

New Governance in the New South:
Can Changes in Water Policy Foster a Shift from a ‘Culture of Consumption’
to a ‘Culture of Conservation’ and Introduce Sustainability to Metropolitan Atlanta
and the Apalachicola-Chattahoochee-Flint (ACF) River Basin?

by

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INTRODUCTION

Water is the most crucial distinguishing characteristic of the planet, on which life depends. The availability of an adequate water supply, in terms of both quantity and quality, is essential to our very existence (Spellman, 2008). The continued mismanagement and inadequate access to clean fresh water will result in increased regional conflicts, ecological degradation, and human illness (Gleick, 1998). There is also a growing recognition that water supply – that is the assurance of a clean and resilient source of freshwater capable of providing water for human use when and where it is needed, while simultaneously supporting instream and associated habitat – is a “critical environmental issue with political, economic, and strategic implications” (Beach *et al.* 2000; Feldman, 2007, p. 1). Resiliency can be defined as “the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks” (Walker *et al.*, 2004, Online).

The World Resources Institute (1999, para. 1) suggests that “the world’s thirst for water is likely to become one of the most pressing resource issues of the 21st Century.” They point out that global water consumption “has risen six-fold between 1900 and 1995 – more than double the rate of population growth – and continues to grow rapidly as agricultural, industrial, and domestic demand increases” (WRI, 1999, para. 1). From a global perspective, about 20% of the Earth’s population lacks access to safe drinking

water, and according to the United Nations, more than 200 million people every year suffer from water-related diseases, and about 2.2 million of them die (Hall, 2003).

This points to a large disparity in access to a clean and resilient supply of freshwater resources between developed and developing countries. North Americans, and people in other developed countries, often consume water in a wholly unsustainable way. According to Gary Wolff and Peter Gleick, “People do not want to ‘use’ water. People want to drink and bathe, swim, produce goods and services, grow food, and otherwise meet human needs and desires” (2003, p.1). The United States in particular has developed a “culture of consumption,” especially regarding water use, and this has led to a tripling of per capita water consumption since 1950 (Simon, 2003).

As population growth and current politico-economic systems have given rise to a culture of consumption that threatens future availability of freshwater resources, cities in the United States and abroad are scrambling to control and secure a resilient water supply in the face of an uncertain future. The first half of this century bore witness to great engineering feats in order to “‘fix water’ so that all interest groups can have as much as they want” (Barnett, 2011, p. 38). Examples of this water-industrial complex include the Central Valley Project in California, which is the largest irrigation scheme in the country, made possible by damming up the waters of the Sacramento and San Joaquin Rivers, and projects such as the Hoover and Glen Canyon Dams, which supply water to 30 million people in seven states (Barnett, 2011). Historically, U.S. cities have relied upon engineering and supply-side solutions, but a paradigm shift must occur to encourage a water resource planning and management rationale based upon sustainability.

Sustainability is the "centerpiece and key to water resources quantity and quality" (Flint, 2004, p. 43).

The term sustainability can be elusory, but several definitions do exist. Perhaps the most widely cited definition of sustainability was put forth by the United Nation's World Commission on Environment and Development in 1987. The commission, often referred to as the Brundtland Commission because Norway's Gro Brundtland chaired the group, described sustainability as meeting current needs without compromising the ability of future generations to meet their needs (World Commission on Environment and Development, 1987). The sustainable development of water resources involves a consideration of the interdependencies among the natural, social, and economic systems involved in the use of water. Sustainability in water resources recognizes the finite nature of freshwater and the physical limits of natural systems, outside of which ecosystem behavior may change in unanticipated and undesired ways. It recognizes water as an inalienable human right and seeks policies, plans, and activities that improve access to clean water. Sustainability in water resources also requires consideration of the transboundary nature of water and challenges us to fully assess and understand the implications of today's decisions on the livelihoods of future generations, as well as the natural ecosystems upon which they will rely. Sustainable management of water resources is an adaptive process: it allows managers to redirect management plans and policies mid-course to reflect growing knowledge of water management and to adapt to unexpected results or changes (Kranz *et al.*, 2004).

Peter Gleick sheds light on sustainability in water resources by defining what constitutes unsustainable water use. As Gleick (1998, p.54) notes, "Unsustainable water

use can develop in two ways: (1) through alterations in the stocks and flows of water that change its availability in space or time and (2) through alterations in the demand for the benefits provided by a resource, because of changing standards of living, technology, population levels, or societal mores.” Sustainable development of water resources is supposed to ensure economic development, ecological protection, and social equity.

Peter Gleick *et al.* (1995) offer a definition of sustainability in water resources with associated criteria that will serve as part of the theoretical framework for this research. Gleick *et al.* (1995, p.574) define sustainable water use as: “*the use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it*” (p. 574). These authors suggest seven accompanying elements of sustainable water planning, depicted in Table 1 below (Gleick, 1998, Adapted by David Feldman, 2007, p.5 to include “criteria”).

Gary Wolff and Peter Gleick (2002) also discuss another way of thinking about water resources sustainability. They describe two “paths” that society may take to meet water-related needs: a “hard” path and a “soft” path. Gleick and Wolff refer to traditional water management, with its investment on structures and other activities to enhance supply, as the “hard path.” Yet, they call attention to an alternative they refer to as the “soft path.” The adjective “soft” refers to the “nonstructural components of a comprehensive approach to sustainable water management and use” (Gleick *et al.*, 2002, p. 3), particularly economic incentives and regulatory action to reduce demand for water.

Table 1: Sustainability Criteria for Water Resources Planning

<i>Criterion</i>	<i>Definition</i>
Maintaining human health	A basic water requirement will be guaranteed to maintain human health.
Maintaining ecosystem health	A basic water requirement will be guaranteed to maintain and restore the health of ecosystems.
Minimum standards of quality	Water quality will be maintained to meet minimum standards. These standards may and will vary depending on the location of the water, and how the water is to be used.
Long-term freshwater renewability	Human activities will not impair the long-term renewability of freshwater stocks and flows.
Data collection and accessibility	Data and other information on the availability, use, quality, and quantity of water will be collected and made available and accessible to everyone.
Institutional mechanisms for resolving conflict	Institutional mechanisms will be established to prevent, alleviate, and resolve conflicts over water.
Democratic decision-making	Water planning and decision-making will be democratic, ensuring representation of all affected parties and fostering the direct participation of affected interests.

They claim that the hard path leads to degraded natural resources, top-down decision making, and less economic sustainability, while the soft path leads to more efficient use of water, transparent decision making, and an understanding and acceptance of the ecological values of water (Gleick *et al.*, 2002). Gleick *et al.* claim that the hard path has relied almost exclusively on centralized infrastructure and supply-side management of water resources through the use of dams, reservoirs, and pipelines to pump water often great distances across political or natural boundaries. The soft path may

also incorporate centralized infrastructure such as reservoirs, but it endeavors to improve the overall efficiency of water use rather than constantly seek sources of new supply. At its root, the hard path versus soft path debate is a debate of demand-side management versus supply-side management; command and control style management of water resources versus dynamic and adaptive management.

While the hard path has produced tremendous economic benefits in the United States, it has come at a significant price. Dams and reservoirs have displaced humans and other species, many freshwater aquifers are being drawn down faster than they are being replenished, and transboundary disputes over shared water resources have intensified. Moreover, the negative impacts to natural habitat abound. More than 20 percent of all freshwater fish species are now threatened or endangered because dams and excessive water withdrawals have damaged the free-flowing river ecosystems in which they thrive (Ricciardi and Rasmussen, 1999). Because of these effects, Gleick *et al.* (2002) contend that the hard path is an inadequate water management paradigm, incapable of meeting the twenty-first century water challenges facing this country (2002).

Recent hard path proposals in Metropolitan Atlanta, including the construction of several reservoirs throughout north Georgia, devised during the throes of drought and legal battles with neighboring Alabama and Florida, threaten the small streams and tributaries in north Georgia and the ecosystems they support. For example, one proposed reservoir on Flat Creek, a tributary to the Chattahoochee River and located at the historic Glades Farm in Hall County outside of Gainesville, would result in the loss of 25 miles of streams and 850 acres of rural farmland as well as culturally significant historical resources (Southern Environmental Law Center, 2013). Moreover, these proposals are

indicative of the choice of a rapidly growing region to rely on supply side solutions to water resource problems, which can be socially and economically costly as well as ecologically destructive, not only for the region they are intended to support, but also for downstream communities, economies, and environments. The persistent growth and sprawl of Metro Atlanta and its associated water use are evident in declines in water quality downstream of Atlanta (Frick, 1998). Disrupted flow regimes in the Apalachicola-Chattahoochee-Flint (ACF) River basin have led to water level declines in the Apalachicola River basin since the 1970s, resulting in floodplain forest drying and changes in arboreal composition (Darst and Light, 2008). Additionally, mean flows in the Apalachicola River have historically averaged 16,400 cubic feet per second (cfs); yet Light *et al.* (1998, p. 49) found that when flows decline below 16,000 cfs, most types of connected aquatic habitat decreased.

Using the sustainability criteria posited by Peter Gleick and David Feldman in Table 1, Wolff and Gleick's analysis of hard path versus soft path water management, and surveys and interviews with water resources experts, this thesis will evaluate the potential of Georgia's 2010 Water Stewardship Act (WSA) and Metropolitan Atlanta's 2009 Water Supply and Water Conservation Management Plan (Metro Plan) to meet the criteria of a sustainable approach to water resource management within Metropolitan Atlanta and the ACF River Basin. Additionally, the analysis of these policies, coupled with qualitative research, will shed light on expert perceptions of the ability of these recent changes in water policy to cause a transformative change in the management of ACF Basin water resources towards a sustainable water management paradigm.

Thus, my research question and sub-questions follow: Do water experts believe that the WSA and Metro Plan can meet Feldman's criteria of a sustainable approach to water resource management within Metro Atlanta and the ACF Basin? Do water resources experts, planners, and managers within the ACF Basin believe that these policies will bring forth a paradigm shift toward water resources sustainability within the basin? Do water experts believe Georgia or Metro Atlanta are on a hard path or a soft path to water resources management? What potential do the WSA or the Metro Plan have to impact this path?

LITERATURE REVIEW

Of all the water on Earth, 99 percent cannot be used for human consumption without significant effort or treatment (Pearce, 2006). Yet, the bulk of the United States' policies seem to disregard this reality by stimulating unchecked growth and development that fosters unsustainable water consumption. Indeed, others have expounded upon and investigated the unsustainability of current water resource management paradigms and ethics in the United States, including Cynthia Barnett (2008, 2011), Peter Gleick (1993), Robert Glennon (2004, 2010), Vandana Shiva (2002), Maude Barlow (2009). As these authors and others have pointed out, these realities can no longer be ignored, as the country is running out of cheap water. Extensive reforms of water policies, land use policies, and the public's perspective on water use are necessary if the country is to use water more sustainably.

There is a disconnect in peoples' minds between where they get their water and where the water comes from. If one were to poll the public and ask where their water comes from, many would likely respond, "my tap." It is difficult to usher in an attitude of conservation and sustainability when much of the public is unaware of where their water comes from, and unaware of the social, economic, and environmental implications of the distribution of freshwater from source to tap. We go to faucets and fill up glasses anytime we please. We grow vast, emerald green lawns in the middle of the Mohave Desert, and we pump huge amounts of water from wells and suffer virtually no immediate repercussions. For most of us, there is simply no link between our own water use and

water resource problems “out there.” Water resource problems are usually caused by too many users attempting to access limited resources combined with the fact that some users make inefficient or excessive (or both) use of the resource. In short, a culture of consumption has combined with population growth to create water resource problems in many parts of the United States.

“There is no shortage of water, unless you try to establish a city where no city should be” (Abbey, 1968, p.126). This is exactly what many developers and local governments have done, especially throughout the American West. By relying on engineered solutions such as dams and grand schemes of overland water transport, big, western U.S. cities such as Phoenix, Albuquerque, Las Vegas, and much of California have enabled greatly expanded populations. Yet most water managers and scientists now recognize the unsustainable nature of this growth. This is true even in the Southeast where Atlanta, Georgia has been locked in a 25 plus year-long battle with neighboring Alabama and Florida over water allocations from the Apalachicola-Chattahoochee-Flint River system.

The deceptively water-rich states of Georgia, Florida, and Alabama have been witness to a particularly complex and drawn out battle over water in the Apalachicola-Chattahoochee-Flint (ACF) River basin (Figure 1). The wealth of stakeholders and divergent interests, coupled with growing distrust, impedes the development of a mutually acceptable water allocation formula for the basin. This, in turn, is threatening the sustainability of many ecosystems and economies in the tri-state area (Jordan and Wolf, 2006).

Beginning at its headwaters in North Georgia, the Apalachicola-Chattahoochee-Flint River basin covers nearly 20,000 square miles and drains parts of Georgia, Alabama, and Florida. As its name indicates, its most significant streams are the Apalachicola, Chattahoochee, and Flint rivers. The Chattahoochee and Flint Rivers both originate in Georgia and flow southwest towards their confluence at Lake Seminole, which empties to form the Apalachicola River, which then flows (after passing through the Jim Woodruff Dam on the Florida-Georgia border) 107 miles through northwest Florida into Apalachicola Bay and the Gulf of Mexico. Approximately three-quarters of the basin lies within Georgia, as does 90 percent of the basin's population (Jordan and Wolf, 2006). The ACF basin is the fifth largest watershed in the United States in terms of flow, and the Apalachicola River discharges more water at its mouth than any other Florida river (Leitman, 2005).

Apalachicola–Chattahoochee–Flint (ACF) River Basin



Figure 1: Overview map of the ACF Basin.

Water Use and Population Growth in the ACF Basin

The ACF Basin, particularly that portion in Metropolitan Atlanta, has experienced dramatic population growth over the last several decades, and this growth has had a correlative effect on water use. Total water use in the ACF River Basin increased by 35% between 1970 and 2005, from an average of 1,475 million gallons per day (mgd) to 1,990 mgd (Marella et al, 2011). According to the Metropolitan North Georgia Water Planning District (Metro District), the combined permitted monthly average surface water withdrawal within the Metro District's boundaries from the Chattahoochee River Basin (including Lake Lanier, near Atlanta) and the Flint River Basin was approximately

820.83 mgd in 2006 (Metro District, 2009). To shed additional light on the water demands of the Chattahoochee and Flint River Basins, the U.S. Army Corps of Engineers uses the following data as their input demands for their Reservoir System Simulation (HEC-ResSim) software, where “AG” and “M&I” refer to agriculture and municipal and industrial, respectively (Table 2) (Steve Leitman, Personal Communication).

Table 2: Summary of Water Demands Upstream of Jim Woodruff Dam

Chattahoochee Basin				Flint Basin		
	AG	M&I	Total	AG	M&I	Total
Numbers are in Million Gallons Per Day (MGD)						
January	2.50	179.72	182.23	0.91	28.15	29.06
February	2.57	215.98	218.56	26.61	28.89	55.50
March	5.14	294.93	300.07	111.68	47.49	159.17
April	12.85	372.44	385.29	245.60	76.09	321.70
May	25.68	547.71	573.39	675.99	105.26	781.25
June	41.10	579.49	620.59	904.00	117.48	1021.48
July	46.24	532.38	578.62	1021.67	142.25	1163.92
August	53.94	650.24	704.18	1097.69	142.63	1240.31
September	28.25	550.34	578.59	799.72	119.25	918.97
October	2.57	358.78	361.36	304.34	69.50	373.85
November	2.57	334.51	337.09	235.35	64.91	300.25
December	5.14	295.64	300.77	202.09	57.55	259.65
Annual Average	19.05	409.35	428.39	468.80	83.29	552.09

Metropolitan Atlanta has consistently been one of the primary water users in the basin, largely because Atlanta is one of the country’s fastest growing urban areas. Metro Atlanta, which includes 28 counties in the Atlanta-Sandy Springs-Marietta Metropolitan Statistical Area, now has more than 5 million people, and no other metropolitan area in the country added more residents than Atlanta from 2000 to 2006 – roughly 890,000 (*Atlanta Journal Constitution*, 2007). However, it should be noted that during the summer months, the ACF Basin’s farmers use more water than Metropolitan Atlanta. Another vital concern is the collective evaporative losses at storage reservoirs (Leitman,

2011, Personal Communication). In this case, hard path water management “solutions” have combined with the South’s hot summers to evaporate large quantities of badly needed water, losses that could be largely avoided with soft path approaches.

Increases in water consumption, stimulated by explosive growth and development within the northern portion of the basin, have led to increased competition for water throughout the ACF Basin and a widening divergence of interests between upstream and downstream users. This divergence ignited a Tri-state Water War between Georgia, Florida, and Alabama more than thirty years ago. There is still no agreement between the three states for developing a water allocation formula for the region.

Water Wars

The lack of an agreed upon definition of sustainable water use in the ACF is a significant threat to the ecological integrity of Florida’s Apalachicola River, floodplain, and bay; the social and economic security of Metropolitan Atlanta; and everything in-between. In the United States there are three options to address water quantity allocations in interstate watersheds. First, opposing parties may pursue a lawsuit through the U.S. Supreme Court; second, federal legislation could require interstate management; and, the third option is to create an interstate compact. The most prudent way to mitigate further damage to the environment, economy, and society is by securing an appropriate water allocation formula for the region via an interstate compact.

In an effort to determine an appropriate water allocation formula, representatives and scientists from Georgia, Florida, and Alabama conducted a comprehensive study from 1992 to 1997, which led to the development of the Apalachicola-Chattahoochee-

Flint River Basin Compact on November 11, 1997. According to the Compact, its purpose is as follows:

It is the intent of the parties to this Compact to develop an allocation formula for equitably apportioning the surface waters of the ACF Basin among the states while protecting the water quality, ecology and biodiversity of the ACF, as provided in the Clean Water Act, Endangered Species Act, National Environmental Policy Act, Rivers and Harbors Act, and other applicable federal laws. ... (ACF Compact, 1997, Article VII).

The ACF Compact was the first such compact in the Southeastern U.S. and the first in the country since the passage of major environmental laws in the 1970s. The ACF Compact established the ACF Basin Commission, which consisted of governors from Alabama, Georgia and Florida, and required it to establish a formula for allocating the surface waters of the ACF Basin (Leitman, 2005). Compact negotiations were extended 14 times between 1998 and 2003, eventually resulting in the termination of the Compact, which signaled a breakdown in negotiations.

The failure of the tri-state governments to reach consensus is not surprising. First, many of the stakeholder conflicts are age-old upstream versus downstream disputes (Feldman, 2007). Atlanta is a “headwaters” metropolis, which means that it depends on a relatively limited source of fresh water—the headwaters of the Chattahoochee River. Groundwater is extremely limited in the region due to underlying bedrock. As one commenter observed, “The Chattahoochee . . . is the smallest river basin providing the most water supplies for any metropolitan area in the U.S.” (Hull, 2000, p. 2). Second, the various demands imposed on the river system share a high intensity; upstream users want to continue the economic health and welfare of a region of more than five million people,

and downstream users want to support the ecology of one of the most biodiverse regions in the United States, with a range of social, environmental, and economic considerations along the way. In the long run, some contend that these divergent demands may be mutually exclusive (Feldman, 2007).

Attempting to maintain in-stream flows while allowing significant off-stream uses is often a very difficult balance to strike. Indeed, the vast array of stakeholders currently serve as an impediment to securing an agreement in the negotiations between the tri-state governments. In a conflict as large in scale, as complex, and as intense as the so-called Water Wars between Alabama, Georgia, and Florida, there are a great number of interests directly and indirectly affected. The stakeholders of the ACF Water Wars can be loosely defined as any group, individual, or natural environment that has an interest or stake in the waters of the ACF basin. All three states have unique and mostly divergent interests. Alabama's interests lie mostly in securing water resources for continued smooth functioning of the Joseph M. Farley Nuclear Generating Station (along the Chattahoochee River, near Dothan, Alabama) and for future economic development in eastern Alabama. The fear is that increased consumption by upstream users in the Atlanta metropolitan area will limit water available to eastern Alabama.

