo metropolitan area.

An additional complicating factor was the lack of adequate sewage collection and treatment facilities and improper disposal of solid waste. This lack lead to contamination of the little water that was available (Johnsson and Kemper, 2005, P. 12).

Each of the issues had some form of legislative direction which was intended to deal with the issue. However, they each lacked complimentary regulation to make the laws operational (Johnsson and Kemper, 2005, P. 12).

The structure of the organization developed for the purpose of water management in the Alto-Tietê River Basin, consisted of as many as 14 separate federal, state and municipal agencies. The relationships between these entities is a complex arrangement and the processes engaged to affect water management entailed a series of dynamic bargaining protocols. The net result was (as of 2006) the establishment of what is essentially a symbolic organization which consisted of a small office with a three-person technical team (Johnsson and Kemper, 2005, P. 21).

A major drought was experienced in Brazil late in 2000 which carried into 2001. The drought eventually leads to a declaration of a national level energy crisis due to insufficient water supply for hydropower systems (Johnsson and Kemper, 2005, P. 13). This impact was also felt by the urban population. However, Johnsson and Kemper do not mention the issue of human suffering. The meteorological mechanisms at work during this event were not unheard of in the region, though rarely experienced to this degree (Cavalcanti & Kousky, 2001, P. 2).

Since December 2013/January 2014 (the normal rainy season for the Southern Hemisphere) the region, which includes Sao Paulo has been experiencing the meteorological anomaly which has previously brought about the drought conditions (Escobar, 2015). This dearth, now in its fifth year, has led to a severe shortage of water throughout the Sao Paulo metropolitan area. The local governments are attempting to curtail excessive use and waste by financially rewarding those who conserve and punishing those who do not by levying a fine. In

addition, the pressure of the water main has been reduced to minimize leakage rates and discourage waste. It is being contemplated by the several local governments to take drastic measures in the form of a complete shutdown of the water distribution system for hours or days at a time.

The Alto-Tiete river basin water system, as of Escobar's article, has only 15% of its volume remaining. Reservoirs in adjacent regions are also at low volumes. A new system that will bring in water from a distant watershed is not expected to be completed until 2016. The impending dry season of 2015 is already upon the region, leaving the expectation of a human tragedy of epic proportions.

Escobar (2015) cites unnamed Brazilian scientists (with expertise in water issues) as blaming a combination of the effects of the current climate anomaly and the ineffective government programs for the growing crisis. They further stated that there is a need to be prepared for increasingly extreme climate events.

The early effort of water management was oriented to industrial and major agricultural uses. The tendency to cater to the desires of the affluent had the potential of resulting in mismanagement (Johnsson and Kemper, 2005, P. 8, 11-12). Due to low-income residents being continually expelled from the urban centers the city's periphery became shanty-towns for the poor (Johnsson and Kemper, 2005, P. 8). Mismanagement of water resources combined with uncontrolled urban sprawl set the context for a potential disaster (Johnsson and Kemper 2005, P. 8, 11-12).

The ingredient which has completed this recipe for disaster is unfortunately mostly beyond the control of any human being. Climate variability, whether of anthropogenic origin or a

completely natural cycle, is the element which is the catalyst for an unexpected event. Yet these events are not unknown.

Based upon historical documentation and the geological record, humanity is very much aware of many potential climatic events. With these we may plan for each as much as it is possible relative to the risk of the event and the potential lost.

Brazil has significant water resources available on a national level. The Amazon is responsible for about 20% of the Earth's fresh water entering the oceans. The river pushes a vast plume of fresh water into the ocean. The plume is about 250 miles long and between 62 and 124 miles wide (Penn, 2001, P. 8). The river basins, lakes and reservoirs which make up the Sao Paulo metropolitan area water supply system do not compare to the Amazon. But the water supply is adequate to the needs of the population.

The referenced data lead one to conclude that the issue which lead to the current crisis is mainly a lack of adequate management. This applies to the domestic housing, sewage collection and disposal/processing, solid waste collection and disposal, as well as the equitable division of water resources. Each of these had some form of legislative effort to administer and control at various levels. However, the lack of operational regulations each law had little or no effect.

Despite the long history of water related policy development and implementation the efforts to date have created what appears to be a bureaucratic system that does not return on the investment of time and resources.

San Joaquin Valley, California

The first human inhabitants of the San Joaquin Valley are believed to have arrived around 11,200 BCE. It is assumed that these pioneers came from the south since at the time the glaciers

and snow of the Cascade and Sierra Nevada mount ranges would have made it impossible to come into the valley from the north (Fagan, 2004, P. 3). Alternatively, these early inhabitants may have been members of the seafaring adventurers who first landed on the transverse coast of California; what is now Santa Barbara County. These were most likely of the Coastal Miwok tribe (Fagan, 2004, P. 134). Up until the arrival of the Europeans the inhabitants of the San Joaquin Valley engaged mainly in hunting, fishing and foraging for fruits, nuts and other fodder that could be found growing in the wild. Eventually the concept of agriculture was discovered and implemented on a small scale at various small sub-tribal locations.

The various tribal units initially had little cause for hostility toward one another due to the ample supply of natural resource. As the environment began to grow more arid and the resulting decrease in resources, inter-tribal hostilities arose (Fagan, 2004, P. 32). As the European invaders began to dominate the land, as well as the indigenous peoples, the strain on the natural resources began to engender strife; erupting into hostile disputes both between the various tribes and the European occupiers.

In the end the Europeans either forced the native population to migrate to less desirable climes or into slavery (Johnston-Dodds, 2009, P. 17). The eventual over utilization of the San Joaquin Valley in the most recent five hundred years has contributed to the extreme impact of the current drought.

Since the conquest by Europeans of the Americas the administration of natural resources has become an issue. With the influx of Europeans intent upon building new lives in what was assumed to be a frontier, the land and it many natural resources, were taxed at a level never seen

before by the indigenous population. Consequently, efforts by the invaders were taken to control the natural bounty for themselves while limiting access to the local tribes.

The forced conversion by the indigenous tribes by the Spanish conquistadores associated priests subjected them to the rule of the Church. The royal land grants to wealthy or well-connected Spanish immigrants gave the grant holder carte blanche in the use of natural resources on their property without regard for the needs of the tribes. Essentially the tribes were conquered and then subjected to all but slave labor. As grand and storied as the California missions are it cannot be forgotten that they were built by the blood, sweat and tears of a subjugated people (Haas, 1995).

Today the efforts to control water usage have seen limited success. After almost seven years of drought a declared state of emergency has required the reduction of residential and business water use by at least twenty five percent. Failure to meet the standard incurs fines. In response the average decreased use has been over forty percent. Though this reduction is commendable it is questionable whether it will have any real effect on issues of water. Other than mandated usage reductions the political efforts have been focused on apportioning what little water is available (Thompson, 1993, P. 682).

As the human social units grow it becomes apparent that there must be defined standards of behavior. Such standards would eventually be developed in application to natural resources. This would at least come about when it became evident that availability of those resources was beginning to decrease.

As the population of California increased and the dependency of much of the nation upon the bounty of the San Joaquin valley, the formerly plentiful supply of water from the various

immediate sources has been depleted while the root sources have not kept up with the increased flow. Political elements in the San Joaquin valley, as well as those of the state of California at large, have attempted to reconcile this continuing deficit mainly by limiting water use for various purposes; specifically, personal/residential and industrial/agricultural.

The earliest policies were directed at the indigenous tribal units. These prevented the tribes from living as they had for many generations. As with many other policies enacted at the federal level, these policies had the net effect of disenfranchising the tribes of their ancestral homelands; water being one of its many. The injustice brought upon the tribes essentially stole the land and its resources from them and gave it to the conquering European invaders (Johnston-Dodds, 2009).

Later policies began to address the occasional water supply issues brought on by droughts and over-use (Thompson, 1993, P. 674). Up to the 1960's the policy was essentially a "political-engineering" (Thompson's term) approach where, as a need for additional water supply was identified, the Federal government would build another water project (dam/reservoir, aqueduct, etc.). These methods unfortunately lead to a significant level of environmental damage in addition to being economically costly. Since the 1970's, however the paradigm employed has been market based. This has been operated as if it were not but another capitalist venture. It was assumed that as demands grew that "the market" would grow and provide the need.

Market based water management has apparently lead to a circumstance that is not unlike that of the ancient system of the tribal groups during episodes of water scarcity; that is, an individual or group have taken on the role of the "big man" also known as the aggrandizer. This

has resulted in poor to unfair resource allocation which works well for the "big man" and his fellows but not so much for the rest of the agricultural water users.

