Managing Regional Water Resources Amidst Rapid Urbanization in Southwest Florida: A Case Study

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Managing Regional Water Resources Amidst Rapid Urbanization in Southwest Florida:

A Case Study

by

Nicole Owusua Caesar

A dissertation submitted in partial fulfillment
of the requirements of the degree of
Doctor of Philosophy
School of Geosciences
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Dedication

With love, to An-Don and Aunty Alice. Thank you.
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# Table of Contents

List of Figures ................................................................................................................................. iii

List of Tables ...................................................................................................................................... iv

Abstract ............................................................................................................................................... v

Chapter 1: Introduction ...................................................................................................................... 1
   Statement of the Problem .............................................................................................................. 1
   Rationale for the Study ................................................................................................................ 5
   Purpose of the Study ..................................................................................................................... 9
   Definition of Terms ....................................................................................................................... 10
   Research Background and Interest in the Study: Situating Myself in the
   Inquiry .......................................................................................................................................... 11

Chapter 2: Review of the Literature: Urban Development ............................................................... 14
   Florida as Opportunity: 19th Century Urbanization Efforts ....................................................... 14
   Tampa Bay as Opportunity: 19th Century Urbanization Efforts ................................................ 17
   Economic Growth in Tampa Bay: Post World War II ................................................................. 19
   Unhinged Development: Urban Sprawl ...................................................................................... 22
   Theoretical Frameworks: Constructions of Nature ..................................................................... 23
   Nature Discourses: Contributions of Environmental Historians .............................................. 23
   Nature Discourses: Contributions of Geographers ................................................................. 25
   Expansionism, Urbanization and Capital: The Treadmills ....................................................... 28
   Conclusion .................................................................................................................................... 29

Chapter 3: Review of the Literature: Freshwater Resources .......................................................... 32
   The Development of Florida’s Water Legislation .......................................................................... 32
   The Southwest Florida Water Management District .................................................................... 37
   Theoretical Frameworks: Organization Theory .......................................................................... 42
   Water Use ...................................................................................................................................... 45
   Unsustainable Water Use: Empirical Evidence ......................................................................... 49
   Water for Urban Growth ............................................................................................................. 52
   Conclusion .................................................................................................................................... 55
   Urban Water Resource Discourses .............................................................................................. 56
List of Figures

Figure 1 A map of the Florida peninsula, with the boundaries of the state’s five water management districts (STJRWMD, 2009) .................................................. 37

Figure 2 A map of the SWFWMD location, boundaries and included counties (SWFWMD, 2005) ............................................................ 40

Figure 3 District-wide annual rainfall levels in inches for 1915 – 2011 ........................................ 48

Figure 4 Distribution of total ground and surface water withdrawals by sector in mg/d (left axis) displayed against annual rainfall in inches (right axis) for 1992 – 2011 ........ 49

Figure 5 The location and infrastructure of the Four River Basins project, (Core of Engineers Report, 1963) ............................................................................. 72
List of Tables

Table 1 Numbers of employees located in Tampa’s central city and suburban tract from 1960 -1990 (U.S Census of population and housing: 1960, 1970, 1980, 1990) ..................................................................................................................................................22

Table 2 Population projections for the counties within the Tampa Bay region, percent population change and projected associated public water-supply demand increase (SWFWMD, 2013) ........................................................................................................................................48

Table 3 Population projections for the counties within the Tampa Bay region, percent population change and projected associated public water-supply demand increase (SWFWMD, 2005) ........................................................................................................................................49

Table 4 Metered and estimated water withdrawals in millions of gallons per day (SWFWMD, 2012) ........................................................................................................................................72
Abstract

Experts and organizations involved in freshwater resources management have emphasized the importance of long-term urban resource planning and management that considers the tight coupling which exists between human – nature – technology systems. The resistance of contemporary urban growth efforts to consider resource carrying capacities and ecosystem requirements has led to costly unintended consequences including the deterioration of natural capital and their associated ecosystem services, and the degradation of water resource flows. As these problems continue to worsen, resource experts have called for the development of a new water resource management paradigm inclusive of various sustainability criteria.

Historically water-rich Florida has demonstrated increased resource strain over the past four decades, in spite of the creation of some of the nation’s most comprehensive water resource and growth management legislation. The Southwest Florida Water Management District was originally created to manage regional flooding in 1961 and has undergone a tremendous expansion in statutorily mandated resource responsibilities over the past 40 years. This case study utilized semi-structured surveys of current and former agency employees to examine the agency’s expansion into integrated water resource management amidst rapid regional urbanization.
Chapter 1: Introduction

Statement of the Problem

Throughout the course of human civilization, freshwater resource management has encompassed numerous initiatives including the provision of adequate water supplies to fulfill domestic, agricultural, cultural and industrial requirements, and the diversion of excess surface water away from settlements. Water is the “economic, social, and cultural lifeblood of humanity” (Feldman, 2007, p. 11) and urban growth remains tightly bound to the availability of dependable freshwater supplies (Gleick, 1996; Mitchell, 2005).

As cities and industrial societies developed from agrarian civilizations, advances in hydrologic engineering made it possible to harness and mobilize increasing quantities of freshwater. This “hard-path” approach, popular during the 20th century, involved massive infrastructural works including canals, pipelines, dams and centralized wastewater treatment plants to support water supply, flood control, irrigation and hydropower projects (Gleick, 2003; 2010). Billions of citizens benefitted from improved sanitation, reduced flood risks, and increased agricultural and energy production. Modern civilization became no less dependent on freshwater resources, even as the conveniences and conditions of urban life rendered it increasingly difficult for societies to recognize their dependence on inflows of natural resources including freshwater (Feldman, 2007; Kaika, 2005; Kaika & Swyngedouw, 2000).

Heralded as being representative of 20th century progress, the large-scale waterworks programs initiated in 1945 (through the late 1970s) included irrigation projects, dams, hydroelectric plants, barrages, inter-basin transfers and river diversions, and wetlands-drainage
and land-reclamation projects (Varady & Iles-Shih, 2009). These resource mobilization efforts produced an array of negative externalities (far-reaching societal and ecological impacts) and contributed towards the environmental decline noted in the World Water Council’s 1999 report on food security and water shortages (Cosgrove & Rijsberman, 2014; Varady & Iles-Shih, 2009). These impacts, evident at regional and international scales, prompted water professionals to supplement their scientific objectives with social and political initiatives, and fostered dialogue among colleagues located in North America, Eastern and Asia. United Nations officials, scientists, engineers and educators called for coordinated international efforts to gather and analyze planetary data. This effort would produce the declaration of the International Geophysical Year (IGY) in July 1957, which paved the way for the development of other scientific global initiatives including the International Hydrological Decade (IHD) (Varady & Iles-Shih, 2009).

International efforts to address the water resource issues that stemmed from industrialization, urbanization, environmental degradation and hydrologic variability became especially prominent during the 1970s (Salman, 2004). The first global conference devoted entirely to water resources issues was the 1977 United Nations (UN) Mar del Plata conference, which highlighted a growing water crisis; specifically, the problem of providing the required amounts of quality freshwater resources to support continued global socio-economic expansion efforts (Biswas, 1978). Recommendations from the resulting Mar del Plata Action Plan covered numerous components of water management including resource assessment, usage and efficiency, and planning and management (Salman, 2004; Biswas, 2004), and served to provide a foundation for the International Drinking Water Supply and Sanitation (DWSSD) decade of 1981 through to 1990 (Salman, 2004; Gleick & Lane, 2005). It should be noted that the DWSSD was
deemed a disappointment by the United Nations General Assembly in December of 1990. The absence of guidelines to encourage public participation, and rapid population increase coupled with slow implementation rates, would render impossible the goal of supplying suitable water and sanitation facilities to significant proportions of rural dwellers by 2000 (Salman, 2004).

The International Conference on Water and the Environment (held in Dublin in January 1992 prior to the June 1992 Rio de Janeiro United Nations Conference on the Environment) was convened to identify priority issues and recommend tools to address international freshwater concerns. Proposed recommendations were included in Agenda 21 (the strategy for sustainable development in the 21st century) (Larsen & Gujer, 1997) and highlighted the need for a holistic approach to freshwater management that coupled the protection of natural systems with social and economic development. The evident impact of land-use on water resources prompted Agenda 21 contributors to recommend that water issues be addressed in concert with land-use planning (Mitchell, 2005).

As such, a water resource planning and management trajectory that incorporated principles of sustainable development would be deemed progressive, but an embedded, often unacknowledged paradox within the very concept may serve to delay its realization. The global community became familiar with the notion of sustainable development via the inherently vague definition and contradictory solutions put forward by the Bruntland Commission’s report, Our Common Future (Wackernagel & Rees, 1996). The Bruntland report suggested that sustainable development is “…development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland et al., 1987, p 43), but failed to adequately address the complex and varied connotations of the term “development”, rendering the definition subject to multiple interpretations and corresponding policy implementations. The
report also stated that “… each country, strives for survival and prosperity with little regard for its impacts on others. Some consume the Earth’s resources at a rate that would leave little for future generations…” (Brundtland et al., 1987, p 213). This suggests recognition of the relationship between 20th century urbanization and economic imperatives to maximize economic production, and detrimental ecological and societal externalities (Daly 1996, Wackernagel & Rees, 1996). This acknowledgement was swiftly undermined within the solutions section of the report which called for “…more rapid economic growth in both industrial and developing countries…” (Brundtland et al., 1987, p 65). This societal – nature tension was illustrated in the U.S from the 1970s onwards as public outcry, quantitative research and environmental legislation served to influence the projects undertaken by national water management agencies including the Army Corps of Engineers and the Bureau of Reclamation. These agencies were required to undertake environmental restoration, the removal of engineered structures and the reallocation of water flows to reverse the ecological demise of projects that were implemented to manage water flows to support urbanization (Colby et al., 1991).

Increased awareness of the tightly coupled nature of urban development and watershed health became evident by the late 1990s, and scholars identified a shift in the dominant resource management paradigm to one which emphasized long-term resource sustainability and systems-level management over the maximization of sustained resource yields.

Influential freshwater researcher Peter H. Gleick suggested that this shift was indicative of a new water resource management paradigm; a shift from constantly seeking new freshwater sources, towards the inclusion of ecological requirements into water policy and the de-coupling of water use and economic growth (Gleick, 2003). Gleick (1996, 2003, 2010) has performed extensive research in this area and has outlined the need for a new water paradigm that embraces
the following principles of sustainable water resources management: (1) a shift away from market-led supply-side water management; (2) a severance of the established ties between economic growth and water use; and (3) the institutionalization of ecological values in the formation of sustainable water policy.

Contemporary water resource management research has focused primarily on international resource management trends, hydrology and hydrogeology, supply and demand-side management, water supply, water quality, conservation, urban growth and land use - land change. Few studies have examined the management and regulatory agencies responsible for regional water resource management amidst this shifting paradigm as outlined by Gleick (2000, 2010). Unpacking agency management mechanisms and their impacts on the resource as they operate within their statutory authority could provide a basis for the development of a framework for sustainable regional water resource management. My investigation, situated at the juncture of the natural and social sciences, and inclusive of 20th century water resource and urbanization literature, provides a lens to better understand the challenges of conducting water resource management in metropolitan regions the 21st century.

**Rationale for the Study**

Traditional approaches to freshwater resource management embraced structural solutions that typified linear, engineering-dominated solutions to the immediate concerns of urbanizing regions including water supply, sanitation, irrigation, and flood control (Gleick, 1996; 2003). An initial dearth of scientific information and lack of understanding of watershed hydrogeology, coupling of surface and groundwater flow, and the water flow levels required to maintain freshwater ecosystem viability, produced unintended water management consequences that became apparent in urban regions by the late 20th century (Mitchell, 2005). These consequences
included the degradation of surface and groundwater quality and quantity, reduction in system recharge rates, and declines in the natural ecosystem services that play fundamental roles in maintaining robust regional watershed budgets (Jønch-Clausen & Fugl, 2001).

For the purposes of this research, I use the term “water management” as a shortened form of “freshwater resource management” which is the mobilization (planning, development and distribution) of naturally occurring potable surface and groundwater resources for uses deemed relevant to societal needs. I use the term “urbanization” to refer to the population increase and associated land use changes that occur on the periphery of geographical regions that are classified as urban (vs. rural). Urban regions typically demonstrate higher population densities and rates of land development.

A number of urban–natural tensions arose during the 19th century as water managers, urban planners and policy makers emphasized water quantity over water quality, often failing to reconcile these two fundamentally inseparable concerns. Furthermore, attempts to manage water resources in a manner that ensures the availability of affordable, dependable supplies of freshwater for urban use without subsequent resource and ecosystem degradation were hampered by a reluctance to reconcile natural resource budgets and distributions with ecological services and societal demands (Ascher, 1999; Beach et al., 2000; Postel, 1997).

To explain further, freshwater ecosystems play vital roles in water storage, capture, and purification, and their health and productivity are strongly coupled to hydrologic variability including seasonal highs and lows (Richter et al., 1997; Stanford et al. 1996). Conversely, traditional water management infrastructure serves to maintain steady water supplies for industrial and domestic use and to dampen fluctuations in surface water levels (Postel & Carpenter, 1997). For instance, cities utilize manmade reservoirs to store higher than average
flows, supplementing water supplies during drier periods and maximizing water supply reliability to secure annual economic benefits (Richter et al., 2003). The resultant dramatic changes to natural hydrological flows significantly alter ecosystem biodiversity and negatively impact water quality and recharge rates (water quantity), thereby producing unintended economic costs to society (Postel & Carpenter, 1997; Richter et al., 2003).

Traditional water management systems were designed to provide targeted technological and engineering solutions to the water supply and wastewater concerns of urbanizing regions, and exhibited high levels of controllability and predictability in the short-term (Pahl-Wostl et al., 2007; Pahl-Wostl et al., 2008). Rooted in the “command and control” paradigm, this non-integrative framework is poorly suited to the consideration of long-term consequences (Booth, 1991) and often leads to the mismanagement of a watershed’s hydrological budget via unsustainable resource utilization rates that result in resource degradation and depletion (Anderson, 2003; Beekman, 1998; Gleick, 2000). For instance, water resource mobilization efforts in Southwest Florida inadvertently contributed to reduced stream levels and spring discharge (reduction in water quantity), increased nutrient loading from fertilizers and urban land run-off into streams and the aquifer (reduction in water quality), and increased sinkhole formation (Tihansky, 2001). The management agency responsible for Southwest Florida’s water resources would undertake large hydrological and ecological restoration efforts to dampen the realized effects of decades of unsustainable freshwater mining.

As the ecological and environmental impacts of hard-path water planning and management frameworks became increasingly apparent during the past two decades, water management and policy discourse broadened (globally and regionally) to include concepts related to sustainability and equity (Gleick, 2003). Researchers illustrated a shift in the water
resource narrative towards ecosystem management, increased stakeholder input and Integrated Water Resources Management (IWRM) during this period (Bellamy & Johnson, 2000; Grumbine, 1994; Johnson et al., 1996; Margerum, 1999; Mitchell & Hollick, 1993; Quinn, 2002) characterized by the consideration of water quality and quantity; surface and groundwater flows; upstream and downstream impacts; freshwater catchments and coastal zones; and perhaps most importantly, the coupling of human – nature – technology systems (Gleick, 2003; Jønch-Clausen and Fugl, 2001; Matondo, 2002).

Robbins et al.’s (2008) study on management authorities and spatially complex insect-borne diseases noted that agencies established decades prior to the emergence of contemporary management concerns demonstrated “… less complex and more clearly delineated substantive roles and simpler, jurisdictionally bound geographies of responsibility …” (p. 96) which served to effectively hamper efforts to curtail emerging crises that were inherently dynamic and spatially-complex in nature (Collingwood, 1960; Smith, 1984; Tihansky & Knochenmus, 2001; Tihansky, 1999). Kessler et al. (1992) recognized the need to examine the processes by which currently embedded management agencies navigate the related concepts of long-term planning, sustainability, and ecosystems’ management. Water management researchers, Fitzsimmons (1999) and Biswas (2004), voiced the concern that these terms represented vague, controversial, poorly defined concepts that did not readily lend themselves to objective evaluation. How then are these concepts mechanized and operationalized by contemporary water resource management agencies? Considering the tightly coupled nature of potable water resources and land-use, how should water management and land-use planning be interrelated? How are contemporary water and land-use systems integrated for management purposes? And what, if any, ramifications exist
for established institutional frameworks of public agencies responsible for water and land
management (Mitchell, 2005)?

The examination of an established (four decades) regional water management agency
with a statutory mandate and taxing authority may produce valuable insight to enable scholars to
understand from the biological, social or physical science perspective, the applied actualization
of management policy to refine and develop improved management theories, which will
hopefully serve to inform improved management tools and policies. My examination is intended
to demonstrate an evolution in agency scope, priorities and capacity-building in response to the
emergence of dynamic resource management challenges.

In summary, although evidence from the literature suggests a trend towards an integrated
approach to water resource management, most research has focused on what this model should
look like or how it should operate in theory. In other cases, scholars have examined isolated
facets of the concept – water supply, water quality, conservation measures, biological diversity,
legislative policy, impacts of land-use on water recharge rates and water quality to name a few.
Researchers have paid little attention to the mechanisms utilized by existing water management
agencies that navigate this contested, often highly political terrain on a daily basis. A qualitative
case study is particularly well suited to tackling research problems using an inductive approach,
in an attempt to explain an issue in a rigorous, valid fashion. I conducted a case study of a
regional water resource management agency to reveal how an agency has navigated the highly
contested terrain of managing an essential flow resource in a rapidly urbanizing region.

**Purpose of the Study**

The purpose of this case study is to gain an understanding of the mechanisms utilized by
the Southwest Florida Water Management District (SWFWMD) to enact sustainable water
resource management within their rapidly urbanizing jurisdiction via the use of semi-structured surveys and document analysis. Survey participants included thirty current and former agency employees with decision-making capacity from the following departments: (1) Land Resources (oversees land acquisition), (2) Operations (oversees mapping and geographical information systems, and hydrologic data), (3) Legal, (4) Resource Data and Restoration (oversees geohydrologic data, surface water improvement and management, and water quality monitoring) Resource Projects (oversees engineering projects, conservation projects, hydrologic evaluation, ecologic evaluation, water supply and resource development, environmental initiatives).

The following research questions guided the inquiry:

- **Research Question A.** How has the institutional history of SWFWMD (since its establishment) shaped contemporary water management within the region?
- **Research Question B.** To what extent is SWFWMD’s capacity to operate within a sustainable natural resource management framework enabled and/or hindered by the agency’s statutory mandate to influence land use decisions?
- **Research Question C.** How has the mandate set forth by Florida Statute 373.036 (which necessitates SWFWMD’s engagement in sustainable water management and ensuring that all required future water needs are met) impacted the institution’s capacity to operate within a sustainable natural resource management framework?

**Definition of Terms**

For the purposes of this study, I define the key terms as follows:

- **Sustainability:** the avoidance of creating diminished returns over time; object or resource utilization in a manner that avoids diminished use over time, thereby prioritizing intergenerational equity.
- **Sustainable development**: the production of improved states of being and/or existence; equitable consideration afforded to ecological, social and economic needs.

- **Ecosystem management**: a management approach that prioritizes the maintenance of ecosystem services.

- **Ecosystem services**: a form of natural capital; the tangible and intangible matter and energy outputs provided by ecosystems.

- **Systems-level management**: a holistic, long-term approach to ecosystem management that seeks to minimize disturbance to the evolutionary and ecological processes of nutrient, matter and energy exchange flows within and between regional ecosystems.

- **Integrated Water Resources Management (IWRM)**: An approach to resource management that incorporates the tenets of systems-level management and sustainable development.