Georgia's interests are many. First, state and north Georgia officials worry about their ability to secure adequate freshwater supplies to support the rapidly growing population of Metropolitan Atlanta. Not only does Metro Atlanta utilize the water in Lake Lanier (created by a dam on the Chattahoochee River) for domestic, industrial, and agricultural use, but lakefront residents depend on certain water levels to maintain property values, which support a \$5.5 billion dollar economy based upon real estate and

tourism (Glennon, 2009). Second, and perhaps most important, demands from Florida and Alabama for increased allocation are perceived as threats to Georgia's sovereignty over its water supplies (Bryan and Rose, 2006). Another major consideration is the important role that agriculture plays in Georgia's economy and way of life. There are many livestock and poultry farms scattered throughout the upper and middle portions of the Chattahoochee and Flint River basins, while the southern portions feature mostly row crops and vegetables (Feldman, 2007). These activities consume a lot of water but they also greatly affect water quality in the region, and their impacts are evident all the way down to the Gulf of Mexico (Wangness, 1997). Yet according to Frick *et al.* (1998), while the urban and suburban land use accounts for only 5 percent of the ACF Basin, these land uses have the most important effect on stream-water quality. However, the interests of Georgia's downstream farmers generally align with those of Florida and Alabama. In the ACF Water Wars, there is Metropolitan Atlanta, and generally everything downstream represents opposing interests.

Florida residents and officials are concerned with sustaining the ecosystems of the Apalachicola River, Bay, and floodplain, including the estuarine seafood industry. Apalachicola Bay supports a \$134 million dollar economy centered on commercial oyster production, which provides ninety percent of Florida's oysters and ten percent of the nation's supply (Glennon, 2009). The effects of drought, coupled with increases in water consumption upstream, are reducing flows in the Apalachicola River, and the productive Apalachicola Bay ecosystem is highly dependent on the historical regime of freshwater inflows. Florida officials are concerned that continued and unbridled growth in Metropolitan Atlanta will "starve the Apalachicola River and Bay of freshwater flows

needed to keep the ecosystems, species, and economy alive" (*Atlanta Journal-Constitution*, May 1, 2008). An analysis of the stakeholders in the ACF Basin also makes apparent the divide between what Mark Lubell (2005, p.174) refers to as the "policy elites" and the "grassroots stakeholders," who he contends, are people who actually consume natural resources and consist of "the fishers, the farmers, the water diverters, the loggers, and other species of what Ostrom (1990) calls 'appropriators.'"

Beginning with the U.S. Army Corps of Engineers' construction of Buford Dam on the Chattahoochee River, and the subsequent filling of Lake Sidney Lanier in 1957, municipalities in North Georgia used the reservoir for drinking water. North Georgia communities continued to draw water from the lake even though Congress authorized and paid for the dam and reservoir in order to support navigation and hydroelectricity generation. In 1989, the Corps of Engineers responded to mounting demand for additional drinking water supplies in rapidly growing Atlanta by unilaterally reallocating storage in Lake Lanier to provide drinking water for Metro Atlanta without obtaining approval from Congress, a tactic which could be characterized as part of a hard path approach. This prompted a lawsuit from the state of Alabama, filed on June 28, 1990, challenging the Corps' water-supply contracts. The state of Florida joined Alabama in this litigation almost immediately and the Tri-State Water Wars were under way, and continue today.

A major development in the ACF Water Wars occurred in July 2009, when Federal District Court Judge Paul Magnuson (2009, p.93) issued the following decision regarding Metro Atlanta's use of ACF waters:

At the end of three years, absent Congressional authorization or some other resolution of this dispute, the terms of this Order will take effect. For

Atlanta and the communities surrounding Lake Lanier, this means that the operation of Buford Dam will return to the “baseline” operation of the mid-1970s.

Judge Magnuson deemed Metro Atlanta’s use of Lake Lanier for water supply illegal, because when Congress authorized Buford Dam in the late 1940s, Atlanta officials declined to share the cost of dam construction, claiming that Lake Lanier would be used primarily for navigation and hydroelectric purposes, and that water supply benefits were merely incidental to the project.

Georgia officials viewed the judge’s ruling as “draconian” and immediately appealed. If the ruling stood, Metropolitan Atlanta’s water supply from the Chattahoochee River would be cut by more than half, with permitted withdrawals reduced from 497 mgd to 230 mgd and permitted withdrawals from Lake Lanier reduced by approximately 95% from 214 mgd to 10 mgd (Kirkpatrick 2010, slides 18-19). However, in June 2011, the 11th U.S. Circuit Court of Appeals in Atlanta overturned Judge Magnuson’s decision, finding that one of the primary purposes of the reservoir was indeed to provide drinking water to the region. The court gave the Corps one year to make a final decision over water allocation from Lake Lanier (Rankin, 2011), and the Corps is currently in the process of updating its basin-wide Master Water Control Manual. In 2013, after the federal declaration of a fishery disaster for Apalachicola Bay’s oyster fishery, Florida filed a U.S. Supreme Court lawsuit against Georgia claiming that excessive water consumption in Georgia threatens protected species and the oyster fishery of the Apalachicola River and Bay (Pittman, 2013).

Current Water Management Policies and Practices in Georgia

Metropolitan Atlanta faces several water supply planning challenges including population growth, drought, climate change uncertainties, and the ongoing ACF Water Wars with Florida and Alabama. The entity tasked with managing these challenges and providing solutions is the Metropolitan North Georgia Water Planning District (Metro District), created in 2001 by the Georgia General Assembly (Figure 2).

In 2003, the Metro District created plans for water supply and conservation, watershed management, and wastewater management, and made updates and revisions in 2009 (Metro District, 2009). The most recent plan includes several conservation policies designed to reduce demand. For example, one policy calls for Metro Chattahoochee River and Lake Lanier water utilities to develop a point of use leak detection program to identify and notify customers of leaks and to “encourage timely repairs;” another policy calls for all new car wash facilities to use recycled water; and yet another policy demands that local utilities establish conservation pricing, which means customers pay higher per unit prices for water if they use more than an established minimum (Metro District, 2009). While these approaches are part of the soft path to water resources management, the plan also includes several hard path, supply-side management policies including encouraging interconnections between county water systems and building new reservoirs (Metro District, 2009).

In the midst of Georgia’s 2006-2009 drought, Georgia’s General Assembly passed the Water Conservation and Drought Relief Act to provide additional revenue for reservoir construction. Despite its misleading title, the main intent of this 2008 legislation, according to former Georgia Governor Sonny Perdue, is to “speed the

construction of new reservoirs by consolidating the state's efforts and partnering with local governments" (State of Georgia, 2008).

This hardly promotes conservation. In fact, the Georgia Environmental Facilities Authority (GEFA), the agency tasked under the Drought Relief Act with "assisting local governments with permitting water supply projects, conducting an inventory and survey of feasible sites for water supply reservoirs and assisting with wetlands and stream mitigation banks," released a report which warns that new reservoirs generate social, physical, and environmental impacts and recommends conservation as the primary option to increase water supply (GEFA 2008, p. iv).

One positive result from Judge Magnuson's 2009 decision, since overturned, is that Metro Atlanta and the State of Georgia recognized the urgent need to develop solutions to north Georgia's water supply problems. In 2009, Governor Perdue created the Water Contingency Planning Task Force (Task Force) in order to investigate water supply and conservation options in the wake of Judge Magnuson's decision. Although the proverbial "faucet" to the Chattahoochee River and Lake Lanier was not shut off in 2012 as Georgia once feared, a water crisis looms, and the Task Force (2009) encouraged the state to pursue a range of water conservation and supply solutions.

Outside of interstate negotiations with Florida and Alabama, it appears that Governor Perdue's remaining efforts were directed towards developing contingency options via his Task Force, which concluded that, if Judge Magnuson's decision stood, there were no options that would prepare Metro Atlanta for the drastic reduction in withdrawals from Lake Lanier and the Chattahoochee River by 2012 (Task Force, 2009). However, the Task Force did prepare two contingency plans for 2015 and for 2020.

Metropolitan North Georgia Water Planning District

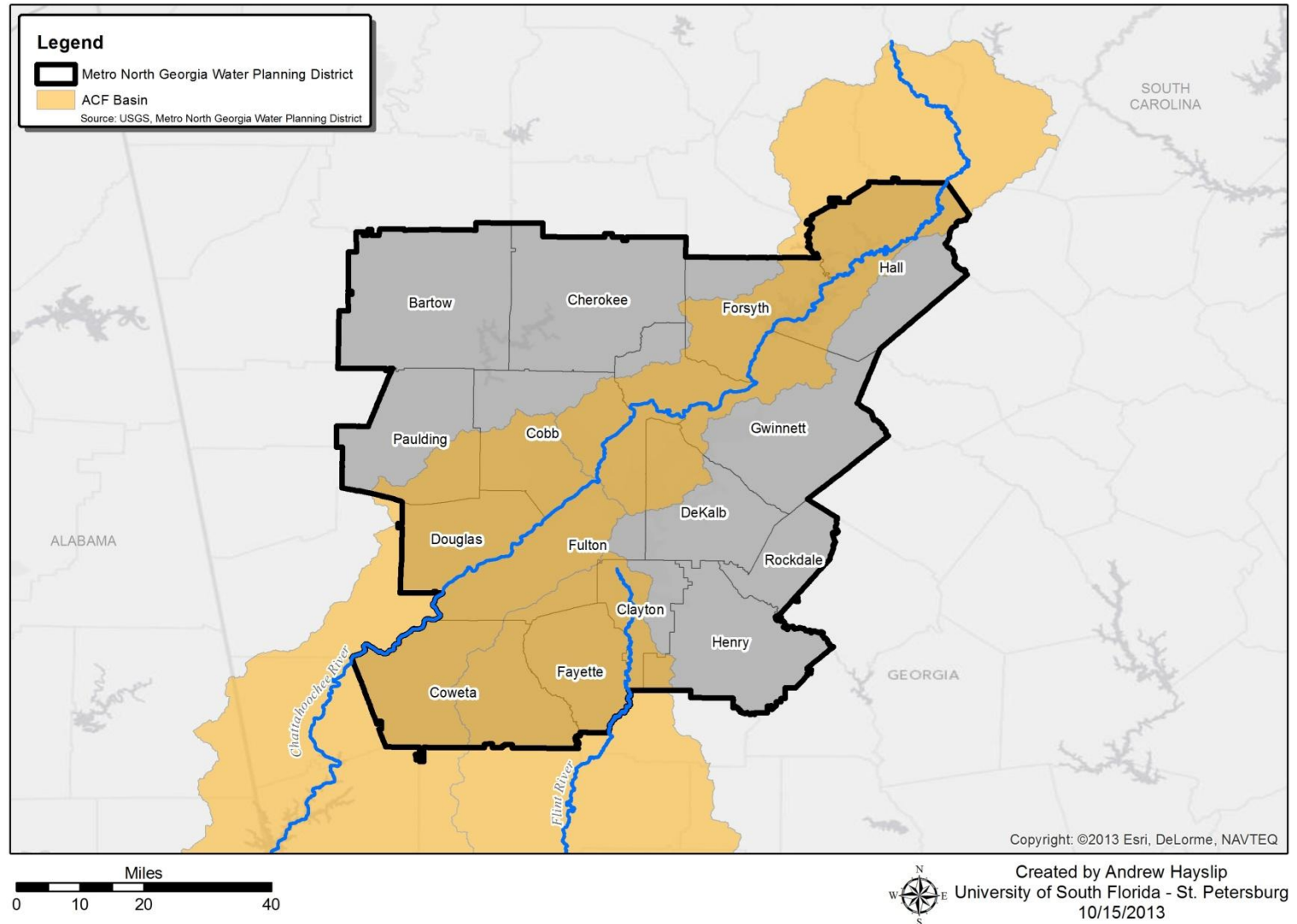


Figure 2: Map of the fifteen county Metropolitan North Georgia Water Planning District in relation to the ACF Basin.

The 2015 plan, while the most costly, was also the most environmentally friendly and included “an indirect potable reuse project” and “isolated groundwater options” (Task Force, 2009, p. 4). The 2020 plan was more supply-side oriented and focused on creating interbasin transfers and building new reservoirs (Task Force, 2009).

Following failed attempts at supply-side fixes such as the oft-ridiculed effort to move the Georgia state line north to claim a portion of Tennessee’s water, and state-sponsored prayer sessions on the steps of the capitol building, Georgia lawmakers finally decided to be proactive and pass legislation that, according to the non-profit conservation organization, American Rivers, will propel Georgia into the forefront of water resources sustainability (Georgia Conservancy, 2010). The potential vehicle to instigate this shift from a ‘culture of consumption’ to a ‘culture of conservation’ is the state’s Water Stewardship Act of 2010 (WSA). Enacted on June 1, 2010, the law contains several soft path provisions, including:

- Encouraging all state departments to evaluate their water conservation practices;
- Requiring standardized leak reporting by public water utilities;
- Submetering of all new multifamily, commercial, and industrial construction beginning July 1, 2012;
- Installation of high efficiency fixtures for all new construction beginning July 1, 2012;
- Tracking allocated but unused agricultural water, and establishing a process for returning unused water allocations to revert back to the state;
- and,

- Statewide scheduling of outdoor watering between 4:00 p.m. and 10:00 a.m. to reduce evaporative loss during peak sunlight hours.

It is worth noting that many of these measures are already included in the Metro District's Water Supply and Conservation Plan (Metro District, 2009). According to Pierre Howard, president of the Georgia Conservancy and the state's former Lt. Governor, "The Water Stewardship Act is the most significant, sweeping water conservation policy in Georgia's history. This is a major success for all Georgians because it will save millions of gallons of water every day, and it will help our leaders reach a positive conclusion to the tri-state water conflict" (Georgia Conservancy, 2010).

Crisis often presents opportunities for change. Atlanta would appear to be in a position to move towards a more sustainable water future, if policy makers and planners take seriously the opportunity to emphasize demand-side conservation measures over scrambling to build infrastructure to supply limitless growth. What do water experts think? Do they believe that the WSA and Metro Plan have the capacity to meet the criteria of a sustainable approach to water resource management within Metro Atlanta and the ACF Basin? Do water resources experts, planners, and managers within the ACF Basin believe that these policies will bring forth a paradigm shift in water resources sustainability within the basin and set Atlanta on a soft path to water resources sustainability? The purpose of this research is to obtain the perspectives on these questions from a range of informed individuals and ultimately posit my own perspective on the policies and actions best suited to set Metropolitan Atlanta on a path towards water resources sustainability.

New Governance in the New South

If water resources sustainability is defined as “*the use of water that supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it*” (Gleick *et al.*, 1995, p. 574), then how does a society make this happen? Through what means is the gap between water resources sustainability theory and practice bridged? Speaking of water resources management, the late Nelson Mandela (2000) once observed, “It is one thing to find fault with an existing system. It is another thing altogether, a more difficult task, to replace it with another approach that is better.” To evaluate these questions, recent research has relied heavily upon case studies that vary widely in approach, scale, and context (Jordan and Wolf, 2006; Feldman, 2007; Scholz and Stiftel, 2005). It is important to note that evolving definitions of water resources sustainability recognize the competing demands between human and ecological needs. Much of this research has been couched within the ecosystem management framework and identifies the need to develop an iterative, adaptive process by which to manage water resources for ecological sustainability. The failure among current approaches to governance in meeting the management demands of complex systems such as those of the ACF Basin, and in dealing with uncertainty and change, point to the need for adaptive governance of these systems (Olsson *et al.*, 2006). M. Lee (unpublished manuscript) refers to such systems of adaptive governance as the “new governance” (Olsson *et al.*, 2006).

As Walters and Holling (1990, p. 2067) described, “two kinds of science influence renewable resource policy and management. One is a science of parts, e.g., analysis of specific biophysical processes . . . The other is a science of integration of parts.” This focus on the “integration of parts” marked a turning point in the evolution of holistic approaches to ecosystem management, as advocated for by Arthington *et al.* (1992) and Richter *et al.* (2003). Walters and Holling argue that decisions related to natural resource management “are not made because of a well-proofed argument in the tradition of experimental science, but because of the accumulation of credible evidence supporting a simple and widely perceived explanation in a political environment that demands action” (1990, p. 2067). Indeed, the balancing act required for the sustainable management of water resources must be born out of a holistic, adaptive approach, which not only manages to achieve a single outcome (e.g. a flow regime that allows for survival, growth, and dispersal of target species); but it requires the “integration of parts” to include the overall health of the ecosystem, as well as the social, cultural, and economic systems that depend on it.

When a water resource competition problem is identified, such as the one that exists in the Apalachicola-Chattahoochee-Flint River Basin, how should people resolve the conflict? What should a conflict resolution process look like? Walker *et al.* (2004) frame this issue within the context of “transformative change” (2004) and expand on the cycle that social-ecological systems (SESs) undertake when faced with change. This cycle, known as an “adaptive cycle,” is comprised of four non-linear phases: growth, exploitation, conservation, and reorganization (Walker *et al.*, 2004). The authors contend that these “cycles occur at a number of scales and SESs exist as ‘panarchies’ – adaptive

cycles interacting across multiple scales. These cross-scale effects are of great significance in the dynamics of SESs” (Walker *et al.*, 2004, on-line). These ideas may be directly applied to the Apalachicola-Chattahoochee-Flint River Basin, a social-ecological system operating at many different scales. Thus throughout this thesis, consideration will be given to the processes that are occurring simultaneously at the various scales that exist within this basin. In linking theories from Gleick *et al.* and Walker *et al.*, the soft path to water resources management can better aid a region, or an SES, through the adaptive cycle and accompanying transformation to a new paradigm of sustainability. Specifically, the soft path’s emphasis on demand side management and conservation, as well as adaptive management and institutional solutions to water problems, is better suited to aid an SES through the conservation and reorganization phases of Walker *et al.*’s (2004) adaptive cycle of transformation, and prevent the perpetuation of the growth and exploitation phases.

Walker *et al.* (2004) expand on the notion of SESs and maintain that the “stability dynamics of all linked systems of humans and nature emerge from three complementary attributes: resilience, adaptability, and transformability.” These attributes are defined herein (Walker *et al.*, 2004):

- Resilience: The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks
- Adaptability: In a SES, adaptability is the collective capacity of the human actors in the system to manage resilience.

- Transformability: The capacity to create a fundamentally new system when ecological, economic, or social (including political) conditions make the existing system untenable. Transformability means defining and creating new stability landscapes by introducing new components and ways of making a living, thereby changing the state variables, and often the scale, that define the system.

Many scholars agree that when a transformation occurs in a social-ecological system, a successful strategy for sustainability centers around adaptive governance regimes.

Continuing with the framework of social-ecological systems (SESs), Olsson *et al.* (2006) relate that there is increasing recognition of the need for more adaptive governance regimes that better handle uncertainty and change – two very uncomfortable notions in the realm of water supply planning and management. Echoing Walker *et al.*'s (2004) emphasis on the importance of scale in the management of social-ecological systems, Olsson *et al.* (2006, on-line) maintain that “adaptive governance relies on polycentric institutional arrangements that are nested, quasi-autonomous decision-making units *operating at multiple scales*” [emphasis added].