Syros Island, Greece

Syros Island is located in the Greek Cyclades complex, south of the Aegean Sea. With an archetypal Mediterranean climate, it has relatively low annual precipitation. In an attempt to mitigate the impact of the occasional water scarcity events, a system of drought-related risk estimation was defined. This risk analysis provided an approximation of the effects of various mitigation options (Giannikopoulou, et al 2017, P.655).

Domestic use takes a back seat because much of that comes from desalination. Since the main effect of droughts is on the agricultural efforts in Syros, the risk management framework focuses on that impact. Toward this end various drought mitigation options were identified:

- Rainwater harvesting for domestic use
- Rainwater harvesting for irrigation
- Wastewater recycling for irrigation,
- Increase of desalination capacity to meet peak demand
- Artificial aquifer recharge
- Crop substitution to more drought resilient ones

A process for the risk-based assessment of drought mitigation options is proposed, which involves three steps, starting from future hazard analysis and concluding with a comparative analysis of potential mitigation options:

- Risk identification. Drought conditions are analyzed in terms of magnitude (severity), duration and frequency (probability of occurrence and return period), on the basis of climate projections;

- Risk assessment regarding anticipated impacts. Impacts are quantified in monetary terms, for the different drought severity levels, and then aggregated to estimate the total risk of economic losses;
- Risk management, through measures for dealing with drought and minimizing risk to an acceptable level. Water balance modelling is used to assess the effect of measures on drought mitigation, whereas measures are compared and ranked on the basis of three criteria: risk, vulnerability and cost-benefit ratio (Giannikopoulou, et al 2017, P.663).

Risk based management efforts ensure that the higher priority uses are targeted with respect to their vulnerabilities and the mitigating actions. This management paradigm is ideal for focusing on the "return on investment" and generally minimizes wasted efforts and assets.

Sana'a Basin, Yemen

The Sana'a Basin is located at the eastern end of the western highland of Yemen, at the southern end of the Arabian Peninsula. The population of the basin, as of 2015, was 3,517,225. The anticipated increase, based upon a ten-year estimate, is expected to nearly reach six million by 2025. This growth is expected to cause water demand to exceed the supply provided by the local rain fall (Taher, 2016, P. 1595).

Overexploitation has caused a shortage of water of adequate quality. Abstraction has been five times higher than recharge resulting in water table levels to decrease by four to eight meters per year. The situation has been exacerbated by a lack of suitable water management methods (Taher, 2016, P. 1593).

Efforts to address the issue include reducing the number of wells drawing on the aquafer and/or decreasing the number of hours of well operation. In addition, since agricultural usage

accounts for about ninety percent of the total water use, more efficient irrigation methods for that community were recommended (Taher, 2016, P. 1593).

This forward thinking is an absolute necessity for any reality which has an element of uncertainty. With climate change guaranteeing an unpredictable state of the major water sources supply could easily fall short of the burgeoning demand of a growing population.

Fúquene watershed, Eastern Andes of Colombia

The Fúquene watershed is in the northern part of the eastern mountain range of the Andes, about 60 miles north of Bogotá. Elevations range from 7875 feet, where the lake Laguna De Fúquene is located, to 12,300, in the surrounding mountains.

Global climate models indicate that the expected rainfall, local to the Andes, will be widely variable. Consequently, it is anticipated that there will be a greater frequency of water scarcity periods (Murtinho, et al, 2013, P. 667).

The projected water scarcity has mobilized various entities intent upon preparing the respective communities for the eventuality. Government at all levels are working with non-government organization (NGO) to enable the local water users to engage with the local management systems and public utilities to this end (Murtinho, et al, 2013, P. 667).

The issue appears to be one of a lack of education of the interested parties with respect to the realities of water scarcity. Perception of the causes and consequences, by the water users, is ill-defined. The desire of the NGO and government cooperative is to assess the level of knowledge and educate as necessary to improve efforts to reduce water use while innovating to increase crop yields.

Major water users being unaware of issues regarding water scarcity would threaten to bring about a cascading social casualty. Misuse and waste might lead to loss of a crop which in

the worst-case scenario could lead to a local famine like condition. Thus, enhances understand on the part of the agricultural community regarding drought causes and consequences is imperative.

Amalgam

Each location has a unique perspective with respect to water issues. These range from the current condition of insufficient water supply, because of significant reduction in local precipitation, to the expectation of future issues which might arise. This is a picture of much of the world; on the one hand there are those dealing with water scarcity and on the other, those who are anticipating such an event.

The situational vectors which results in a state of water scarcity consist of more than just a lack of precipitation. In the case of Sao Paulo, there has been a situation where water was available but not of a level of quality that would be sufficient for human uses. Whereas, in Yemen, the condition of water scarcity is a future probability due to the estimated imminent increase in population.

Some of the causes of a condition of water scarcity can be anticipated while others happen only with a minimal level of regularity or forewarning. However, the consequences are well known and can be dire for those impacted.

No matter the location or exact circumstance a combination of the efforts in each instance would likely achieve satisfactory results. Thus, any entity tasked with ensuring adequate water for a user base could adhere to the following:

- the Major water users need to acquire a proper perspective regarding drought causes and consequences. To this end public information sessions could be regularly scheduled

- A thorough risk program could be implemented to identify specific vulnerabilities, risks for each and potential mitigating actions.
- Alternative water sources could be developed to supplement existing sources.
- Regulatory policy should allocate using a doctrine of fairness where available resources are shared according to a reasonable method of apportionment.
- Contingency plans should be developed to address shortage events.
- Legislation must have attendant regulations
- Management must be objective in discharge of legal obligations
- Water should be managed as a common-pool resource (CPR) and not a marketable commodity (Cleveland, 2014, Pl 297).

In any event, it should never be assumed that a location or region will always have enough water. Many of the factors that contribute to the main issue of water scarcity are well known and constitute the sciences of meteorology and climatology. However, the myriad possible impacting elements of the planet, solar system, galaxy and the reality we know as the universe are currently quite beyond the full understanding of humanity. Therefore, it is crucial that policy makers take this element of uncertainty seriously when defining the requirements that will ultimately generate expenditures of revenue.

Literature Application

Water issues and the management thereof eventually lead to the end user by way of the policy document. The various specific communities either enjoy or endure the implementation of these edicts. However, the agricultural user community is likely to suffer most when these guidelines are implemented in a condition of water scarcity.

Policy Documentation

Introduction:

Though the application of general systems theory to the development, implementation and administration of policy was thought to provide a crucial conceptual structure (Dror, 1969, p. 2) the hanging issue was that of the confusion over what exactly constituted a policy (Guba, 1984, p. 63). A difference in definition between the writer and the reader/implementer of the term could make it irrelevant or worse yet destructive (Guba, 1984, p. 64). Dror considered the then application of social sciences from a systems perspective as little better than the advice of a seer or shaman (Dror, 1969, p. 4).

Fortunately, those who would follow in the footsteps of Dror have furthered the science of policy analysis. Guba began to develop a systematic framework by which to devise and analyze policy. The first element was termed the "policy type". This would indicate proximity to the point of action of a directive; that is, the intention, action or experience.

The next element would be the "policy determiner". This would be the individual or body which exercised authority in the matters impacted by the specific policy, the functionary who fleshes out the details of the policy or the client who experiences the implementation (Guba, 1984, p. 65).

The "definition of policy" is the central point of Guba's matrix, giving substance to policy intent, thus: Goals or intents, standing decisions, guide to discretionary actions, et al. Guba further identifies such elements as the proximity to point of action and what the policy looks like.

Together this matrix informs a process for defining and interpreting policy statements (Guba, 1984, p. 65). Though the exemplar areas specified by Guba hold sway over different

areas than the issues within the pale of the Goleta Water District, yet, the matrices and processes can be easily applied thereon.

Further maturation of systems thinking applied to policy development and analysis can be seen in the work of Bardach (2012). The "eightfold path" contains steps which, though not always required, are often necessary for an adequate treatment of an issue from a policy definition/implementation/interpretation perspective.

Bardach's eight-fold path is well suited to apply this philosophy. The steps can be accomplished in any order though a basic definition of the issue at hand is the most logical point of departure. The steps:

- Define the Problem
- Assemble Some Evidence
- Construct the Alternatives
- Select the Criteria
- Project the Outcomes
- Confront the Trade-offs
- Decide
- Tell Your Story

(Bardach, 2012, p.xvi).