**Research Background and Interest in the Study: Situating Myself in the Inquiry**

My academic background includes a Bachelor’s degree in Computer Science, Master’s degree in Marine Science and current study toward a Ph.D. in Geography, Environmental Science and Policy. My master’s and doctoral degrees were pursued within different departments of the same university. In this section, I share a brief autobiographical account of the experiences that led to my current role as a doctoral student and my interest in this dissertation topic.

I was a voracious reader and decided at a very young age to emulate Dr. Dian Fossey, to disappear into wild untamed nature to conserve and protect the flora and fauna that I discovered within the pages of my Lexicon encyclopedia on the tiny Caribbean island of St. Lucia. Throughout my pre-baccalaureate education my favorite subjects included Biological Science
(the unpacking of the inner mechanisms of organic life and ecological processes) and Social Studies (the examination of human society, culture and social processes).

St. Lucia’s micro-economy provided few employment opportunities for advanced studies in the Humanities, and Natural Science degrees were always held in very high regard. After completing Cambridge Advanced Level exams in Biology, Chemistry and Mathematics, and Computer Science studies (at my father’s urging), my inherent love for the outdoors prompted me to enroll in the study of biological processes in oceanic environments at the Master’s level.

Armed with quantitative, deductive natural science skills to examine the what and how of environmental degradation and barriers to biological conservation and sustainable natural resource management, I became increasingly aware of the limitations of a positivist epistemology and methodology to provide answers to the fundamental question of why. Furthermore, during my studies it became apparent that the what, how and why did not lie squarely in the realm of nature and natural science, but at the boundary of society and nature. I was surprised to learn that the most effective method to enact conservation measures (a la Dr. Fossey) involved researcher and resident education and collaboration, and I never imagined that solutions to ecological preservation in “the field” lay, in actuality, within the societal actions which occur far afield.

Unwilling to pursue further research that emphasized monitoring and reporting ecological decline, and frustrated with the Marine Science research community’s seeming inability to effectively communicate any apparent societal causes of degradation to the agents responsible, I pursued social science training in the human constructions of space and place. This constructivist, interpretative paradigm was well suited to understanding societal constructions of
nature, the *why*, which must be laid bare to make way for the development of more sustainable frameworks.

I was fortunate to secure a summer position as a planning department intern at SWFWMD in the year that I began to construct my dissertation proposal. My access to agency personnel, meetings and documents revealed snippets of the formidable task of managing an essential flow resource, which was tightly coupled to urban development, in a region undergoing rapid urbanization. I believe that my training within the Department of Geography and Environmental Science and Policy (now the School of Geosciences) and position as a SWFWMD Planning Department team member equipped me with the background knowledge and research skills required to effectively conduct this dissertation study.
Chapter 2: Review of the Literature: Urban Development

The literature guiding this study resides in the applied fields of environmental geography, political ecology, and freshwater resources management, and includes the following two major topic areas: (1) urbanization in Southwest Florida and Tampa Bay (the region’s largest metropolitan city, and (2) freshwater resources and SWFWMD. In this chapter, I review the relevant literature on each topic, and include literature on the theoretical frameworks of: (1) constructions of nature, (2) theoretical freshwater discourse, (3) the treadmills of production and consumption, and (4) organization theory which serve to guide the inquiry.

Florida as Opportunity: 19th Century Urbanization Efforts

Nelson Manfred Blake (1980) suggests that the American passion for ‘improvements’ during the 19th century was symptomatic of the nation’s industrial growth period. The expansion of trade boundaries fostered the desire for the construction of shipping ports, the expansion of land and ocean transportation networks, and the dredging of rivers and construction of canals. During this period, ‘Frontier Florida’ presented investors and settlers with dangerous coastlines, vast expanses of marshland, scattered settlements and long travel distances. Early boosters and politicians envisioned fertile farmland, residential settlements, a network of railroad tracks to transport materials, produce, workers and visitors, and an intra-coastal waterway and a cross-Florida canal (Blake, 1980). The seeds of the mechanization of nature were thereby planted early in the state’s development and contributed to the desire for control and mastery over nature
which served to effectively alienate human from non-human nature (Archer, 2004; Collingwood, 1960; Davis & Arsenault, 2005; Williams, 2003).

During the Second Industrial Age (the second half of the 19\textsuperscript{th} century), the state of Florida experienced the national railroad boom (in the 1880s), as capitalists from the north (capital-rich but land-poor) sought to reap profit from the rapidly industrializing nation by investing in previously untapped land markets (Blake, 1980). Businessmen seeking quick profits turned to Florida during the three decades following the Civil War. Canals and railroads were needed to gain access to the State’s interior, and drainage efforts were required to transform Florida’s vast swamplands into productive farmland. To facilitate this process, the federal government granted 22 million out of a total 38 million acres to Florida’s Internal Improvement Fund (IFF) in accordance with the Swamplands Act of 1850. The act granted 12 public-domain states exclusive control over frequently submerged lands that were deemed unfit for habitation or cultivation (Davis & Ogden, 1994). The IFF, comprised of the governor and four state cabinet officers, was responsible for converting swampland to pastures, farmland and residential developments. The demands of land speculators greatly influenced the IFF Board of Trustees, the State’s legislature and the resulting land use policies, which were all highly vulnerable to frequent personnel changes within the state administration (Blake, 1980; Davis & Arsenault, 2005).

During the 1860s, the plans of Florida’s pioneer businessmen, including William H. Gleason, included draining the swamplands near the Everglades to produce arable fields, the building of a cross-state canal to assist trade and tourist vessels and lay railroad tracks to give farmers in the north access to new markets. Many of these early land developers lacked funding and, therefore, depended on the municipal, state and federal government for subsidies, charters
and land grants. A second wave of businessmen emerged in the 1880s with similar plans and the millions of dollars to execute them (Blake, 1980; Noll & Tegeder, 2009).

To succeed in any land development venture in Florida, investors required the cooperation and endorsement of a range of influential political actors including state legislators and judges. Consequently, growth coalitions were formed to organize effective political lobbying. Investors and developers, primarily concerned with the accumulation of capital possible from land development, were the dominant fraction in these growth coalitions. The second wave of big businessmen included Hamilton Disston who benefitted from a political climate favorable to growth under Governor William D. Bloxham who entered office in 1881. After inheriting the country’s largest Saw and File manufacturing company, Disston and his associates vowed to drain a large portion of the Everglades to produce land suitable for sugar farming (Barbour, 1964). Disston and Governor Bloxham developed a great rapport, and the IFF anticipated that his drainage operations would result in an increase in value of the state’s half of the reclaimed land (Blake, 1980; Davis & Arsenault, 2005).

IFF trustees signed off on Disston’s Florida Land Improvement Company’s drainage contract in September of 1881, allowing the purchase of four million acres of land in central Florida for 25 cents an acre. Disston continued his dredging projects for over a decade, mobilizing monetary flows through land sales and attracting clients with advertising brochures about Central Florida’s favorable construction costs, transportation facilities and soil conditions. To ensure the widest possible influx of capital, Disston established immigration offices in Europe and throughout the U.S. to aggressively promote his rural - to - urban land development projects (Blake, 1980), manufacturing, packaging and selling what would come to be known as the “Florida dream” (Mormino, 2005).
Tampa Bay as Opportunity: 19th Century Urbanization Efforts

Hillsborough County and the city of Tampa exemplify the economic expansionism of the Second Industrial Age to such a degree that Tampa was included as one of the nation’s 23 mega growth regions in the early 20th century (Lang, 2006). A sleepy community of 5,800 cattle-ranching families and farmers in 1880, Hillsborough County experienced its first wave of economic growth with the advent of the cigar industry and the arrival of the Henry Plant Railroad in 1885 (Grismer, 1950; Kerstein, 2001). Although the cigar industry necessitated continuous trade between Tampa and Cuba, direct access to Tampa from the rest of the U.S. remained difficult. Travelers were required to disembark from a train journey at Cedar Key (100 miles north of Tampa along the Gulf Coast) to board a steamboat to their final destination (Kerstein, 2001). The construction of the Plant Railroad enabled Tampa’s participation in the market expansion that swept across the U.S. during the second half of the 19th century.

Henry B. Plant relocated to the southeast as superintendent of the Adams Express Railroad Company in 1854 and became president of the Southern Express Company in 1861 after receiving control of the southern properties previously owned by the Adams Express Company. Poised to benefit from the numerous railroad foreclosures following the Civil War and the Depression of 1873, Plant purchased the Atlantic and Gulf Railroad in 1879 and renamed it the Savannah, Florida and Western (SF&W) (Kerstein, 2001). Confident about the possibilities for economic recovery within the region, Plant began his railroad expansion projects with the extension of the SF&W, reaching Jacksonville in 1881, and Gainesville in 1884. He created the Plant Investment Company and purchased the land grants and rights of the Jacksonville, Tampa, and Key West Railroad in 1883, appropriating their exclusive franchise for railroad construction within Tampa (Kerstein, 2001).
Tampa’s railroad construction was completed in January of 1884, and services to Jacksonville and New York became available in 1885. Tampa’s economy also benefitted from sea trade, via the creation of Port Tampa by the Plant Investment Company in 1887. The extension of the railroad to Old Tampa Bay, 10 miles southwest of Tampa, would result in the incorporation of the Port Tampa City which continues to serve as a major port for trade and passengers (Kerstein, 2001).

Local business owners, lawyers and professionals established a Tampa Board of Trade (hereafter TBT) in May of 1885 to capitalize on the region’s railroad connections and port improvement projects. As the region’s first growth coalition, the TBT maintained that current and future business owners would realize increased economic gains from the expansion of the area’s commercial activities, and that residents would experience wealth generation from the subsequent increase in land values. Consequently, the TBT avidly encouraged efforts to promote growth within the Tampa community and beyond. Official city efforts included the provision of tax breaks to land developers and manufacturers willing to invest in Tampa, thereby luring “capitalists to invest in the city” (Kerstein, 2001, p. 30), and urging the U.S. government to settle existing land claims near Fort Brooke, a military outpost from 1824 that would become an incorporated town in 1885, to foster urban growth projects (Grismer, 1950; Kerstein, 2001).

What happened in Tampa during those formative years is remarkably similar to Harvey Molotch’s (1976) description of other U.S. cities as “growth machines” where local elites “…profit through the increasing intensification of land use of the area in which its members hold a common interest…” (p. 309). The early experiences of Tampa are also a good illustration of the argument by Eben Fodor, an environmental and civic activist, to the effect that “the engine of growth is powered by the fortunes resulting from land speculation and real estate
development…The primary business interests are the landowners, real estate developers, mortgage bankers, realtors, construction companies and contracts, cement and sand and gravel companies, and building suppliers” (cited in Hayden 2003, p. 15). Also germane to Tampa’s formative development is another suggestion by Fodor that other professionals’ whose jobs were primarily growth-dependent, including urban planners and engineers, tended to provide strong ideological support for the expansion of the urban built environment (Fodor, 1999).

**Economic Growth in Tampa Bay: Post World War II**

Tampa Bay experienced an upswing in economic activity during World War II. Much of the state of Florida was transformed into a military industrial complex from 1941 to 1945 as a result of the nation’s war effort (Mormino, 2005). Shipyards were established along Tampa’s Hooker Point, aerial complexes were constructed at MacDill, Drew and Henderson fields, and a Coast Guard base was erected in Bayboro Harbor, St. Petersburg. This economic boom was followed by the loss of thousands of jobs, as war-time industry inevitably declined in 1945 (Kerstein, 2001; Mormino, 2005).

However, the passage of the Social Security Act in 1935, and amendment in 1946 with the creation of pension plans, followed by the development of the Veterans Administration and Federal Housing Administration programs, enabled millions of working-class Americans and retirees to utilize guaranteed pensions and increasing land values in the North to take advantage of Florida’s inexpensive housing and numerous tax advantages (Hayden, 2003; Mormino, 2005). The generous housing entitlements of the Servicemen’s Readjustment Act of 1944, allowed millions of veterans to purchase property in Florida. Tampa Bay cities including Clearwater and St. Petersburg, went a step further by supplementing the federal government’s benefits by awarding free property lots to veterans (Hayden, 2003; Mormino, 2005). The decommissioning
of the Drew Army Air Field and the subsequent establishment of the Tampa International Airport in 1947 served to provide snowbirds, retirees, veterans and immigrants with convenient access to the region.

In response to the reduction in private manufacturing investments during and following the Depression, the closing of shipyards and subsequent job losses, and the decline of the cigar industry following World War II, the Tampa Chamber of Commerce renewed its commitment to attract new industry by increasing the city’s and county’s allocation of financial resources for marketing and business recruitment six-fold from $13,000 in 1953 to $78,500 in 1954. The Chamber’s Executive Head, W. Scott Christopher, organized the metropolitan region’s first growth coalition, the Council of 100, in 1954, to provide additional support and funding for industrial recruitment efforts (Kerstein, 2001).

The first group of signatories to the Council of 100 included representatives of Tampa’s major economic institutions, including the Tampa Tribune, Lykes Brothers, Exchange National Bank and Bushnell Steel Works. Within the first two months of becoming established, the Council’s membership had increased from 23 to almost 200 business organizations (Kerstein, 2001). The region’s business-friendly climate and Florida’s ‘right-to-work’ status encouraged several major companies, including Metropolitan Life Insurance and Chase Manhattan, to establish back-office operations and regional headquarters in Hillsborough County, as the country’s central cities witnessed job growth within the service industry and continued job decline within the manufacturing sector from 1967 to 1979 (Kerstein, 2001). The Council of 100 has become the predominant political force behind the region’s growth, so much so that Site Selection magazine, a business planning and expansion guide for company executives, named the group one of the nation’s top ten development groups in 1999 and 2000 (Site Selection, 2000).
Prior to the 1940s, Tampa’s leading industries involved cigar manufacturing, phosphate mining, citrus farming, and port operation activities, with employees residing near established industrial nodes, including the Port of Tampa, Ybor City and West Tampa (Hammer, 1961; Kerstein, 2001). From the 1950s to the 1990s, however, the spatial expansion that resulted from Tampa’s suburban growth led to the decentralization of employment away from the above industrial nodes, as the surrounding suburbs gained both more residents and jobs (Kerstein, 2001). This phenomenon was in line with national trends, where central cities of the 20 largest metropolitan areas experienced a 0.1% population increase, compared to a 45% increase in suburban population, as employees found greater housing and job opportunities in the suburbs during the 1950s (Teaford, 1993).

As federal subsidies and social security made the Florida Dream (Mormino, 2005) more affordable, attainable, and acceptable to millions of Americans, land developers rapidly erected subdivisions in South and Central Florida and in coastal cities, to capitalize on the residential requirements of newcomers. In Tampa, real estate developers followed the I-75 interstate northward, building and marketing suburbs such as Carrollwood to residents seeking suburban communities (Kerstein, 2001). Table 1 demonstrates the migration of Tampa’s employees from the central city to suburban tracts between 1960 and 1990. According to Mormino (2005), the widespread use of the pesticide DDT to control mosquitoes, and the availability of residential air conditioning units, spurred the development of modern Florida cities. Mormino suggests that “breathtaking shifts in technology, rising levels of affluence, the emergence of large numbers of senior citizens and retirees, new freedoms and old customs, political and leisure revolutions, a Great Society and a Cold War, cul-de-sacs and coast-to-coast expressways…” (2005, p. 45) contributed to the widespread urbanization of Florida and the Tampa Bay region.
Unhinged Development: Urban Sprawl

As previously discussed, the Great Depression and World War II negatively impacted the city’s expansion efforts for 15 years. Returning veterans with war-time savings, coupled with a shift from manufacturing to consumer goods production by the federal government and industry, resulted in a housing boom during the middle of the 20th century (Hayden, 2003; Platt, 2004; Rome, 2001). These predominantly single-family homes were built on undeveloped green spaces on the periphery of older city centers and initially favored white households. Nonwhites and lower-income socioeconomic groups were left to compete for overpriced housing within deteriorating city centers, whilst federal housing subsidies and highway construction programs supported and encouraged the progression of white flight and urban sprawl (Hayden, 2003; Jackson, 1985).

A campaign to promote home ownership was developed as a recovery strategy following the stock market crash and the Great Depression. It is interesting to note that unlike most other affluent civilizations, Americans would come to idealize the house and yard rather than the model neighborhood or the ideal town.

As Republicans and Democrats wrestled with housing alternatives throughout the 1930s, Republicans gained the upper hand because they prompted the ideal of home ownership without ever tallying the full physical or social costs of individual homes on separate plots of land served by roads, sewers, and parks. Democrats who built well-designed multifamily housing and


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<td>Central city tracts</td>
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<td>76,630</td>
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complete communities with all of the necessary public amenities in place were told their plans were too expensive (Hayden 2003, p. 126).

The federal government demonstrated a willingness to shape development to benefit real estate, manufacturing, finance, insurance, and auto interests. A very powerful growth coalition with close ties to the Republican Party was formed under the administration of President Hoover, and “…a new era of suburban development would soon emerge, dominated by large firms with federal backing” (Hayden 2003, p. 127).

The production of millions of houses, supported by federal subsidies and involving huge profits for land developers, would serve to configure the indebtedness and material wealth of the nation’s residents (Hayden, 2003). Demographers defined the suburbs as “the non-central city parts of metropolitan areas” (Hayden, 2003, p. 3) and these low-density single-family housing developments would come to dominate the American cultural landscape, demonstrating increased voting power and greater economic growth than older city centers (Hayden, 2003). Postwar suburbs were constructed at great speed and deliberately planned to maximize consumption of mass-produced goods and minimize the responsibility of the developers to create public space and public services. In the vast new suburbs built in the late 1940s and 1950s, definitions of public and private were reshaped, as loans guaranteed by the federal government poured into private real estate development firms.

Theoretical Framework: Constructions of Nature

Nature Discourses: Contributions of Environmental Historians

Collingwood proposes three cosmological movements in his 1960 work, The Idea of Nature, that pertain to man’s attempts to differentiate the internal from the external in an effort to understand and define the world around him. The first movement was attributed to the Greeks
who envisioned nature as being in ceaseless motion, possessing a soul and permeated by mind which was directly responsible for regulating the environment. The second movement occurred in the 16th and 17th centuries as a direct reaction to the Platonic and Aristotelian cosmologies of the 14th and 15th centuries, and encompassed the works of Copernicus, Telesio and Bruno. Whereas the Greeks perceived nature as having inherent intelligence, these renaissance thinkers, as coined by Collingwood, attributed the orderliness of the natural world to the intelligence of a divine creator. Collingwood suggests that the ongoing industrial revolution, including the development of the printing press, pulley, pump and clock, contributed to the renaissance view of nature as a machine. The third movement relates to the modern view of nature. Whereas the Greeks viewed man as a microcosm of the nature macrocosm, and the renaissance viewed nature as the handiwork of God, much as machines were the handiwork of men, the modern view insisted on “…explanations through efficient causes…” (p. 94). Collingwood suggests that the modern view of nature emerged from mid-18th century historical studies that involved the concepts of process, change and development and were first compiled to produce the Encyclopédie, and would later produce the theory of evolution. British literary critic Raymond Williams similarly suggests “…the idea of nature contains, though often unnoticed, an extraordinary amount of human history…” (cited in Cronon, 1991, p. 25)

The works of Collingwood and others, including Glacken’s Traces on the Rhodian Shore (1973), provide lengthy historical discussions on the meanings and conceptions of nature over the centuries. Cronon (1991) addresses the importance of historical components to modern conceptions of nature in an alternative manner to Collingwood. Rather than review the influence of historical components on the trajectory of the development of current views of nature, Cronon chooses to utilize historical works by anthropologists, literary scholars and critical theorists to
demonstrate that nature is not natural but is instead a purely human construct. Cronon reminds us that our understanding of the world around us is intrinsically embedded in our values and assumptions. With the acknowledgement that we encounter the world ‘out there’ not first-hand but rather through a personal perceptive lens and related perspective, we realize that our use and meaning of the word ‘nature’ speaks as much about ourselves as that which we are attempting to label. Our conceptions of nature are influenced by culture, time and place. As a result, ideas of nature exist within a specific cultural context that is reflected in the meanings that we assign to nature (Collingwood, 1960; Cronon, 1991).