In the sustainability criteria for water resources planning posited by David Feldman (2007) and Gleick *et al.* (1998) (Table 1), sustainable water resources planning includes institutional mechanisms to prevent, alleviate, and resolve conflicts over water. When couched in the discussion of adaptive governance and social-ecological systems, it is evident that institutional mechanisms need to be multiscale solutions that “provide a balance between decentralized and centralized control . . . and connects individuals, organizations, agencies, and institutions at multiple organizational levels” (Olsson *et al.*,

2006, Online). One popular mechanism for establishing an institutional framework within a social-ecological system (particularly in multiscalar, transboundary watersheds) is through a transboundary water management institution (TWMI).

Existing literature often utilizes case studies to analyze the efficacy of TWMI in resolving water conflicts and implementing sustainability. The earliest techniques to resolve transboundary water conflicts involved top-down approaches for water allocation through “original litigation” in the Supreme Court, which developed the legal doctrine known as “equitable apportionment” (Dellapena, 2006, p. 53). However, original litigation between states before the Supreme Court “failed to deal adequately with the water-management needs of multistate regions” or multiscalar SESs using the framework discussed above (Dellapena, 2006 p.54). A recognition of the need for federal involvement in transboundary water management conflicts emerged, but states were generally concerned about losing sovereignty over their water resources to the federal government, thus many solutions began to take the form of interstate compacts (Dellapena, 2006). Interstate compacts are authorized agreements between states provided for by the U.S. Constitution so that interstate conflicts can be handled on a regional basis, as opposed to direct Supreme Court oversight (Dellapena, 2006). However, interstate compacts do require the consent of Congress, in addition to all states involved (Dellapena, 2006).

Interstate compacts, following the nuances of regional climate and geography, vary greatly; in the western United States the emphasis of interstate compacts is on the direct allocation of water resources without much concern for institutional governance (Dellapena, 2006). However, in the humid eastern United States, interstate compacts

follow a much different course. One of the most notable examples, the Delaware River Basin Compact (1961) “combines the state and federal governments in a commission authorized to make far-reaching regulatory and operational steps in order both to preserve and protect the water environment of the basin and to allocate the benefits of the waters of the basin to individual and public entities within the basin” (Dellapena, 2006, p. 56). Most eastern water compacts were created as a result of the social and ecological problems that resulted from large water demands by major cities, particularly New York, Chicago, Boston, and now, Atlanta.

There are three major federal compact commissions in the eastern United States: the Delaware River Basin Commission (DRBC), the Susquehanna River Basin Commission (SRBC), and the Interstate Commission on the Potomac River Basin (ICPRB). Both the DRBC and SRBC are distinct from the ICPRB in that they were both established by federal-interstate compacts, whereas the ICPRB is an example of an interstate compact commission (Gentzler and Hines, 2006). The distinction lies in the role of the federal government; in the DRBC and SRBC cases, the federal government is an equal participant with the states, whereas in the ICPRB example, congressional consent is required but the federal government is not an equal participant. In this example, “the roles and functions are determined by the nature of the compact and the amount of authority granted to the commission by the member jurisdictions” (Gentzler and Hines, 2006, p. 79).

In recognition of the American South’s cultural geography, with its emphasis on states’ rights and concern regarding federal involvement in resource allocation issues, it is conceivable that an interstate compact commission similar to the ICPRB may be more

politically acceptable in the context of the ACF Basin; however, it is debatable if it would be as effective as the DRBC and SRBC due to its lack of regulatory authority.

Regardless of the nature of the compact, these three examples of eastern U.S. TWMIIs have been effective at achieving their goals, which are to “promote interstate comity, remove causes of controversy, and provide for cooperative planning and actions for conservation, use, development, management, and control of . . . water-related resources” (GAO, 1981, p. 4). For these TWMIIs, the goals have primarily revolved around water quality problems resulting from factories, mills, and shipyards spawned by the Industrial Revolution. However, water quantity problems were also present in these watersheds, particularly in the Upper Delaware Basin, where between 1955 and 1967, New York City built three large reservoirs, prompting concerns from downstream users, particularly the City of Philadelphia which faced threats of saltwater intrusion from Delaware Bay (Gentzler and Hines, 2006). The Susquehanna River Basin faced many of the same concerns as the Delaware River Basin, albeit on a smaller scale.

The relative successes of these TWMIIs in implementing sustainability across varying watershed scales depends on the criteria by which one measures success, which is a crucial issue in all discussions of ecosystem management. In the case of the DRBC, dissolved oxygen levels in the Delaware Estuary improved, fecal coliform levels decreased, and the Commission set a national precedent in establishing standards for water quality in the Delaware Estuary by “adopting regulations to implement those standards through a wasteload allocation process” (Feldman, 2007, p. 113). Another criterion of success wrought by the DRBC was the revival of the shad fishery in the non-tidal reaches of the Delaware River, a direct result of water quality efforts enacted by the

DRBC (Feldman, 2007). In the case of the SRBC, Feldman contends that while the Commission's record of achievement is mixed, "its inter-basin diversion policy, coupled with its efforts to restore shad and other fisheries, reveals a strong corporate aspiration of the commission to adhere to sustainability ideals and to utilize adaptive management principles" (Feldman, 2007, p. 127).

Through case studies and literature review, it is apparent that local context guides the relative success of merging science and policy for the common cause of enacting transformative change and implementing sustainability in a social-ecological system, particularly in transboundary water conflicts. Regarding solutions to international transboundary water conflicts, Aaron T. Wolf (2006, p. 143) explains that "the uniqueness of each basin, whether hydrological, political, or cultural, stands out in the creativity of many of the treaties." Indeed, the ACF Basin is politically, ecologically, culturally, and ethically unique, even among eastern U.S. river basins due to its location in the American South, with a deep and historic aversion to federal government involvement in what many residents believe are states' rights issues. This recognition of the unique political and cultural geography of the South will require a unique approach to implement sustainability and cultivate a soft path to water resources management; one that more carefully balances issues of state sovereignty and federal regulation.

Part of the uniqueness of the ACF Basin lies in the fact that one of the primary water users, Metro Atlanta, is a sprawling metropolis of over five million people living across fifteen counties and 92 cities. Thus, the Metro North Georgia Water Planning District is essentially a TWMI operating at an intrastate scale. Due to Metro Atlanta's unique position within the Tri-state Water Wars and the ACF Basin, one must also

consider how sustainability is implemented not only at the basin scale, but at a more local scale as well. Adaptive governance, the process of creating adaptability and transformability in social-ecological systems, relies on “polycentric institutional arrangements that are nested, quasi-autonomous decision-making units operating at multiple scales” (Olsson *et al.*, 2006). Metro Atlanta is one of these quasi-autonomous decision-making units, and when “navigating the transition” towards an adaptive governance at the local scale, a key element is the “management of problems in different domains and the development of composite policies or solutions to these different problems” (Olsson *et al.*, 2006).

There are many case studies that highlight how water resources sustainability has been implemented at a local scale, including the remarkable work accomplished in San Antonio, Texas (Barnett, 2011), but perhaps the most effective eastern U.S. example is the City of Boston. Sandra Postel (n.d.) hails Boston as one of the biggest success stories of urban water conservation in the country. In the 1980s, Boston faced the proverbial “two paths in the woods;” with a growing population and its 412-billion-gallon water reservoir declining rapidly, the Massachusetts Water Resources Authority (MWRA) had to take action. At the time, the best option appeared to be to increase supplies by diverting the Connecticut River to the Quabbin Reservoir at an estimated cost of \$500 million (Postel, n.d.). This path would certainly be what Gleick *et al.* would refer to as the hard path. Instead, at the behest of citizen and environmental groups, the MWRA began a comprehensive conservation strategy that involved repairing leaks in the water distribution system, retrofitting homes with water efficient fixtures, conducting water audits, increasing water rates, and ratcheting up public education efforts about the

importance of conservation (Postel, n.d.). Additionally, in an effort to soften this top-down approach with active citizen participation, the MWRA also established a citizen watchdog group called the Water Supply Citizens Advisory Committee. The culmination of these soft path efforts resulted in a significant decrease in total water use: from 125.5 billion gallons per year in 1980 to 70.9 billion gallons per year in 2009 (Postel, n.d.).

Similarly, in Metropolitan Atlanta, two paths diverge in the southern woods: the hard and soft paths for water resources management. Which path is Metropolitan Atlanta currently taking? What impact has recent water policy had on the trajectory of this path? Ultimately, do recent changes in water policy provide more support for social-ecological systems at the local, state, and basin-wide scales? Will such policy changes help the region successfully transition into a sustainable water future?

METHODS

In order to operationalize the research objective, I used a mixed-methods qualitative approach as a means for exploring and understanding what water resources experts think about social, economic, and environmental problems in the ACF Basin (Creswell, 2009). Surveys and in-depth interviews were used to produce emic data that shed light on the varying perspectives of water resources planning and management within the basin, as well as visions for success or failure with regards to Georgia's 2010 Water Stewardship Act and its role in the ACF Water Wars. Expert sampling was used to ensure the informants were qualified to provide insight on the issue, and the sampling was also stratified throughout the basin to best ensure that informants represent all significant stakeholders. According to Guest *et al.* (2006), guidelines for determining non-probabilistic sample sizes are virtually nonexistent. This research employed expert sampling for both surveys and interviews, which is a type of purposive sampling. Purposive sample sizes typically rely on "the concept of 'saturation,' or the point at which no new information or themes are observed in the data" (Guest *et al.*, 2006, p. 59).

The initial sampling frame consisted of 35 informants who were selected according to occupation, affiliation with certain stakeholder groups or non-profit organizations, geographic area representation, and perceived level of expertise with regards to the field of environmental and/or water resources planning and management. This sampling frame (Appendix A) ultimately expanded to include 80 individuals in

order to obtain a higher number of responses. The participants represent all of the geographic regions within the basin, as well as different interests and organizations within that area. For example, Atlanta-based informants are affiliated with different economic, social, and environmental interests, and they represent government and non-government institutions. The same methodology was employed throughout the basin to ensure a valid set of data that includes perspectives from all ACF Basin stakeholders.

Recruitment procedures included an introductory email (Appendix A) with a link to the survey that was created using a web based survey software called Survey Monkey (SurveyMonkey Inc., www.surveymonkey.com). The beginning of the survey included the informed consent document. In order to proceed to the survey, participants were asked to read the informed consent document and then answer ‘yes’ or ‘no’ as to whether or not they would proceed with survey. The survey was designed so that participants could not proceed unless agreeing to participate in the research. The potential respondents were also asked to forward the recruitment email to any of their associates, or other individuals that might be able to provide informed commentary on issues related to environmental and water resources planning and management in the ACF Basin. This request is a form of snowball sampling, and it is used in order to include additional informants who otherwise might be omitted from the initial sampling frame. Participants obtained via snowball sampling are identified in Appendix A.

Eleven in-depth interviews were then conducted with selected respondents from the initial sampling frame. The following criteria were used to determine which respondents were selected for an interview. The first criterion was participation; were survey respondents willing to be interviewed? The second criterion was a perceived level

of expertise. If a participant responded to a survey in an informed manner, then he/she was asked to participate in a follow up interview. Then the sampling frame for interviews was stratified in a similar method as the surveys to ensure appropriate geographic representation of all stakeholders involved.

Interviews were conducted via phone and recorded using Google Voice (Google, www.google.com/voice). This method provides multiple benefits. First, because of Google's policies with regard to recording phone calls, phone interview participants were automatically notified when the recording commenced. This provides an additional level of assurance that all participants know they were being recorded. Additionally, Google Voice recordings are very clear, allowing increased accuracy during interview transcription. Finally, recordings are automatically password protected, which increases data security.

Only the principal investigator has access to the audio/video recordings and digital data is stored on a password protected computer and hardcopy transcripts were stored in a locked filing cabinet for the duration of the study and will remain there for up to five years following the close of the study. The author was responsible for managing all data, addressing regulatory issues, obtaining informed consent, communicating with the university's Institutional Review Board (IRB), and conducting analysis. Faculty advisor Dr. Christopher Meindl served as co-investigator.

The water resources sustainability criteria outlined in Table 1 were used to both construct the survey and interview questions and in part to analyze the transcripts. For example, responses to certain questions were analyzed according to the criteria in Table 1, which helped me to posit a grounded finding of whether or not a certain water resource

management strategy was or was not likely to foster sustainable water use according to the sustainability criteria in Table 1. Upon the collection and analysis of the survey results and interview transcripts, I triangulated data from surveys, interviews, and content analysis of pertinent research related to water resources planning and management to produce a rich dataset to help me answer, or at the very least, shed light upon my research questions.

While non-probability expert and snowball sampling helped me target the desired informants, such methods can increase the risk of overweighting subgroups that are more accessible. The potential negative effects of this were minimized by ensuring a geographically stratified sample that included informants from a variety of public and private organizations. All informants provided consent prior to interviews and surveys, and the university's Institutional Review Board granted permission to proceed prior to interaction with informants; there were virtually no risks or benefits to the participants for participating in this study. Once the questions and protocol were developed, they remained static throughout the process to minimize variability and increase validity.

Since the sampling frame includes a highly targeted group of experts, data integrity was a priority. This particular research afforded me with ample time to ensure integrity since the sample size is relatively small. After the surveys were completed, the results were analyzed and stored in a safe and secure environment. I transcribed interviews immediately following the interview process, and due to the high quality of the recordings, the transcriptions are accurate and valid. Interview transcripts are also stored on a secure, backed up computer.

Due to the contentious nature of the ACF Water Wars, particularly in a legal sense, and the high profile status of some participants within select government and non-government organizations, anonymity was ensured for all survey and interview participants. However, some participants agreed in writing to be identified within this research in an effort to increase the validity of the results. These participants are identified throughout, while the remainder remain anonymous.

RESULTS

Surveys

The sampling frame for potential survey respondents consisted of 80 individuals throughout the ACF Basin. Thirty individuals began the survey, however, only 20 respondents completed the survey, a response rate of 25%. Surveys were sent between 25 October 2012, and 22 February 2013 in multiple waves as the initial sampling frame of 35 individuals was expanded to include 80 individuals.

The survey questions were designed to shed light on my research questions: namely, what are the perceptions among water experts of the potential effectiveness of the Georgia Water Stewardship Act and the Metro Plan? What do these people think about current water policy in the State of Georgia and the ACF Basin? Do they think the new policies and plans will precipitate the transformative change required to set the ACF Basin on the soft path to water resources sustainability? Respondents were asked to rate their reaction to the Georgia Water Stewardship Act (WSA) on a five point scale as follows: ‘very positive,’ ‘positive,’ ‘neutral,’ ‘negative,’ ‘very negative.’ As seen in Figure 3, 70% of the respondents rated their reaction to the WSA as either positive or very positive. Of these 70%, the respondents were well stratified throughout the basin, indicating a positive reaction to the legislation from all sub-basins. Thirty percent of respondents indicated a neutral reaction to the legislation, and these individuals also represent all sub-basins.

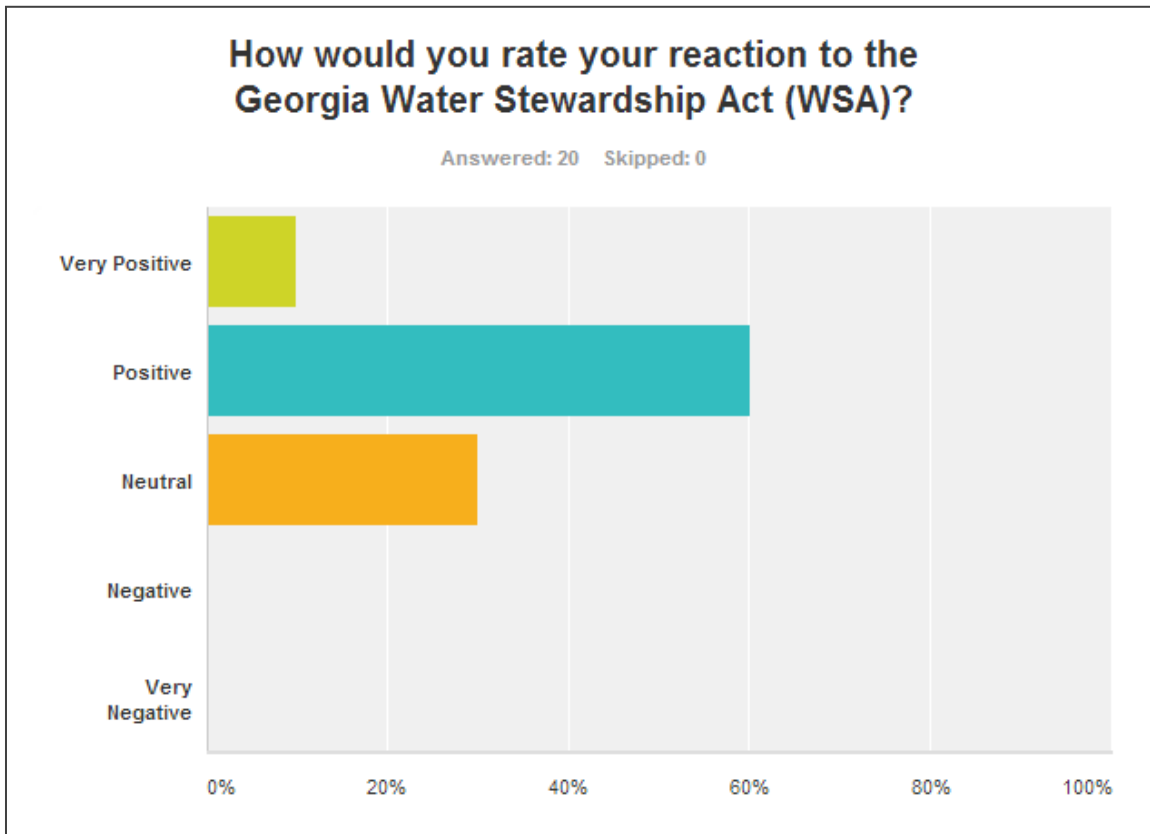


Figure 3: Reaction to the WSA.

Participants were then asked how much impact they believed the WSA will have on water resources planning and management in Georgia. Sixty percent believe the WSA will have a minor impact on water resources planning and management in Georgia, while 40% believe it will have a significant impact. There is no clear geographic pattern of the respondents for this question (Figure 4).