Two issues with the ideas of Bardach which might be of concern to the social scientist in the process of composing a policy, is that the process depends upon intuition as much as it does a graven-in-stone method. Also, it assumes that the process will entail trial and error and the attitude of the participants might well be somewhat hesitant (Bardach, 2012, p.xvii). Yet in the midst of this sense of indecision there are usually some steps which will appear as predetermined.

Although the ideal employment of this method is to deal with an issue by defining a specific policy it is also useful in "reverse engineering" the process to fully appreciate an existing policy and ensure proper application at the client level.

With respect to the issue at hand the matrices of Guba might be used to orient the analysis in this case the policy question leads us to the clients, the local small-scale farmers, to seek their feeling with regard to the various policies of the Goleta Water District.

Addressing the policies extant from the perspective of the client farmer will entail identification and classification of the customer community.

Global

The United Nations has been the source of many documents espousing environmental causes, and calls to action, in favor of various ecological conservation efforts. Few if any of these amount to binding policies for the signatories; even if the respective national governments ratify the document.

With each treaty where the USA is a signatory, generally the following statement is appended thereto:

"The United States hereby declares, pursuant to Article 30, paragraph 5, that any amendment to an annex to the Convention shall enter into force for the United States only upon the deposit of its instrument of ratification, acceptance, approval, or accession with respect thereto." Thus, for the most part very few dictates of the global community have become policy applicable to any water district within the USA.

In addition, the United Nations engages the process of coordinating the various efforts of UN work on water issues and sanitation through the UN-Water organization (UN-Water, 2017). UN-Water's Policy Briefs provide short and informative analyses on issues that draw upon the combined expertise of the United Nations System. They are the UN's joint position in the subject

in question, but don't have the effect of a policy (Tamara Slowik, UN-Water Technical Advisory Unit, personal communication, July 26, 2017).

National

The United States Federal Government (USG) executive branch defines policy based upon legislative documents signed into law by the President of the United States (POTUS). Two recent major documents were the Federal Water Pollution Control Act, of November 27, 2002 and the Safe Drin king Water Act of December 31, 2002.

The U.S. Code › Title 43 § 661 - 666, include codes which apply to water in general and "public" water in particular. These deal with appropriation on public lands; rights of way for canals and ditches, Reservation of reservoir sites generally, et al.

Though these documents certainly are applicable to the location where much the customer base of Goleta Water District resides, the specific codes are largely at a level where they do not directly impact the intended subject of this research.

State

The state of California water policies reaches back to the days of the Spanish conquest. Previous to this era the indigenousness tribes rarely had any significant issues since their population size did not impose a demand on the natural water flows that exceeded its capacity. The Spanish Conquistadores essentially came in and claimed the area as belonging to their then current royalty defining the water as property of the kingdom. Water from that perspective was considered to be available to all for private uses. When land was granted to an individual or family, the water rights also only applied to domestic use (Dravnieks 2001, pp3-4).

When California was ceded to the United States by Mexico through the Treaty of Guadalupe-Hidalgo there was no US based governing body nor codified policies regarding property or water rights (Dravnieks 2001, pp6-7).

Present day water policy at the state level falls under the auspices of the California Environmental Protection Agency (CalEPA, 2012). The State Water Resources Control Board, an office under CalEPA, operates via regional boards. The GWD falls under the Regional Water Quality Control Board, Central Coast Region. The Water Quality Control Plan for the Central Coastal Basin (Central Coast Regional Water Board. 2016) constitutes the primary policy document applicable to the GWD from state level authority.

County

The county of Santa Barbara policy authority is the Water Resource Division (SBWRD) of the Department of Public Works. The SBWRD consists of two separate dependent districts: the Santa Barbara County Flood Control and Water Conservation District (FCD) and the County Water Agency (SBWA) (Boelhouwer 2017).

The SBWA was established by the state legislature in 1945 to control and conserve storm, flood and other surface waters for beneficial use and to enter into contracts for water supply.

The FCD was created in 1955 by the State legislature because of severe flooding and damage resulting from storms in the early 1950s. The purpose of the FCD was to provide protection from flooding and aid in conservation of storm and flood waters for public use.

In1 994, after a succession of county reorganizations, the County Water Agency and the Flood Control District were combined to form the new Water Resources Division of the Public Works Department.

The primary policy document issued by the County of Santa Barbara is the Integrated Regional Water Management Program (Santa Barbara Water Resources, 2013).

City

The Goleta Water District came into existence in November of 1944 as a subdivision of the State of California Water Code. At the time, the region was in the midst of a severe drought just as it is currently. Since then the area has experienced droughts during the periods of 1959 to 1962, 1976 to 1977, 1987 to 1992, 2007 to 2009, and the current episode beginning in 2012.

The Goleta Water District management consists of a board of five members (known as directors), elected by the residents of the City of Goleta, and a professional staff (Goleta Water District, 2017, January). The professional staff is lead by the General Manager and an Assistant General Manager, who serves as the Chief of Staff. The board acts as a legislative body while the professional staff acts as an executive element; the General Manager serving in the capacity of a chief executive. Board member elections occur during the general and midterm election and are seated for four years. Thus in 2016 two of the director seats were open and in 2018 three director seats will be open.

This area is generally described as having a “warm-summer Mediterranean” climate (Kesseli, 1942). Yet it has experienced severe droughts regularly, at least since 101 BCE, at a rate of 4.5/100 years (Hughes & Brown, 1992). Thus, the Goleta Water District, in concert with the California Department of Water Resources, and in conjunction with the various members of

the Association of California Water Agencies, have developed standards to define what constitutes a drought and what actions or user restrictions are implemented and which particular points.

The Goleta Water District has established five water shortage stages each with specific triggers and use reduction objectives (Kennedy/Jenks Consultants, 2010). The implementation of each stage is dependent upon three basic criteria:

1. The reduction in available water sources relative to the normal expected demand for the next twelve months.
2. The ability to provide a specific percentage of deliveries over the next twenty four month
3. Contamination of water supply

Thus, a water shortage is not only possible as a result of a naturally occurring drought but also due to pollution of the various water sources.

The ongoing drought has triggered the various stages at the following points:

- Stage I March 2014
- Stage II September 2014
- Stage III May 2015.

At the stage II the District did not impose mandatory irrigation restrictions or demand reductions on agricultural customers. The stage III implementation included restrictions on the use of overhead sprinklers on outdoor commercial crops and orchards. Outdoor crops and orchards irrigated with overhead sprinklers could be watered before 10:00 A.M. and after 4:00 P.M. This would not apply to the use of drip or micro-spray irrigation, or irrigation of indoor greenhouses.

The Goleta Water District board meets monthly, as a whole. In this public venue proposed policy changes are presented and considered by its members. Changes may be recommended by the Goleta Water District professional staff as well as by the customer community. Prior to their introduction, proposals are reviewed by respective committees consisting of one or more members of the board and professional staff. The respective committee may recommend acceptance or rejection.

A local municipal agency is the ideal entity to observe democracy in as pure an application as can be found in a nation as large as the United States. The Goleta Water District, in effect a microscopic democratic state, is an implementation of democracy. Boundaries of its power are delineated by international, federal and state policies but within these limits the Goleta Water District and its constituents operate as a democratic state with respect to water issues.

The foundational body of policy documents rests upon the Goleta Water District Code, with the latest revision being completed and approved in 2006 (GWD, 2006). In addition, the district also adheres to the Goleta Water District Water Supply Management Plan (GWD, 2011), the Urban Water Management Plan, updated in 2010 (Kennedy/Jenks Consultants, 2010) and the Ground Water Management Plan, updated in 2016 (GSI Water Solutions, Inc., 2016). These documents distill the voluminous regulatory and advisory documents that flow down to the district from the international, federal, state and county agencies.

From the aforementioned documents, the Goleta Water District board and professional staff developed and implemented various policy documents to address specific issues. These include regulations applied when a drought is declared. The Goleta Water District Drought Preparedness and Water Shortage Contingency Plan (Kennedy/Jenks Consultants, 2014, p.5-1) stipulates explicit “triggers” for each of five stages of a water shortage emergency. The actions required for each stage included elements of public outreach, demand reduction, enforcement and other operational efforts (Goleta Water District, 2014, November, p. 4-1).

The tactics, techniques, and procedures (TT&Ps) defined by the board and employed by the professional staff of the Goleta Water District are subject to change based upon input from the customer base, the staff and the board. It is also possible to act upon recommendations from external sources such as state, federal or international agencies or input from scholarly research results.