**Nature Discourses: Contributions of Geographers**

Acknowledging the contribution of environmental historians including Cronon (1991) and Glaken (1973) to the societal-nature discourse, Demeritt (1994) recommends the production of a new common language to encourage dialogue between environmental historians and cultural geographers. Demeritt (1994) envisions mutual benefit in this exchange as he suggests that environmental historians assign agency to nature (thus ignoring its dimension as a social construct), whilst cultural geographers seemingly ignore any autonomous properties of nature (viewing nature as a purely social construct). Gerber (1997) agrees that the development of common metaphors, categories and language would benefit academic discussions on the social construction of nature but proposes a re-examination of the three-fold division of social, metal and physical factors that are embedded within the discourse stating that “….to account for the social construction of nature, the physical, mental (habitus) and social all need to be linked…” (p. 12). This three-fold division is drawn directly from Lefebvre’s attempts to unify the fields of “…first, the physical-nature, the Cosmos; secondly, the mental, including logical and formal abstractions; and, thirdly, the social…” (cited in Gerber 1997, p. 2).
David Harvey utilizes the works of Durkheim (1915), Tuan (1977) and others, to deconstruct the larger society-nature discussion, to examine the influence and formation of societal concepts of space and time. Harvey’s (1990) paper, *Between Space and Time*, reminds the reader that space and time are social constructions rooted in the dominant mode of production and its associated social relations. Harvey states that “…each social formation constructs objective conceptions of space and time sufficient unto its own needs and purposes of material and social reproduction and organizes its material practices in accordance with those conceptions…” (1990, p. 419). Harvey further suggests that the technological changes and rapid economic growth characteristic of capitalistic modes of production result in powerful transformations in societal conceptions of space and time (1990). These transformations become apparent in a society’s culture and politics (Harvey, 1990), influencing the society’s conceptions of, and relations towards, nature.

The language utilized in discussions relating to nature continues to evolve as nature continues to be understood in a multitude of ways. Castree (2005) suggests that our collective understanding of nature is conditioned by knowledge-producing domains, including academic institutions, the mass media, the tourist trade, the non-governmental sector and the business sector. “As individuals we are all exposed to particular mixtures of nature-knowledge in our lifetime…our understanding of nature is heavily influenced by the truths and norms about nature imparted to us through the variety of knowledge - producers mentioned above …” (Castree, 2005, p. 12).

The literature clearly demonstrates scholarly consensus with regards to the influence of societal constructs on conceptions of nature despite their individual treatment of the subject matter. Harvey (1990) discusses technological advancement in capitalist economies and the
associated cultural transformations. Williams (2003) provides empirical evidence in his discussion of a transition away from Greek reverential attitudes towards nature to its commodification, sale and trade as capital accumulation processes sped up, leading to the exploitation of the natural world. Quoting Cicero “…all the things in this world which men employ have been created and provided for the sake of men…and the forests were only as good as they were useful …” (cited in Williams, 2003, p. 101). Collingwood (1960) suggests that the development of machines during the industrial age transformed conceptions of nature during the period of the renaissance thinkers to that of nature as machine. Williams (2003) proposes that the resulting human conceptions of control and mastery over nature served to remove human society from within the realm of nature to a realm above nature. Finally, Castree (2005) suggests that our “…knowledge of nature is not the same as the natural world it purports to represent…” (p. 12), and is informed by a variety of knowledge-producers, including academic institutions, the mass media, the non-governmental sector and the business sector.

Zimmerer (1994) questions our very ability to examine the dialectical relationships between society and nature as we employ terms and concepts that are always already socially constructed and embedded. Latour (2004) reminds us that our ecological perceptions are mediated through the sciences and highlights “…the politicization of the sciences through epistemology in order to render ordinary political life impotent through the threat of an incontestable nature…” also stating that “…nature becomes knowable thru the intermediary of the sciences, defined thru the interventions of professions, disciplines, and protocols…” (p. 10). This belief prompts Latour to suggest that researchers must first let go of nature, that is, let go of socially embedded, politicized concepts of nature masquerading as ‘true nature’, as we recognize
that our always already present social constructs render any knowledge of ‘nature out there’ completely inaccessible (Cronon, 1991; Harvey, 1990).

**Expansionism, Urbanization and Capital: The Treadmills**

Allan Schnaiberg (1980) developed the theory of the treadmill of production (TOP) as part of an attempt to explain the rapid increase in environmental issues across industrial nations during the post World War II period. TOP claims ran counter to ecological modernization (EM) theory, which favored the utilization of existing or slightly modified economic, social or political institutions to solve global environmental problems without renouncing economic growth (York et al., 2003). TOP proponents suggested that the achievement of a sustainable water management framework would continue to be improbable as long as ecological concerns continued to be overshadowed by the continued drive to increase capital gains, and for as long as economic criteria remained at the foundation of production and consumption decision-making (Schnaiberg et al., 1999).

Although critiques of various facets of TOP theory have emerged in recent years, including calls for TOP’s theoretical model and its conception of the environment to be comprehensively updated (Foster, 2005), TOP’s focus on the expansionist tendencies of contemporary economies, and their detrimental environmental and social consequences, remain particularly valuable to explain the societal-nature tensions that arise in rapidly urbanizing regions like Southwest Florida. By proposing that contemporary economies are not motivated by a need to accumulate capital, but to acquire, retain and increase that which capital provides, complimentary explanations like Foster’s (2005) offer additional insights to explain the peculiar dynamics of urban structure formation. Foster suggests that the primary dangers and drivers of capitalist growth are better explained by a treadmill of *accumulation*, rather than *production*. 
This analytic shift from production to accumulation finds support in the seminal work of Sweezy (2004) who argued that the engine of the entire macro-economic system is powered by the actions of participants who labor tirelessly in the pursuit of profit and the accumulation of more capital.

David Harvey’s (1990) work contends that the technological changes and rapid economic growth characteristic of capitalistic modes of production result in powerful transformations in societal conceptions of space and time. These transformations become apparent in a society’s culture and politics, influencing the society’s conceptions of, and relations towards, nature. Foster (2005) offers that detrimental environmental effects related to the single-minded pursuits of profit for its own sake are worsened by a “metabolic rift,” where humans are separated from nature via the continued polarization, or alienation, of town and country. For the purposes of my study, these two treadmill theories will be considered as complimentary explanations rather than separate or opposing forces.

Bell (2006) offers an additional element to the treadmills of production and accumulation via the proposition that the very nature of consumption patterns often serves to destroy value via resource use and misuse, thereby consuming rather than accumulating value. He posits that the means of production and consumption are both means of accumulation, and suggests that TOP theory be amended to include the contributions of consumption processes towards environmental degradation, as citizens and the environment are organized into situations that rapidly consume large volumes of standardized products via these consumption lines (Bell, 2006).

Conclusion

The predominant development paradigm demonstrated throughout the Second Industrial Age viewed natural resources as abundant, if not infinite, but devoid of intrinsic value (Brulle, 2002).
Boosters who flooded into Florida after the Civil War, assumed a primordial right to transform natural resources into commodities for human consumption (Blake, 1980; Brulle, 1996). The rapid development of machine technologies during this period of expansion and industrial growth transformed conceptions of nature to that of nature as machine. The resulting human conceptions of control and mastery over nature would serve to remove human society from within the realm of nature to a realm above nature (Collingwood, 1960; Foster, 2000; Williams, 2003). Gottdiener noted that:

Business, finance, and government at all levels converge on urban space to alter or transform it, because in most cases class fractions of capital require it, the property sector produces it, and the government has made it profitable to do so (1985, p.68).

Contemporary regional urbanization, typified by low-density residential neighborhoods and expanses of impervious hard-pavement cover, reflect a similar development paradigm to that of the 19th century. Smith (1984) and Foster (2000) both posit that the transformations associated with contemporary industrialization and urbanization dominate conceptions of nature and produce a rift between nature and society, between inherent non-human first nature and second nature (which is produced by human activity). Decades earlier, during the 1955 Wenner-Gren Conference on Man’s Role in Changing the Face of the Earth, Lewis Mumford would caution that the emergent single-use, low-density development would:

loosen bonds that connect the city’s inhabitants with nature and transform, eliminate, or replace its earth-bound aspects, covering the natural site with an artificial environment that enhances the dominance of man and encourages an illusion of complete independence from nature (Mumford, 1956, p. 386).

Suffice to say that the economic paradigms that have informed contemporary urban development provide little in terms of a framework for economic and ecological sustainability.
Solutions will not arise from “the ever greater privatization of nature and the conditions of human existence. Instead they are to be found in the direction of the ‘socialization’ of nature and production, and the creation of a more democratic, egalitarian world order, one that incorporates into its logic an abiding concern for other species and future generations” (Foster, 1999, p. 33).
Chapter 3: Review of the Literature: Freshwater Resources

The Development of Florida’s Water Legislation

British colonies east of the Mississippi adopted English common law to govern their surface water bodies. Referred to as the riparian system, property ownership bordering a watercourse entitles the owner to utilize the natural flow of water across their property providing that downstream users are not negatively impacted (Regan, 2003). This provision is referred to as reasonable use and requires the consideration of environmental, social and economic interests (Hamann, 1998). Considered to be more protective of the water resources than Western water law which is based upon the premise that water is a property right derived from a historic claim to water, this system’s weaknesses include a lack of consideration of the needs of non-riparian owners, lack of administrative controls, and a failure to adequately address groundwater allocation or the couplings of ground and surface water - a necessity in Florida’s Karst environment (Regan, 2003; Swihart, 2005). The particulars of this system were considered during the creation of the Model Water Code (Maloney et al., 1972) which served as a framework for the Florida Resources Act of 1972, widely known as Chapter 373 (Finnell, 1973; personal communication, 2013). Another important piece of legislation passed that year was the Environmental Lands Management Act or Chapter 380. A study participant who worked with Dean Frank Maloney and his team to draft the Model Water Code at the University of Florida suggests (about the 1970s):

That was at a time when there was a heightened interest in doing things right environmentally and all that good stuff, and so the legislature responded with both pieces of legislation that were pretty noteworthy and
as part of that they divided the state of Florida up into what would ultimately be five water management
districts. Now it is important that the five water management districts that were created, that the boundaries
of those districts were decided on the basis of surface water as opposed to ground water and I think that
was probably largely done because the big thing was still flood control and if you were going to be in
charge of flood control then you need to be in charge of all the things that were involved with surface water
flows. And so that is kind of how the water management district was, the truth is there were more than five
but they created some smaller ones for transition purposes but the truth is today we have five water
management districts in the State of Florida. They evolved from that legislation that was passed in 1972
(personal interview, April 11, 2013).

This informant went on to say the following of Model Water Code’s framework for the water
management districts:

I do not think that, you know the code was not really detailed but I think the, I will tell you what I think are
the strong points, the code envisioned that you would have an agency at the state, a department at the state
that was going to oversee the water management districts and one of the constant battles or issues that you
deal with in that arrangement is where is the power vested, who is in charge, and I think with the Model
Water Code and I think everybody else would say this, the ideal thing is that you got somebody at the state
level in charge and directing what is happening at the regional level. The one thing that I think everybody
would agree with is that when it comes to water, water does not observe political boundaries. The irony is
that in many instances you would have a political boundary that would run down the middle of a river, does
not make a whole lot of sense that you have one political body on one side of the river doing one thing and
then you have another political body on the other side doing something else because the truth of the matter
is the river is there and having two different standards just does not work. So the idea was that we were
going to have water management districts that were going to manage water on a regional basis. That
concept I believe is a very good concept, it is a very valid concept and I think it was one that most people
would agree with (personal interview, April 11, 2013).

The establishment of regional legislated water management agencies based on hydrologic
boundaries is unique to Florida. The 1972 Water Resources Act established five water
management districts with broad authority and responsibilities (Figure 1). The 1972 legislation is continuously amended as new resources pressures materialize as a result of urban growth. As a result the water management districts now bear very broad responsibilities that go beyond far beyond initial concerns of flood control and water supply as evident in the list of assignments contained in the Declaration of Policy of the modern Water Resources Act:

The agency and the governing board shall consider cumulative impacts on water resources and manage those resources in a manner to ensure their sustainability.

The legislature declares that the Districts:

· Promote the health, safety, and general welfare of the people of this state (Section 373.016, Florida Statutes)
· Promote recreational development, protect public lands, and assist in maintaining the navigability of rivers and harbors
· Promote the public policy set forth in section 403.021
· Preserve natural resources, fish, and wildlife
· Promote the conservation, replenishment, recapture, enhancement, development, and proper utilization of surface and groundwater
· Promote the availability of sufficient water for all existing and future reasonable-beneficial uses and natural systems
· Prevent damage from floods, soil erosion, and excessive drainage
· Minimize degradation of water resources caused by the discharge of stormwater
· Manage water and related land resources
· Develop and regulate dams, impoundments reservoirs, and other works and to provide water storage for beneficial purposes
Numerous tasks are assigned to the Districts in other sections of Chapter 373, Florida Statutes, including:

- Assist the state in issues of interstate water management
- Acquire and manage land and facilities (373.139)
- Sell and manage bonds (373.563 and others)
- Promote Florida-Friendly landscaping (373.139)
- Plan and help fund the development of “alternative water supplies” (373.196)
- Assist in the development of regional water supply authorities (373.1961, 1962, and 1963)
- Implement a large land acquisition program (373.199)
- Plug abandoned artesian wells (373.207)
- Implement a water use permitting program with many conditions and exceptions (373.216 and other provisions of Part II of Chapter 373)
- Assist in the statewide water conservation program for public water supply (373.227)
- Promote the reuse of reclaimed water (domestic wastewater) (373.250)
- Help to assure that “Sufficient water [is] available for all existing and future reasonable-beneficial uses and the natural systems, and that the adverse effects of competition be avoided (373.0831(2))
- Develop a funding strategy to pay the cost of all the recommended projects (373.0361 (2)(b))
- Assist local governments in the development and revision of their comprehensive plans (373.036 (8))
- Establish minimum flows and levels for surface and groundwater resources (373.042 and 373.0421)
- Administer water use, well construction, and environmental resource permitting systems (Parts II, III, and IV of Chapter 373)
- Adopt rules for any action that affects interested parties (373.113), consistent with the many procedural and substantive requirements of the Florida Administrative Procedures Act (Chapter 120)
- License water well contracting businesses (373.323)
- Manage a comprehensive stormwater and wetland permitting program (Part IV of Chapter 373)
- Coordinate district permitting with the related wetland programs of the federal government (373.4143)
- Inspect stormwater management systems as they are constructed (373.423)
- Facilitate the use of mitigation banks to offset the impacts of wetland permitting (373.4135, 4136 and 4137)
- Direct the emergency operation of any other stormwater management system or reservoir so as to protect life and property (373.439)
- Conduct annual budget, including public workshops and hearings (373.536, 539)
- Identify enough water supplies to meet all reasonable beneficial needs for the next twenty years (Section 373.0361 (2)(a))
The Southwest Florida Water Management District

SWFWMD (also referred to as the District) was created by the Florida legislature in 1961 (modeled after south Florida’s Central and Southern Flood Control District) in response to the major flooding that occurred during the 1960 passage of Hurricane Donna. The Peace, Hillsborough, Oklawaha, and Withlacoochee rivers produced extensive flooding due to the storm and prompted the creation of the Four River Basins Project, a hard-path approach (executed by the U.S. Army Core of Engineers and overseen by SWFWMD) to prevent such flooding from occurring in the future (SWFWMD, 2009; Swihart, 2011).
The primary role of the first of Florida’s five legislated regional water management agencies was to serve as the local sponsor of the Four River Basins Project, where the flood control infrastructure would be built by the U.S. Army Core of Engineers and primarily funded by the federal government. Reflecting the socio-urban priority following the 1960 flooding event and with the new and evolving concept of water resource management, the District’s responsibilities would broaden as new areas of need were identified by public citizens, the legislature, and via delegation from other state agencies (SWFWMD, 2009). Asset resource mapping was undertaken throughout the 1970s, natural systems protection emerged as an area of priority in the 1980s, regional assessments and cooperative efforts were prioritized in the 1990s, and the impacts of urban land use and water resource consumption and quality were prioritized in the 2000s (SWFWMD, 2009).

Visits to the agency’s library and meetings with their long serving (now retired) librarian revealed the incorporation of new responsibilities from 1960 onwards. Documentary analysis of internal agency documents produced a timeline, of sorts, of the agency’s priority areas. For instance, an eight-page report produced in 1967, *The SWFWMD and the Ark*, affirms the agency’s focus on flood protection during the 1960s. This particular report, one of the few documents produced during the agency’s first decade in operation, provides a short history of agency formation, the organization of regional watershed basins, and a summation of the monies acquired, lands purchased and engineering structures erected to aid the agency’s flood control efforts (SWFWMD, 1967).

Southwest Florida contains eleven watersheds (water flows on the land surface) and ten major springsheds (water flows beneath the land surface) that interact with all or part of the sixteen counties within SWFWMD’s purview. Agency reports produced during the 1970s
demonstrate the importance given to understanding the hydrological and hydrogeological conditions of SWFWMD’s watershed boundaries throughout that decade (SWFWMD, 1977).

The term “environmental assessment” appeared in agency documents during the 1980s as the number of agency scientists increased and environmental assessment protocols were developed. For the first time since its inception, SWFWMD had the capacity to produce documents that included the effects of planned construction projects and the resulting lowering or raising of the water table on riverine fauna, pine flatwoods, forestland and aquatic ecology (SWFWMD, 1980). Although ecosystem water resource requirements of each system had yet to be scientifically determined for the region, statements on the ecosystem succession that would likely occur as a result of water-level fluctuations were included (SWFWMD, 1980). Document language suggested a utilitarian view of nature (Cronon, 1992) at this time, with little priority afforded to ecological considerations beyond their usefulness to urbanization efforts.

Agency documents containing aquifer parameters, hydrostratigraphy and water flow models dominated agency publications until the Water Supply Needs and Sources document was produced in 1992 (SWFWMD, 1992). Although absent of ecological concerns, the document revealed the agency’s prioritization of engineering-intensive hydrological models and graphs to improve resource estimates for use with population projections and public supply water demand forecasting (SWFWMD, 1992).

In 1997 SWFWMD began producing Regional Water Supply Plans (RWSP) every five years. These RSWPs are modeled on the earlier Needs and Sources document. The 1997 RWSP opening statements acknowledged water supply as a critical issue for the 1990s and beyond, noting that Florida expected 260,000 new residents between 1995 and 1996 (SWFWMD, 1997). With the expected population surge, the document described the challenge of ensuring adequate
future water supplies for urban and natural systems and recommended cooperative water planning at the state, regional and local levels (SWFWMD, 1997).

An examination of the agency’s 2001 RWSP depicted a region under intense pressures from ongoing urbanization. The document included extensive descriptions of water use caution areas, minimum flows and levels to encourage ecosystem vitality, water resource assessment projects, and water quality improvement programs (SWFWMD, 2001). The 2006 RWSP included a number of supply-side, alternative water supply management approaches (SWFWMD, 2006). It appeared that ongoing urbanization processes were butting up against the ecological and hydrologic systems’ carrying capacity as Southwest Florida ushered in the 21st century.

Figure 2. A map of the SWFWMD location, boundaries and included counties (modified from SWFWMD, 2005).
To execute its purview, SWFWMD operates within four overarching areas of responsibility: (1) water supply, (2) water quality, (3) natural supply and, (4) flood protection.

In response to the legislature, and under the District’s rule-making authority under Chapter 373, agency scientists and lawyers collaboratively craft language to create an acceptable interpretation of a rule. Drafts are presented to the public via workshops and community presentations (members of universities, local utilities, local environmental groups and mining companies are expressly invited. Notices are posted in newspapers and on the agency’s Facebook and Twitter pages) before a final draft is presented to the board for approval. Subsequent to board approval, a 21-day comment or challenge period occurs before the rule adoption.