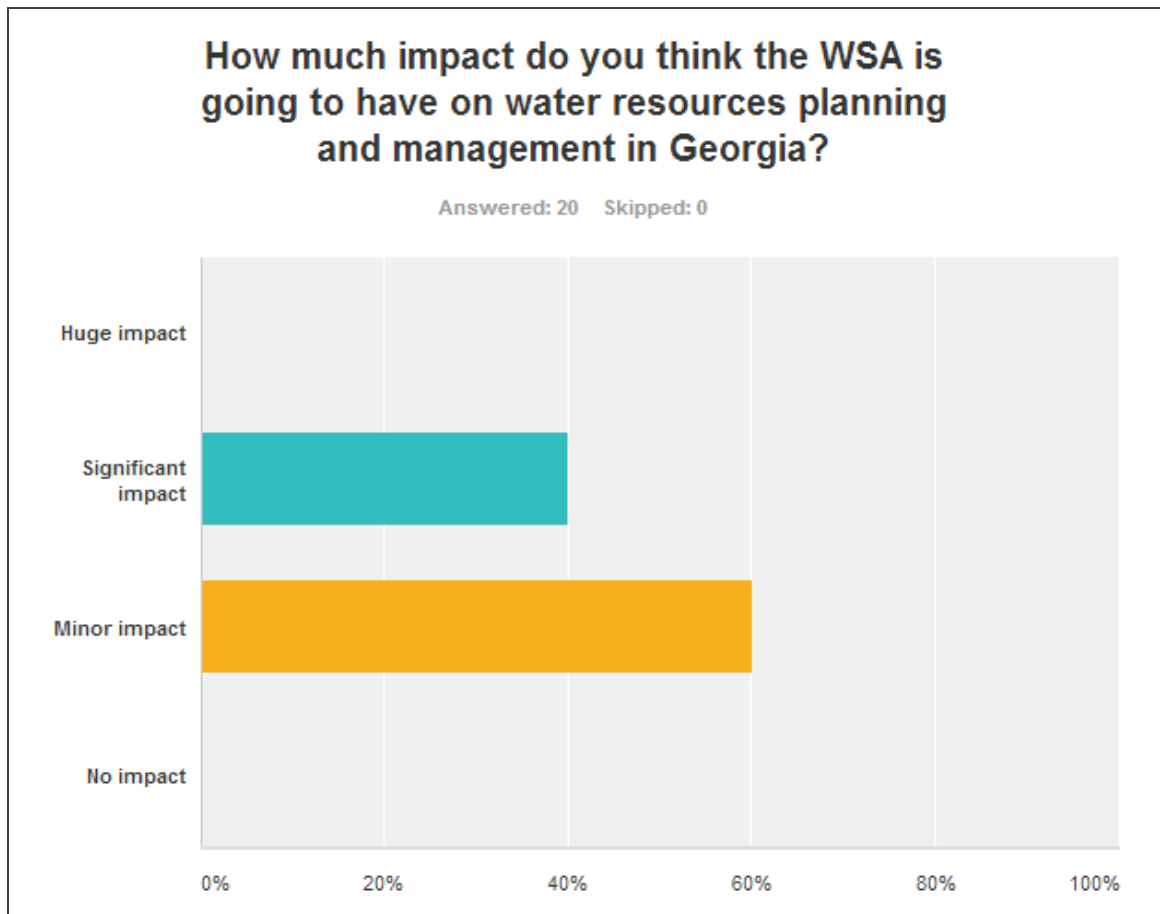


Figure 4: Impact of the WSA on water resources planning and management in Georgia.

The next question (Figure 5) asked respondents, “In your opinion, how likely is it that the WSA will be effective in mitigating the ACF Water Wars between Georgia, Florida, and Alabama?” Suggested responses ranged from ‘very likely’ to ‘not at all likely.’ Thirty percent of respondents indicated that it was not at all likely, 65% believe it is only slightly likely, and one person indicated that it was somewhat likely. Zero respondents believed it was very likely.

The next series of questions asked respondents to rate the effectiveness of several mechanisms within the WSA with regards to their potential to cause a shift towards a “culture of conservation” of water resources in Georgia (Table 2).

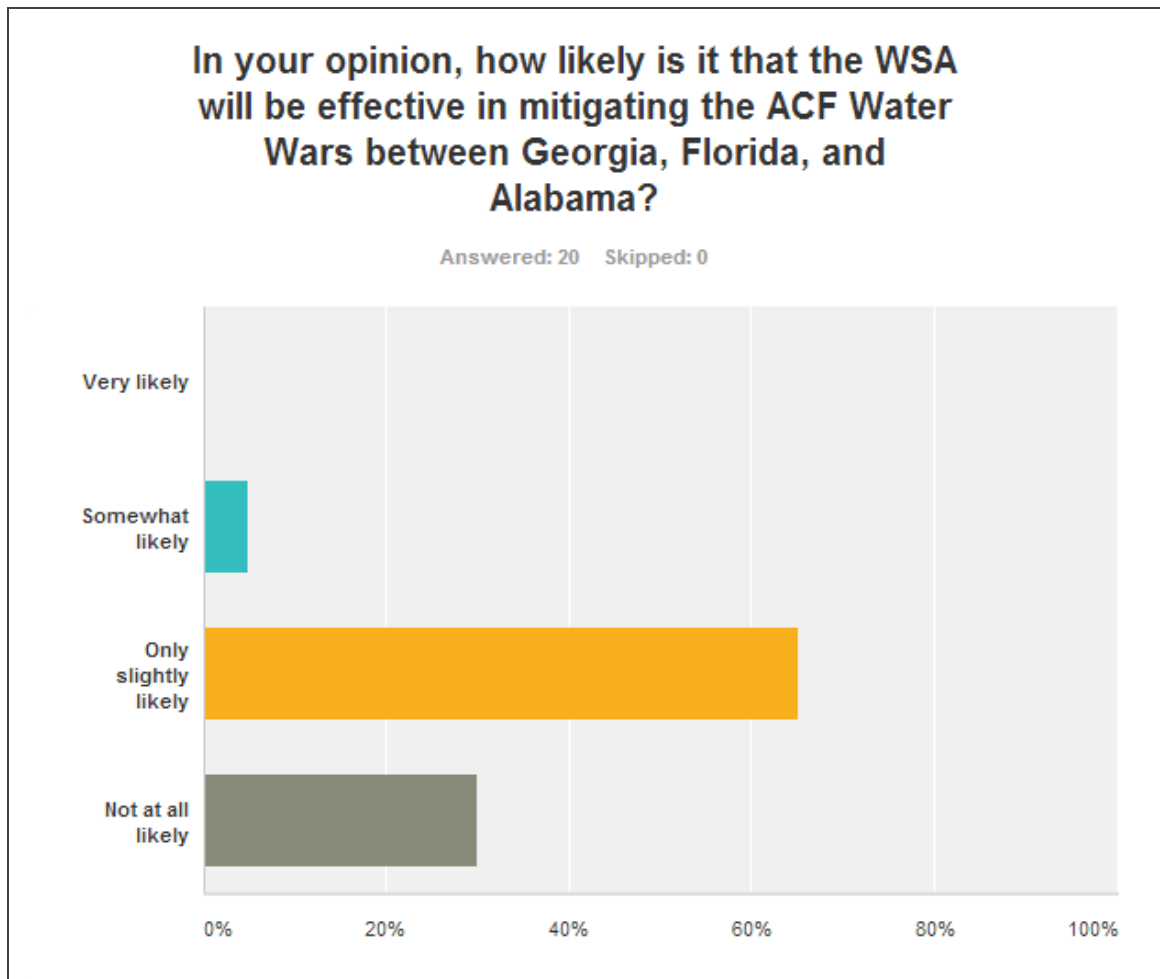


Figure 5: Likelihood of the WSA in being effective in mitigating the ACF Water Wars

The first mechanism is the requirement that new commercial and residential construction must install water efficient fixtures such as toilets, faucets, shower heads, and urinals. Eighty percent either agree or strongly agree that this mechanism will be effective in creating a culture of water conservation, while 10% either disagree or strongly disagree. An additional 10% of respondents were neutral regarding this mechanism. The second mechanism is the requirement that new industrial construction must install efficient cooling towers – 75% of respondents either agreed or strongly agreed that this requirement will be effective in creating a culture of conservation.

Table 3: Participant perceptions of WSA’s ability to foster a ‘culture of conservation.’

Table 3	Mechanism will be effective in creating a ‘culture of conservation’ with regards to water use. (Numbers in the cells represent the number of respondents.)				
WSA Mechanism	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
New commercial and residential buildings must install water efficient fixtures	1	1	2	13	3
New industrial construction must install efficient cooling towers	1	0	4	13	2
State agencies must create incentive programs (i.e. retrofits)	0	1	3	10	6
The GA EPD must set “standards for water loss and leak detection”	0	2	2	11	5
Outdoor watering is limited to between 4pm and 10am	2	2	6	7	3
Track agricultural water permits; unused water reverts back to the state.	2	3	8	5	2

The next mechanism is the requirement that state agencies must create incentive programs for conservation such as retrofits, conservation pricing, and grey water use. Retrofitting in this context means to replace, change, or modify older plumbing fixtures in both commercial and residential buildings with those that are more efficient. Grey water use means the reuse of household wastewater that generally does not contain water from toilets. Eighty percent of respondents either agree or strongly agree that this requirement will be effective in creating a culture of water conservation in the State of Georgia.

The next mechanism is the requirement that the Georgia Environmental Protection Division (EPD) must set standards for water loss and leak detection for all medium and large public water systems. Again, 80% percent of respondents either agree or strongly agree, while only 10% disagree that this requirement will be effective in creating a culture of water conservation in the state.

The next mechanism in the WSA is a requirement to limit outdoor watering between the hours of 4 p.m. and 10 a.m. Half the respondents either agreed or strongly agreed that this will be effective in creating a culture of water conservation, while 20% either disagreed or strongly disagreed. Thirty percent neither agreed nor disagreed. In terms of the WSA's requirement for the state to track unused water withdrawal permits for agriculture purposes, and to establish a process for returning unused water allocations back to the state—35% either agree or strongly agree while 25% disagree or strongly disagree that this requirement will be effective in creating a culture of water conservation in Georgia. There was no clear geographic pattern for this disparity in perception. Forty percent of respondents were neutral.

The final mechanism discussed within the survey was the requirement for the state to establish a Joint Committee on Water Supply to study the existing reservoir system and suggest options for water supply. Thirty percent of respondents either agree or strongly agree that this requirement will be effective in creating a culture of water conservation, while 50% of the respondents either disagree or strongly disagree, with the remaining 20% being neutral.

Next, respondents were asked how successful the WSA would be in restoring trust to the negotiations process, after having read that the breakdown in negotiations

between the three states was attributed in part to mistrust among the negotiating parties (Leitman, Personal Communication). As seen in Figure 6, 75% believed the legislation would have no impact on the negotiations between Georgia, Florida, and Alabama. Twenty percent believed it would be somewhat successful in restoring trust, while one respondent believed it would be disadvantageous in restoring trust among the negotiating parties.

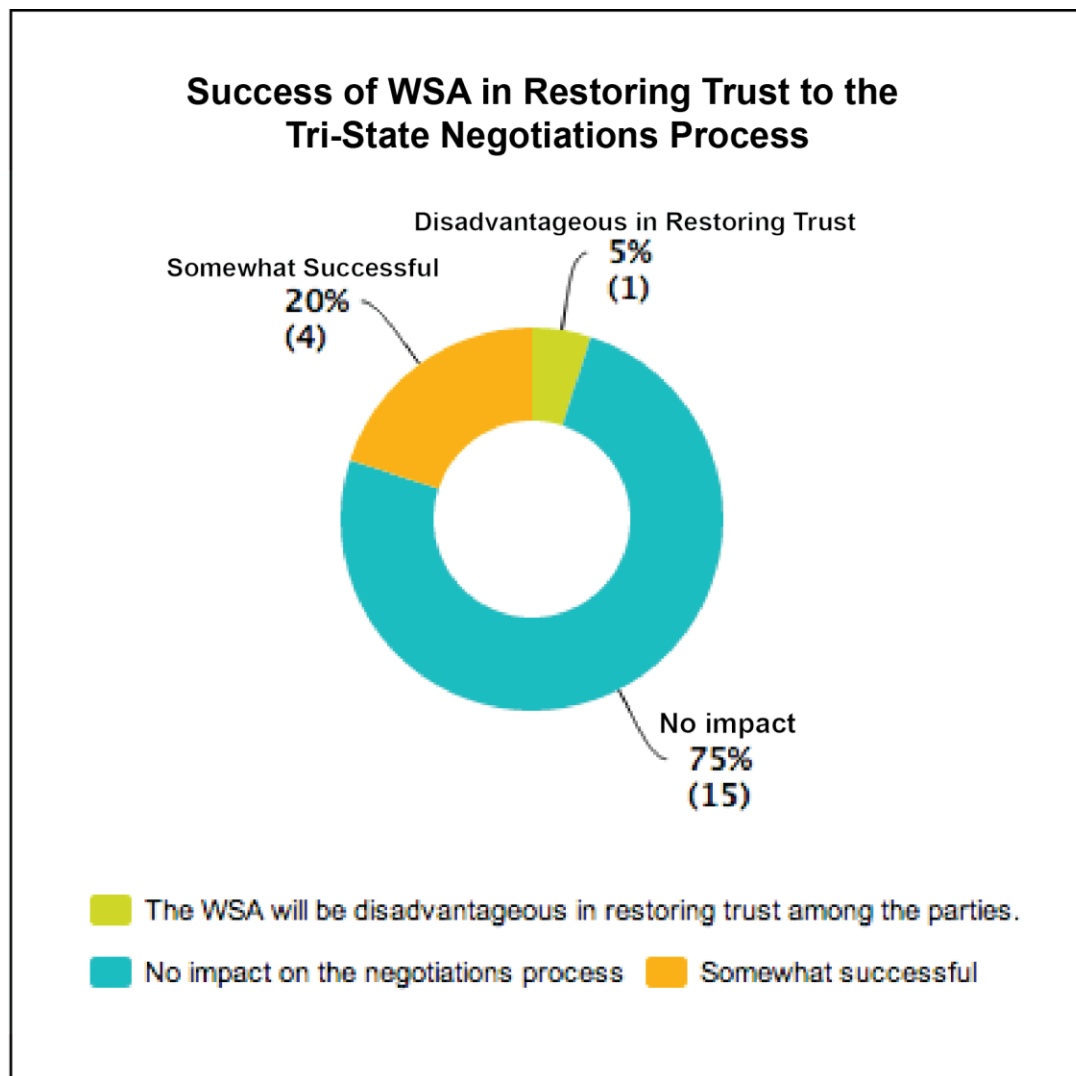


Figure 6: Success of WSA in restoring trust in the ACF negotiations process.

In an effort to shed light on the other key policies in the state pertaining to water resources planning and management, participants were asked their opinion on which will

be the most effective piece of policy in setting the ACF Basin on a path to water resources sustainability. Participants were given the options of the ‘WSA,’ the ‘Metro Plan,’ ‘none of the above,’ or ‘other.’ Ten percent responded that the WSA would be most effective while 15% believe that the Metro Planning District Water Supply and Conservation Plan (Metro Plan) would be most effective. All respondents who replied that the Metro Plan would be most effective are located in Metro Atlanta. Thirty percent responded “none of the above,” and the remaining 45% percent responded “other” – these respondents listed what they thought would be most effective in setting the ACF Basin on a path to water resources sustainability. Respondent 18 calls for “a comprehensive river basin commission, much like the Delaware or Colorado, which is currently being established through the auspices of the ACF Stakeholders group.” One state official from Florida related that in order to set the ACF Basin on a path to water resources sustainability, demand side reductions are needed for both municipal and industrial uses as well as significant increases in all water conservation practices.

The next question was open-ended and asked respondents if there “are any glaring omissions in the Water Stewardship Act.” Fifteen percent of the respondents simply responded, “no” or “none comes to mind.” One respondent replied, “probably,” and one had no comment. Open-ended responses included the need to better address agriculture and the need for substantive elements that would provide “teeth” to the legislation. Some respondents also commented on the relatively weak outdoor watering restrictions.

According to Tom Swihart, who is from Florida, there is “no commitment to adopting of [sic] suitable ‘minimum flows,’ no recognition of the need for a water use fee, no call for eliminating agricultural subsidies that drive patterns of high water use.” Laura Hartt, from

the Chattahoochee Riverkeeper, maintains, “There are far too many exemptions to the daytime outdoor watering restrictions for those to be effective. There is not enough focus on retrofitting existing homes and businesses. There is inadequate funding to support local government efforts to implement conservation and efficiency measures.”

Respondents were then asked to discuss what they thought were the most effective elements of the WSA. Four respondents commented that the water loss audits will be an effective requirement going forward. Others suggested that retrofits and changes to the plumbing code will be the most effective elements of the WSA.

The next question asked respondents if they think Metro Atlanta’s current freshwater usage is sustainable and allowed for open-ended comments. Forty-five percent of respondents believe water use in Metro Atlanta is currently sustainable and 55% rated Metro Atlanta’s use of freshwater as either not very sustainable or unsustainable. Of this 55%, just over three-quarters represent interests downstream from Metro Atlanta. Mike Thomas, general manager at the Clayton County Water Authority, maintains that Metro Atlanta’s use of freshwater is sustainable, and points out that “for the Clayton County Water Authority, our demand peaked in the year 2000 and has steadily declined ever since despite continued service area population growth.” Indeed, this confirms another respondent’s claim that some water providers are better than others within the Metro District’s boundaries in terms of conservation and efficiency. However, without unified requirements throughout the Metro District, the disparity in effectiveness, and perception of effectiveness among water providers may continue to grow. According to Respondent 18, “The future growth will not be met through building new reservoirs. An assessment

of conjunctive use alternatives is needed, along with a wastewater residuals analysis and reuse are key to finding a sustainable solution.”

The next series of questions were pulled from the Table 1’s criteria for sustainable water resource management and are used to gauge experts’ perceptions of the sustainability of water resources management in the ACF Basin. The first question asked respondents to rate their level of agreement with the following statement: “Current (including the WSA and Metro Plan) water resource management strategies within the ACF Basin maintains or restores the health of ecosystems within the basin.” As seen in Figure 7, 40% of the respondents strongly disagree with this statement. An additional 20% disagree and 30% neither agree nor disagree, while just 10% agree with the statement. Respondent 18 explains in the commentary that more than 95% of consumptive water use in the basin can be attributed to South Georgia’s agriculture, and that Florida’s focus on Metro Atlanta is misguided if the goal is to protect ecosystems. Instead, Respondent 18 contends that “Florida’s goal . . . is about strangling Atlanta’s economic growth (they want businesses to move there instead). Why else would they focus on Atlanta metro water use (which is a drop in the proverbial bucket), when the real problem is water use in South Georgia?” Towards that end, Woody Hicks, hydrologist at Georgia’s Joseph W. Jones Ecological Research Center at Ichauway in the Flint River basin, commented that the over-allocation of agricultural permits from both groundwater and surface water sources is significantly degrading the riverine ecology in the lower ACF, pointing out that endangered mussels are on the brink of extirpation in small tributaries. One respondent from Metro Atlanta maintains that the Metro Water Plan

takes a more holistic look at the watershed, but generally focuses more on mitigating damage than on restoring health.

The next question touches on water quality in the ACF Basin and asked respondents “Since the 1991 USGS Water Quality Study [Wangness and Frick, 1991], do you believe water quality issues in the basin have either gotten worse, stayed the same, or gotten better.” Of the 19 responses to this question (one respondent skipped this question), 32% believe water quality has improved, 26% believe it has stayed the same, and 11% believe it has gotten worse. Of the 32% (seven respondents) that believe water quality has improved, six are located in Georgia within either the Chattahoochee or Flint Sub-basins. The remaining 31% chose to provide an open ended response to provide a more nuanced picture of water quality issues in the ACF Basin. In particular, one water resources expert from the Middle Chattahoochee basin related that the river is in better condition now than it used to be in terms of most pollutants, but there are legacy pollutants, including PCBs and Chloridine, that will take years to work themselves out of the river because they cannot be practically removed. Other respondents contend that there has been improvement in some places due to lawsuits by Georgia environmental advocates, while some agricultural areas remain unchanged (Respondent 18).