A recent case in point was as a result of the watering restrictions which would be implemented if the board were to declare a stage IV level of water shortage emergency. A proposal was submitted by interested parties which requested an exemption for "fault tolerant grasses" from the limitations defined in the Goleta Water District Code (Board of Directors, Goleta Water District, 2017).

An analysis of past meeting agendas shows that such requests to alter any of the policy documents are not a regular consideration. Still this exhibits the democratic nature of the Goleta Water District operation. The aforementioned proposal was discussed between the board members then tabled for further discussion by the Water Management & Long-Range Planning Committee sources (personal observation from Goleta Water District monthly meeting, February 14, 2017).

Policy Analysis Take-away

Local Resultant Set of Policies and Real-World Practice

Policies that impact the operation of the Goleta Water District (GWD) descend from various levels of authority. As these settle down they lay heavily on top of the GWD management. Policy dictates from those who exercise overarching authority tend to exert pressure by way of subsidies from taxes collected across the board imposed upon all local individuals and corporations. That is, federal taxes are partially returned to the local authorities only insofar as that local authority abides by applicable federal mandates.

This section includes a "collection" (see references) and a high-level analysis of the extant policy documents which directly or indirectly apply to the operation of the GWD. This listing is in no way

completely exhaustive, but only includes those which sufficiently show the major impacts the subject small-scale family farmers, of policy with respect to drought responses.

The term “Local Resultant Set of Policies” (RSOP) is borrowed from the security paradigm which is used by Microsoft in controlling a Windows information technology (IT) enterprise (usually referred by the user community as “the network” or “the server”). In reality, the system consists of any number of servers, desktops, laptops, switches/routers, firewalls, et al. These are each referred to in IT parlance as “objects” as well as user accounts and groups. The Group Policy Object (GPO) is a series of settings which are defined to control what a user can do or what digital objects can be accessed and/or manipulated. Different groups of policy settings are developed to apply to the various types of objects such that a server object has a more robust security profile than a desktop or a standard user account has fewer privileges than an administrative account.

High level GPOs are applied to all objects in the IT enterprise whereas low-level GPOs are tailored to apply to only specific types of objects. The same basic principle is at work for virtually any organizational system where there are various levels of authority. There are high level requirements that apply to all and low-level requirements that are tailored for each specific local context. The conglomeration of these policies is then applicable to the lowest level of the system; hence my use of the concept of the RSOP.

The Goleta Water District is the lowest level of authority applicable to its local water customers. Yet there are policies which descend from the Federal, California State and Santa Barbara County entities whose purview includes water issues. There are basic policies which include water quality for potable user (CalEPA, 2016), and specific policies such as installation and operation of desalination plants or processing and uses of recycled water (CalEPA, 2012).

The current list of policies considered (references) consists of thirty-one documents ranging in size from two (2) to five hundred seventy-five (575) pages.

Though agricultural water use is mentioned at each level of authority (CalEPA, 2013, P.1), there is no focus on behalf of these that would reduce the prospect of bankrupting conditions. Therefore, without additional special consideration the chance of significant hardship coming upon this small and voiceless group is great. The fact that the GWD board was lenient in the implementation of the shortage stage requirements, applicable to the agricultural community, indicates that they are aware of the precarious state of this set of their customers and perhaps the value of its contribution that belies its apparent quiet significance (Stumbos, 1993).

Chapter 3: Methods

Elements

The following is a list of the details of the intended methods for this study. It is followed by a narrative description of the same. This list, however, will only deal with the farmers.

Method: Qualitative

Methodology: Ethnographic narrative

What: interview

Data sources: Participant interviews

Whom: Family farms

Number of participants: 5 to 7 farmers

Where: Local farms

Selection criteria for participants: Small-scale USDA definition and family operated

When: At the convenience of the farmer

Setting: Field, orchard, et al or that required by the participant

How long: 60 minutes

Optional: Research article(s) using similar methodology

Narrative

The process of research will follow the principles of ethnography; that is, this research will discover the community mindset or philosophy, common beliefs and behaviors of the Goleta small-scale, family farmer. The intent is to understand the experiences of the various small-scale crop family farmers during the recent and continuing drought, as well as any other period of water scarcity. This will be expressed as individual narratives from the very people who have lived and are even now living the experiences. This study will explore the lived experience of

belonging to this small but vital group within the local community. Amongst the general population this minority group shares a specific resource but the extent to which they rely on it is much greater, in that their livelihood depends upon it.

An ethnographic methodology is employed to investigate the unique case typifying this social category. Individual interviews will be used to gather data and investigate the lived-experience complexities of the human system, and underlying group process at work, whether within the immediate/extended family or extrafamilial organization.

The subject, in this study, will be much more than something to be observed. The research interviews will be conducted at the place of the individual or family employ; the family property, that is worked to produce their given crop, which is also their home.

The intent is to be, not only asking questions and collecting data, but also engaging as much as is possible with the work of the farmer. In this way, the energy and time spent by the family will hopefully have some measure of compensation in the form of the researcher's hands on work in the field or orchard.

The individual farming families will be selected from a variety of sources. First local and area farmers markets will be canvassed, and prospects identified. Also, the local agricultural commission has provided names and contact information of agricultural entities which use certain chemicals in their processes. These locations are certified by the county through a rigorous qualification standard to transport, store and apply the insecticides and fertilizers in question. From this list, a group may be selected which meets the requirements defined by the United States Department of Agricultural (USDA). The classification of agricultural entities is based upon a value which the USDA calls the Gross Cash Farm Income (GCFI). The definition of the Small family farm is one which the is GCFI less than $350,000 per year (USDA 2015,

p.iii). This value was recently changed from the gross revenues as well as the amount increased from $250,000 (MacDonald, et al, 2013.p7).

Of the one hundred forty agricultural users connected to the Goleta Water District the intent is to interview at least five who meet the requirements of a small-scale family farm. The selection process will consist of a vetting process beginning with face to face canvassing at local farmers markets. If this effort does not produce the required number and quality of prospects a direct mail effort to the mailing list derived from the Santa Barbara California County Agricultural Commission. will be implemented. Most of the potential subjects are focused on crop farming vice livestock. The crop farmers are the sub-group that will be considered.

In addition to the small-scale farmers, the members of the Goleta Water Board will be asked to participate in the interview protocol. The series of questions included in the protocol are derived from that of Burnham, et al (2016). Two separate protocols (Appendix A and B) were developed for the respective subject.

The methodology employed will be based upon grounded theory, in that the attempt will be to seek to discover a hypothesis while collecting, coding and analyzing the resulting data (Auerbach & Silverstein, 2003, p.6). One could only guess what the small-scale farmer's experience might entail. It would seem logical that these would have suffered through such a period; but their subjective experience expressed in their words, with their tone of voice and body language will inform a theoretical framework (Auerbach & Silverstein, 2003, p.7).

In addition, at least two of the five directors of the Goleta Water District board will be asked to be interviewed using a separate but similar protocol from that used for the farmers.

Though the reality of anthropogenic climate change is deemed a settled fact of science (Oreskes, 2004), yet in this paradigm it should be considered independent since the impact of the small-scale farmer would be minimal when considered by itself.

Coding and Analysis

Coding will be a variable result of the interviewee's words, facial expressions, tone of voice as well as other non-verbal communication. This is since the qualitative methodology is about the voice of the participants (Auerbach & Silverstein, 2003, p.126). Positive and negative responses will be graded using a scale not unlike the 5-point Likert, based upon the interviewer's subjective interpretation; this will provide a pseudo-quantitative result. Ad hoc real-time alterations to the verbiage of the protocols may be necessary as varying language skills are encountered.

Labeling of each location will be accomplished in a manner that protects the identity and privacy of the participants. Each will be identified using the name of a farm or ranch which has appeared in a television show or movie, such as Ponderosa, Little House, South Fork, et al. The relationship between each actual location and the pseudonym will be known only to the author.

References:

Alwang, J. & Norton, G., (2011). What types of safety nets would be most efficient and effective for protecting small farmers and the poor against volatile food prices? *Food Security, vol. 3, no. S1, 2011, pp. 139–148.*, doi:10.1007/s12571-010-0089-9. Retrieved from https://link-springer-com.fgul.idm.oclc.org/article/10.1007%2Fs12571-010-0089-9

Amsalu, A., Beshah, T., & Tafa, K. (2006). Determinants of Physical Soil and Water Conservation Practices in Ethiopia's Semi-Arid Tropics: The Case of Bati District. *Social and Basic Science Research Review*,*2*(12), 525-541.