The governing board and executive branch define goals for each area of responsibility and develop strategic initiatives or tasks to achieve those goals. Initiatives may include the development of a regional water supply plan, establishment and recovery, conservation, or the development of regional priorities based on diminished spring flow, aquifer degradation, rapid population growth, etc.

A number of projects result from the establishment of strategic initiatives:

(1) Regional water supply planning to:

   a) develop accurate and reliable water supply and demand projections.

   b) identify sufficient regional water supply sources to meet demand. Supply and demand-side planning includes conservation, which is the second cheapest source of water after groundwater.

(2) Assist in the development of non groundwater sources (alternative water supply initiatives).

(3) Co-fund projects to increase resource availability and storage capacity, and support
research in reclaimed water (called reclaimed water strategic initiatives).

(4) Encourage water conservation via the permitting process. The agency promotes a water conserving rate structure (which encourages block rates over uniform), and can require utilities to adopt a new rate structure by a certain date.

(5) Fund research on minimum flows and levels for surface water after studying the system. Staff submits a priority list of impacted surface waters to the board and regional scientists are invited to review findings.

(6) Flood plain management and protection via extensive modeling utilizing terrain data, historical rainfall records, vegetation information and other physical characteristics of the site and administered through the Environmental Resource Permit Process. Each area of responsibility affects the issuance of permits, and concurrency is maintained via internal meetings and periodic assessments. The three permit types issued for resource management are:

   (1) Well construction permits issue licenses and regulate the well drilling community.

   (2) Environmental Resource Permits concern any developments that impact wetlands and outdoor surface water flows. Recommended mitigation procedures to developers often include water catchments, the use of pervious surfaces and berms.

   (3) Water Use Permits (consumptive use permits) concern water withdrawals for sectors, excluding individual residential use.

Theoretical Framework: Organizational Theory

In a 1999 examination of organization vs institutional structure and theory, Tolbert and Zucker posit that under the Parsonian sociological tradition, institutions are distinct from organizations - which are concrete social units situated within institutions. Institutions are
further regarded as various sectors of society, identified by differing practices and values including culture, religion, the family, the state and the market. Del Casino et al. (2000) suggest that institutional theory arose from the critique of discrete, internalized conceptions of organizations during the 1970s.

Institutional Analysis suggests that “…organizations, and the individuals who populate them, are suspended in a web of values, norms, beliefs, and taken-for-granted assumptions that are at least partially of their own making” (Barley & Tolbert, 1997, pp. 93). Co-opted by Structuration Theory as it developed, Institutional Analysis became situated within the allocative, regulatory and authoritative resources available to actors. This analytic process is suited to the examination of the shared rules that identify categories of social actors and their relationships or activities or relationships (Barley & Tolbert, 1997, p. 96). While this institutional perspective served to destabilize organizational boundaries, organization theory remains committed to the organization as an empirical object in its own right (Del Casino et al., 1996).

My case study is an examination of the activities of a water management agency, so I choose to adopt Del Casino et al.’s (1996) approach with respect to organization theory conventions and elect to use the term organization vs. institution. Functionalist approaches in organization theory propose that organizations are bounded units which exhibit a defining set of rules and practices, a fixed membership, and a precise locational extent (Scott, 2013). Conversely, critical realists perceive organizations as object or event producing entities with actors embedded in wider economic, political and social structures and mechanisms (Sayer, 1992). Examinations of organizations are often complicated by their dialectical embeddedness within wider social relations, as these relations often undermine any assumed delineations of an
organization’s boundaries. Alternatively, researchers gain operational entry-points by which social relations may be examined when organizations are perceived as being dialectically embedded in the wider society within which they are situated (Del Casino et al., 1996).

This theory is well suited to this case study for a number of reasons. The socio-spatial complexity of necessary and contingent relations of organizations to the wider socio-political arena (in this case) may help to frame the researcher’s inquiry (Del Casino et al., 1996). During my proposal development, my major professor and I discussed the spatial and ecological impacts of regional urban growth patterns, the establishment and influence of pro-growth coalitions on regional development, and the apparent socio-nature tension, which viewed freshwater resources as necessary for regional economic progress, yet secondary to the economic growth priorities that depended on continual, healthy resource budgets. My professor and I decided that an examination of the region’s water management agency would provide a useful lens to unpack regional perspectives as they relate to urban growth, economic vs. ecologic considerations during urbanization, and possibilities for sustainable management. Researchers suggest that organizations are productive of certain meanings rather than others, and they can therefore be chosen candidates through which to view the operation of social power that limits what is thought, as well as what is thought to be possible (Sayer, 1992; Del Casino et al., 1996). This study utilizes purposive, semi-structured interviews with current and former District department managers to gain insight into agency operations by gathering management narratives and professional perspectives related to the research questions. The decision to examine an agency through employee perspectives is a valid one, as “…the structure and operations of organizations are produced by actors who are embedded in socio-historical-spatial relations and who possess
practical knowledge of these relations, mechanisms, and structures” (Del Casino et al., 1996, p. 529).

**Water Use**

Florida’s extensive urban growth has occurred on top of a limestone platform (Marella, 2009; Vacher & Quinn, 1997) that contains the state’s major water supply (Hyde, 1975; Marella & Berndt, 2005). The productive Floridan aquifer lies beneath the entire state and is replenished at an average rate of 2.3 inches per month, or 10,000 gallons per week (Maupin & Barber, 2005; Tibbals, 1990). Florida’s hydrogeologic cycle includes ground and surface water flows from Alabama and Georgia into northern and northwestern Florida, and outflows to the Gulf of Mexico and Atlantic Ocean. The *hydrologic divide* crosses the state from Cedar Key on the Gulf coast to New Smyrna Beach on the Atlantic coast (Betz, 1984). Inflows from Georgia and Alabama contribute to freshwater supplies north of the divide. These flows do not cross the hydrologic divide. The resulting hydrologic island to the south is totally dependent on local rainfall to replenish freshwater resources although 75% of the state’s population resides south of the hydrologic divide, and receives only 44% of the state’s annual rainfall.

Florida demonstrates two climate regimes. The northern two-thirds of the state are humid-subtropical, with cooler winters and less distinct wet and dry seasons. The southern one-third of the state (including the keys) is tropical savanna, warm year-round, with pronounced wet seasons in the summer and dry seasons in the winter. The state receives approximately 53 inches of rain each year, but rainfall often occurs in heavy downpours and is not equally distributed across the state. For instance, Key West receives an average of 40 inches annually, while the Panhandle receives 69 inches.
The following graphs were created with Software Query Language with data provided by the District’s economic analysis office. Figure 3 displays annual district-wide rainfall in inches from 1915 to 2011. The reader can clearly see the 1956 – 1957 drought event followed by the wetter years of 1958 – 1960. The 27-inch, four-day downpour of March 1960, immediately followed by Hurricane Donna in September, led to the District’s creation and launched the massive Four River Basins flood control project. The graph also clearly displays that no sooner had the 57 million dollar flood control project gotten underway, public attention would turn to a lack of rainfall by late 1962.

An examination of the dramatic 1970 to 1980 population growth in Hillsborough, Pinellas and Pasco counties (Table 2), and comparison with declining rainfall trends from 1981 to 1984 demonstrate urban and resource conditions ripe for regional water wars. A participant who was employed at the District for the duration of the water wars suggests:

By saying there is insufficient water, the water management district in a sense are limiting growth. That becomes a political issue, and next thing you know, the water management district has been denuded.

These comments speak clearly to an economic growth paradigm rooted firmly in the assumption of cheap and perhaps limitless freshwater resource availability. This pro-growth agenda (minus resource or ecologic considerations) may very possibly serve to hamper sustainable management efforts by the region’s water management district. During a discussion on the rupture that exists between the dominant regional urban growth paradigm and the need for long-term, sustainable resource management, one participant hinted at the District’s navigation of this issue:

Our approach was to do incremental rule making to address the problems that we knew existed. In terms of the big issues, we started the water use cautionaries, which we did in advance of recognition of what they call water resource cautionaries, and these were areas where we knew the withdrawals were exceeding the
environmentally sustainable and sometimes resources levels because that was Highland Bridge, Eastern Tampa Bay and Northern Tampa Bay and Eastern Tampa Bay was salt water, Highland Ridge was mostly lake levels and declining flows in the Northeast River, and Northern Tampa Bay was lakes, stream flows.

Figure 4 displays total surface and groundwater withdrawals by the various usage sectors that operate within Southwest Florida. Withdrawals for public supply surpassed those of the historically high-use agricultural sector in 2003. Table 3 contains population projections through 2025 and the associated percent increase in resource demand. Degradation to the resource and its associated ecosystems have been noted for decades and institutionalized via the creation of water use caution areas, yet resource demands continue to track population growth rather closely. Numerous participants discussed the District’s emphasis on alternative water supplies as a means to supply the expected quantities. Another item worth noting from Figure 4 is the relatively low rate of resource extraction by the mining sector as compared to public supply, and the very high rates of natural system disturbance caused by regional mining activities. Regional public-supply water use is incredibly wasteful and generally apportioned as follows: 20% for drinking and cooking, 20% for showering and 60% for outdoor landscaping (SWFWMD, 2006). This percentage represents the onerous water requirements of suburban landscaping. The following section will provide some insight into the negative ecological externalities that result from unsustainable pumping rates.
Figure 3. District-wide annual rainfall levels in inches for 1915 – 2011.

Table 2. Population of counties within the SWFWMD in 1000s (SWFWMD, 2013).

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlotte</td>
<td>28,059</td>
<td>59,507</td>
<td>112,821</td>
<td>142,266</td>
<td>155,262</td>
<td>160,124</td>
<td>165,653</td>
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<td>Citrus</td>
<td>19,887</td>
<td>55,747</td>
<td>94,645</td>
<td>118,649</td>
<td>133,791</td>
<td>141,277</td>
<td>144,476</td>
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<td>DeSoto</td>
<td>13,254</td>
<td>19,163</td>
<td>24,094</td>
<td>32,196</td>
<td>33,864</td>
<td>34,95</td>
<td>35,697</td>
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<td>Hardee</td>
<td>15,051</td>
<td>20,384</td>
<td>19,668</td>
<td>26,769</td>
<td>26,874</td>
<td>27,809</td>
<td>28,425</td>
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<td>Hernando</td>
<td>17,593</td>
<td>45,738</td>
<td>102,726</td>
<td>131,39</td>
<td>157,156</td>
<td>173,022</td>
<td>180,329</td>
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<td>Highlands</td>
<td>29,98</td>
<td>48,103</td>
<td>69,238</td>
<td>87,417</td>
<td>95,614</td>
<td>98,75</td>
<td>102,869</td>
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<td>Hillsborough</td>
<td>494,803</td>
<td>651,956</td>
<td>837,028</td>
<td>1003,435</td>
<td>1143,154</td>
<td>1233,373</td>
<td>1312,809</td>
</tr>
<tr>
<td>Lake</td>
<td>70,119</td>
<td>105,91</td>
<td>153,468</td>
<td>212,347</td>
<td>267,587</td>
<td>297,875</td>
<td>313,641</td>
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<tr>
<td>Levy</td>
<td>12,817</td>
<td>20,064</td>
<td>26,123</td>
<td>34,644</td>
<td>38,355</td>
<td>40,73</td>
<td>41,218</td>
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<tr>
<td>Manatee</td>
<td>97,854</td>
<td>150,318</td>
<td>213,563</td>
<td>265,644</td>
<td>306,845</td>
<td>323,453</td>
<td>339,282</td>
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<tr>
<td>Marion</td>
<td>70,557</td>
<td>124,238</td>
<td>197,095</td>
<td>260,221</td>
<td>303,558</td>
<td>331,407</td>
<td>343,287</td>
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<tr>
<td>Pasco</td>
<td>78,551</td>
<td>196,662</td>
<td>281,937</td>
<td>347,038</td>
<td>421,844</td>
<td>465,536</td>
<td>485,24</td>
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<td>Pinellas</td>
<td>529,536</td>
<td>733,143</td>
<td>856,166</td>
<td>922,15</td>
<td>929,426</td>
<td>916,22</td>
<td>927,574</td>
</tr>
<tr>
<td>Polk</td>
<td>231,081</td>
<td>324,095</td>
<td>407,756</td>
<td>485,515</td>
<td>547,373</td>
<td>602,924</td>
<td>624,14</td>
</tr>
<tr>
<td>Sarasota</td>
<td>122,651</td>
<td>204,557</td>
<td>279,748</td>
<td>327,165</td>
<td>367,912</td>
<td>380,043</td>
<td>390,708</td>
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<tr>
<td>Sumter</td>
<td>15,017</td>
<td>24,438</td>
<td>31,882</td>
<td>53,738</td>
<td>69,261</td>
<td>94,32</td>
<td>102,876</td>
</tr>
<tr>
<td>Total</td>
<td>1846,81</td>
<td>2784,023</td>
<td>3707,958</td>
<td>4450,584</td>
<td>4997,876</td>
<td>5321,813</td>
<td>5538,224</td>
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<td>SWFWMD</td>
<td>6864,885</td>
<td>9841,133</td>
<td>13033,307</td>
<td>16047,515</td>
<td>17842,038</td>
<td>18838,613</td>
<td>19608,85</td>
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</table>
Figure 4. Distribution of total ground and surface water withdrawals by sector in mg/d (left axis) displayed against annual rainfall in inches (right axis) for 1992 - 2011.

Table 3. Population projections for the counties within the Tampa Bay region, percent population change and projected associated public water-supply demand increase (SWFWMD, 2005).

<table>
<thead>
<tr>
<th>County</th>
<th>2005</th>
<th>2015</th>
<th>2025</th>
<th>Population increase / %</th>
<th>Increase in public supply water demand / %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillsborough</td>
<td>1,157,006</td>
<td>1,413,811</td>
<td>1,626,389</td>
<td>60</td>
<td>59</td>
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<tr>
<td>Pinellas</td>
<td>1,055,765</td>
<td>1,072,525</td>
<td>1,097,660</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Polk</td>
<td>475,339</td>
<td>643,750</td>
<td>732,325</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td>Pasco</td>
<td>367,519</td>
<td>569,140</td>
<td>671,440</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td>Sarasota</td>
<td>358,227</td>
<td>473,067</td>
<td>539,093</td>
<td>51</td>
<td>50</td>
</tr>
<tr>
<td>Manatee</td>
<td>291,524</td>
<td>418,140</td>
<td>487,775</td>
<td>67</td>
<td>67</td>
</tr>
<tr>
<td>Hernando</td>
<td>101,115</td>
<td>176,400</td>
<td>204,600</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>Citrus</td>
<td>93,515</td>
<td>155,100</td>
<td>178,200</td>
<td>51</td>
<td>51</td>
</tr>
</tbody>
</table>

Unsustainable Water Use: Empirical Evidence

Numerous surficial and subterraneous studies have demonstrated the negative impacts of water-intensive urbanization on Southwest Florida’s hydro-geologic landscape. Urban surface loading and unsustainable rates of resource mining and mobilization have accelerated incidents of sinkhole formation and saltwater intrusion (Tihansky, 1999). The karst features within
SWFWMD’s jurisdiction play a dominant role in the region’s hydrogeologic system (Scott et al., 1994; Tihansky & Kokenemus, 2001) and numerous karst-related studies have investigated the impacts of urban growth on the region’s land and water resources. Tihansky (1999) notes that sinkholes may form in response to land-clearing activities, rerouting surface-water drainage, and the drilling of wells. Springs located downstream from a sinkhole may demonstrate temporarily increased discharge, or may cease to flow (Trommer, 1992), and sinkhole formation beneath lake and riverbeds lower groundwater levels and may lead to the draining of the surface water body (Sinclair et al., 1985).

Such disruptions in the hydrologic flow are evident in the upper Peace River where surface flow has been disrupted by the formation of sinkholes in the river bed (SWFWMD, 2008), and where the impacts of anthropogenic disruptions of the hydrologic regime are evident. Groundwater levels and natural drainage patterns have been altered by extensive phosphate mining and land reclamation activities within the Peace River basin. The associated hydrologic impacts include the following: (1) groundwater levels within the Upper Floridan aquifer system have been reduced to support mining activities, including the processing and transportation of phosphate ore; (2) natural surface drainage systems have been replaced by anthropogenically modified surface topography, including swales and ditches; (3) overland surface flow has been impeded by the creation of surface depressions and pits; (4) base flow has been reduced or eliminated as a further consequence of topographical modification; and (5) rates of rainwater infiltration into the intermediate aquifer system have increased due to the disturbance and reduction of the upper confining phosphate matrix (Lewelling & Wylie, 1993).

The increasing water demands of urban regions, and technological advancements related to hydrologic data, have spawned new areas of research, bolstered by the use of GIS and remote
sensing technologies concerned with the impacts of urban stressors and land use decisions on the region’s hydrologic system. For instance, Kruse et al. (2006) utilized GPR in west-central Florida, as a non-invasive alternative, to map and image sinkhole structures, and to determine their groundwater recharge potential. Other researchers including Xian and Crane (2005) utilized Landsat imagery to map the extent of conversion of Tampa Bay’s natural landscapes to impervious surfaces, and noted an approximate three-fold increase in impervious surface area between 1991 and 2002. These results were extrapolated using the slope, landuse, exclusion, urban extent, transportation and hillshade (SLEUTH) model to predict future urban growth patterns within the Tampa Bay watershed. Study estimates suggest that impervious urban land surfaces will cover 38% of the watershed by 2025.

Discussions on urban land-use and land-change (lulu) invariably leads to questions about surface and groundwater quality, as urban regions exist and operate within watersheds that are connected to wider hydrologic systems. As the examples of Pinellas county and St. Petersburg show (Rand, 2003), municipal, industrial and agricultural water use, if poorly managed, can lead to the over-pumping of aquifer systems. The reduction in hydrostatic pressure can lead to sinkhole formation, saltwater intrusion and the dewatering of rivers, lakes and wetland environments. The intentional redirection of surface water flows can also disrupt natural hydrologic regimes as recharge may be eliminated in certain areas and discharge increased in others, whilst urban and agricultural contaminants are rapidly transported to the aquifer through karst terrain (Lewelling & Wylie, 1993; Tihansky & Knochenmus, 2001; Trommer, 1992). The currently available empirical evidence clearly demonstrates the need for a management paradigm that considers the tightly coupled nature of human–natural resource technology in contemporary urban regions.
Water for Urban Growth

The Florida Council of 100 continues to be a dominant force in Southwest Florida’s urban growth initiatives. This non-governmental organization acts in an advisory capacity to the Governor, and works closely with the State legislature and the Chief Justice, on matters related to economic growth (Florida Council of 100, 2011). CEOs of the State’s prominent business organizations are invited to join, and include the Florida President of BellSouth Telecommunications, the Chairman of Disney Attractions, the Vice Chairman of Bank of America, the President of the University of Miami and the President of Gulf Power. The land development sector is represented by members such as the CEO of the St. Joe Company (one of Florida’s largest land holders and real estate developers), the director of the CSX Railroad Corporation (which services most of the nation’s east coast, including the Canadian provinces of Quebec and Ontario), and the CEO of the Haskell Company (one of the nation’s largest design and construction firms) (Florida Council of 100, 2011). Members “…are expected to have a stake in Florida and in the achievement of the Council mission…” (Florida Council of 100, 2011), which is “…to be a forum of strategic thinkers and leaders having a major positive effect on Florida public policy that enhances the quality of life and economic well-being of all Floridians…” (Florida Council of 100, 2011).