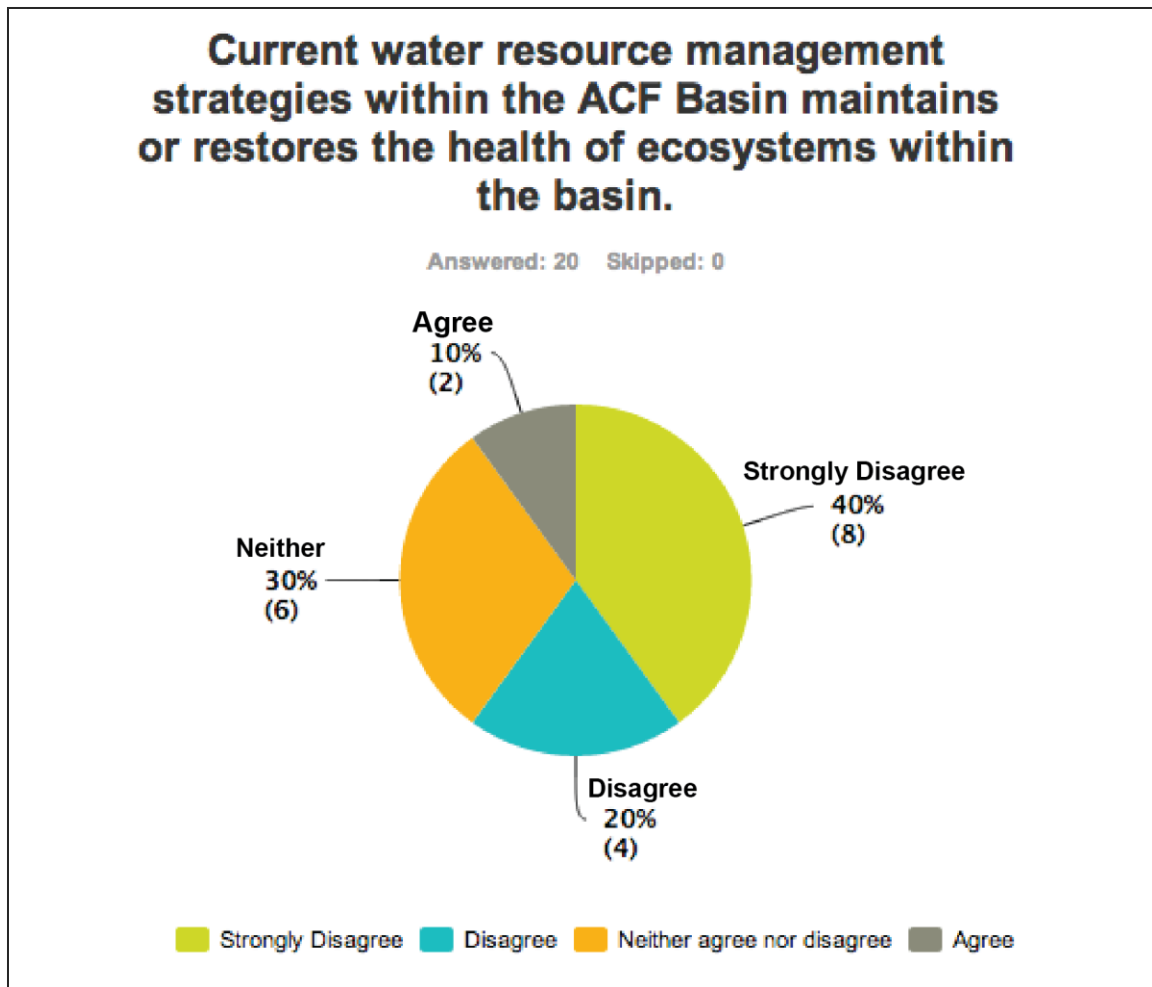


Figure 7: Ability of current water management strategies to maintain ecosystem health in the ACF Basin.

The respondents were then asked to rate their level of agreement that the WSA and Metro Plan have the capacity to alleviate water quality issues within the basin (Figure 8). Forty percent of the respondents either disagree or strongly disagree that the WSA and the Metro Plan have the capacity to alleviate water quality issues within the basin, while 25% would agree. Of the 25% that agree, 80% are located within the Upper Chattahoochee Sub-basin. Thirty-five percent of the respondents neither agree nor disagree. Respondent 18 related that “...the biggest water quality issues have nothing to do with Atlanta. Both water quality and quantity are dominated by agricultural water use, and there is no mechanism to manage ag water use in Georgia.”

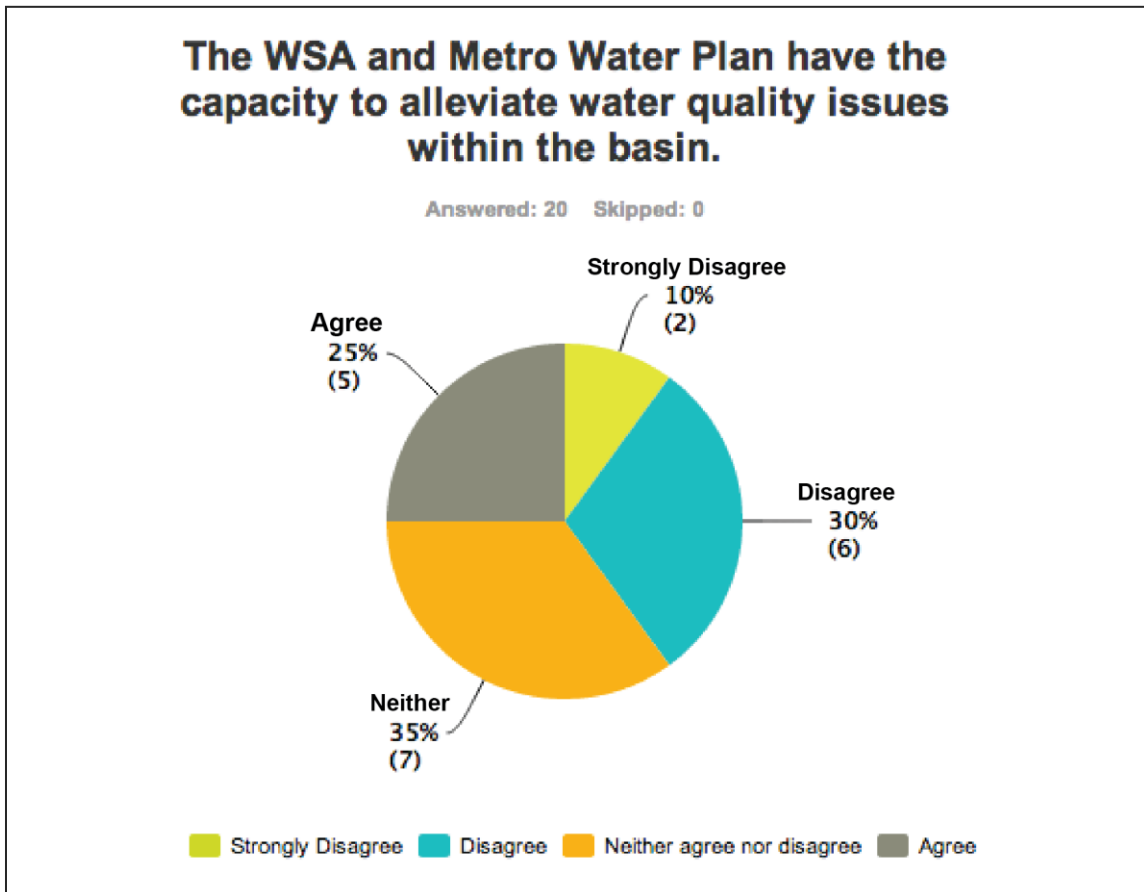


Figure 8: Capacity of the WSA and Metro Plan to maintain standards of water quality.

The next question asked respondents to rate their level of agreement with the following statement, “The data and other information on the availability, use, quality, and quantity of water in the ACF Basin is adequate for public participation and awareness.” As seen in Figure 9, 45% of the respondents throughout the ACF Basin agree with this statement, while 35% disagree and 10% strongly disagree. The remaining 10% neither agree nor disagree.

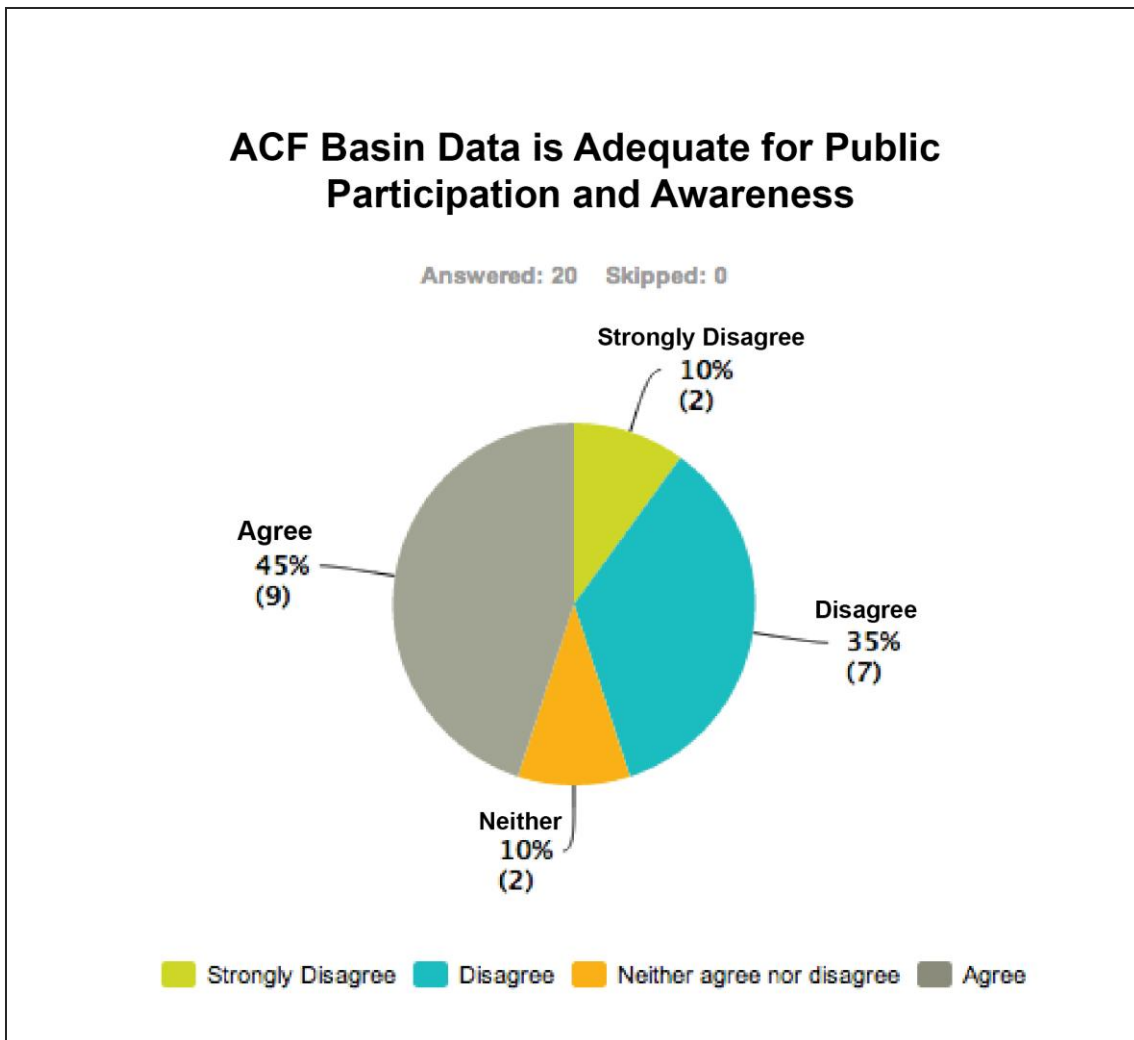


Figure 9: ACF Basin data availability and accessibility.

This question also generated significant commentary. Florida’s Tom Swihart maintains that “this is not an information deficit problem. People know very well the scale of ongoing disturbance of water resources and other natural system components. It is a mixed values and legal question at this point.” Other respondents agree that there is ample data available for public consumption, but Wilton Rooks with ACF Stakeholders and the Lake Lanier Association suggests that “it is a matter of presenting the data in a form that the public can understand.” Respondent 11 confirms that there is plentiful data

available to the public, but “a lot of digestion is required. There is no single source where a member of the public can go and get their mind completely around the issues.”

The following two questions gauge respondents’ perceptions of the impact of Georgia water policy on interbasin transfers (IBTs). The first asks if the WSA will prevent or reduce the need for future interbasin transfers. Fifty percent of the respondents either disagree or strongly disagree that the WSA will prevent or reduce the need for future interbasin transfers. Twenty-five percent agreed that the WSA will prevent or reduce the need for future interbasin transfers and the remaining 25% neither agreed nor disagreed.

The follow up question regarding IBTs asks respondents whether or not they agree, and to what extent, with the statement that the Metro Planning District Water Supply and Conservation Plan will prevent or reduce the need for future interbasin transfers. Again, 50% of the respondents either agree or disagree with this statement. Thirty-five percent agree, while 15% neither agree nor disagree. In their commentary, half of the respondents clarified that it will reduce the need, but generally will not prevent new IBTs. One respondent maintains that “there is a limit to how much Atlanta can conserve. Since it only uses 250 cfs now, it is impossible to ‘conserve’ enough to significantly reduce that amount. The majority of the water in the Chattahoochee above Atlanta flows right on by Atlanta to meet downstream user needs. The focus should be on all users taking action to reduce water consumptive use.”

The next question asks respondents if there are specific changes that would make the WSA stronger. One respondent was not certain, two had no comment, two simply state that there were no specific changes that would make the WSA stronger, one

respondent said yes but did not elaborate further. The remaining fourteen provided a series of suggestions such as more strict outdoor watering restrictions including limiting the number of watering days per week, and developing specific funding mechanisms for local governments to implement additional conservation measures. Other suggestions include establishing tradable water withdrawal and water quality permits, more significant controls on agricultural water use, and implementation of Low Impact Development (LID) best practices.

Next, respondents were asked; “How likely is it, in your view, that the WSA will mitigate downstream ecological problems caused by overusage of water upstream?” Eighty-five percent responded that it was not very likely or not at all likely. Three respondents believe it is likely, two of which represent the Upper Chattahoochee Basin, the other representing the Flint. Two respondents brought the focus back to agriculture, stating that agriculture is the issue, not urban use.

The following two questions focus on the planning processes that led to the creation of the WSA and the Metro Plan. The first question asked respondents to rate the planning process that led to the WSA in terms of how democratic and participatory it was, with 1 being the least democratic/participatory and 5 being the most democratic/participatory. The average rating on this question was 3.14. Figure 10 further suggests that respondents were almost evenly divided on this question.

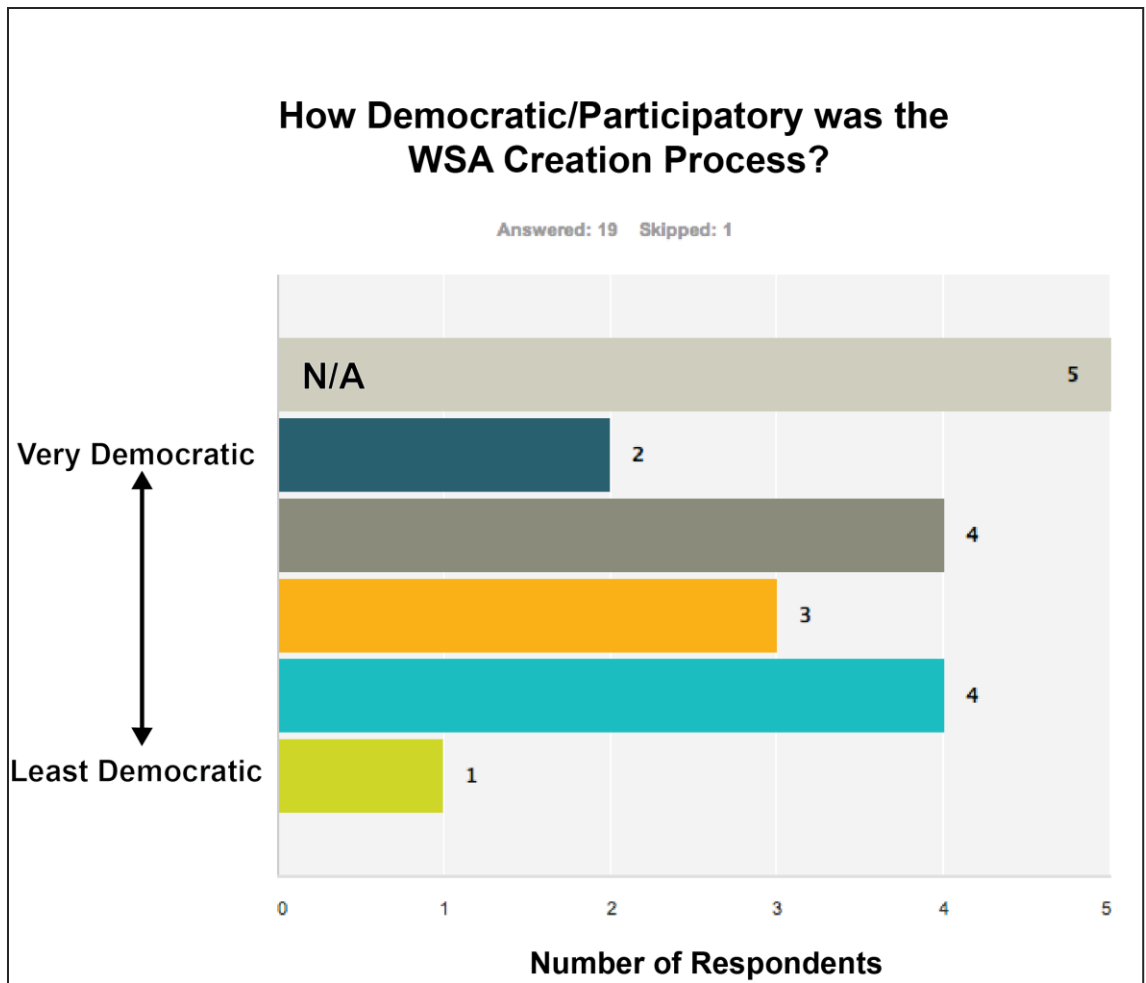


Figure 10: Expert perceptions of democratic/participatory nature of the WSA creation process.

The second question asked respondents to rate the planning process that led to the creation of the Metro Plan, with 1 being the least democratic/participatory and 5 being the most democratic/participatory. The average rating for this question was 3.21, and Figure 11 shows that respondents were mostly evenly divided in their views of the process for creating the Metro Plan.