Anderson, M., (2005). *Tending the wild: Native American knowledge and the management of California's natural resources*. University of California Press. Berkeley, USA.

Ash, C., Hanson, B., & Norman, C. (2002). Earth, air, fire, and water. *Science*, *296*(5570), 1055. Retrieved from https://fgul.idm.oclc.org/docview/213567739?accountid=10868

Auerbach, C. F., & Silverstein, L. B. (2003). *Qualitative data: an introduction to coding and analysis*. New York: New York University Press.

Bachman, S., (2011). *Goleta Water District Water Supply Management Plan* (pp. 1-82) (USA, Goleta Water District). Goleta, CA: Goleta Water District. Retrieved from http://www.goletawater.com/assets/documents/water_supply/Water_Supply_Management_Plan_Final_3-31-11.pdf

Bardach, E. (2012). *A practical guide for policy analysis: The eightfold path to more effective problem solving.* Los Angeles: Sage.

Burnham, M., Ma, Z., Endter-Wada, J., & Bardsley, T. (2016). Water Management Decision Making in the Face of Multiple Forms of Uncertainty and Risk. *JAWRA Journal of the American Water Resources Association*,*52*(6), 1366-1384. doi:10.1111/1752-1688.12459, Interview Protocol only.

Retrieved from http://repository.iutahepscor.org/storage/f/2015-07-21T13%3A52%3A51.262Z/iutah-interview-protocol-burnham-ma-endter-wada-bardsley-2013.pdf

Burrelsman, K. M. (2009). A *search for meaning: The family's response to serious mental illness* (Doctoral dissertation, Antioch, 2009) (pp. 1-177). Santa Barbara, CA: Antioch. Retrieved from https://etd.ohiolink.edu/rws_etd/document/get/antioch1273765830/inline

Cavalcanti, I. & Kousky, V., 2001. Drought in Brazil during summer and fall 2001 and associated atmospheric circulation features. Center of Climate Prediction, National Centers Environmental Prediction. Retrieved from http://climanalise.cptec.inpe.br/~rclimanl/revista/pdf/criseing.pdf

Cleveland, D. (2014). *Balancing on a planet: The future of food and agriculture.* University of California Press. Berkeley and Los Angeles, CA

Craig, R. (2010). Stationarity is Dead - Long Live Transformation: Five Principles for Climate Change Adaptation Law. *Harvard Environmental Law Review, 34*(1), 9-75. Retrieved from http://ssrn.com/abstract=1357766

Creswell, J. W. (2014). *Research design: qualitative, quantitative, and mixed methods approaches*. Los Angeles, CA: Sage.

Devereux, S., (2000). Famine in the Twentieth Century. IDS Working Paper 105. *Institute of Development Studies, 2000*. Retrieved from https://opendocs.ids.ac.uk/opendocs/handle/123456789/3435

Dror, Yehezkel. (1969), *Policy Analysis: A Theoretic Framework and Some Basic Concepts*. Santa Monica, CA: RAND Corporation

Drummond, J., & Barros-Platiau, A. (2006). Brazilian Environmental Laws and Policies, 1934–2002: A Critical Overview. *Law and Policy, 28*(1), 83-108. Retrieved from http://papers.ssrn.com/sol3/DisplayAbstractSearch.cfm

Escobar, H. (2015). Drought triggers alarms in Brazil's biggest metropolis. *Science,347*(6224), 812-812. Retrieved from http://www.sciencemag.org/content/347/6224/812

Fagan, Brian M. *Before California: an archaeologist looks at our earliest inhabitants*. Rowman & Littlefield, 2003.

Gamble,L., (2005) Culture and climate: reconsidering the effect of palaeoclimatic variability among Southern California hunter-gatherer societies, World Archaeology, 37:1, 92-108, DOI: 10.1080/0043824042000329586 Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.565.1361&rep=rep1&type=pdf

Garau, B. (2008 June), *Dangerous holes in global environmental governance: The roles of neoliberal discourse, science, and California agriculture in the Montreal Protocol.* http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.620.1364&rep=rep1&type=pdf

General Assembly (UN) resolution 64/292, *The human right to water and sanitation*, A/RES/64/292 (30 August 2010), available from undocs.org/A/RES/64/292.

Giannikopoulou, A. S., Gad, F. K., Kampragou, E., & Assimacopoulos, D. (2017). Risk-based assessment of drought mitigation options: The case of Syros island, Greece. *Water Resources Management, 31*(2), 655-669. doi:http://dx.doi.org.fgul.idm.oclc.org/10.1007/s11269-015-1057-0. Retrieved from https://search-proquest-com.fgul.idm.oclc.org/docview/1982519702?pq-origsite=summon&https://search.proquest.com/abicomplete

Glaser, B. G., & Strauss, A. L. (2012). *The discovery of grounded theory: strategies for qualitative research*. New Brunswick: AldineTransaction.

Glassow, M., Gamble, L., Perry, J. & Russell, G.(2010) Prehistory of the Northern California Bight and the Adjacent Transverse Ranges. In Jones, T. & Klar, K. (Eds) *California Prehistory:Colonizatoin, Culture and Complexity* (pp.193-214). Plymouth, UK: AltaMira Press

Glazer, A. N., & Likens, G. E. (2012). The water table: The shifting foundation of life on land. *Ambio*, 41(7), 657-69. doi:http://dx.doi.org.fgul.idm.oclc.org/10.1007/s13280-012-0328-8. Retrieved from https://search-proquest-com.fgul.idm.oclc.org/docview/1112137008?pq-origsite=summon&https://search.proquest.com/abicomplete

Gleick, P. (1996). Basic water requirements for human activities: Meeting basic needs. *Water International, 21*(2), 83-92. Retrieved from http://pacinst.org/wp-content/uploads/2012/10/basic_water_requirements-1996.pdf

Gleick, P. (1999). The Human Right to Water. *Water Policy, 1*(5), 487-503. Retrieved from http://pacinst.org/wp-content/uploads/sites/21/2012/10/basic_water_needs_human_right_to_water.pdf

Goleta Water District. (2006). *Goleta Water District Water Code*. Retrieved from http://www.goletawater.com/assets/documents/other/GWD_Water_Code_0720.pdf

Goleta Water District. (2014). *Drought Preparedness and Water Shortage Contingency Plan*, Retrieved from http://www.goletawater.com/assets/uploads/documents/FINAL%20GWD%20Drought%20Management%20Plan%20July%202014.pdf

Goleta Water District. (2017). *Goleta Water District Water Code*. Retrieved from http://www.goletawater.com/assets/uploads/documents/other/GWD_Water_Code_010118.pdf

Goleta Water District. (2018). *Drought update*. Retrieved from http://www.goletawater.com/summer-drought-update

Goleta Water District. (2018). *Urban Agricultural Drought Portal*. Retrieved from http://www.goletawater.com/drought-portals/urbanagdroughtportal

Greenberg, J. H., & Greenberg, G. (2013). Native American Narratives as Ecoethical Discourse in Land-Use Consultations. Wicazo Sa Review, 28(2), 30-59. Retrieved from http://search.ebscohost.com.fgul.idm.oclc.org/login.aspx?direct=true&db=ofs&AN=90556329&site=ehost-live

Haas, L. (1995). *Conquests and historical identities in California, 1769-1936*. Berkeley: University of California Press.

Hanak, E. et al (2011). *Orchestrating the Management of Water Scarcity, Quality, and Flooding. In Managing California's water: From conflict to reconciliation.* San Francisco, CA - California: Public Policy Institute of California. Retrieved from http://www.ppic.org/content/pubs/report/R_211EHR.pdf

Hundley, N. (1992). *The great thirst: Californians and water, 1770s-1990s*. Berkeley: University of California Press.

Ingram, B. L., & Malamud-Roam, F. (2013). *The West without water: What past floods, droughts, and other climatic clues tell us about tomorrow*. Berkeley: University of California Press.

Jara-Rojas, R., et al. "An analysis of the joint adoption of water conservation and soil conservation in Central Chile." *Land Use Policy*, vol. 32, 2013, pp. 292–301., doi:10.1016/j.landusepol.2012.11.001.