The Council’s interest in establishing a regional competitive advantage is clearly outlined in the organization’s mission statement and the economic interests of its membership. Member agencies and individual CEOs stand to gain enormously from the finance (Bank of America), development (CSX Railroad Corporation, St. Joe Company and Gulf Power), and advertisements (BellSouth Telecommunications, Disney Attractions) of regional growth projects. Aware that these projects would grind to a halt in the absence of adequate freshwater resources (Sklivaniotis
& Angelakis, 2006) in the contemporary era of increasing public concerns with regards to ecosystem viability (Rand, 2003; Scholz & Stiftel, 2005), the Council’s Water Management Task Force was created in the spring of 2002. This task force was created to “…recommend statewide water management policies and recommendations that foster sustainable and environmentally sound water supplies and resources that are economically feasible to meet current and future Florida needs…” (Florida Council of 100, 2003, p. 2). This is a mission that was clearly extracted from Statute 373, but it failed to provide further clarification on the attainment of the contradictory goals of achieving ecological sustainability whilst endorsing continued water-intensive economic growth.

The thirty-member task force responsible for the creation of the 2003 report entitled “Improving Florida’s Water Supply Management Structure” included: Gary Morse, Chairman and CEO of The Villages; Jean-Marc Allard, Chairman and CEO of Hubbard Construction; Jim Apthorp, Director of the Collins Center for Public Policy; Andy Barnes, Chairman and CEO of the St. Petersburg Times; Llwyd Ecclestone, Chairman of PGA Resorts Company; Bob Fagan, President, Chairman and CEO of TECO Energy; Bob Moss, President and CEO of Bob Moss and Associates; and Lance Ringhaver, President of Ringhaver Equipment. Sixteen of the thirty task force members were CEOs of land development companies. Other members included government advisor, Jim Smith (a former Secretary of State), and influential lobbyist under former Governor Charlie Christ, Brian Ballard of Smith and Ballard, and the CEOs of real estate management, construction equipment rental, media, land mining, farming, and utilities corporations (Florida Council of 100, 2003). In other words, this taskforce represented a veritable who’s who of state-wide economic expansion and capital accumulation. The administrators of regional environmental and water management agencies were conspicuously
absent from the water management taskforce due to the organizational structure and recruitment restrictions of the Council.

Although the Council’s water report alluded to the inclusion of “…sound water policy that protects the environment, while at the same time, enhances economic development and growth that has been forecasted…” (Florida Council of 100, 2003, p. 3), the report focused exclusively on hard-path, supply-side solutions. The task force correctly reiterated that most of the State’s growth occurs below the hydrologic divide, which occurs just south of I-4, which separates the currently water-poor south from the relatively water-rich north. The report failed, however, to include relevant information on the rapid urbanization and unsustainable water-mining that occurred in the State’s southern regions during the 20th century that caused ecosystem decline and hydro-geologic structural damage (Barnett, 2007). In this context, the central Florida Kissimmee River and south Florida Everglades restoration projects are costly and inconvenient reminders of the collateral environmental costs that invariably accompany the runaway economic growth for which Southwest Florida is well known. In fact, recent studies suggest that the Everglades restoration project, the most expensive and ambitious environmental rehabilitation project in the history of the U.S., is more concerned with improving the economic viability of South Florida (by way of a water supply), than with restoring the ecological vitality of the Glades itself (Barnett, 2007; Melville, 2004).

The recommendations of the 2003 Water Management Task Force report included: (1) the transfer of surface water from northern water bodies, including the Suwannee River, to support the growth plans of South Florida land developers and regional planners (Pittman, 2003); (2) the creation of a state water supply commission to review the “local sources first policy” (which ensures that all reasonable water supply possibilities within county and city borders are
exhausted before attempts are made to acquire supplies from elsewhere); make recommendations to the Governor and the cabinet on the resolution of water supply disputes; and encourage the establishment of regional and/or countywide water wholesale suppliers (water privatization), among other supply-side responsibilities. Other responsibilities, including ecosystem protection, drought prevention, storm water capture and water quality improvements, were excluded from the proposed commission’s list of duties (Florida Council of 100, 2003). Upon release, the report generated a firestorm of criticism from environmental agencies, including Earthjustice and the Florida Audubon Society, and from North Florida residents and political representatives who were concerned with the possibility of stifling economic growth in their region due to the potential resource limitations that may have occurred as a result of the proposed water transfers (Klein, 2006).

Conclusion

Florida’s residents became increasingly aware of the negative environmental consequences of the state’s rapid urbanization and associated water engineering projects during the mid 1960s (DeGrove, 1984; Mormino, 2005). Impacts included the impaction of the Oklawaha river by the Cross Florida Barge Canal, reduction of water supplies to the Everglades National Park, and saltwater intrusion of coastal wells as early as the 1940s (SFWMD, 2002). These impacts were exacerbated by the severe 1970 to 1971 drought conditions.

South Florida received rainfall levels 22 inches below normal, from the winter of 1970 to the winter of 1971, resulting in extreme drought conditions and the occurrence of extensive muck fires in the Everglades (DeGrove 1984; SFWMD, 2002). Freshwater supply issues were further aggravated by prior Everglades’ drainage projects and the construction of overflow canals from Lake Okeechobee to the coast that rendered the Biscayne aquifer susceptible to salt water
intrusion (DeGrove, 1984). This period of “Water Crisis” in South Florida was thought to have been intensified by the unchecked urban growth in previous decades. The response to this crisis would involve a coalition of political and environmental forces that would develop a suite of land and water management tools that would be touted as some of the most advanced in the nation (Stein, 1993; Song, 2007).

Although the 1970 – 1971 freshwater supply shortage provided the incentive for the 1971 Governor’s Conference on Water Management in South Florida, the focus quickly shifted to the development of comprehensive policies and administrative capacities to manage urban growth (DeGrove; 1984). Governor Reuben Askew challenged the conference’s 150 participants, including land developers, state and local government employees, federal agency representatives and environmentalists, to “…build a peace in South Florida, a peace between the people and their place…between the natural environment and the manmade settlement…between the creek and the canal…between the works and needs of men and women…and with the life of mankind itself.” (DeGrove 1984, p. 107). Conference participants produced a report that stressed a “limits-to-growth” agenda, and called for a comprehensive land and water use plan for state and regional levels with state-driven leadership (Statement to Governor, 1971).

**Urban Water Resource Discourses**

Water flows cross physical spatial boundaries, and the conceptual boundaries between natural and urban landscapes. The mutable nature of this resource supports research of an interdisciplinary nature to examine aspects of hydrology, hydrogeology, geomorphology, human geography and physical geography. Water shapes and is shaped by our produced landscapes, cultures and economies, and therefore bears both social and natural aspects (Swyngedouw, 1999).
Maria Kaika’s socio-spatial examination of urban water flows (originating in nature, mobilized via industrial technology and distributed throughout urban regions and into residential homes) begins with a discussion on the urbanization of water and the existing nature/society dualism (2005). In the early 19\textsuperscript{th} century, industrial cities experienced deteriorating social and environmental conditions as over-crowding, poor sanitation, industrial discharge and urban discharge fouled the air and water. Nature appeared hostile and urban centers began to plan large-scale water supply and sanitation projects. From the late 1800s to the late 1900s these large scale projects, including the construction of communication and transportation networks, promoted modernization as the path to societal advancement (Bakker, 2003; Kaika, 2005). Nature was transformed from an impediment to a prerequisite for urban growth by capital investment, institutional changes, technology and labor power (Bakker, 2003; Kaika, 2005).

Kaika (2005) suggests that the historical geographical processes of industrialization and urbanization attempted to render modern cityscapes autonomous and independent from nature’s whims (2005). Ellen (1987) echoed numerous geographical scholars, including Blaikie and Brookfield, in his statement that “…cultural evolution increases not only the possible range of techniques for transforming nature, but also the requirements of a population in the form of energy and materials…” (p. 49). In this way cultural advancement and technological progress often serve to increase the complexity of human-environment linkages (Figure 1), encouraging the wider utilization of nature rather than resulting in the freedom from nature that most technocrats purport. Kaika (2005) speaks directly to this point, and notes that attempts to render the cityscape independent from nature’s processes was predicated upon the establishment of “…intricate networks and flows of natural elements, social power relations and capital
investment cycles, which in fact, not only did not separate nature from the city, but instead wove them together more closely into a socio-spatial continuum…” (p. 5).
Chapter 4: Method

Purpose of the Study

The purpose of this qualitative case study is to gain an understanding of the mechanisms utilized by the Southwest Florida’s water management agency to navigate and engage in sustainable regional water resource management. Participants included thirty current and former agency employees with decision-making capacity from the following departments:

1. Land Resources (oversees land acquisition), 4 participants
2. Operations (oversees mapping and geographical information systems, hydrologic data) 3 participants
3. Legal, 3 participants
4. Resource Data and Restoration (oversees geohydrologic data, surface water improvement and management, water quality monitoring), 10 participants
5. Resource Projects (oversees engineering projects, conservation projects, hydrologic evaluation, ecologic evaluation, water supply and resource development, environmental initiatives), 10 participants

The following research questions served to guide the inquiry:

- **Research Question A.** How has the institutional history of SWFWMD (since its establishment) shaped contemporary water management within the region?
- **Research Question B.** To what extent is SWFWMD’s capacity to operate within a sustainable natural resource management framework enabled and/or hindered by the agency’s statutory mandate to influence land use decisions?
Research Question C. How has the mandate set forth by statute 373.036 (which necessitates SWFWMD’s engagement in sustainable water management and ensuring that all required future water needs are met) impacted the institution’s capacity to operate within a sustainable natural resource management framework.

A case study was designed to gain entry into the professional experiences of senior department managers who are or were employed at SWFWMD. Professionals at the managerial level were selected based on their role in the agency’s decision making process and the degree of collaboration required across departments to carry out their functions. SWFWMD is responsible for the execution of legislated water management rules into objectives or projects that can be carried out to achieve the desired resource management results within its jurisdiction.

The agency’s operations are best examined at the level of senior management who oversee the execution of department functions, and interact frequently with technical and operational staff, executive management and the governing board. In this way, senior management provides a lens into the inner workings of SWFWMD, including the agency’s approaches to adaptive management and sustainable management.

Qualitative Case Study Discourse

A research paradigm serves as the interpretive framework that stanchions a study. The chosen area of investigation and the data required guide the planning and design stages of the research and inform the methodology (Guba, 1990). Becker (1996) suggests that although the methodological assumptions of the two predominant research paradigms may differ, the two perspectives (qualitative and quantitative) are molded from the positivist and post-positivist traditions of the physical and social sciences. The positivist tradition suggests the existence of an
external reality that may be observed, assessed and understood, whereas the post-positivist view contends that reality may only be approximated (Guba, 1990).

The idiographic nature of qualitative research encourages rich descriptions of social phenomena, and stresses the socially constructed nature of reality (Denzin & Lincoln, 2011). Qualitative researchers are concerned with the creation of, and meaning derived from social experience. Social inquiry is thought to be shaped by the interaction and situational constraints that develop between the researcher and the focus of the study. Alternatively, quantitative researchers attempt to conduct studies within a value-free framework that emphasizes the determination and analysis of the casual relationships that exist between variables (Denzin & Lincoln, 2011).

Qualitative research design arose from the traditions of anthropology, sociology and psychology (Maccoby & Maccoby, 1954; Charmaz & Belgrave, 2002) where the philosophy emphasized the phenomenological basis of the research (Denzin & Lincoln, 2003). The qualitative interpretive approach applies multiple methods towards the capture of as much “reality” as possible. The captured reality is observed and interpreted to develop theories to explain that which was experienced (Berg & Lune, 2004). This approach emphasizes the discovery and verification of theories. Conversely, the quantitative approach is utilized when one begins with a theory, and seeks to test for confirmation or disconfirmation (Newman & Benz, 1998).

Qualitative studies examine a single subject or case over an extended period of time, in an attempt to understand the person or phenomenon (Charmaz & Belgrave, 2002). Coding is informed inductively from the interpretations of the data (Berg & Lune, 2004; Denzin & Lincoln, 2003) whereas nomothetic, quantitative studies code data in accordance with predefined
operational and standardized definitions (Newman & Benz, 1998). The qualitative, inductive paradigm is better suited to this study as an in-depth interviewing and observational approach lends itself to attaining a more comprehensive understanding of the participants’ perspective than the inferential, empirical methods and materials of the quantitative approach.

Gall et al. (1996) suggest that researchers conduct case studies to produce detailed descriptions of a phenomenon, cultivate possible explanations of the phenomenon, or to appraise the phenomenon. Case studies may serve to draw attention to the question of what can be specifically learned from the single case (Denzin & Lincoln, 2011). Case study researchers define the focus of their studies and spend an extended period of time in their research participants’ environment to gathered in-depth data from a wide variety of sources in an attempt to produce a description of the phenomenon from the participants’ perspective (Charmaz & Belgrave, 2002). Kirk and Miller (1986) suggest the benefits of observing people in their own territory, interacting with them in their own language and on their own terms. Researchers thereby often assume an interactive role with their participants, becoming personally involved with the persons or phenomenon being studied (Denzin & Lincoln, 2011).

Qualitative data analysis lends itself to the inductive process of arranging data into categories to aid in the identification of any patterns or relationships that may exist amongst the categories (Glaser & Strauss, 1967). This process does not occur in a linear fashion like quantitative analysis, but instead entails navigation back and forth between the various levels produced during cyclical, overlapping phases of the analysis process (Patton, 2002). While this mode of analysis may appear to lack a standard procedure, qualitative inquiry is no less systematic or rigorous than quantitative inquiry.
Patton (2002) reminds us that the written and spoken word may include tinges of ambiguity, regardless of the care taken during the wording of question items or answer coding. Interviews should not be regarded as passive or neutral tools of data collection, but rather an active interaction between persons that forges the creation of negotiated and contextually based results. The context of each interview is one of relation and interaction. The product is a reflection not only of accounts and replies, but of the social dynamic between participants. It is therefore important that researchers remain aware that interview participants’ engage in the active construction of knowledge throughout the question and response process (Gubrium & Holstein, 2001; Atkinson & Coffey, 2003; Denzin & Lincoln, 2011).

Ethical concerns traditionally highlight the issues of informed consent, the participants’ right to privacy and protection from harm. Other ethical concerns relate to the covert use of recording devices, the researcher’s degree of involvement with the group of participants and their environment, and the authenticity and integrity of the researchers’ reports (Charmaz & Mitchell, 1996). Marcus & Fisher (1999) summarize these concerns by plainly stating that a great degree of attention should be placed on the voices of the respondents.

**Data Collection**

As introduced in the previous section, inductive analyses are content-driven and lend well to descriptive, exploratory studies. Data are usually generated via purposive sampling and codes emerge from careful reading of the data during the analysis stage (vs. being predetermined). This type of research involves the purposeful use of a variety of interconnected interpretive practices and empirical methods including case studies, interviews, artifacts and personal experience (Patton, 2002).
The data collected for this study included one-on-one interviews conducted with each water management professional, documents including academic publications, social history narratives, legislative documents and newspaper articles, and field notes. Study participants were purposefully selected for their situated knowledge based on factors including their agency responsibilities and duration of agency employment, and recommendations from participants via snowball sampling.

SWFWMD is headquartered in Brooksville and is one of the largest employment agencies for residents of Hernando, Sumter and Citrus counties. Thanks to its status as a governmental entity (long-term job security) and location, agency departments exhibit very low turnover rates, and study participants demonstrated historical institutional and resource management knowledge ranging from 15 to 30 years.

Data collection would not have been possible without my gatekeepers at the agency who became familiar with me during my 2008 summer internship in the Planning Department. These individuals were invaluable in promoting the degree of trust and assurance that their current and past colleagues required to feel comfortable to candidly discuss resource management issues with someone with whom they weren’t personally familiar.

During the fall of 2012, and spring and summer of 2013, I conducted one-on-one interviews with each participant, each lasting approximately 2-3 hours (much longer than the anticipated time of 45 minutes, due to participant candor) at the nearest public library or in a quiet, comfortable public space of the participant’s choosing where their local library was not a feasible option. Survey instruments were designed in a semi-structured format with the flexibility to allow for probing and follow up questions. Each interview was recorded on my
Olympus WS-600S digital voice recorder and transcribed using Express Scribe © on my personal computer.

Although the survey instruments were constructed with a working knowledge of the related literature, they were exploratory in nature and not theory-driven. Participants were viewed as conversation partners during the interview process (Rubin & Rubin, 2011) where I laid the general interview framework in a broad, open-ended manner to create the low-pressure environment of an informal conversation. Participants were allowed and encouraged to expand on any ideas that arose during the interview process that were meaningful to them.

My observational field notes were especially useful in the recording of participant non-verbal cues including facial expressions, vocal tones or tension in the neck, shoulders or arms when certain topics, ideas, thoughts or memories were being relayed.

With respect to textual analysis, academic publications, social history narratives and newspaper articles were used to cross check participant accounts of regional water management occurrences. Legislative articles were cross-referenced with scholarly historical, contemporary articles, and newspapers to examine the impacts of expanded statutory authority or management adjustments that were made with respect to water resources, ecosystem protection and land development.

**Researcher Journal**

The researcher serves as the primary research instrument during a qualitative inquiry, and it is therefore important to be aware of one’s presuppositions, biases and emergent shifts in thought process and development as the inquiry is conducted (Patton, 2002; Stake, 2010). In lieu of this, I maintained a reflective journal to record my personal reflections as they related to my initial understandings and expectations of the process, my role as a researcher, my initial
understandings of the participants’ experiences, and ideas and questions that arose with relevance to the study. I reviewed my reflections throughout the inquiry process and found it a valuable tool to track my developing interpretations and development as a researcher.

Data Analysis

For the purposes of this study, responses recorded during the semi-structured interviews were transcribed. These transcriptions along with related field notes were interpreted by reducing the narrative texts into codes via paraphrasing, summarizing and categorizing the data (Flick, 1998). This data reduction process assists with the sorting and determination of relevant themes and categories. ATLAS.ti © qualitative data analysis software was used to aid in the management of this coding process. The software’s organizational interface for data analysis enabled me to keep track of primary documents (interview transcripts), codes, emergent themes, quotations and memos.

Concept codes were allocated to phrases and sentences to expedite the process of thematic grouping under the broad themes that were relevant to the study and related to the research questions. These phrases, sentences and concept codes were examined using ATLAS.ti © and Excel © spreadsheets to permit data sorting and examination. Related field notes were utilized to substantiate transcripts and were also entered into the spreadsheets.

The coding process utilized open, axial or selective coding protocols to analyze data. The process involved the close observation and examination of words, phrases and sentences to aid in the construction of concepts and categories from field notes and recordings (Strauss & Corbin, 1990). Open coding was the initial stage where category properties were described. Axial coding served to identify causal relationships between categories to decipher explicit relationships between categories and sub-categories of phenomena. Selective coding
systematically related previously identified core categories to one another, thereby integrating categories to develop patterns for analysis (Flick, 1998).

Validity, Credibility and Ethical Considerations

Validity in qualitative research has been depicted in a myriad of ways by various experts in the field. Morse et al. suggest that a valid or true account is one which accurately represents the features of the phenomena that it is intended to describe or theorize (1986). Validity can be enhanced through every stage of the research process including research design (Guest et al., 2008). This study utilized three data sources for the purposes of triangulation. The triangulation of data sources and methods via the use of multiple points of reference can minimize the intrinsic bias that can affect single-observer, single-theory and single-methods research studies (Berg & Lune, 2004; Flick, 2004).

Another proposed method to improve validity during the research process relates to the survey instrument and the data collector. The data collector should be informed and comfortable with the purpose behind the questions contained within the survey instrument, to fully realize the inductive opportunity presented by the interview process. I participated fully in the process of survey creation, and served as the sole data collector.

With respect to credibility, Patton suggests that the credibility of qualitative research “hinges to a great extent on the skill, competence, and rigor of the person doing fieldwork” (2002, p. 14). Credibility further refers to the confidence in the truth of the findings, including an accurate understanding of the context (Patton, 2002). Where credibility is concerned I would like to call attention to the section in Chapter 1 where I discussed my personal role and interest in the research in the hopes that the reader would gain a deeper understanding of my perspective as the researcher. I also acknowledge the need to reflect on and make transparent any potential
biases, assumptions, personal expectations or prior experiences that may affect the analysis or subsequent interpretation of the data (Guba, 1981; Patton, 2005; Shenton, 2004). The use of a researcher reflective journal served this purpose for my research.