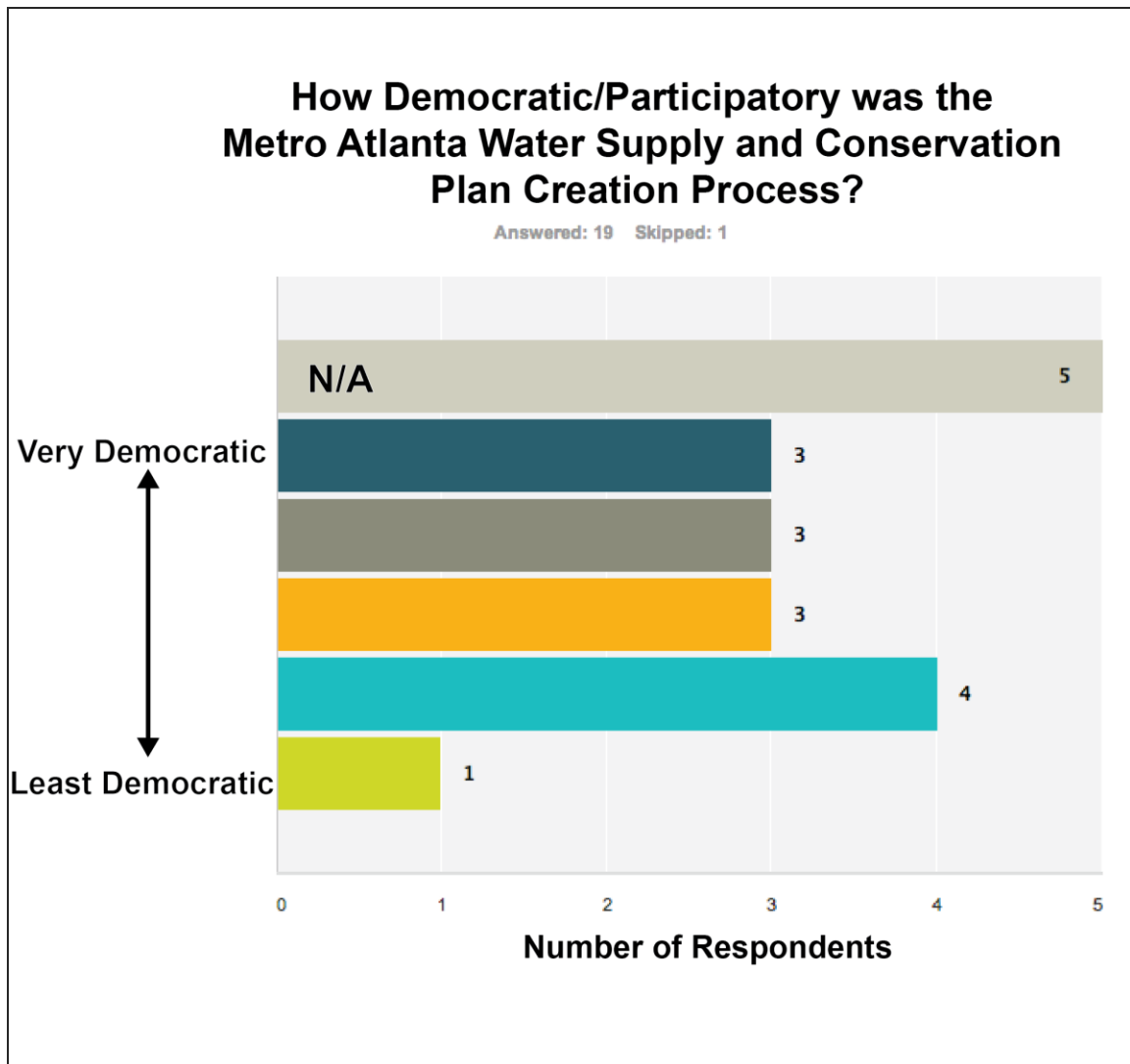


Figure 11: Expert perceptions of democratic/participatory nature of the Metro Plan creation process.

Respondents were then asked a series of questions relating to the dichotomy of hard path versus soft path in water resources management. To ensure that the respondents understood these terms, it was explained that the soft path represents demand-side solutions and adaptive management that allows for incremental changes to policy to incorporate new data and models; whereas, the hard path represents more supply-side solutions (i.e., more reservoirs, interbasin transfers, and other structural solutions) (Gleick *et al.*, 2003).

The respondents were then provided with the following statement, and were asked to relay their level of agreement: “Metropolitan Atlanta is currently on a ‘soft path’ for water resources management.” Fifty percent of the respondents either strongly disagree or disagree with this statement, and this 50% are well stratified throughout the basin. Twenty-five percent (also representing all sub-basins) agree, and the remainder neither agree nor disagree (Figure 12).

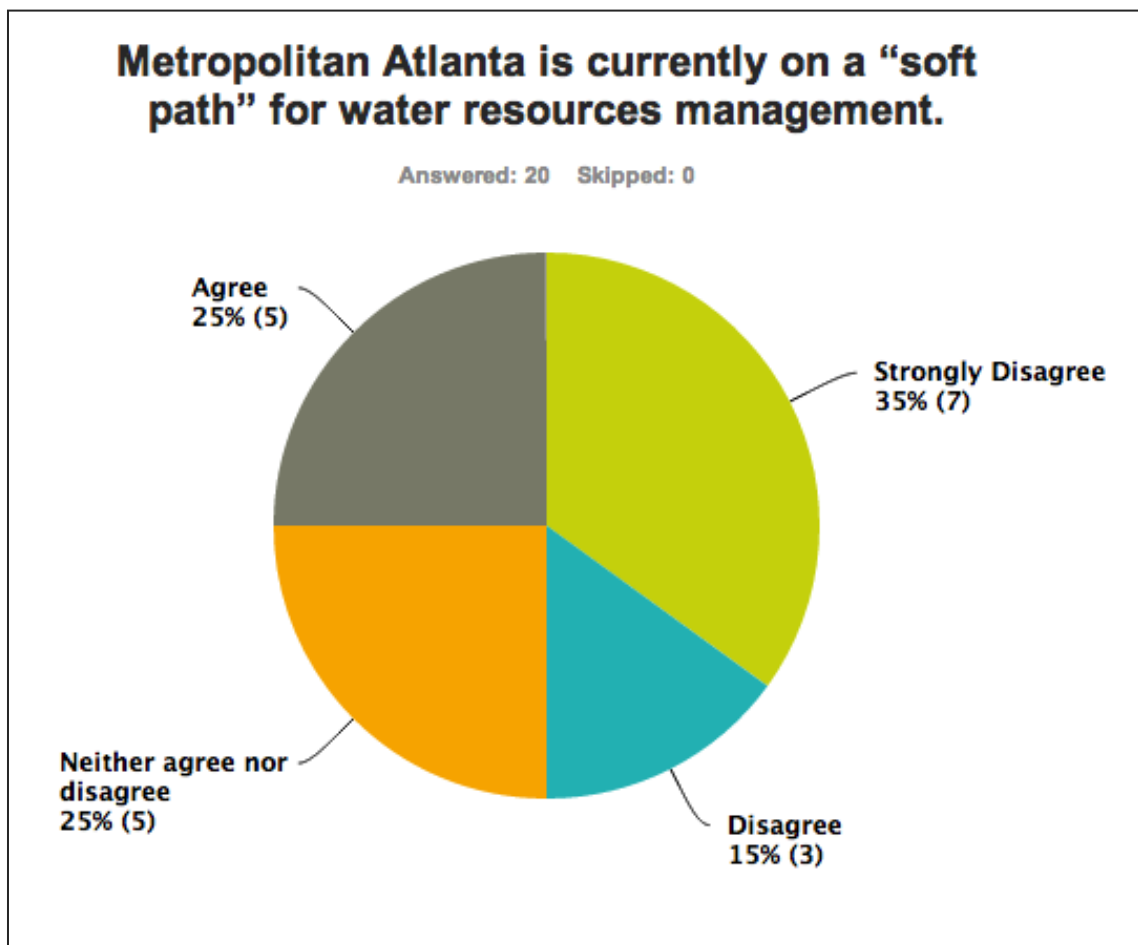


Figure 12: Metropolitan Atlanta and the soft path for water resources management.

The next question asked respondents whether or not they agree that Metropolitan Atlanta is currently on a “hard path” for water resources management (Figure 13). Sixty percent of respondents either agree or strongly agree with this statement, 30% neither agree nor disagree, and 10% disagree. Of those that agree Metro Atlanta is currently on a

hard path for water resources management, three represent interests within the Upper Chattahoochee basin, two represent interests within the Flint River basin, and three represent interests within the Apalachicola River basin. Zero respondents strongly disagree with this statement.

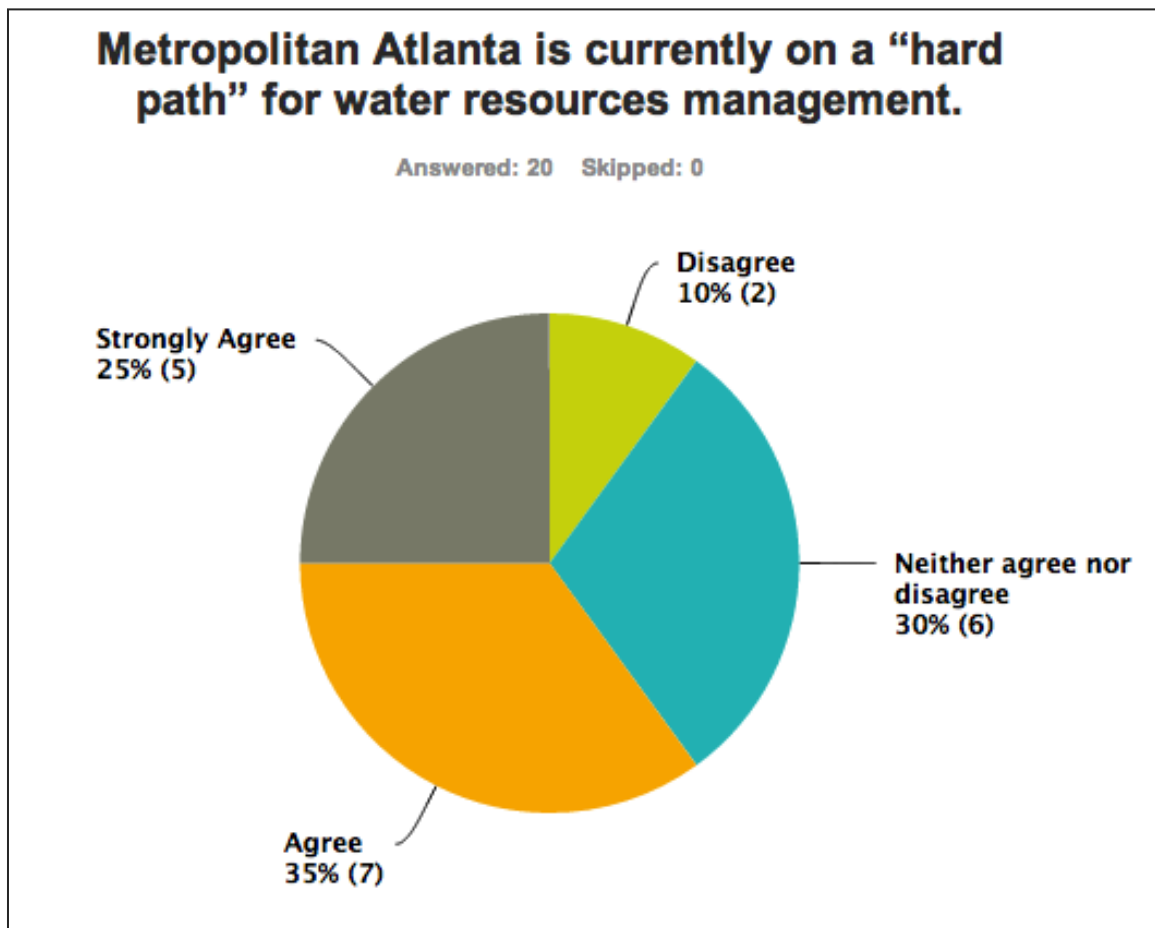


Figure 13: Metropolitan Atlanta and the hard path for water resources management.

The next question asked whether or not respondents agree with the statement that the WSA will significantly help Metropolitan Atlanta get on a soft path for water resources management (Figure 14). Forty percent either disagree or strongly disagree with this statement, 25% agree with this statement, and 35% neither agree nor disagree. Respondents were then asked whether or not they agree that the Metro Water Plan will

significantly help Metro Atlanta get on a soft path for water resources management. Fifty percent neither agree nor disagree with this statement, while forty percent either disagree or strongly disagree and 10% (n=2) of the respondents agree with the statement that the Metro Water Plan will help shift Metro Atlanta towards a soft path for water resources management (Figure 15). Both respondents who agree are located within the state of Georgia; one within the Upper Chattahoochee Sub-basin and the other represents a University located outside of the ACF Basin.

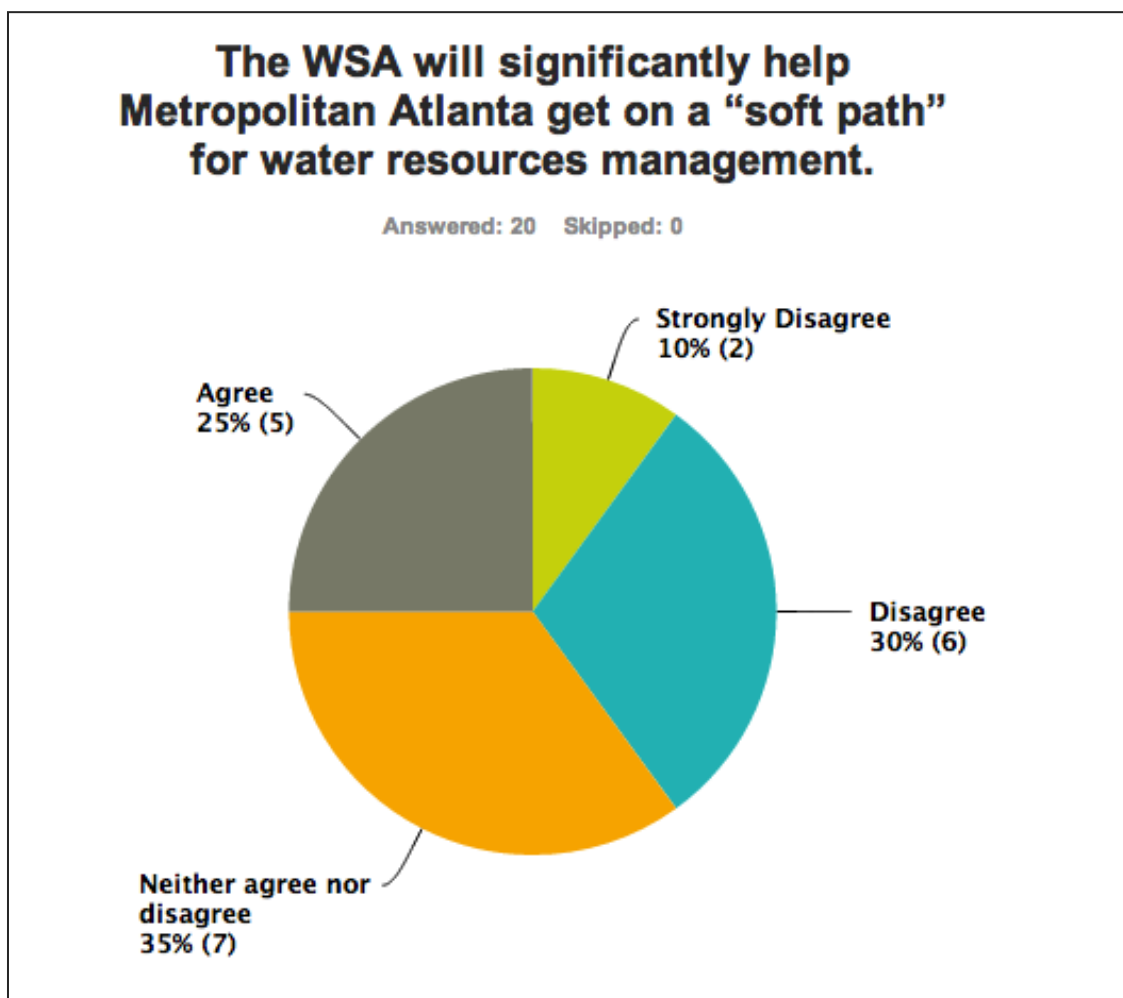


Figure 14: Impact of the WSA on Metro Atlanta’s water management path.

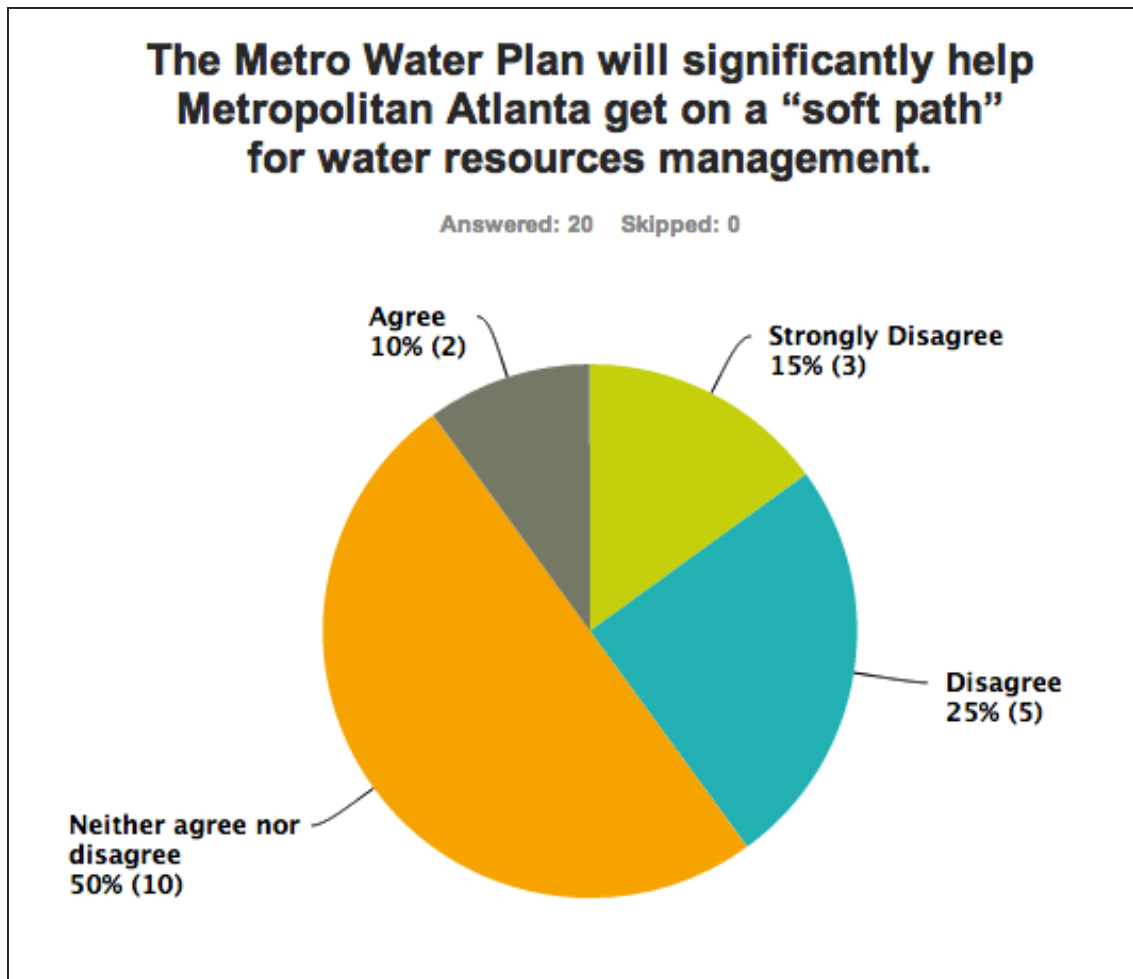


Figure 15: Impact of the Metro Water Plan on Metro Atlanta’s water management path.

The final survey question was open ended and broadly asked respondents “What actions are needed in order to best set Metropolitan Atlanta and the ACF Basin on a path to water resources sustainability.” Thirteen respondents answered this question with a range of responses. Glen Page, general manager of the Cobb County-Marietta Water Authority, calls for a “consistent, non-reactionary, goal-driven direction of the region” and “increasingly stakeholder-driven solutions.” Woody Hicks with the Jones Ecological Center in South Georgia also calls for a stakeholder driven water plan that is agreed upon by the three states. Respondent 11 contends that funding of conservation and efficiency

measures are needed in order to best set Metro Atlanta and the ACF Basin on a path to water resources sustainability.

Interviews

In an effort to produce a more substantive analysis of Georgia's water policy and its implications in the wider context of the ACF Basin, I conducted eleven in-depth phone interviews with participants from throughout the ACF Basin between 15 May and 8 August 2013. The duration of most interviews was between one hour and one and a half hours. All of these participants were among the water experts who participated in the initial survey. Four represented the Upper Chattahoochee (Atlanta area) sub-basin, two represented the Lower/Middle Chattahoochee sub-basins, three represented the Flint River sub-basin, and one represented the Apalachicola sub-basin. The final interviewee is involved in academia in Florida but is located outside of the Apalachicola sub-basin. A breakdown of interview participants by name (if permitted), interest, organization (if permitted), and sub-basin represented is provided in Appendix C.