Johnsson, R., & Kemper, K. (2006). *Institutional and policy analysis of river basin management : the Alto-Tiete river basin, Sao Paulo, Brazil* (World Bank Policy Research Working

Paper 3650). Washington, DC; World Bank. Retrieved from http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-3650

Johnston-Dodds, K. (2009) *Early California Laws and Policies Related to California Indians.* Sacramento, California Research Bureau

Josselson, R. (2013). *Interviewing for qualitative inquiry: a relational approach*. New York: Guilford Press.

Kennedy/Jenks Consultants (2010), *The 2010 Urban Water Management Plan* http://www.goletawater.com/assets/GWD_2010UWMP_Final.pdf

Kennedy/Jenks Consultants (2013), *Technical Report on Optimizing the Goleta Water District Water Conservation Program.* Retrieved August 7, 2016, from http://www.goletawater.com/assets/documents/conservation/GWD%20Water%20Conservation%20Final%20Report%2011%20June%202013_web.pdf

Konner, M. and Eaton, S. B. (2010), *Nutrition in Clinical Practice*, Paleolithic Nutrition.25: 594–602. doi:10.1177/0884533610385702

Kummu, M., Ward, P., Moel, H., & Varis, O. (2010). *Is physical water scarcity a new phenomenon? Global assessment of water shortage over the last two millennia*. Environmental Research Letters, 5(034006), 1-10. Retrieved March 7, 2015, from http://iopscience.iop.org/1748-9326/5/3/034006

Loeb, E., (1926). The Creator Concept Among the Indians Of North Central California. *American Anthropologist, Volume 28, Issue 3, Version of Record online: 28 OCT 2009.* Retrieved from http://onlinelibrary.wiley.com/doi/10.1525/aa.1926.28.3.02a00020/pdf

MacDonald, J. M., Korb, P., & Hoppe, R. A. (2013 August). *Farm Size and the Organization of U.S. Crop Farming*(US, USDA, Economic Research Service). Retrieved from https://www.ers.usda.gov/webdocs/publications/45108/39359_err152.pdf?v=4152

Macko, S. A., Engel, M. H., Andrusevich, V., Lubec, G., O'Connell, T. C., & Hedges, R. E. (1999). Documenting the diet in ancient human populations through stable isotope analysis of hair. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *354*(1379), 65–76. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1692445/pdf/10091248.pdf

Meadows, D. H., & Wright, D. (2008). *Thinking in systems: A primer*. White River Junction, VT: Chelsea Green.

Moratto, M. (1984). *California Archeology.* Coyote Press, Salinas, US

Mount, J. & Hanak, E., (2016). Just the facts: Water use in California. *Public Policy Institute of California.*

Mount, J. & Hanak, E., (2016). Just the facts: Water use in California. *Public Policy Institute of California.*

Murtinho, F., Tague, C., de Bievre, B., Eakin, H.& Lopez-carr, D. (2013). Water Scarcity in the Andes- A Comparison of Local Perceptions and Observed Climate Land Use and Socioeconomic Changes. *Human Ecology; New York Vol. 41, Iss. 5, (Oct 2013): 667-681. DOI:10.1007/s10745-013-9590-z.* Retrieved from *https://search-proquest-com.fgul.idm.oclc.org/docview/1439577852?pq-origsite=summon&accountid=10868*

Naidoo, L (2012). *Ethnography: An Introduction to Definition and Method, An Ethnography of Global Landscapes and Corridors*, InTech, Retrieved from: http://cdn.intechopen.com/pdfs/31534.pdf

O'Reilly, K., 2012. Ethnographic methods [second edition]. Abingdon: Routledge, 272pp.

Oreskes, N. (2004). BEYOND THE IVORY TOWER: The Scientific Consensus on Climate Change. *Science,306*(5702), 1686-1686. doi:10.1126/science.1103618. Retrieved from http://science.sciencemag.org/content/306/5702/1686/tab-pdf

Padgham, J., (2009). Agricultural development under a changing climate: Opportunities and challenges for adaptation. *World Bank, Agriculture and Rural Development & Environment Departments. August 2009, Issue 1.*

Penn, J. (2001). *Rivers of the World*. ABC-CLIO, LLC, Santa Barbara, CA.

Price, T. D. (2007). *Europe's first farmers*. Cambridge University Press., Cambridge, UK.

Richards, M. (2002). A brief review of the archaeological evidence for Paleolithic and Neolithic subsistence. *European Journal of Clinical Nutrition*; London Vol. 56, Iss. 12, (Dec 2002): 16 p following 1262. Retrieved from https://search-proquest-com.fgul.idm.oclc.org/docview/219657812?pq-origsite=summon&accountid=10868

Roco, L., Poblete, D., Meza, F., & Kerrigan, G. (2016). Farmers' options to address water scarcity in a changing climate: Case studies from two basins in Mediterranean Chile. *Environmental Management, 58*(6), 958-971. http://dx.doi.org.fgul.idm.oclc.org/10.1007/s00267-016-0759-2 Retrieved from https://fgul.idm.oclc.org/docview/1833158696?accountid=10868

Saini, G., Sampson, E. L., Davis, S., Kupeli, N., Harrington, J., Leavey, G., . . . Moore, K. J. (2016). *An ethnographic study of strategies to support discussions with family members on end-of-life care for people with advanced dementia in nursing homes. BMC Palliative Care,15*(1). doi:10.1186/s12904-016-0127-2

Sangasubana, N. (2011). *How to Conduct Ethnographic Research*.The Qualitative Report, 16(2), 567-573. Retrieved from http://nsuworks.nova.edu/tqr/vol16/iss2/14

Santa Barbara County – Flood Control District (2016), *Rainfall and Reservoir Summary*. Retrieved from: http://cosb.countyofsb.org/uploadedFiles/pwd/Water/Hydrology/rainfallreport.pdf

Scott, W. & Davis, G. (2006). *Organizations and Organizing: Rational, Natural and Open Systems Perspectives*. 1st Edition. Pearson

Shakun, J. D., Clark, P. U., He, F., Marcott, S. A., Mix, A. C., Liu, Z., . . . Bard, E. (2012). Global warming preceded by increasing carbon dioxide concentrations during the last deglaciation. *Nature, 484*(7392), 49-54. Retrieved from https://fgul.idm.oclc.org/docview/1012159509?accountid=10868

Sheffield, J., Wood, E. F., & Roderick, M. L. (2012). Little change in global drought over the past 60 years. *Nature, 491*(7424), 435-8. Retrieved from https://fgul.idm.oclc.org/docview/1223498983?accountid=10868

Solomon, S., (2010). *Water: The epic struggle for wealth, power and civilization.* Harper Collins, London, UK.

Steduto, P., Hsiao, T., Fereres, E. and Raes, D., (2012). Crop yield response to water. Food And Agriculture Organization Of The United Nations. Retrieved from http://www.fao.org/docrep/016/i2800e/i2800e.pdf

Steduto, P., Hsiao, T., Fereres, E. and Raes, D., (2012). Crop yield response to water. *Food And Agriculture Organization Of The United Nations*. Retrieved from http://www.fao.org/docrep/016/i2800e/i2800e.pdf

Stumbos J. (1993). *Small farmers: Who are they and why do they matter?* Calif Agr 47(2):6-7. Retrieved from http://calag.ucanr.edu/archive/?article=ca.v047n02p6

Taher, T. (2016). Groundwater abstraction management in Sana'a Basin, Yemen: a local community approach. *Hydrogeology Journal, September 2016, Volume 24, Issue 6, pp 1593–1605.* Retrieved from https://tinyurl.com/ya3zel6b (tiny URL)

Thompson, B. H. (1993, May). Institutional Perspectives on Water Policy and Markets. *California Law Review, 81*(3), 671-764. doi:10.15417/1881

United States Department of Agriculture. USDA Economic Research Service. (2013). *USDA Small Farm Definitions.* Retrieved from www.articles.extension.org/pages/13823/usda-small-farm-definitions#.UsV_8ifCYx4

United States Department of Commerce. Bureau of Economic Analysis. (2018). *Bear Facts*. Retrieved from www.bea.gov/regional/bearfacts/pdf.cfm?fips=06000&areatype=STATE&geotype=3.