The 30 research participants who volunteered to participate in my IRB approved dissertation study were granted the anonymity and confidentiality that they were assured before and during the interview process. Their names and identifiers were coded, and the only persons with access to the original transcripts are my graduate supervisor (who is not affiliated with SWFWMD) and I.
Chapter 5: Results

Introduction

In this chapter, I present the themes that emerged from my inductive case study of the mechanisms by which SWFWMD engages in the practice of water resources management through the reflections of senior managers with 10 to 30 years of institutional history. My data analysis resulted in the emergence of the six themes presented below.

Emergent Themes Related to Research Question A: How has the institutional history of SWFWMD (since its establishment) shaped contemporary water management within the region?

Theme 1: Urban pressures on the resource continuously change form

Theme 2: Leading from top: The governing board sets the tone

Emergent Themes Related to Research Question B: To what extent is SWFWMD’s capacity to operate within a sustainable natural resource management framework enabled and/or hindered by the agency’s statutory mandate to influence land use decisions?

Theme 1: Data: The significance of eye witness and empirical evidence

Theme 2: Convincing others to enact change

Emergent Themes Related to Research Question C: How has the mandate set forth by statute 373.036 (which necessitates SWFWMD’s engagement in sustainable water management and ensuring that all required future water needs are met) impacted the institution’s capacity to operate within a sustainable natural resource management framework.
Theme 1: Fuzzy delineation of environmental agency responsibilities at the level of the State

Theme 2: Permitting

Through the processes of de-contextualization and re-contextualization, thematic analysis pursues the characterization and summation of participants’ perceptions and professional experiences to apply the results to the research questions at hand vs. the construction and assessment of theoretical models. In the sections below, I provide a detailed look into participant representations of the operationalization of regional water management in South Florida with respect to the aforementioned research questions. To support this portrayal, I include excerpts from relevant literature sources and verbatim extracts from participants’ interview transcripts.

To clarify the presentation of extracts, I have made no changes to participants’ quotations. Deleted elements of possible participant identifiers and participants’ quotations perceived as either irrelevant to the theme under consideration or unnecessary to convey meaning are indicated via the punctuation “…” . Any text inserted to clarify meaning or to provide the reader with additional information are inserted within square brackets (i.e. [ ]).

As previously mentioned, surveys were conducted with past and current employees, and participants were invited to participate under guaranteed anonymity. Although I do not provide many extracts from the other data sources collected for the larger study (e.g., newspapers articles, agency documents and field note transcripts, I draw on these sources throughout my analysis to help clarify contextual descriptions and implied meanings within the participants’ interview reflections.
Emergent Themes Related to Research Question A

The first research question guiding this inquiry is, “How has the institutional history of SWFWMD (since its establishment) shaped contemporary water management within the region?” My analysis of the interview transcripts and my familiarity with the literature helped me to understand my participants’ perspectives, which are presented in this section.

SWFWMD was created as the local sponsor of the Four River Basins project (Figure 6), a federal government flood control project, created following the severe flooding that occurred on Florida’s west coast in 1958, 1959 and 1960. On September 2, 1960, John W. Wakefield, director of the Florida Department of Natural Resources (now Florida’s Department of Environmental Protection) sent a memorandum proposing legislation for the creation of a new regional agency. This ‘Southwest Florida Water Control District’ was to be responsible for the comprehensive management of water for all legitimate purposes.

Surface water flows of the Peace, Hillsborough, Withlacoochee and Ocklawaha River (a tributary to the St. John’s River) would be managed via a series of reservoirs, spillways, culverts, levees, canals and locks (Figure 5).

Blake’s *Land into Water, Water into Land* (1980) traced Florida’s water policy evolution from its initial emphasis on late 17th century navigation improvement (1820s), to drainage efforts (1880s), flood control projects (late 1920s) and water supply management in the 1970s. SWFWMD’s areas of emphasis would shift in a similar fashion each decade as regional land use intensified. Table 4 indicates water use by sector in SWFWMD. Note that public supply use quantities surpassed agricultural use in 2004.
Figure 5. The location and infrastructure of the Four River Basins project. (Army Corps of Engineers Report, 1976).

Table 4. Metered and Estimated Water Withdrawals in Millions of Gallons per day (SWFWMD, 2012).

<table>
<thead>
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<tbody>
<tr>
<td>Agricultural</td>
<td>552.74</td>
<td>503.59</td>
<td>706.73</td>
<td>412.11</td>
<td>369.32</td>
<td>381.14</td>
</tr>
<tr>
<td>Public Supply</td>
<td>471.12</td>
<td>461.90</td>
<td>534.04</td>
<td>456.58</td>
<td>473.82</td>
<td>470.62</td>
</tr>
<tr>
<td>Industrial/Commercial/Power</td>
<td>145.50</td>
<td>62.61</td>
<td>57.61</td>
<td>50.28</td>
<td>60.56</td>
<td>53.24</td>
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<tr>
<td>Generation</td>
<td></td>
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<tr>
<td>Mining/Dewatering</td>
<td>87.22</td>
<td>140.26</td>
<td>89.79</td>
<td>80.95</td>
<td>41.54</td>
<td>22.67</td>
</tr>
<tr>
<td>Recreational/Aesthetic</td>
<td>42.40</td>
<td>59.02</td>
<td>69.81</td>
<td>67.72</td>
<td>91.03</td>
<td>60.59</td>
</tr>
<tr>
<td>Total</td>
<td>1,298.98</td>
<td>1,227.39</td>
<td>1,457.98</td>
<td>1,067.63</td>
<td>1,036.26</td>
<td>988.26</td>
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Theme 1: Urban pressures on the resource continuously change form

Twentieth century urbanization efforts practiced single-use water resource planning and management to address pressing regional needs including flood control, irrigation, sanitation and
water supply. Within a few decades, managers, citizens and policy makers recognized the integrated nature of water flows and urban development, and the associated need for long-term, multi-purpose resource planning. Holistic approaches to planning and management became increasingly important as population and economic growth lead to the competition for water flows within regional watersheds and springsheds. Southwest Florida experienced water resource quality and quantity supply issues as urbanization progressed from the 1970s onwards (Table 3 and Table 4). One participant noted:

At that time I was most involved [1990s], it was a sustainable water supply. It was drought proofing, the portable water resource, that becomes the first part of the story. When I was involved in the mid ‘90’s, particularly the Tampa Bay region had gone through pretty significant drought, and there were impacts being seen in the well field areas. The water management district was kind of moving from flood regulation to providing permits for water consumption. They were looking more holistically at the resource, trying to figure out how to balance agriculture and municipal use of trying to be as considerate as they can be to the environment under trying times. There was a great public outcry for the reduction in ground water pumping while I was there in SWFWMD, and I was trying to deal with that. The drought and the impacts were really pointed in 1992.

Participant responses agreed on a shift in regional management strategies from the traditional hard-path approach, to one that considered the full complexity related to the management of an essential flow resource. Another participant stated:

The agency’s priority in those early days was very clearly flood control. The Water Management District came about in response to flooding after Hurricane Donna, and back in the mid-70’s, that was still the primary thrust of the agency’s mission. Those priorities did change overtime in a number of ways. Water use permitting, and this is my environmental perspective coming into play here, but the concern about impacts of lakes and wetlands as a result of ground water withdrawals, in its early days and its infancy, and the relationships were poorly understood and not necessarily agreed to by everybody. That emphasis on
environmental protection in the concern with ground water withdrawals sort of grew over the next two decades from the mid ‘70’s to mid ‘90’s.

Here, a participant speaks directly to the widely publicized regional competition for groundwater supplies between Pinellas, Hillsborough and Pasco counties (Tampa Bay Water Wars) and the more or less concurrent development of rules to reduce the impact of urban water withdrawals on natural systems (minimum flows and levels).

In the first three years that I was there in the 80s the priority was developing the storm water rule which became the environmental resource protection rules, so that three years span that was the priority, that was kind of something new, after that when I came back in 93 the priority was water supply development, the water wars in northern Tampa bay, the legislative mandate to establish minimum flows in levels, so those were the general priorities.

Thus, the first theme to arise from the data related to Research Question A relates to SWFWMD’S adoption of adaptive management strategies, in direct response to evolving urban pressures on regional water resources.

**Theme 2: Leading from top: The governing board sets the tone**

The second theme, “Leading from top: The governing board sets the tone” emerged from participant’s reflections on the leadership provided by the agency’s 13 member governing board. Board members decide on agency policies which then are executed an executive director (chosen by the board) and his staff. Members are appointed by the governor, confirmed by the senate, and serve four-year terms on a voluntary basis. Their only qualifications need be that they secure the governor’s endorsement and are selected from candidates with significant experience in: local government; government-owned or privately owned water utilities, the development industry; financial business; accounting agriculture; law; civil engineering; environmental science; o; hydrology (Section 373.073(2), F.S). It is ironic that the specialties most often absent
on the water management district’s board are hydrology and environmental science (Swihart, 2005).

Appointed board members were thought more likely to demonstrate an interest in regional needs versus members elected by various sub districts. As a result of this assumption the model water management code’s recommendation for appointed board members was as follows:

The members of an Area Water Board could be elected by the general electorate within the Area or perhaps in some manner designed to represent water users within the Area, or appointed by local units of government within the Special Water Management Area, or even appointed by various departments of the State Government. The Regulated Riparian Model Water Code rejects these alternatives because it makes too likely that the Area Water Board would see its function as serving the short-term needs of those who elect or appoint it rather than as implementing the State’s regulatory policies relative to the waters of the State (in Swihart, 2005, p. 41).

Boards meet formally once a month to review the development and adoption of rules, regulations and orders necessary to enforce the powers and duties delegated to them by the Department of Environmental Protection, and appointed to them by the legislature. One participant noted:

The board has every influence. The board sets the budget, the millage, approves the budget, approves the projects, approves the agreements, and approves the rule changes. If they don’t like the rules, they go and change the rule. It’s all in the pleasure of the board. I think you see that with the strawberry growers. Even if it’s in the rule, it’s not being funded. They would be sued for not carrying out the rules.

Another noted:

The governor is the only person they’re accountable to, and they might well be on the board after the person stops being governor, and they will be representing the view of the governor that a lot of people are not fond of…once they get appointed, I was surprised by the independence from the governor that supported them. Philosophically the governor is who they’re supposed to answer to, but I know from
personal experience that most recently, since Governor Scott, they were free agents across the state. I’m not sure but I think Governor Crist had a lot to do with how the South Florida Water Management District dealt with everglade issues. Prior to that, I know Governor Bush was frustrated at times by not being able to count on board members voting the way he wanted them to vote. So once you’re appointed, you’re relatively unaccountable.

These responses were echoed by the other participants and may speak to Schneiberg and Clemens (2006) assertion that actors’ (in this case representatives of various dominant facets of the State) behavior can be attributed to the characteristics and motives of their already embedded “special interests”, and not to the motives of the agency that they serve (SWFWMD). The authors suggest that individual action is often derived from scripts or schemas drawn from shared cultural systems.

To explain further, participant accounts clearly indicate that attempts to restrict demonstrations of special interests by the board have proved fruitless as board members frequently act in support of their industry or in the interests of the governor who appointed them. This may be due to the fact that elected governors demonstrate a tendency to endorse economic elites with notable influence within their communities, who benefit from regional economic growth. (Gonzalez, 2005; Swihart, 2005). For instance, recent board member appointees have included vice-presidents of Disneyworld Resorts and the largest sugar grower in the Everglades area (personal communication, 2013). Board members are expected to abstain from voting in cases of conflict of interest that may lead to personal gain, but they are not excluded from discussions leading up to the vote, which often provides dominant members with an opportunity to canvass votes (personal communication, 2013).

Although board members rely heavily on input and guidance from SWFWMD’s Executive Director and staff to understand the permits and rules that are brought up for
introduction or review, participants demonstrated a keen awareness of board member interests and motives. Prominent citrus farmer Joe Davis (who served as chairman of the board during the Tampa Bay Water Wars), was widely touted for his support of long-term resource planning which improved the District’s public support ratings from 23% (prior to his appointment) to 80% (personal communication, 2012). Land developer Carlos Beruff (the current board chairman) was unanimously voted worst board member in history by every participant for his hostile demeanor during meetings and demonstrated voting and canvassing for his special-interests that run counter to sustainable resource management (personal communication, 2013).

**Emergent Themes Related to Research Question B**

The second question guiding this inquiry is, “To what extent is SWFWMD’s capacity to operate within a sustainable natural resource management framework enabled and/or hindered by the agency’s statutory mandate to influence land use decisions?” Land use is an expression of a region’s economy, as modified by social needs and desires. Society’s utilization of the land and the land-based services in support of ecological, social and economic requirements speak to the region’s capacity (or lack thereof) to enact sustainable planning and growth management. Freshwater is required not only for economic growth, but in the support of healthy ecosystems, many of which provide valuable ecosystem services and provide the basis for Florida’s tourism industry.

**Theme 1: Data: The significance of eye witness and empirical evidence**

The first theme to emerge from the data collected for Research Question B relates to the significance of eye witness and empirical evidence to enact positive resource management changes. Aquatic ecosystems (for the most part) require adequate sediment and organic matter
inputs, clean water, a variable water flow regime, a naturally diverse biotic community and natural fluctuations in heat and light (Sparks, 1995; Walker et al., 2004). Significant alterations to these requirements results in the loss of species and ecosystem services in wetlands, rivers, and lakes (Holling & Meffe, 1996; Scheffer et al., 1993). The ecological consequences that result from the negative externalities of urbanization often become apparent after the degradation of previously unappreciated ecosystem services begin to tangibly impact societal freshwater needs. For instance, wellfields located in wetlands in Hillsborough county supplied freshwater to Tampa for 20 years before showing any signs of distress (personal communication, 2012). During a discussion on Hillsborough County wellfields, one participant shared the following instance of wetland stress:

Trees falling down was kind of interesting. In part, their water budget is dramatically changed. It stresses the trees, they lose their soils, and so their support is weakened, but they also, and this is Cyprus trees I’m particularly talking about, rot at the base, and then they break off and fall over. So, sort of the combination of the lack of support and the stress of the trees caused by the change in their water budget that causes it.

These ecosystems demonstrate highly variable ecological states, resilience and environmental regimes, with some displaying high rates of inter-annual variation. Changes and biotic and physical states may appear gradually, but once ecosystem thresholds are breached the resulting succession is often difficult and expensive to reverse (Holling, 1973; Holling & Meffe, 1996; Walker et al., 2004). Many participants referred to signs of resource and ecosystem stress from the period of the Tampa Bay Water Wars. The Tampa Bay Water Wars refer to a two decade (1970s – 1990s) political and legislative battle between neighboring Pinellas, Hillsborough and Pasco counties for cheap water supplies. The peninsula of Pinellas County established well fields in neighboring Hillsborough and Pasco counties to provide cheap groundwater to meet increasing demand after saltwater intrusion contaminated local water wells.
in the 1920s (Meindl, 2010). Here, a participant discusses the tensions that arose between urban regions competing for priority access to regional groundwater supplies.

When I came around, it was early ‘90’s, when we had a lot of our well fields in existence pumping at close to their permitted rate. We also had a period of low rainfall for a period of five consecutive years, and in many areas, lake and water levels dropped to the level where some lakes were completely dry. The press got out there, took pictures, and said look how horrible this is, and it was a big public outcry. It pitted the newer utilities against the older established utilities. The new ones wanted us to cut back our pumpage because it was in their county, and you shouldn’t have cheap water just because it’s cheap. The older counties had a question of why “why should we have to give up what we paid for and permitted” and we fought. We wound up in the administrative hearing with the district in the mid ‘90’s when two of our members sided with SWFWMD against Tampa Bay Water and three of our members. So our members in court were against each other. It was over this issue of impacts to lakes and wetlands and the cost of water.

The St. Petersburg peninsula experienced a population boom during the 1920s, as newcomers flocked to coastal cities in Central and South Florida (Mormino, 2005). Saltwater intrusion, where seawater is drawn in-land into aquifers due to over-pumping of the freshwater aquifer, usually stems from insufficient hydrogeological knowledge and data, and economic avarice. To support urban growth rates that outstripped those of Hillsborough and Pasco counties, and to locate water supplies to replace their overdrawn aquifer, St. Petersburg and Pinellas County began purchasing well fields in northwest Hillsborough and central Pasco counties as early as the 1930s (Hamann, 1998). Pumping rates at the new well fields in Hillsborough and Pasco counties began to exhibit signs of strain in the mid 1960s as residents near the well fields noticed significant lake and wetland drainage (Rand, 2003). The ensuing legal battle was also prompted by population growth in Hillsborough and Pasco counties during the 1970s. Participants and publications on the Water Wars attest to the importance of citizen campaigns during the lengthy legal battle that ensued as the counties fought to continue pumping
at these unsustainable rates (Rand, 2003). A District employee during this contentious period recounts Pinellas County’s unwillingness to reduce groundwater pumping to aid ecosystem recovery:

So she sent me what the urban areas such as Pinellas County were saying: “We have permits”. “We had consumptive use every time we were withdrawing. We are not doing anything wrong here, and by the way, there is a drought going on. It used to be pasture land, and now subdivisions in Pasco and Hillsborough Counties. It’s not just us. You’ve [SWFWMD] seen a great deal of ditching and other agricultural flow changes that are causing part of the problem”. So they were basically saying 1. We’re acting lawfully 2. It’s not our fault. The counties particularly to the North were saying: “How could you be so stupid? Look at what’s happening? There’s cracks on our walls, and there’s sink holes. Trees are falling over and you people are watering your lawns like there’s no tomorrow”.

The West Coast Regional Water Supply Authority was created by state legislature in 1974, in an attempt to encourage the local governments of Pinellas, Hillsborough and Pasco counties, and the cities of St. Petersburg and Tampa, to collaboratively develop new water supplies (Meinhart, 1989). Pursuits of localized economic growth would inhibit any cooperative efforts to produce new water supplies during this period, even as the combined populations of Pinellas, Hillsborough and Pasco counties increased by 30% from 1980 to 1990 (Rand, 2003).

To further illustrate the theme at hand, this participant recounts the development of SWFWMD’s ecosystem monitoring protocols:

We hired the first scientist to actually do that type of monitoring back in the mid ‘70’s, and I remember that guy almost got fired. He told a reporter that he felt there was a link between ground water withdrawals and wetland impacts… and the reporter got his name wrong so he didn’t get fired. It was a pretty sensitive subject back then. [He] did some of the earliest monitoring of the well- fields and areas outside [of the well-filed] but nearby, and established the relationship of certain things that happened in wetlands. He was a wetlands guy and not as much a lake guy, but the lakes went down too. So there was a suite of symptoms that he developed. Vegetation monitoring, meter square, quadrants and things like that looking at the
species composition of vegetation and watching it shift from wetlands species. It would succeed and things like soil oxidation and those things, and he was the first one that was documenting this. As we reissued those water use permits to those big users, we required them to do monitoring as well.