The range of interests represented by the interview participants include: conservation, recreation, economic development, community development, water supply, local government, water policy, and academia. Attempts were made to conduct interviews with members of the agricultural community, but I was unable to obtain an interview with an expert representative of this interest. Organizations that are represented include: the Chattahoochee Riverkeeper, Lake Lanier Association, Cobb County-Marietta Water Authority, Clayton County Water Authority, Alabama Office of Water Resources, the City of Columbus, Georgia, Jones Ecological Center (located in the Flint Sub-basin),

the Florida Department of Environmental Protection, and the University of Florida. Some respondents agreed to be identified within the study, while some chose to remain anonymous.

Since expert sampling was used, it would have been desirable to obtain permission to identify all participants so as to increase validity; however, due to the contentious nature of the ACF Water Wars, and in particular, the ongoing litigation that continues as of March 2014, it is not surprising that some participants chose to remain anonymous. Additionally, the ongoing litigation is very likely a predominant factor in explaining the rate of non-response for both survey responses and interview participation. Out of an initial sampling frame of 80 individuals, 20 completed the online survey, and of this 20, 11 agreed to participate in a follow up interview.

The interviews were recorded using Google Voice and later transcribed using a web-based transcription tool called Transcribe (Wreally Studios Ltd., <https://transcribe.wreally.com/>). The interview transcripts were systematically analyzed to outline various themes as they relate to the research objectives. Descriptive coding was used to highlight key themes in both interview transcripts and open-ended survey questions (Saldaña, 2009). The transcription process resulted in approximately seventy-three pages of data. First, the transcripts were read for comprehension and to facilitate a general understanding of the data. Then, transcripts were re-read and interesting and recurring themes were highlighted. To better analyze the range of attitudes and perceptions among the interview participants to a certain question, a large spreadsheet was developed that allowed for the analysis of key themes and quotes to a particular question. Simultaneously, a collection of “analytic memos” was developed as emergent

patterns, themes, and concepts were recognized in the data (Saldaña, 2009). This collection of notes was initially integrated into early drafts of this thesis, and key themes developed around these in the discussion section of this document. Ultimately, perspectives of interviewees are as divergent as the interests in the basin. However, common themes and interesting notions did emerge and will be discussed in detail in the following section.

DISCUSSION

Georgia's water policies were evaluated using the survey and interview results and compared against Table 1 (Criteria for a sustainable approach to water management). The Georgia Water Stewardship Act (WSA) and the Metropolitan Atlanta Planning District's (District) Metropolitan Atlanta Water Supply and Conservation Plan (Metro Plan) were the two primary pieces of policy evaluated in this research. Thus, the geographic area (and political entity) of focus often switched from Metropolitan Atlanta to the State of Georgia, and then ultimately to the ACF Basin. Some participants expressed sharp disagreement with regard to the role of Metropolitan Atlanta in the ACF Water Wars, and these varying opinions will be discussed as well.

Perceptions of the 2010 Georgia Water Stewardship Act

There is general agreement that, at the very least, the WSA is a step in the right direction. Seventy percent of survey respondents reacted either positively or very positively to the WSA. Yet there is also general agreement that the WSA does not do enough to achieve results in streams. According to Interviewee 8 from Georgia, and representing the Flint River basin in Georgia, "What's lacking in Georgia water policy is a focus on keeping healthy flows in the streams and rivers . . .the WSA goes a long ways towards conservation and efficiency, but it doesn't focus on the result that matters most, which is the result in the flowing body of water."

The WSA is perhaps more effective as a symbolic gesture designed to help generate a shift towards water conservation in Georgia. According to Woody Hicks, from the Joseph W. Jones Ecological Research Center in the Flint River basin, “Folks in Atlanta have begun the paradigm shift away from the unlimited water mentality . . . it will take a while, but legislation like the WSA will eventually produce a more conservation minded community.” According to Tom Littlepage, Branch Chief at the Alabama Department of Economic and Community Affairs (ADECA), Office of Water Resources, the WSA “represents certainly a very visible effort on behalf of the State of Georgia to institutionalize conservation concepts.” Others are less optimistic: according to one Georgia water expert I spoke with who represents the Upper Chattahoochee River sub-basin, “I don’t know if it’s enough to entirely shift [the state towards a ‘culture of conservation’] . . . The WSA was more of a gesture just to ‘check the box’ than it was to generate meaningful savings through aggressive conservation programs.”

Indeed, some of the dissatisfaction towards the WSA stems from the fact that the legislation omitted several policies that many observers agree contribute to water resources sustainability. These omissions range from more significant conservation measures to the blatant exemption of farmers and electric power producers from the requirements of the WSA, thanks to the power of their lobbies in Georgia. According to Wilton Rooks with the Lake Lanier Association and the ACF Stakeholders, “It’s very simple. It’s the power of lobbies and lobbyists . . . agriculture is a huge industry in Georgia, it’s the largest industry. As such, nobody in the State of Georgia wants to economically harm that industry...” Interviewee 8 from Middle Georgia (Flint sub-basin) maintains that the agriculture and power industries “need to be explicitly included . . .

what you have to overcome are some fairly powerful lobbies in order to do that. Ag and energy need to be held to a standard; it might not be the same standard that M&I [municipal and industrial] are, but there certainly needs to be a standard.” Tom Littlepage from ADECA, Office of Water Resources, adds “. . . if you look at the history of water resource management, particularly in the Southeast, I think the ag sector . . . wants to make sure that they aren’t arbitrarily mistreated or unfairly prioritized in a lower fashion than other needs, and historically [they] have had the ability to ensure that legislation didn’t jump in and create arbitrary impacts.” What has resulted is what some would consider an unfair and disproportionate impact to the residential sector. According to Laura Hartt, Chattahoochee Riverkeeper (Metro Atlanta), “When you actually look at what the restrictions are, there are huge . . . exemptions in the Act, so a lot of large water use gets a pass . . . Most of the restrictions are really on single family households, not so much on the other water users throughout the state.”

Water Policy in Metropolitan Atlanta

Some participants adamantly pointed out that Metropolitan Atlanta was already ahead of the WSA with the creation of the Metro Planning District and the Metro Water Plan. “Metro Atlanta was already ahead of the WSA . . . this kind of caught the rest of the state up [with Metro Atlanta]” (Interviewee 3, State of Georgia). Mike Thomas, general manager with the Clayton County Water Authority maintains, “I don’t believe it provided anything that we didn’t already know and have available to use; it is kind of forcing some of the laggards to get on board.” Glen Page, general manager with the Cobb County-Marietta Water Authority, believes the bigger step that was needed to shift the state

towards a ‘culture of conservation’ was “taken when the Metropolitan North Georgia Water District was created in the early 2000s that required our ongoing planning and commitment with mandatory conservation steps built into that for all of the member utilities of the District, which is over 100 in the 15 county region.” The Metro District released its original Metro Water Plan in September of 2003, which it updated in 2009. Furthermore, the District adopted a suite of amendments to its Water Plan in December 2010, approximately six months after the Governor signed the WSA. These amendments include the following measures (Metro District, 2010):

1. Each water provider must identify methods to reduce water loss in an expedited fashion based on knowledge of the distribution system. Water losses include real water loss from system leakage and apparent water loss from illegal water use, billing, and metering errors. The previous goal targets communities with water losses greater than 10%. These communities will cut the *difference* between their documented water loss and a presumably more acceptable water loss of 10% in half by 2035 (for example, a water provider with a 16% water loss would reduce water loss by 3% by 2035).
2. Implement a program to convert older, inefficient toilets to high-efficiency toilets (HET) in multi-family homes (e.g. apartments, townhomes, and condominiums).
3. Develop a point of use leak detection program to notify customers of possible leaks using the most appropriate meter technology.
4. Adopt an ordinance or policy to meter private fire lines in commercial buildings to identify and reduce improper water use, resulting from either leaks or unlawful use of water from fire lines for non-fire related purposes.

5. Provide sufficient funding and staffing in local governments to implement all required water conservation measures. Responsible parties include Metro Chattahoochee River and Lake Lanier water systems.

6. Adopt a water waste policy or ordinance to reduce outdoor water waste. Noncompliance with such provisions may be treated as a municipal code violation. Violators should be warned and could potentially be subject to monetary penalties or termination of water service.

Perspectives of the effectiveness of these amendments were varied, much like the responses to the WSA, but generally respondents believe these are good measures, even if they are just an incremental step on the path to water resources sustainability in Metropolitan Atlanta. According to Mike Thomas, “They’re another incremental step. . . they’re going to have varying effectiveness. Some utilities will have already implemented those measures and some haven’t. And some of those amendments are kind of a voluntary thing.” Indeed, the language included in Metro District’s 2010 amendments include verbiage such as “should” as opposed to more definitive language such as “shall.” For example, action item 5.14 – Multi-Family HET Rebates states “each local water provider *should* offer a program to convert older, inefficient toilets . . . to a 1.28 gallons per flush (gpf) model for multi-family properties built in or prior to 1993 within their community” (Metro District, 2010) [emphasis added]. Additionally, the amendments state that “local water providers *should* implement a strategy to distribute, install, or provide incentive to replace higher flow fixtures in multi-family properties built in or prior to 1993” (Metro District, 2010) [emphasis added].

Interviewee 8 from Middle Georgia (Flint sub-basin) asserts that “there is no good enforcement mechanism, and so you continue to have counties like Fayette who are just not on board, where per capita use continues to increase even in the recession, as well as total use. So you have good players and bad players, and there’s no way to really reward the good players and there’s no way to bring the bad players into line. That’s a great list of things to do, but it’s kind of optional.”

Others suggest that the amendments simply were not ambitious enough. Tom Swihart (2011), former administrator in the Office of Water Policy in the Florida Department of Environmental Protection, points to the water loss reduction targets that require water providers to cut the difference between their water loss and 10% in half by 2025 (2035 for water providers located outside of the ACF Basin), “Four of the five Florida water management districts require for water use permits for pumping water supplies no more than 10% water loss rate. One of them has 15% but they’re considering moving to 10%. So that was attainable in Florida, so I don’t think . . . moving partway towards 10% is much to brag about.” Laura Hartt from Metro Atlanta, representing the Chattahoochee Riverkeeper agreed, “The deadlines were great, it’s sort of the first time they’ve done that, [but] we thought the deadlines were awfully far out. We also think that they should be getting down to 10%, not just halving it.”

The Hard Path Versus the Soft Path to Water Resources Management in Metro Atlanta

Gleick *et al.* (2002) discuss two paths for water resources planning and management in the ACF Basin, the soft path and the hard path, with the former representing more of a demand-side approach through increased conservation,

efficiencies and adaptive management, and the latter representing more of a supply-side approach using reservoirs, interbasin transfers, and other engineered solutions to increase supply. Sixty percent of survey respondents either agree or strongly agree that Metropolitan Atlanta is currently on a “hard path” for water resources management, but a deservedly more nuanced discussion emerged through the interview process. Seven out of 11 interviewees believe that Metro Atlanta is on both paths simultaneously, which some believe is acceptable. The remaining four interviewees believe Metro Atlanta is on primarily a hard path to water resources management. Interviewee 8 from Middle Georgia explained, “I think both pathways are currently operative. . . The Purdue administration with the WSA had more of that softer pathway in the mix, but the current administration is wholly uncommitted to that [soft] pathway. Nevertheless, there are individual local jurisdictions and advocacy groups that are making headway on that softer pathway. But both pathways are operative, and that’s probably healthy in a marketplace of competing ideas.”

Tom Littlepage, Branch Chief at ADECA, Office of Water Resources, adds that

“...there’s an effort towards both. I think the challenge of just relying on just the soft path is difficult especially if you look at the ability to sustain future growth and economic development, because the fundamental concepts of how you grow and encourage industries to locate in your area are predicated on water security and water availability. . . the soft path is more difficult to establish those parameters of certainty and security and minimizing risks than the hard path, and so ultimately I think, for a sustainable—both a hydrologically sustainable and a politically sustainable path—you need some combination of both . . .”

Tom Swihart agrees that “If they’re doing efficiency and . . . supply augmentation in the reservoirs, I guess they’re on both paths at the same time. But definitely in the last few years, Georgia and Atlanta have moved closer to what Peter Gleick calls the soft path. . .”

However, Laura Hartt (Chattahoochee Riverkeeper, Metro Atlanta) contends that “They’re on the hard path. I mean, they want to engineer and build their way around the Corps and around Florida and around Alabama, and they’ve got some consultants that are making a lot of money off of these deals. I don’t think the WSA is going to get us out of that.” Indeed, despite the WSA and revised Metro Water Plan, there has been a strong and persistent push for increased water supply in Metropolitan North Georgia through the construction of additional reservoirs. In early 2011, newly elected Georgia Governor, Nathan Deal, committed the state to spending \$300 million over four years to develop new sources of water supply, but declined to include conservation projects in his plan.

Interviewees were asked if the program to increase supply through additional reservoirs is a sustainable solution for the State of Georgia and Metropolitan Atlanta. Some contend that it is wholly unsustainable, others maintain that it’s part of the solution to North Georgia’s water problems, while still others maintain that it must be done given the uncertainty of future supply in the growing region. According to Mike Thomas, “As long as we cannot reach a reasonable settlement with Alabama and Florida, it has to be [part of the solution] . . . there’s plenty of water there without [additional reservoirs], but given the uncertainty over our ability to use Lake Lanier for water supply, I don’t see any other choice.” Laura Hartt from Metro Atlanta refutes this claim:

“... we hear repeatedly, ‘we already did conservation, we’re not doing anymore conservation. Now we’re on to the next piece.’ And you know the next piece was conceptualized before the 11th Circuit ruling [that authorized use of Lake Lanier for Metro Atlanta water supply]. That’s what’s so ironic about all of this obsession with reservoirs; that was in response to fear of getting cut off, and then when we have a high court come back and say ‘No, no, you’re not cut off. In fact the Corps *has* to give you water,’ you know, we’re still on the same path, the same ‘got to build reservoirs.’”

Interviewee 8 from Middle Georgia (Flint sub-basin) contends that the reservoirs are not a solution to North Georgia's water problems because "we don't have a supply problem. So it's an answer to a problem that doesn't exist. That's a \$300 million dollar public works project . . . to get reservoirs going . . . so that subdivisions can be built around them. . ."

Laura Hartt, Chattahoochee Riverkeeper, relays another theme that emerged, which is that additional supply will likely be necessary at some point, but demand-side measures should be exhausted first: "It's not to say that we'll never need another reservoir, but we feel like there's a logical sequence you should go through before you get to that point. Because reservoirs are so expensive, they do take so long to build, and they are so destructive. But there are things to do ahead of time." Things such as continuing to ratchet up conservation and efficiency measures and increase storage in existing reservoirs prior to constructing new ones: "we found up to 400 MGD through conservation, efficiency measures" (Laura Hartt). Rick Jones, Planning Director for the City of Columbus, Georgia (approximately 120 miles downstream from Atlanta), concurs: "I would hope that before we spend billions of dollars [on water supply], we would look at ways we can actually curb our uses."

Nearly all participants concluded that the hard path of building more reservoirs will cost a lot of money but there will be environmental costs as well, which are inextricably connected to the economy. Woody Hicks, from the Jones Ecological Center explains:

"More storage will be required, but there will be large ecological costs. Reservoirs destroy natural aquatic habitat and change river flow patterns. The ecology changes as moving water species are extirpated from the basin. Species river corridor migration is halted by the dam. Reservoirs change the habitat. Reservoirs

also change the water availability to downstream users. Reservoirs increase the rate of evapotranspiration losses and during periods of drought . . . evapotranspiration is the largest water consumer in the ACF Basin.”

Laura Hartt with the Chattahoochee Riverkeeper in Metro Atlanta echoes the concern regarding the environment: “these reservoirs, they’re going to obliterate beautiful, tiny tributaries to the main stem of the Chattahoochee. There are water quality issues that go with that.”

There may also be hidden political costs to Georgia’s reservoir building program.

According to Interviewee 8 from Middle Georgia:

“Perhaps a hidden cost that a lot of people don't think about is that when you're building reservoirs, and you allow subdivisions to go in around them, you're building up constituencies of people that don't really manifest themselves politically until 20 or 30 years out, who do not want the level of that reservoir to fluctuate. And so, the very uses for which you built the thing become anathema to future generations. So you're building in a political cost for people who have not been born yet. And all you got to do is look at the furor at what's going on in Lanier or West Point every time there's a drought. Because those are... many, many tens of millions of dollar economies that have built up, and land values that have built up around those lake levels. So there's this huge political dynamic that builds up over time as you let houses and marinas and other development go in around these reservoirs.”

Reservoirs are not the only indication of Metro Atlanta’s hard path trajectory. The most recent proposal from the State of Georgia, which is an amendment to the Flint River Drought Protection Act via Senate Bill 213, is an approximately \$1 billion dollar proposal to protect surface water flows through the use of augmentation projects. Augmentation projects include the controversial technique of aquifer storage and recovery (ASR), which pulls water out of the Georgia portion of the Floridan aquifer, stores it in a deeper aquifer, and then uses that water as needed to supplement flows in the

Flint River and Apalachicola River. According to Laura Hartt, Chattahoochee Riverkeeper, “the reason they want to do that is they want to let Metro Atlanta pull more out of Lanier and Chattahoochee.”

Interviewee 8 (from the Flint sub-basin) concurs, “the most recent proposal is a 150 well ASR field in Southwest Georgia to supplement flows at the Florida line to take pressure off of the system, primarily to take pressure off of Metro.” This proposal has the potential to ignite future transboundary conflicts, as the Floridan aquifer underlies Florida, Georgia, Alabama, Mississippi, and South Carolina. This also has implications for increasing intrastate conflicts between North and South Georgia. There is also concern that the “ASR will prevent downstream users access to ‘reasonable use’ of any water added by these projects and could negatively impact water levels in the ACF basin” (Boyd, 2013). Senate Bill 213 will be revisited in 2014 after having stalled in the 2013 legislative session.

Water Resources Sustainability Criteria and Transboundary Water Management Institutions

In order for an approach to water resources management to be sustainable, it must meet certain criteria (Table 1). During the course of this research, one of these criteria elicited considerable discussion and commentary and ultimately resulted in one of the key themes of this thesis, which is that “institutional mechanisms will be established to prevent, alleviate, and resolve conflicts over water.” Interviewees were asked “What sort of institutional mechanisms are in place, or need to be put in place, to prevent, alleviate, or resolve the current dilemma? And what might need to change to prevent future water

resources planning and management problems in the ACF.” Responses included highlighting the need for a reprioritization of water use and a hierarchy of use based on need, and for a paradigm shift in how people, particularly those in the Southeast, view and manage water resources. This stems from a historic perception of the South as a relatively water rich region.

Participants also highlighted the need for the U.S. Army Corps of Engineers (USACE) to update its operations of the existing reservoirs in the ACF. Interviewee 8 (Flint sub-basin) asserts that "The Corps, at the federal level, is going to have to align its operations on the Chattahoochee side with modern reality. Barge traffic is no longer an issue and so the flow needs in Florida are not driven by that as they were in the original engineering plan. . . the Corps may need some new congressional authorization to really get this done, but the operation of those reservoirs is going to have to change in some fundamental ways." Glen Page, water supply manager in Metro Atlanta, concurs that “The USACE has policies that are archaic and they are so bureaucratic that they cannot move and make decisions . . . The policies of the USACE . . . drastically need to be reviewed and updated where their reservoirs are managed for flood control based on 1940s technology. . .”