USDA. (2015 January). Census of Agriculture (Vol. 2, Ser. 10) (USA, USDA, National Agricultural Statistics Service). USDA. Retrieved from https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Typology/typology13.pdf

Ward, F., & Michelsen, A. (2002). The economic value of water in agriculture: concepts and policy applications. *Water Policy*,*4*(5), 423-446. doi:10.1016/s1366-7017(02)00039-9

Woolf, N. (2015). A Hypothesis About the Origin of Biology. *The Journal of the International Astrobiology Society*, Volume 45, Issue 1–2, pp 257–274. Retrieved from https://link.springer.com/article/10.1007/s11084-015-9426-5

Yanow, D. (2000). *Conducting interpretive policy analysis*. Thousand Oaks, CA: Sage Publications

Zenovich, M. (2017) director. Water and power: A California heist [Netflix]. National Geographic, http://www.channel.nationalgeographic.com/water-and-power-a-california-heist

Appendix A: Informed Consent Form

Fielding Graduate University

Informed Consent Form

Goleta Water District Drought Policy Impact on Small Scale Farmers

NAME OF SUBJECT: _____

You have been asked to participate in a research study conducted by Dennis P. German, a doctoral student in the School of Leadership Studies at Fielding Graduate University, Santa Barbara, CA. This study is supervised by Annabelle Nelson, PhD. This research involves the study of water policy impact on the small-scale family farms of Goleta, California and is part of Dennis' Fielding dissertation. You are being asked to participate in this study because of your being one of the few small-scale family farmers in Goleta.

Before you agree to participate in this research study, it is important that you read and understand the information provided in this Informed Consent Form. If you have any questions, please ask the researcher for clarification.

Why Is This Study Being Done?

The purpose of this research is to allow the small-scale family farmers to tell their stories about coping with conditions of water scarcity and dealing with the Goleta Water District.

How Many People Will Take Part In The Study?

Several (5-7) local small-scale family farmers who are customers of the Goleta Water District and 1 or 2 members of the Goleta Water District Board

What Is Involved In The Study?

If you agree to participate in this study, you will *answer simple questions about your experience during the drought and with the Goleta Water District. You will have the opportunity to speak openly and at length about your experience*.

How Long Will I Be in The Study?

The study involves an interview, to be arranged at your convenience. This will last approximately 60 minutes or more depending upon your desire to speak on the subject. The total time involved in participation will be approximately no more than an hour.

What Are the Risks Of The Study?

The risks to you are considered minimal and there is a probability that you may experience some emotional discomfort during or after your participation. Should you experience such discomfort, please contact the counseling services and/or therapists provided in the attached list.

New Findings:

If, during this study, significant new information becomes available that may relate to your willingness to continue to participate, this information will be provided to you by the researcher.

What about Confidentiality and Protection?

Study related records will be held in confidence. Your consent to participate in this study includes consent for the researcher and supervising faculty who may also see your data. Your research records may also be inspected by authorized representatives of the Fielding Graduate University, including members of the Institutional Review Board or their designees. They may inspect, and photocopy as needed, your records for study monitoring or auditing purposes. In addition, parts of your record may be photocopied.

The information you provide will be kept strictly confidential. The verbal informed consent and other identifying information will be kept separate from the data. All materials will be kept on encrypted media. The recordings will be listened to only by the Researcher and members of the dissertation committee. Any records that would identify you as a participant in this study, such as informed consent forms, will be destroyed by me approximately three years after the study is completed.

The results of this research will be published in my dissertation and possibly published in subsequent journals, books or presentations

The security of data transmitted over the Internet cannot be guaranteed, therefore, there is a slight risk that the information you send to me via email will not be secure. The collection of such data is not expected to present any greater risk than you would encounter in everyday life when sending and/or receiving information over the Internet.

Participation in Research Is Voluntary:

You are free to decline to participate or to withdraw from this study at any time, either during or after your participation, without negative consequences. Should you withdraw, your data will be eliminated from the study and will be destroyed

The researcher is also free to terminate the study at any time.

Compensation:

No compensation will be provided for participation.

Study Results:

You may request a copy of the summary of the aggregate final results by indicating your interest at the end of this form.

Additional Information:

If you have any questions about any aspect of this study or your involvement, please tell the Researcher before signing this form. You may also contact the supervising faculty if you have questions or concerns about your participation in this study. The supervising faculty has provided contact information at the bottom of this form.

You may also ask questions at any time during your participation in this study.

If you have questions or concerns about your rights as a research participant, contact the Fielding Graduate University IRB by email at irb@fielding.edu or by telephone at 805-898-4034.

The Institutional Review Board of Fielding Graduate University retains the right to access the signed informed consent forms and other study documents.

Two copies of this informed consent form have been provided. Please sign both, indicating you have read, understood, and agree to participate in this research. Return one to the researcher and keep the other for your files. The Institutional Review Board of Fielding Graduate University retains the right to access to all signed informed consent forms.

I have read the above informed consent document and have had the opportunity to ask questions about this study. I have been told my rights as a research participant, and I voluntarily consent to participate in this study. By signing this form, I agree to participate in this research study. I shall receive a signed and dated copy of this consent.

_____
NAME OF PARTICIPANT (please print)

_____
SIGNATURE OF PARTICIPANT

_____
DATE

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Yes, please send a summary of the study results to the email address or postal address (optional) provided below:

_____ _____

NAME (please print) Email Address (please print)

_____

Street Address

_____

City, State, Zip

Appendix B.1: Recruitment Letter (Farmer)

<<Date>>

<<Name of potential participant>>

<<Address>>

<<City, State, Zip>>

Re: *Goleta Water District Drought Policy Impact on Small Scale Farmers*

Dear *<<insert name>>*:

I am writing to let you know about an opportunity to participate in a research study about water issues and drought policy in Goleta. This study is being conducted by Dennis P. German at Fielding Graduate University in Santa Barbara. This study will allow the small-scale family farmers to tell their stories about coping with conditions of water scarcity and dealing with the Goleta Water District.

Your use of pesticides in your farming/ranching operation requires the listing of your contact information with the County agricultural commission. We are writing to tell you that we believe you may meet the subject requirements of an approved research study about Goleta Water District drought policy impact on small scale farmers.

Agreement to be contacted or a request for more information does not obligate you to participate in any study.

If you would like additional information about this study, please call Dennis P. German at 805-364-4316.

Thank you again for considering this research opportunity.

Appendix B.2: Recruitment Letter (Goleta Water District Board Member)

<<Date>>

<<Name of potential participant>>

<<Address>>

<<City, State, Zip>>

Re: *Goleta Water District Drought Policy Impact on Small Scale Farmers*

Dear *<<insert name>>*:

I am writing to let you know about an opportunity to participate in a research study about water issues and drought policy in Goleta. This study is being conducted by Dennis P. German at Fielding Graduate University in Santa Barbara. This study will allow the small-scale family farmers to tell their stories about coping with conditions of water scarcity and dealing with the Goleta Water District.

Your membership on the Goleta Water District board of directors brings a particular perspective which we wish to include in an approved research study about Goleta Water District drought policy impact on small scale farmers.

Agreement to be contacted or a request for more information does not obligate you to participate in any study.

If you would like additional information about this study, please call Dennis P. German at 805-364-4316.

Thank you again for considering this research opportunity.

Appendix C.1: Interview Protocol (Farmer)

Interview Protocol for the study "The Least of These: The experiences of Small-scale Family Farms During Drought Conditions in Goleta, California"

Interviewer:
Interviewee:
Date of interview:
Location of interview:

Crop Farmers

Thanks for taking the time to talk to me. I am a PhD candidate at Fielding Graduate University studying the impacts of the drought on Goleta's local family farms. The research will show how you have fared with the policies that the Goleta Water District implements during drought condition. During the interview, I'd like to discuss with you the challenges you face; how you have dealt with droughts in the past and how you expect to deal with droughts in the future. This interview should take about 60 minutes. Everything you tell me during the interview will be kept strictly confidential and your name and the location of your farm/ranch will not be revealed to anyone beyond my research team. For data coding and analysis, it will be helpful for me to record this conversation. Do you feel comfortable with this? If not, please let me know now. Again, thank you for your willingness to participate in this interview. Unless you have any questions, let's go ahead and get started.

SECTION 1: BACKGROUND ON INTERVIEWEE AND ORGANIZATION

To begin, I'd like to ask a few questions about your role at [organization] and some of the basic management challenges your organization faces.

1. I read on your website that you [do the following] here at [organization].
    a. Is this still your major responsibility?
    b. Is there anything else you are responsible for managing and making decisions about?
2. What are the most pressing management challenges your organization faces?
    a. What are the year-to-year, short-term planning challenges faced by your organization?
    b. What are the five-to-ten-year, long-term planning challenges faced by your organization?

c. Among these management challenges, which are considered top priorities for your organization to address?

d. How does Goleta's population growth and the expected rise in municipal water demand impact your organization's planning and decision-making?

e. How does providing agricultural water fit into your organization's priorities and management challenges?