Aquatic ecosystems can be restored or protected or restored by recognizing their tight coupling to terrestrial environments and to other aquatic systems. One such initiative arose as a result of the Warren Henderson Act described below:

…the Warren Henderson Act was passed in 1984, and Florida went from having a minor interest in wetlands protection to a larger interest, and the Water Management District added wetlands protection to its management in storage of surface water program in 1984. So wetlands protection became a much larger Flood control is still an issue today, but wetlands protection became important starting about the mid ‘80’s, which is when I came back in the Water Management District as an ES III [environmental scientist]. Water quality became an issue about that same time. Florida got its first storm water rule in 1979 maybe, but around the mid 80’s, storm water became a much bigger issue in Florida as well. MSSW’s rule [management and storage of surface waters permitting] went from being a rule that was intended to regulate fairly large impoundments and prevent flooding to a rule that regulated much smaller activities, all types of development and regulated them for flood control for storm water management and wetlands protection. So that was a big turning point. When the MSSW’s rule was adopted, and there was already one in place but there was a very limited impoundments over the acres kind of into a developmental regulation that addressed the 3 legs of the stool: flood control, storm water quality, and wetlands protection. That was 1984 so that was a big change. .. So it being the Wetlands Act, it specifically implied that the water management districts would regulate wetland impacts related to agriculture. It didn’t preclude water management districts from regulating the other types of wetland impacts, but it’s specifically mandated to agriculture. In the same time frame, Florida adopted a new storm water management rule, which was 17-25, and began to delegate the authority to implement that rule to the Water Management District, so it was adopted by the DER [Department of Environmental Resources] now the DEP [Department of Environmental Protection]. They had few engineers, but we were like up to our necks when it comes to engineers, so the DER at the time delegated the authority to storm water discharges under 17-25 to the
water management districts and this was to the St. John’s District, South Florida District, and the Southwest. We all got that delegation in ’82 or so. It approved the MSSW rule in ’84, it brought in the delegation of storm water management regulation under the 17-25 as part of that umbrella. Coming out of the gate in ’84, the new MSSW rule incorporated the 17-25 storm water management as well as the regulation of wetland activities as it is required under the Warren Henderson Act. In taking on those 2 extra pieces, because it was basically a flood control rule before that, the Water Management District included it the scope of the protection to not just protecting wetlands and agriculture, but protecting wetlands as a part of development. There were some exceptions to mining and other things that were exempt. So wetlands protection became across the board as part of MSSW…

The Wetland Act legislation served as an attempt to restore and ensure that dynamic water flow patterns are maintained within the historical range of variation to promote the integrity and sustainability of the region’s wetland systems.

The literature on ecosystem health and water resources also states that aquatic ecosystems have particular light, thermal and sediment requirements; chemical and nutrient inflows and outflows; and biotic populations which fluctuate naturally. Nutrient input from urban sources can quickly overwhelm a systems’ ability to flush and regulate nutrient loads and requires specific emphasis on water quality (for ecosystems) and not just water quantity (for urban systems). With respect to SWFWMD one participant discussed an emphasis on regional water quality during the 21st century as environmental degradation became increasingly apparent.

Then the emphasis on water quality really picked up in the last few years because of the total maximum daily load and impaired waters. This is a requirement of the clean water act and there’s a process whereby you identify water that don’t meet standards and then identify which parameters that don’t meet standards and then you go through this process determining what level of discharge that they could tolerate to meet standards, and then that becomes the total maximum daily load, and then you implement an action plan to reduce those discharges to those wetlands to those waters to bring it back to conformance with the standards. In Florida, there’s well over 1, 000 water bodies that don’t meet those standards and that has
resulted in the identification of those water bodies as being impaired and the criteria that they are subject to in terms of storm water discharges and stuff is elevated to provide them for their protection and now for the last 5-10 years, the emphasis on water quality protection have gone up substantially due to that process, which has now been cumulated, somewhat indirectly but related in the numeric nutrients standards. So what you then see in that evolution is the surface water program started as basically a dam regulation in the early ’70’s to a wetland emphasis and storm water to a much stronger on water quality and storm water. Water quality was there at least from the mid ’70’s, but it’s kind of like the ground water withdrawal impact issue again. The evidence of impact was apparent, but it takes a lot of land out of development to do good storm water treatment and so you have to push that elephant up the hill. The science was in some cases not as well understood and cloudy. You had industrial discharges and you had sewage treatment plant discharges, agricultural discharges, and you had all kinds of stuff going downstream, and to determine which was storm water related and which was other was not clear at the time. What happened was under the clean water act, those big discharges got taken off line. They realized that storm water was a big piece of the pollution pie there, and so storm water had to be regulated. There was even a clean water lawsuit in ’89 or so that dealt with that and caused some regulation at the federal level. The understanding that storm water was the culprit didn’t really become apparent until all of the other of all culprits became out of the way. It was easier to deal with that factory with its big pipe than it is all of those developments with all of their little pipes cumulatively having the same effect. It’s one thing to tell some big paper mill that they have to do that than it is to tell every shopping center, every high way, and the other thing was determining water body by water body and what the problem was and what the cause of the problem was, and how much a problem it was, was very science intensive. It’s still an ongoing controversial area of science and there’s a lot of phosphorus in the ground naturally than other areas of the state. There’s a lot of variables that make it complicated.

**Theme 2: Convincing others to enact change**

As previously mentioned, Florida sits atop a productive aquifer (Marella, 2009) and continues to bear its historical reputation of being water rich, although water demands continue to increase, and regional karst systems and ecosystems indicate signs of resource strain at current
withdrawal levels (Tihansky, 1999). Economic elites, technocrats and city growth machines unwilling to reduce profit margins or growth rates in the short-term are often reluctant to apply changes to their preferred growth model (Molotch, 1996; Fodor, 1999). SWFWMD is not immune to State and regional politics, and participant data indicates that one of SWFWMD’s major challenges relates to communicating and convincing executive staff, the governing board and the legislature of the need to change course if and when current decisions prove to be unsustainable.

Scholars suggest that the dominant paradigm in water resources management and land development is that of sustained yield, which reflects the neoliberal capitalist paradigm discussed by Harvey (1990) and in the treadmills of consumption and production. These values rose to prominence during 19th century urban and industrial expansion, and consider natural resources only as valuable as their appropriation for human consumption. Within this paradigm, resource management serves to provide a continuous supply of market-oriented goods. Researchers have identified a turn in water resource policy, where agency missions have shifted from water development to water management. Current academic, management and policy discourse on ecosystem management, integrated water resources management and sustainable development suggests that riparian systems, groundwater flows, and watershed resources should be managed in a manner that benefits economic and ecologic systems a like (Colby et al., 1991; Holling & Meffe, 1996;).

Enacting this paradigm shift in regions with a history of water-intensive growth is easier said than done. For instance, Florida’s Council for 100’s 2003 report was introduced in Chapter 2 where the Council proposed the appointment of a seven-member water commission with the power to transfer water from less developed areas north of I-4 (the State’s hydrologic divide) to
support continued economic growth south of the divide (Council of 100, 2003; Swihart, 2005). The proposal was immediately shut down by then-governor Jeb Bush due to public outcries, only to be re-proposed by staff of the Florida Senate’s Environmental Preservation and Conservation Committee in 2009 (Meindl, 2010). Study participants reported similar frustrations, where beneficiaries of urban growth proved reluctant to the adoption of more stringent resource management measures.

… and then the water use rules got stronger overtime, got revised, required more stringent monitoring and make the criteria for permit issuance more clear in terms of their impact. That brought in permitting monitoring, and the network of monitoring expanded. It went from one guy with a few sites to a number of scientists with a number of sites. The monitoring well network got better, so the science was kind of the same all along… a consulting firm working for Pinellas County or St. Pete said that there were four things that were causing impacts to lakes and wetlands: drought, drainage, development, and diversion. It did it’s best to smoke up the issue. It’s an interesting example of how they try to escape the cause.

This instance is a clear demonstration of commodity interests who often fear that ecological resource considerations will disadvantage their claim to the resources available on public lands or curtail their opportunities to use and manipulate water resources.

Sustainable water management researchers have further suggested that general consensus is required across practices and disciplines on the implementation of “sustainable” approaches and ecosystem management. Both terms suggest a departure from current practices but the management and policy sphere have yet to develop concretized methods to achieve either of these goals. The goals in and of themselves are constantly up for discussion and revision, especially in socio-nature considerations. Without agreed-upon operational definitions of the terms and their mechanizations, the very concepts themselves will continue to be contested. Lee (1992) asserts that the very term sustainability became popularized as a political slogan in the
1980s and continues to be invoked without a working definition. A participant spoke to this exact point during a discussion on the Tampa Bay Water Wars:

They [Pinellas County] thought that they would agree and solve the problems, but the flaw was in the way it was structured…They had to get permits, and it worked a little bit. So things were going okay, and the different thing was that most of the well-fields were operated by their [Pinellas County] own people, their own staff, so it wasn’t much of an organization that changed things. It sounded like a good idea. By the late 80’s, that information [ecosystem degradation] was available. It took a little while for upper management to realize there was a problem, but then they finally did in the early 90’s. There was a severe drought and coincided with the lake lands getting dry, but finally got to the point, where the district staff said things were going out. They put things on agenda [governing board meeting agenda] to be discussed, and made the board realize they were going to do something. So it was a tricky deal. You want sustainability but [have] nothing immediate to take its place.

The lack of agreed-upon operational terms and definitions continues to prove problematic for resource managers attempts to rally support. Gale and Cordray (1994) pointedly state that with regards to sustainability, there is no agreement on what is to be sustained! Furthermore, the lack of definitional consensus makes it difficult for policy-makers to develop robust policy proposals that relate to specific management issues and outcomes.

**Emergent Themes Related to Research Question C**

The third research question is, “How has the mandate set forth by statute 373.036 (which necessitates SWFWMD’s engagement in sustainable water management and ensuring that all required future water needs are met) impacted the institution’s capacity to operate within a sustainable natural resource management framework?” Florida’s Water Resources Act has been amended on numerous occasions without reconsideration of the basic structure. A sprawling water management system that is not clearly oriented to long-term sustainability has developed
over time, preferred by residents over a single State authority for fear of the impacts of trans-regional water movement on local economic growth (Klein, 2006; Swihart, 2005).

**Theme 1: Fuzzy delineation of environmental agency collaboration and responsibilities**

The first theme that emerged with respect to SWFWMD’s ability to sustainably manage water and ensure supplies for all future needs was a fuzzy delineation of environmental agency collaboration and responsibilities. The 1972 Water Resources Act gave the DEP (former DER) general supervisory authority over the State’s water management districts which can be challenging at times, as outlined by participants.

Districts are an entity under DEP [Department of Environmental Protection]. It’s kind of strange because you have agencies under [the] state, and I’m not certain how to define that … When it first started they wanted to give the water districts control over water use permitting and there was a subsection of the department of agriculture to consumer services, and they did not want that responsibility. It came to the water management district. So the districts under [statute] 373 work under DEP. It keeps us too close to Tallahassee and also allows DEP to delegate the things that they don’t want to do and raise taxes for.

Water resource managers who seek to enact adaptive management strategies in rapidly urbanizing regions may find their existing administrative and legal structures unsuitable to tackling contemporary planning concerns. This excerpt highlights a participant’s frustration at the lack of concurrency between land development and water management:

Growth and water resources goes [sic] hand in hand. You’ve got to have enough water to support the growth. We can’t try to help try sustain the water here, and let the growth go rampant because there’s another agency that allows it….In my opinion, the other agencies that allow it are DCA [Department of Community Affairs], DEP.

The convoluted relationship between SWFWMD and the DEP is further realized in that the DEP secretary lacks the authority to appoint or dismiss board members as both appointed by
the governor. Furthermore, DEP’s funding comes from annual legislated appropriations, whilst SWFWMD’s board maintains independent powers to assess property taxes and secure the revenues necessary to fund the agency and its operations. The DEP is also responsible for: reviewing and approving SWFWMD’S priority lists for the establishment of minimum flows and levels; reviewing and commenting on the agency’s water resource development programs; coordinating the State’s drought response with the agency; developing guidelines for regional water supply plans with SWFWMD and coordinating policy development on statewide water use rules permitting with SWFWMD. These overlapping responsibilities may lead to continued discord between the two organizations until responsibilities are comprehensively reviewed at the State level (Klein, 2006; Maloney, 1972; Swihart, 2005).

The literature suggests that 21st century water managers constantly tackle issues of looming administrative decentralization, property rights and incoherent interagency coordination. Conflicting or fuzzy delineation of agency responsibilities and overlapping authority among local, state and federal agencies present formidable institutional barriers to achieving integrated resource management. The following excerpt speaks to the aforementioned issues of agency incoherence in Southwest Florida:

I’m not sure giving more authority to regional entities who aren’t elected is always the right answer. So I might say that it might be sufficient but the inner coordination piece is not. This goes to the question of governance and that is a big flipping question. The way we are governing Florida is not appropriate for the 21st century. It is crazy. It’s just not a way to run a train system. It’s really a mess. So rather than questioning whether the current authority of the water management district is sufficient, I would argue for really figuring who’s responsible for what and having this multijurisdictional conversation about how we govern ourselves. More land use follows transportation decisions than any other kind. Water is the other one. The coordination is not there… Perfect ideal model would be regional in nature with all of the infrastructure that is regional in nature will be dealt with in sort of a common way or forum. So water
transportation, air quality, land use, would at least be a common forum for the discussions for the impacts and the planning’s regarding those extra jurisdictional kinds of things. I don’t know what exactly that looks like or what you call it. So when I was a DCA, I thought they were serious about taking [the] planners, and co locating them in the field because wouldn’t that be nice to have our analysis of local decisions that have larger impacts, [DCA] planners out there in the field with other planners in the other agencies? That never happened…. What is the truth is that often agencies expect that impacts are being dealt with by another agency. This is a really big thing that I and others have tried years of trying to figure out, but we never have been able to crack this nut… I was in a meeting when I was [worked at] the DCA with the most experienced planners, and there was a storm water conversation going on. [A DCA] planner said and she looked at him, and said we don’t review that, we thought you [SWFWMD] reviewed that and they said they don’t. They [the two planners] were shocked and troubled. It was a big issue.

**Theme 2: Permitting**

The second theme to arise relates to the importance that SWFWMD appears to place on its permitting or regulatory process. Many states developed administrative regulatory systems for water management and allocation. The 1957 Florida Water Resources Act was initially created by a study commission established by the legislature in 1955 (Hamann, 1998). The 1972 Act was then developed to launch an administrative permitting system based on the theory of reasonable-beneficial use.

To execute its purview, SWFWMD operates within four overarching areas of responsibility: (1) water supply, (2) water quality, (3) natural supply and, (4) flood protection. In response to the legislature, and under the District’s rule-making authority under Chapter 373, agency scientists and lawyers collaboratively craft language to create an acceptable interpretation of a rule. Drafts are presented to the public via workshops and community presentations (members of universities, local utilities, local environmental groups and mining companies are expressly invited. Notices are posted in newspapers and on the agency’s facebook and twitter
pages) before a final draft is presented to the board for approval. Subsequent to board approval, a 21-day comment or challenge period occurs before the rule adoption.

The governing board and executive branch define goals for each area of responsibility and develop strategic initiatives or tasks to achieve those goals. Initiatives may include the development of a regional water supply plan, establishment and recovery, conservation, or the development of regional priorities based on diminished spring flow, aquifer degradation, rapid population growth, etc.

A number of projects result from the establishment of strategic initiatives:

- Regional water supply planning to:
  - develop accurate and reliable water supply and demand projections.
  - identify sufficient regional water supply sources to meet demand. Supply and demand-side planning includes conservation, which is the second cheapest source of water after groundwater.

- Assist in the development of non groundwater sources (alternative water supply initiatives).

- Co-fund projects to increase resource availability and storage capacity, and support research in reclaimed water (called reclaimed water strategic initiatives).

- Encourage water conservation via the permitting process. The agency promotes a water conserving rate structure (which encourages block rates over uniform), and can require utilities to adopt a new rate structure by a certain date.

- Fund research on minimum flows and levels for surface water after studying the system. Staff submit a priority list of impacted surface waters to the board and regional scientists are invited to review findings.
• Flood plain management and protection via extensive modeling utilizing terrain data, historic rainfall, vegetation information and other physical characteristics of the site and administered through the Environmental Resource Permit Process.

• Each area of responsibility affects the issuance of permits, and concurrency is maintained via internal meetings and periodic assessments. The three permit types issued for resource management are:
  • Well Construction Permits issue licenses and regulate the well drilling community.
  • Environmental Resource Permits concern any developments that impact wetlands and outdoor surface water flows. Recommended mitigation procedures to developers often include water catchments, the use of pervious surfaces and berms.
  • Water Use Permits (consumptive use permits) concern water withdrawals for sectors excluding individual residential.

The participant below demonstrated disagreement to the notions that the District’s permitting process is predominantly passive:

Hydrology studies also give specific information on where there’s water and the permitting processes react. We don’t wait for them to come and then evaluate them…we work with local governments to help them figure out where they’re going to get their water sources. Other than that, they buy a piece a land, and they come in and want a permit, and at that point, we look at where it is, we have to look at studies, what supply plans say, and if they’re in an area that’s hard to get water. Then we’ll go back to them, and ask them to show us this and this, or there is water, then they can get it. It all comes together with the districts reports and projects. It blends into the permitting program.

Here, a participant outlines how the permitting process is used to monitor users for breaches in compliance (withdrawals beyond permitted quantities):
Primary procedures are we got our rules that must be complied with, and we go after them for non-compliance through meters. For the golf courses or subdivisions for example, they have meters and they'll find out if you're over watering. So that's on the water side, and then for the ERP [Environmental Resource Permit] side, they'll know if you're not cleaning out what you're supposed to clean out because they have periodic inspections to make sure that you have your systems running smoothly….. The Permitting Department will send out a letter that you're exceeding your water, and you don't come in compliance within a certain period, they'll go after them for fines and whatever. Legal has nothing to do with the letter that goes out, but after that, they'll be fined. There might be a complaint that goes out, it might go right into litigation or administrative hearing.

This excerpt demonstrates the process of permit adjustments in response to new management rules:

The drivers for the change, well in ‘82 the focus was surface water management and environmental resource permitting or wet lands protection because of the Warren S. Henderson Wetland Protection Act that was passed in the 80s and then the switch in the 90s to water supply was due to SWFWMD scientists determining that we had water scarcity and we began to more critically and strictly review applications for water use permits by the large water users in municipalities in the water supply authority.

This final excerpt represents the frustration of many participants, who voiced the difficulty of attempting to sustainably manage water resources in a high growth region:

SWFWMD's approach to handling the changes in the 90s in light of the realization that there was scarcity and environmental harm being caused was to, I guess, get very stringent, and in some cases deny water use permits and that was at first. Initially the approach was to be very protective of the environment, it lead to a lot of litigation, the legislature stepped in and said, the municipalities need to form a new entity to manage the water resources and SWFWMD was directed to fund that entity to help them develop new strategies. New supplies that were not groundwater related and try to, SWFWMD I think tried to work one hand as a regulatory heavy hand and the other hand as a partner and money, and so it was kind of a hard balance line to walk.
The reasonable-beneficial use rule contains elements of the riparian and prior appropriation allocation doctrines, which will be discussed further in Chapter 5. SWFWMD was thereby granted authority to comprehensively manage the water resources within its boundaries and to grant permits for water use if usage quantities will exceed the agency’s established thresholds. Individual domestic users are exempt from the permitting process, however other users must demonstrate that their requested use is (1) reasonable and beneficial as defined by statute; (2) is consistent with the public interest and; (3) will not negatively impact existing legal users (Maloney, 1972; Klein, 2006).
Chapter 6: Conclusion

Introduction

Freshwater cycles are disrupted as degraded ground and surface water quantity and quality impact dependent natural ecosystems, urban systems, and the integrity of the resource. Norman et al. (2012) recommend that urban water managers seek to resolve the competition for water supplies by various economic sectors, public uses and ecosystem services; balance water management at various scales; and reconcile uncoupled hydrologic and geopolitical boundaries. Gleick (2000) puts forth recommendations to encourage the new water management paradigm which rose to prominence in the resource literature during the late 1900s. Gleick’s recommendations include a shift away from market-led supply-side water management, a severance of the established ties between economic growth and water use, and the institutionalization of ecological values in the formation of sustainable water policy.

In Southwest Florida, citizens, water managers and policy makers began to witness the impacts unsustainable freshwater mining on surface and groundwater flows, and their associated ecosystems. Located south of the state’s hydrologic divide and on the coast, the City of St. Petersburg and Pinellas County exhausted their limited groundwater supplies and drew saltwater into what were once freshwater wells by the 1930s (Blake, 1980; Rand, 2003). To continue county-wide growth, well fields were purchased in neighboring Tampa and Pasco counties. As populations expanded in those neighboring counties, residents who lived near the well fields began to report the drying of local lakes and wetland systems. Another instance of a failure to reconcile urban resource requirements with the flows required by natural systems became
apparent as phosphate mining and land reclamation within the Peace River basin resulted in the formation of sinkholes in the riverbed during the early 1960s (SWFWMD, 2008). A participant with over 30 years of organization and resource history shared the following on District operations during the 1960s:

In the ‘60’s when the district’s doing their flooding work, people in northwest county and Pinellas county started about becoming this agency to overseeing the water law. The district was sort of hesitant to get into that, so there were a number of board meetings. In 1968, they agreed to become this regulatory district and that was a big step. I hardly have documents myself, but I’ll have to think about who can get you, because I know a couple of people that was involved in that. The statutory was already there in the ‘50’s but no one ever went to that big step of having a regulatory district. First thing they did was to regulate wells, instead of regulating withdrawals, so they went into well construction, and they developed some rules for that. So it started out in northwest Hillsborough county because people were worried about the wells from Pinellas. During the ‘60’s when these discussions were being held, other areas came out. It came apparent that more than one areas of the district had water use issues.

This excerpt discusses a fledging agency’s attempts to find its footing in an urban region with expansionist goals. Not yet aware of the tools and management adjustments that would be required to handle competition states (in this case, competing counties), the organization of no more than 100 staff members at this point (personal communication, 2012) appears to gingerly step into the era of flood control.

**Urbanization Informs Water Management**

Urbanization patterns in Southwest Florida demonstrate that freshwater is often taken for granted and used near the point of abstraction, although urban form and urbanization processes are reliant upon resource availability and incorporation into urban infrastructure (Kaika, 2004; Heynen et al., 2005; Normal e al., 2012). The physical and social environments of sprawling
regional urban growth are informed by the historical-geographical processes that shaped perceptions of the socio-natural landscape relations during 20th century regional development (Swyngedouw & Kaika, 2000). The manicured, manufactured suburban and exurban zones would present a second nature (as coined by Lefebvre) where nature is highly commodified and a socially produced urban landscape results, shaped by economic, social and political processes that in turn mediate urban socio-ecological relations (Harvey, 2000; Merrifield & Lefebvre, 2000). Although dependant on natural resources for community viability, the socio-first nature (naturally occurring ecological systems) divide produced during urban capital expansion created an imagined societal disconnect from said metabolized, transformed, and commodified resource flows (Katz, 1998; Swyngedouw & Kaika, 2000).

This case study developed out of concern for the spatial and ecological impacts of regional urban growth patterns, the establishment and influence of pro-growth coalitions on regional development, and the apparent socio-nature tension which viewed freshwater resources as necessary for regional economic progress, yet secondary to the economic growth priorities that depended on continual, healthy resource budgets. An examination of the region’s water management agency could provide a useful lens to examine regional perspectives as they relate to urban growth, economic vs. ecologic considerations during urbanization, and possibilities for sustainable management. Researchers suggest that organizations are productive of certain meanings rather than others, and they can therefore be chosen candidates through which to view the operation of social power that limits what is thought, as well as what is thought to be possible (Sayer, 1992; Del Casino et al., 1996).

Collected data revealed that the District (and associated approaches to management) was shaped by contemporary urbanization processes. This explains how the environmental and
resource concerns discussed in Chapter 2 occurred in a region where a legislated water management agency had existed for decades.

The literature suggests that the District’s areas of priority evolved each decade, in response to the changing demands of regional urbanization on the resource. The development of the organization’s data collection and science arm proved critical in the demonstration of correlations between urbanization and resource degradation. Data collected during this study did in fact reveal that urban pressures on the resource changed constantly and required constant applied and legislative adjustments to resource management. Study findings also speak to the importance of data collection and empirical evidence as necessary tools for management. The following excerpt speaks to the Districts early formative years and the evolution of the agency’s scientific capacity:

SWFWMD started in 1961 as a result of hurricane Donna. It was the first time that they realized that this district was different even though it was based on Hurricane Donna and a flooding event that occurred right here and it wasn’t just getting rid of the water, it was also making sure that there was water available. The idea was more comprehensive than just getting rid of the water. That was non-definitive though, until the late 60’s and that’s when SWFWMD was in an organizational phase and forming around nobody even knowing what water management was until late 60’s and what began to happen to bring focus was what St. Petersburg and Pinellas county was doing in north west Hillsborough, they were pumping the water from the area. The populations began to increase through the 60’s, even though they were pumping out of there, St. Pete was pumping out of there since the 30’s but it wasn’t until the 60’s when people began to live there did they begin to notice the impacts. The rumbling started in northwest Hillsborough in the late 60’s. There was a study, I don’t know the name of the study but it was a definitive study by the USGS sponsored by the district, which for the first time, established the nexus between the pumping and the impacts. That was the first time that technically and scientifically it was a strong suspicion it they didn’t have absolute evidence, the scientists were beginning to conclude that.
That really gave legs to the concern about what was happening in northwest Hillsborough. At the same time on a collateral track you have major drought that occurred in the early 70’s that’s when Ruben Askew was governor and he and all the people at that time were being subjected to an awareness that a number of things. A national awakening of environmental concerns and concerns to get rid of the water and truly sustain our water supply.

Participants agreed on the import of legislative changes to improve overall resource management. This excerpt speaks directly to a few of the legislated changes that were enacted to keep pace with the effects of regional urbanization:

You can’t write a law and expect to solve the situation through time. It has to evolve along with more sophisticated understanding of the public and the legislature of the problems that exist and those problems have changed their new different and bigger. The laws have to change through time. Those laws evolved very well from the time they were written in 1972. The water resources act has been changed almost every session to the point where I think it was very effective. An example of laws that were changed and how it impacts what we’re talking about. The Warren Henderson wetlands protection act of 1984 introduced by senator Henderson and was approved the legislature, had the money paid for it and what that act did was say look around the state and look at the dredging going around the state, you’re dredging coastal marshes and wetlands and they talked about the importance of marshes as the spawning grounds. If you wipe out the marshes you are wiping the 50% Gulf fisheries. Dredge and fill became a very important function in the state of Florida economically because the cheapest lands were the wetlands and if you change it by dredging it, creating and now putting that fill on top, and building it up to an upland [system] and put house you make money. It was happening everywhere. The state didn’t have enough money because it was a huge undertaking to put your arms around the problem of dredge and fills in the state which was rampant and those doing it had a lot of political strength. What they did was pass the acts and gave the responsibility to implement the restrictions to develop the rules to environmental regulation at the time so DER was to develop the rules and when they did that they could not and wasn’t going to pay for it. They simply delegated it to the water management
districts which had funding mechanisms so you saw the ad valorem taxing rates of the water management districts increased substantially. The taxing capabilities of the water management districts are all basically one mil because of the constitution referendum that gave them the taxing capability. The legislature can reduce the one mil if that’s what they want to do. When the Warren Henderson act passed most raised their taxes up to the limit the legislature had set for. They built huge head quarters. Hiring hundreds of staff, mostly scientists, planners in order to carry out the protection act.

SWFWMD’s responsibilities would broaden from the 1970s through to the 1980s as the agency and the legislature sought to incrementally improve resource planning. The following excerpt relates to the two environmental acts passed under Governor Askew in 1972.

The Florida Legislature passed in 1972 the Water Resources Act, Governor Askew was in office at the time and that was a very significant piece of legislature and then they passed another piece that year called Environmental Lands it now appears in Chapter 380. Environmental Lands Management, it put the state of Florida into the planning business and protecting areas of critical state concern. So there were two major pieces of environmental type legislation that were passed in 1972…That was at a time when there was a heightened interest in doing things right environmentally and all that good stuff and so the legislature responded with both pieces of legislation that were pretty noteworthy…

IWRM and Land Development: The Need for Increased Concurrency

The District addressed natural systems protection as an area of priority during the 1980s. As the number of agency scientists increased, environmental assessment protocols were developed and documents began to utilize eco-centric terms such as “environmental assessment”. Scientists began to include the effects of planned construction projects and the resulting lowering or raising of the water table on riverine fauna, pine flatwoods, forestland and aquatic ecology in
agency documents (SWFWMD, 1980). Thanks to these efforts, the District began the practice of monitoring and assessing ecosystem health by the mid to late ‘70s.

The failure to consider ecosystem requirements on the front-end of urban development projects often results in the need for costly remediation efforts, especially when nearby urban regions begin to be impacted by ecosystem service declines. SWFWMD’s Peace River restoration initiatives provide a pertinent example. The 2,350 square mile Peace River watershed encompasses all or parts of six counties within Southwest Florida and contains over ten major water features including Lake Hancock and Lake Gibson. Nourished primarily by rainfall, the river extends 120 miles from its headwaters in the Green Swamp to Charlotte Harbor (Florida’s second largest estuary, after Tampa Bay). The country’s largest phosphate mines are situated within the watershed, and their overpumping of groundwater created ecological and hydrogeological impacts that became evident by 1974. In response, the District created a number of conservation areas within the watershed, but major restoration would be required to restore surface water flows, aquifer recharge, improve ecosystem health and improve overall water quality. Estimated project cost of the Upper Peace River Restoration Initiative: 770 million dollars (SWFWMD, 2009).

Water and land-use management have traditionally been treated separately by academia, planning, and government, but contemporary literature demonstrates tight coupling between societies, land, and water, and supports the reconceptualization of this approach (Swyngedow, 1999). Water flows and ecosystems do not adhere to administrative boundaries. Enacting sustainable, ecosystem management requires coordination among land and water management agencies at all levels of government; rather than decentralization, which further fragments
decision making among discrete local, federal and state organizations. As such, a brief narrative on the State’s development of land-use legislation is presented below.

A fifteen member Governor appointed task force comprising of state agency representatives, regional planning council representatives, university faculty, and legislators, utilized Article 7 of the American Law Institute’s Model State Land Development Code to draft a land and growth management bill in January 1972 (DeGrove, 1984; Stein, 1993). Similarly to the Land Development Code that it was modeled after, the bill left most land use decisions to local governments providing that their decisions reflected relevant regional and state interests, and highlighted the need for balanced consideration of all competing social, environmental and economic factors (Stein, 1993; DeGrove, 1984). The Florida legislature would pass the following bills put forward by the task force during the 1972 session: 1) the Environmental Land and Water Management Act of 1972 or Chapter 380; 2) the Florida State Comprehensive Planning Act of 1972; 3) the Land Conservation Act of 1972; and 4) the Florida Water Resources Act of 1972 (DeGrove, 1984; Stein, 1993).

One notable outcome of this legislative package involved the creation of the first Environment Land Management Study Committee (ELMS) that would recommend the implementation of the Areas of Critical State and Developments of Regional Impact (DRI) programs (Pelham, 2007). These bills were intended to facilitate the protection of natural systems, but in spite of these land and water management initiatives, continued urban sprawl would necessitate the creation of the Local Government Comprehensive Planning Act in 1975 (Song, 2007; Stein, 1993). This Act would mandate the adoption of comprehensive plans by incorporated counties and municipalities, but its effectiveness would be hindered by an inability to monitor implementation mechanisms at the local government level, and by a lack of state
financial resources to aid local governments with the preparation of quality comprehensive plans (DeGrove, 1989; Song, 2007).

The Florida legislature enacted the 1985 Growth Management Act in an attempt to target and correct the inefficiencies of the 1975 Act (Pelham, 2007; Song, 2007), and to curtail sprawl by specifying requirements for vertical and horizontal land use consistency. Vertical consistency would ensure agreement between state, regional and local comprehensive plans, while horizontal consistency would ensure compatibility between various local comprehensive plans (DeGrove, 1992). These growth management initiatives continued to be amended and revised throughout the next two decades.

In 1993 the Florida Legislature restricted powers previously granted to regional planning councils by reducing the scope and significance of regional policy plans, and began a phased elimination of the Developments of Regional Impact (DRI) process (Pelham, 2007). The DRI section in Chapter 380 outlined the approval process for developments with a scale or location that may affect the wellbeing of residents in more than one county. Local and regional governments could participate in growth management efforts by reviewing and subsequently approving, denying or amending applications for developments that met applicable criteria (DeGrove, 1989). Negative feedback from local governments would prompt a reversal of both of these initiatives by the Legislature in 1995 (Pelham, 2007). These issues would be readdressed in 2009, when Governor Charlie Crist signed State Bill 360 into law, providing developers and counties with DRI review exemptions, redefining urban service areas to include more rural lands, and lessening transportation concurrency requirements in low-density areas (Florida Legislature, 2009).
Collected data revealed that the District’s (and associated approaches to management) permitting process is the primary method via which SWFWMD engages in regional land-use. Participants agreed that land-use authority has historically been vested at the level of the local government (cities and counties) whilst water regulatory authority has resided at the District level since the early 1970s. One participant stated that:

Because the water management districts have limited authority over land use, the way they get into land use is that you have to go to them to get permits when you do work within waters of the state and they also regulate what you do with storm water, but they really have very little to do with the kind of land use that you can have because historically land use decisions have been vested in the local government and you hear the argument that the Government closest to the people is the best and they want people to be elected as opposed to appointed and that is a whole next debate.

Although Florida has been heralded for producing some of the nation’s most comprehensive water management and growth management legislation, very few formal links between land-use planning and water management have been established in the law books (Angelo, 2001; Tarlock, 2002). Despite this separation of responsibilities, agency documents and participants mentioned the advisory role of the District’s planning department in the local government comprehensive planning process. District planners review comprehensive plan amendments and applications for Developments of Regional Impact. Planners also review state-mandated water supply facilities work plans, which many cities and counties were required to adopt in 2008. These water supply plans represent local government water use projections for ten year periods.

Participants raised a few interesting concerns with respect to the current separation of land-use decisions and the water resources expected to support economic growth. One concern lay with the difficulty in convincing local governments to afford equal consideration to long-
term resource planning, ecosystem carrying capacity and economic growth. The District’s water supply discussions with local governments often became contentious and litigious. The litigious nature of the Tampa Bay Water Wars has been well-documented in the literature, another such matter concerned the establishment of Minimum Flows and Levels.

During the 1990s as environmental stress related to urbanization became increasingly apparent, water management districts were required to establish minimum flows for streams, rivers, canals, wetlands, ground, and surface waters by the legislature. Districts were required to consider ecosystem requirements and establish the minimum water flows required to prevent significant harm to the system. “Significant harm” as a concept is open to interpretation, which increases difficulty with respect to implementation. A study participant with legal experience explained “…we also went into litigation regarding for example, minimum flows and levels was a big issue. We were mandated to set minimum flows and levels on several water bodies. It became controversial at times.” (personal communication, 2012).

Another concern raised by participants involved the fuzzy delineation of agency responsibilities. Local governments were required to ensure that the necessary infrastructure was in place to supply new development under the direction of the (now defunct) DCA, while the District reviewed the water supply quantities requested by developers and in local government water supply plans. Local regional planning councils served in an advisory capacity to assist local governments with smart growth and mixed-use initiatives, but low-density developments continue to dominate regional land-use patterns. One participant noted “We can’t try to help try sustain the water here, and let the growth go rampant because there’s another agency that allows it….In my opinion, the other agencies that allow it are DCA, DEP. (Personal communication, 2013). With respect to SWFWMD’s ability to improve concurrency between land development
and water management, another participant noted that “They can offer their opinions, but they can’t do anything because their hands are tied. They need more permitting rights, more rights over permitting on growth, instead of just offering their opinions on growth, they need more rights.” (personal communication, 2013).

**Conclusion**

Sassen suggested that the accelerated growth of urban regions in an age of global urban competition often served to inadvertently decrease the geo-environmental and physical resilience of cities (1992). Regional urbanization exponentially increased impervious surface area, sharply reduced rainfall infiltration, increased evapo-transpiration, accelerated surface runoff and decreased water quality, thereby degrading the freshwater resources on which livelihoods, ecosystems and continued urban development depend (Xian & Crane, 2005). A shift in the region’s dominant development paradigm will be required for any attempts of sustainable resource management to have the desired impact.

Baron et al. (2002) presented a number of management policies that explicitly incorporate freshwater ecosystem needs (particularly in systems with naturally variable flow regimes) to foster linkages between water quantity and quality. These concepts lend themselves to the charting of adaptive and ecosystem management approaches:

(1) Water resources should be defined at the watershed level, to encourage systems’ context thinking

(2) Education and communication efforts should be encouraged across disciplines, particularly among ecologists, hydrologists, engineers, and economists to promote and facilitate integrated views of freshwater resources
(3) Restoration efforts should be ramped up and supported with robust regional ecological principles

(4) Pristine freshwater ecosystems (or those close to it) should be protected

(5) Societies dependence on naturally functioning, healthy ecosystems should be recognized

Over the past four decades, SWFWMD has demonstrated a commitment to the expansion of its operations to include many facets of IWRM. The study data collected suggest that agency efforts are often hampered by a pro-growth agenda, which exists within iterations of the governing board and at the levels of the local government and the State. The agency has developed the capacity for adaptive and ecosystem management, but far greater cooperation is required from land development interests in order for sustainable resource management to occur.

**Recommendations for Future Study**

This qualitative case study was designed to examine the mechanisms utilized by the Southwest Florida’s water management agency to navigate and engage in sustainable regional water resource management. Freshwater resource management is often difficult and complex as management policies impact (and are informed by) a region’s socio-historical geography, resource management legislation, economic growth policies, and environmental carrying capacity (to varying degrees). An IWRM agenda (which incorporates the tenets of systems-level management and sustainable development) often becomes difficult to achieve due to existing legal regimes that fail to provide a framework for the comprehensive integration of land development and resource management legislation. Land development, environmental management, and water management agency turf wars, and/or poor agency communication also serve as a hindrance.
Further research is also required to examine the legislative frameworks that are best suited to afford equal priority to ecologic and economic considerations, and the various organization structures that operate within these frameworks to realize sustainable regional resource management.

Urban environments metabolize resources, and resource metabolism is often informed by regional socio-historical processes. Metabolism refers to the environmental transformation (often degradation) that results from urbanization. These environmental transformations reveal the predominant socio-nature relationships required for their reproduction, to sustain current socially-produced and politically-informed urban landscapes. An examination of the metabolisms involved in the production of water resource degradation and low-density suburban landscapes would reveal how social relations of production are expressed through urban development patterns. Research on urban sprawl has been conducted in the realm of planning, urban geography, and remote sensing to name a few, but interdisciplinary research that straddles the natural and social sciences (the theoretical and the applied) are critical to understand the complicated socio-ecological-political forces that inform conceptions of nature and resource utilization (by extension).
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Appendix: IRB Certification

August 23, 2012

Nicole Caesar, M.S.
Geography, Environment and Planning
5303 North Central Avenue
Tampa, FL 33603

RE: Expedited Approval for Initial Review
IRB#: Pro00006449
Title: Resource regulation, institutional practice and social regulation: A case study of environmental governance within Southwest Florida’s Water Management District.

Dear Ms. Caesar:

On 8/23/2012 the Institutional Review Board (IRB) reviewed and APPROVED the above referenced protocol. Please note that your approval for this study will expire on 8/23/2013.

Approved Items:
Protocol Document:
Caesar_Dissertation Proposal.doc

Consent Document:
Caesar_Consent Form.pdf
Please use only the official, IRB-stamped consent/assent document(s) found under the "Attachment Tab" in the recruitment of participants. Please note that these documents are only valid during the approval period indicated on the stamped document.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review categories:
(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

[Signature]

John A. Schinka, Ph.D., Chairperson
USF Institutional Review Board