3. How does [organization] work with other local, state, and federal agencies to address the challenges we just talked about facing your organization? If not, what prevents your organization from working collaboratively with other agencies?

SECTION 2: DROUGHT PREPAREDNESS

Next, I'd like to ask some questions about how you and your organization have managed drought in the past and what lessons for the future you have learned from those experiences.

1. What have you and your organization learned about dealing with drought from previous experiences?
    a. What are the tradeoffs you must make during droughts?
    b. How do you prioritize those tradeoffs?
    c. What has your organization done to deal with previous droughts that has prepared you for future droughts?
    d. What do you wish your organization could be doing to better deal with drought?
    e. What prevents your organization from doing this?
    f. How does water for agricultural uses fit into your drought management strategies?
    g. What concern do you have about your organization's capacity to deal with future droughts and water scarcity?
    h. What is the threshold that needs to be crossed for a drought to become an unmanageable emergency?
    i. In your opinion, how many consecutive years of drought can your organization handle given your current capacity and resources?

j. How do droughts affect your organization's interaction with other local, state, and federal agencies?

k. What enables you to work effectively across agencies in times of drought?

l. What prevents you from being able to work effectively across agencies in times of drought?

Appendix C.2: Interview Protocol (Goleta Water District Board Member)

Interview Protocol for the study "The Least of These: The experiences of Small-scale Family Farms During Drought Conditions in Goleta, California"

Interviewer:
Interviewee:
Date of interview:
Location of interview:

Goleta Water District Board Member

Thanks for taking the time to talk to me. I am a PhD candidate at Fielding Graduate University studying the impacts of the drought on Goleta's local family farms. The research will show how you have fared with the policies that the Goleta Water District implements during drought condition. During the interview, I'd like to discuss with you the challenges you face; how you have dealt with drought in the past and how you expect to deal with droughts in the future. This interview should take about 60 minutes. Everything you tell me during the interview will be kept strictly confidential and your name and the location of your farm/ranch will not be revealed to anyone beyond my research team. For data coding and analysis, it will be helpful for me to record this conversation. Do you feel comfortable with this? If not, please let me know now. Again, thank you for your willingness to participate in this interview. Unless you have any questions, let's go ahead and get started.

SECTION 1: BACKGROUND ON INTERVIEWEE AND ORGANIZATION

To begin, I'd like to ask a few questions about your role at [organization] and some of the basic management challenges your organization faces.

3. I read on your website that you [do the following] here at [organization].
    c. Is this still your major responsibility?
    d. Is there anything else you are responsible for managing and making decisions about?
4. What are the most pressing management challenges your organization faces?
    a. What are the year-to-year, short-term planning challenges faced by your organization?
    b. What are the five-to-ten-year, long-term planning challenges faced by your organization?

c. Among these management challenges, which are considered top priorities for your organization to address?

d. How does Goleta's population growth and the expected rise in municipal water demand impact your organization's planning and decision-making?

e. How does providing agricultural water fit into your organization's priorities and management challenges?

3. How does [organization] work with other local, state, and federal agencies to address the challenges we just talked about facing your organization? If not, what prevents your organization from working collaboratively with other agencies?

SECTION 2: DROUGHT PREPAREDNESS

Next, I'd like to ask some questions about how you and your organization have managed drought in the past and what lessons for the future you have learned from those experiences.

2. What have you and your organization learned about dealing with drought from previous experiences?
   m. What are the tradeoffs you must make during droughts?
   n. How do you prioritize those tradeoffs?
   o. What has your organization done to deal with previous droughts that has prepared you for future droughts?
   p. What do you wish your organization could be doing to better deal with drought?
   q. What prevents your organization from doing this?
   r. How does water for agricultural uses fit into your drought management strategies?
   s. What concern do you have about your organization's capacity to deal with future droughts and water scarcity?
   t. What is the threshold that needs to be crossed for a drought to become an unmanageable emergency?
   u. In your opinion, how many consecutive years of drought can your organization handle given your current capacity and resources?

v. How do droughts affect your organization's interaction with other local, state, and federal agencies?

w. What enables you to work effectively across agencies in times of drought?

x. What prevents you from being able to work effectively across agencies in times of drought?

SECTION 3: PLANNING FOR CHANGE

Going forward, climate and other hydrological, ecological, and social changes may have an impact on your organization's ability to manage water. Now, I'd like to talk a little more about how your organization is planning with respect to the different changes that are occurring in the Goleta area.

1. What is the nature of the discussion within your organization about climate change?
2. What is your organization doing to manage and plan for climate change?
    a. If nothing, what prevents your organization from doing anything?
    b. What do you wish your organization were doing to address the potential impacts of climate change, which for this region have been predicted to be increased frequency, severity and duration of drought, reduced water availability, and changes in precipitation patterns?
3. What are the biggest barriers for your organization to adapt to climate change?
4. What needs to happen for your organization to more effectively manage and plan for climate change?
    a. What information would help your organization make decisions?
    b. What types of collaboration with the research community or other local, state, and federal agencies would help your organization?
    c. What policy changes or actions by the state legislature would you like to see?
    d. What institutional changes would you like to see?
    e. What infrastructural changes would you like to see?
    f. Is the current built infrastructure managed by your organization set up to deal with shifts in precipitation from snow to rain and earlier spring runoff?

5. In your opinion, how does climate change create new management and planning challenges for your organization?
    a. Given that we live in an arid state with frequent droughts, is climate change a novel problem for your organization?
    b. How does climate change make existing problems such as [list problems they mentioned previously one by one] worse?
    c. How would climate change create challenges for delivering agricultural water to farmers?
    d. How would climate change interact with the rapidly increasing population in Utah?
    e. How would climate change interact with urbanization of former agricultural land?
    f. How would climate change interact with the current trend of transferring water from agricultural uses to municipal and other high value uses?

SECTION 4: CURRENT USE OF INFORMATION AND MODELS

I have just a few more questions about the information and models your organization is using to make water management decisions.

1. What information is your organization using to predict water supply, both year-to-year and at the decadal scale?
2. What information is your organization using to predict water demand, both year-to-year and at the decadal scale?
3. How is your organization coupling water supply and demand models?
4. How is your organization modeling dynamic changes in hydrologic, ecological, and social systems when predicting water supply and demand?
    a. How is your organization taking into consideration these dynamic changes in future water management and planning?
    b. If your organization is not doing it currently, what is preventing your organization from considering these dynamic changes?

Appendix D: Participant Demographics

1. What is your gender?
    a. Male
    b. Female

2. What is your age?
    a. 18-29 years old
    b. 30-49 years old
    c. 50-64 years old
    d. 65 years and over

3. What is the highest level of education you have completed?
    a. some high school
    b. high school graduate
    c. some college
    d. trade/technical/vocational training
    e. college graduate
    f. some postgraduate work
    g. post graduate degree

4. What is your religious preference?
    a. Roman Catholic
    b. Seventh-Day Adventist
    c. Mormon
    d. Christian Scientist
    e. Muslim
    f. Protestant
    g. Jewish
    h. an Orthodox church such as the Greek or Russian Orthodox Church
    i. Something else (please specify)

5. Would you describe yourself as a "Born-again" or evangelical Christian?
    a. Yes
    b. No
    c. Don't Know

6. Do you happen to be a member of a church, synagogue, mosque, or other organized religious group?
    a. No
    b. Yes

7. Did you happen to attend church, synagogue, mosque, or some other religious worship service in the last seven days?
    a. Yes, Did attend
    b. No, Did not attend

9. Ethnicity: We want to be sure that we have spoken to a broad mix of people in your area. Are you, yourself, of Hispanic origin or descent, such as Mexican, Puerto Rican, Cuban, or other Spanish background?
    a. Yes
    b. No

10. Race: What is your race? Are you white, African-American, or some other race?
    a. white
    b. African-American
    c. Other (please specify)

11. Other than the effort required for the agricultural operation, are you now employed full-time, part-time, not employed, or retired?
    a. full time
    b. part time
    c. not employed
    d. retired

12. Including yourself, how many people live within your household?

13. Are there any children under the age of eighteen years currently living in your household?
    a. Yes
    b. No

14. What is your marital status?
    a. single/never been married
    b. married
    c. separated
    d. divorced
    e. widowed

15. How would you describe your political views?
    a. very conservative
    b. conservative
    c. moderate
    d. liberal
    e. very liberal