While participants highlighted a range of institutional changes that need to take place, by far the most prevalent theme is the need for a transboundary water management institution (TWMI) to govern water resources planning and management on a regional scale in the ACF Basin. Eight of the 11 interviewees highlighted the need for a TWMI much like the Delaware River Basin Commission, which involves the states of New Jersey, New York, Pennsylvania, and Delaware. Woody Hicks stated flatly: "In my

personal opinion the only way the ACF Basin can be managed is through a federally created commission, similar to the Delaware River Basin Commission. Individual state management creates a scenario for constant turmoil." President Kennedy and the governors of the four basin states created the Delaware River Basin Commission in 1961; it was born out of the need to

“promote interstate comity; to remove causes of present and future controversy; to make secure and protect present development within the states; to encourage and provide for planning, conservation, utilization, development, management and control of water resources of the basin; to provide for cooperative planning and action by the signatory parties with respect to such water resources; and to apply the principal of equal and uniform treatment to all water users who are situated similarly and to all users of related facilities, without regard to established political boundaries” (Gentzler and Hines, 2006, p.83).

Glen Page (Metro Atlanta) agrees that an interstate compact will be vital in securing a sustainable water future for the ACF Basin:

"We've [ACF Stakeholders] been trying to do a lot of good work in terms of scientific studies and modeling and these things, but there's one effort that we have, which I think moving forward is going to be the most significant thing we do as a group, and that is we're looking at institutional structures for managing water basins."

According to Wilton Rooks (Metro Atlanta), "One of the things that we're putting forward is the need for what we have labeled a transboundary institutional management provision." Indeed, ACF Stakeholders have been researching transboundary management options for the ACF Basin through a university collaborative involving researchers from the University of Georgia, University of Florida, Florida State University, Auburn University, and Troy University. This university collaborative's role is to research what models exist in other regions and to assess their applicability for the ACF Basin.

Despite overwhelming recognition of the need for some sort of transboundary water management institution, some water experts are not as optimistic about the efficacy of this type of solution. For example, according to Tom Littlepage (ADECA, Office of Water Resources),

“In recognition of state sovereignty, the concept of developing a model like the Delaware River Basin Compact where essentially you have the river basin function superseding states’ rights is... I don’t know that it’s ever going to work here, [it] certainly won’t work here in the short term. The idea of having an institution that supports the analysis of what’s going on in the basin, and to the degree there can be agreed upon metrics of action or trigger levels or concern levels, and then integrate that into some comprehensive action plan that recognizes individual state sovereignty . . . that’s a very difficult concept, because obviously you’re going to have disagreements and challenges, and typically between upstream and downstream political forces...”

CONCLUSIONS

Perceptions from water resources planners and experts from throughout the ACF Basin regarding the effectiveness of the Georgia Water Stewardship Act of 2010 are mixed, but nearly all participants agree that the Act serves as a good start as part of the larger effort to cause a paradigm shift in the way that water resources are perceived and managed in the ACF. The need for this transformation is now understood and advocated for by many water resources planners, managers, and other experts throughout the Basin. Georgia's WSA and Metro Atlanta's Metro Water Plan will move the needle a little bit towards that end, but more ambitious policy is required if the region, and the state, are to move towards a culture of conservation and establish a sustainable water resources management paradigm.

A range of factors ultimately prevent Georgia's current water policies, including the WSA and the Metro Water Plan, from fostering a robust culture of conservation and instituting the transformative change that Olsson *et al.* (2006) describe as a necessary precursor to adaptive governance and sustainability. These factors include a lack of funding for implementation, the meager nature of the conservation and efficiency requirements, the lack of clearly defined mechanisms for tying a policy goal to specific flows in streams, and the exemption of large water users from the new law and policies. It is evident that the political process that gave birth to the WSA (and perhaps to a lesser extent, the Metro Water Plan) was influenced by powerful interest groups, particularly

the agriculture and power sectors. These sectors must be explicitly included in any new water management laws and policies due to the sheer volume of water they consume and the role that these industries play in basic human survival.

There is also evidence that a lot of the water quantity problems in the basin are related to poor statewide management and an “out of control permitting system,” perhaps more so than overuse in Metro Atlanta or by agriculture in the Lower Flint River basin. Interviewee 8 representing the Flint sub-basin relates that in the early 2000s, the Georgia Department of Natural Resources (DNR)

“adopted a flow policy that remains interim, that grandfathered all permits in, and established monthly 7Q10 as the instream flow policy. . . [which] basically takes the lowest 7 day average of every year, plots them on a line, and looks at the 10 year recurrence interval for a particular month, and it’s plotted on a log scale. And so, what will happen is if the climate changes, meaning rainfall patterns, or if the withdrawal pressure or volumes change, you can drive 7Q10 down close to zero or even zero... That’s not a flow policy at all, that’s a policy for killing creeks and rivers... And when you have that policy in place, what you have guaranteed is that everybody can get a permit, and ultimately everybody’s rights are violated due to the fact that everybody’s rights were honored” (Interviewee 8).

Indeed, more than a decade ago, Georgia’s Department of Natural Resources (2001, p. 26) observed,

“although DNR’s 7Q10 rule is designed to protect water quality, it is NOT based on the science of how much water should remain in a stream to maintain a healthy aquatic community. Georgia’s population continues to increase at a fast pace, and with this growth comes a corresponding increase in demands for water for consumption and wastewater assimilation. This phenomenon brings more stress on streams, particularly in north Georgia (where communities must mostly use surface water rather than groundwater), as we collectively attempt to meet these increased water demands. Georgia’s rapid human population growth in the last 30 years is also contributing to stress experienced by aquatic communities through such conditions as storm water runoff from impervious surfaces,

sedimentation from land disturbing activities, displacement of natural streams by reservoirs, and depletion of groundwater.”

To mitigate the negative effects of these current statewide policies, the WSA and other related policies need to be amended to include “the codification of a scientifically based transparent process by which everybody can come to the table and say zero is unacceptable, here’s our consensus on what is acceptable” (Interviewee 8, Flint sub-basin).

In addition, Metropolitan Atlanta must emerge as a conservation leader due to its unique geography as a rapidly growing metropolitan region of over five million people located at the headwaters of its primary water source; this must happen regardless of its implications in the larger conflict at hand. As a region within a region, it is faced with finite resources which cannot fuel limitless growth. Conservation and efficiency measures should be fully utilized before continuing down the hard path with engineered supply side measures such as interbasin transfers, new reservoirs, and ASR projects in South Georgia, because these hard path efforts are ecologically destructive and very expensive. There is concern that the region may continue to scramble to institute conservation and efficiency measures only during times of drought, and return to “business as usual” when the rains come back. Tom Littlepage from Alabama agrees that “this recognition of, ‘well, if we got a new source, or if we conserve, we’re over this hump and we don’t need to change our views or historical usage patterns.’ If that’s the result, we failed. I mean, the idea is to help people recognize we got to sort of change how we view this.” Woody Hicks from South Georgia seconds this notion: “It’s easy to slip into complacency once the rains return.”

The creation of the Metro District by the Georgia General Assembly in 2001 and the adoption of the Metro Water Plan in 2003 (updated in 2009 and amended in 2010) were significant steps in setting Metro Atlanta down a path to water resources sustainability. However, implementation of a few simple measures can make the plan more effective. Examples include tightening the water loss reduction requirements to require water providers in Metropolitan Atlanta to get down to no more than 10% water loss by 2035 or sooner; increasing funding and expanding the Retrofit on Reconnect program, which forces efficiency upgrades; increased conservation or tiered pricing for water users; and, implementing a more aggressive program to locate and repair leaks in the water utility distribution system. Certainly, Metro Atlanta could take heed from the success of Boston, Massachusetts and the Massachusetts Water Resources Authority (MWRA) in implementing sustainability at the local and regional government scale.

Indeed, this research has shown that water resources experts within the ACF Basin are increasingly recognizing that there will need to be something more powerful, perhaps something beyond what a single piece of policy can deliver, in order to establish a true culture of conservation within the basin. Several participants alluded to the need for a “paradigm shift” in how water resources are managed in the Southeast, or a “blue revolution,” as Cynthia Barnett puts it (2011). Barnett (2011) also points to the example set by the City of San Antonio and the San Antonio Water System (SAWS), which has nearly halved per capita water use in the last twenty-five years, from 225 gallons per day to 115 gallons per day. As a result, SAWS actually pumps less from the Edwards Aquifer now than it did then – a decrease in total use despite 67% more customers (Barnett, 2011). A similar effect might have been observed in Metropolitan Atlanta had Judge

Magnuson's order not been overturned by the 11th Circuit Court of Appeals; nevertheless, the WSA and the Metro Plan serve as an important start towards a "blue revolution" and an evolved water ethic in the American South.

Even with the WSA and the Metro Plan in place, the ability of a singular statewide or regional policy to mitigate the ACF Water Wars is debatable. The need for an institutional solution to the problem is apparent, but the three states have a unique set of obstacles or barriers to the establishment of a successful transboundary water management institution. First, the divergence in needs and values among stakeholders is greater than in other Eastern U.S. examples and difficult to overcome for the traditionally water rich South. Additionally, the issue of state sovereignty is also a major barrier to the success of a TWMI. Mike Thomas with the Clayton County Water Authority (Flint sub-basin), highlighted this sentiment: "Atlanta doesn't want anybody telling them what they can do or can't do." Current political and philosophical undercurrents in the South relating to the negative perception of federal government involvement in states' rights may serve as an obstacle to the successful creation of a federal interstate compact. Tom Littlepage, Branch Chief at ADECA, Office of Water Resources, argues that across the Southeast, "we generally as states are reluctant to let the federal government dictate how we're going to use things within our state borders, and obviously water is a key aspect of that philosophy . . ." Nevertheless, the region must overcome these obstacles in order to chart a sustainable water future for the ACF Basin and its stakeholders and to resolve the ongoing conflict in the region.

The consensus from the water experts who contributed to this research is that, while there are still many obstacles to overcome; divergence in interests, interstate

distrust, powerful political lobbies and a current political climate in which partisan platforms decry federal government involvement in states' issues, the ultimate solution should be a stakeholder-driven process that emphasizes the criteria of a sustainable approach to water resources management (Table 1). Notably, the establishment of a transboundary water management institution will be key in charting a sustainable water resources management paradigm in ACF basin.

Much of the discussion in this thesis has focused on perceptions of sustainability in water resources among what Mark Lubell (2005, p. 174) refers to as “policy elites.” In fact, expert sampling was utilized in order to solicit data from those who are most informed regarding water resources planning and management, water supply, water policy, and environmental conservation, and this method could further contribute to what Lubell (2005, p. 175) refers to as a “lack of academic attention to the behavior of grassroots stakeholders.” While this may be one of the shortcomings of this thesis, it opens the door for future research involving a rich analysis and comparison of perceptions among and between “grassroots stakeholders” and the “policy elites,” with an ultimate goal of facilitating public learning, a vital factor towards instituting a new governance in the “New South.”

Future research in the ACF Basin should continue to focus on reconciling the divide between technical players and policy elites with grassroots stakeholders through the process of public learning, which according to Mark Lubell (2005, p.174), “includes both increasing knowledge about the possible outcomes of different policy and behavioral choices, and also changing views about the legitimacy of decision processes and behavioral restrictions.” Indeed, if “policy elites can agree on a set of rules for

governing water resources, and can change those rules in response to public learning, then adaptive governance may succeed” (Lubell, 2005, p.174).

The scale and focus of this research often oscillated between Metro Atlanta, the State of Georgia, and the ACF Basin. While at first glance this may seem frenetic, I would argue that it is a necessary consequence of studying transboundary water conflicts. Thus, it is fitting that many experts believe that adaptive governance will be crucial in implementing and maintaining a sustainable water resources management paradigm in the South, for adaptive governance relies on polycentric institutional arrangements *operating across multiple scales* (Ostrom, 1996; McGinnis, 1999).

Crisis presents opportunities for change, and indeed the ACF Water Wars are nothing short of an economic, environmental, social, and political crisis (Leitman, personal communication). This crisis can be seen as being analogous to Olsson *et al.*'s (2006) poignant metaphor of “shooting the rapids,” describing the often tumultuous nature of change in environmental governance when old rules and management paradigms are no longer effective in sustainably managing what these authors refer to as social-ecological systems. Indeed, the social-ecological system that comprises the ACF Basin has been shooting the proverbial rapids for more than thirty years, and it is doubtful that the WSA or the Metro Plan alone are enough to cause the transformative change needed to set the Basin on a soft path to sustainability. Rather, much work must be done to facilitate the public learning that is necessary to serve as the basis for adaptive governance of the ACF Basin.

It is unclear at this point what is downstream of the turbulent rapids of transformation, though the results of this research point to an institutional framework,

similar to that of the DRBC or SRBC, that is tailored specifically to handle the nuances of values and culture that is unique to the American South. Indeed, a TWMI that utilizes sound science to set the parameters for success, works to build social capital and trust between and among grassroots stakeholders and policy elites, and operates with an understanding and deference to the cultural geography of the American South, would be a welcome site on the other side of the rapids of change, and one with the highest chances of success in implementing sustainability in the Apalachicola-Chattahoochee-Flint River Basin.

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APPENDIX A: Sampling Frame

Table 4: Sampling Frame

Name	Interest	Organization	Sub-Basin
Confidential	Environmental Planning/Water Resources	Atlanta Regional Commission (ARC)	Upper Chattahoochee
Confidential	Local Government	Metro North Georgia Water Planning District	Upper Chattahoochee
Confidential	Business and Economic Development	Council for Quality Growth	Upper Chattahoochee
Confidential	Environmental and Conservation	Chattahoochee Riverkeeper	Upper Chattahoochee
Laura Hartt	Environmental and Conservation	Water Policy Director, Chattahoochee Riverkeeper	Upper Chattahoochee
Wilton Rooks	Recreation/Economic Development	Executive Vice President, Lake Lanier Association, ACF Stakeholders Executive Committee	Upper Chattahoochee
Confidential	Local Government	City of Atlanta	Upper Chattahoochee
Confidential	Urban Agriculture	Urban Agriculture Council	Upper Chattahoochee
Confidential	Environmental and Conservation	Georgia Department of Natural Resources	Upper Chattahoochee
Confidential	Environmental and Conservation	Nature Conservancy – Georgia	Upper Chattahoochee
Confidential	Community Development	Georgia Department of Community Affairs	Upper Chattahoochee
Glen Page	Water Supply	General Manager, Cobb County-Marietta Water Authority	Upper Chattahoochee
Confidential	Economic Development	Metro Atlanta Chamber of Commerce	Upper Chattahoochee

Table 4: Sampling Frame (continued)

Name	Interest	Organization	Sub-Basin
Confidential	Water Supply	Cobb County-Marietta Water Authority	Upper Chattahoochee
Confidential	Local Gov't	ARC Environment and Land Use Committee	Upper Chattahoochee
Confidential	Regional Gov't	ARC Environmental and Land Use Committee	Upper Chattahoochee
Confidential	Real Estate	ARC Environmental and Land Use Committee	Upper Chattahoochee
Confidential	Community Development	ARC Environmental and Land Use Committee	Upper Chattahoochee
Confidential	Environmental and Conservation	Upper Chattahoochee Riverkeeper	Upper Chattahoochee
Confidential	Environmental and Conservation	Upper Chattahoochee Riverkeeper	Upper Chattahoochee
Confidential	Community Planning	GA Dept. of Community Affairs	Upper Chattahoochee
Confidential	Water Resources Management	Cobb County – Marietta Water Authority	Upper Chattahoochee
Confidential	Water Resources Management, Local Gov't	Rockdale County	Upper Chattahoochee
Confidential	Private Industry/Irrigation	Ewing Irrigation	Upper Chattahoochee
Confidential	Environmental Protection	Turner Foundation	Upper Chattahoochee
Confidential	Environmental and Conservation	American Rivers	Upper Chattahoochee
Confidential	Water Resources Management, Local Gov't	Fulton County Public Works Water Services Division	Upper Chattahoochee
Confidential	Water Resources Management	Cobb County Water System	Upper Chattahoochee
Confidential	Agriculture	Middle Chattahoochee Water Coalition	Lower/Middle Chattahoochee
Confidential	Environmental and Conservation/State Gov't	Georgia Environmental Protection Division	Lower/Middle Chattahoochee
Confidential	At Large	Confidential/ACF Stakeholders	Lower/Middle Chattahoochee

Table 4: Sampling Frame (continued)

Name	Interest	Organization	Sub-Basin
Confidential	Environmental, Economic Development	Tri Rivers Waterway Development Association	Lower/Middle Chattahoochee
Confidential	Environmental and Conservation	Alabama Dept of Environmental Management	Lower/Middle Chattahoochee
Confidential	Environmental and Conservation	Alabama Dept of Environmental Management	Lower/Middle Chattahoochee
Tom Littlepage	Water Supply	Branch Chief, ADECA, Office of Water Resources	Lower/Middle Chattahoochee
Confidential	Power Industry	Alabama Power Company	Lower/Middle Chattahoochee
Confidential	Power Industry	Southern Nuclear Operating Company	Lower/Middle Chattahoochee
Confidential	Environmental and Conservation	Alabama Rivers Alliance	Lower/Middle Chattahoochee
Confidential	Water Supply	USACE – Mobile District	Lower/Middle Chattahoochee
Confidential	Water Supply/Economic Development, Local Gov't	City of LaGrange	Lower/Middle Chattahoochee
Confidential	Local Gov't	Troup County Planning Dept	Lower/Middle Chattahoochee
Confidential	Economic Development, Local Gov't	Lagrange-Troup County Chamber of Commerce	Lower/Middle Chattahoochee
Confidential	At Large	Greater Columbus Chamber of Commerce	Lower/Middle Chattahoochee
Rick Jones	Local Gov't	Planning Director, City of Columbus	Lower/Middle Chattahoochee
Confidential	Local Gov't (Water Supply)	City of Eufala	Lower/Middle Chattahoochee
Confidential	Local Gov't (Planning)	City of West Point	Lower/Middle Chattahoochee
Confidential	Local Gov't	City of West Point	Lower/Middle Chattahoochee
Michael Thomas	Water Supply	General Manager, Clayton County Water Authority	Flint

Table 4: Sampling Frame (continued)

Name	Interest	Organization	Sub-Basin
Confidential	Agriculture	Mitchell County Farm Bureau	Flint
Confidential	Agriculture	Farmer, ACF Stakeholders	Flint
Confidential	Environmental and Conservation	Flint Riverkeeper	Flint
Woody Hicks	Environmental and Conservation	Hydrologist, Jones Ecological Center, ACF Stakeholders Executive Committee	Flint
Confidential	Industry/Economic Development	Proctor and Gamble	Flint
Confidential	Academia, Water Policy and Management	Albany State University – Flint River Water Policy Center	Flint
Confidential	Local Gov't/Planning	City of Albany	Flint
Confidential	Local Gov't/Planning	City of Albany	Flint
Confidential	Academia, Agriculture	GA Center for Urban Agriculture	Flint
Confidential	Environmental and Conservation	Apalachicola Riverkeeper	Apalachicola
Confidential	Seafood/Economic Development	Franklin County Seafood Workers Association	Apalachicola
Confidential	Seafood/Economic Development	Franklin County Oyster & Seafood Task Force	Apalachicola
Confidential	Water Quality	The Nature Conservancy	Apalachicola
Ted Hoehn	Environmental and Conservation	Florida Fish and Wildlife Conservation Commission (FWC)	Apalachicola
Confidential	Recreation	Lake Seminole Association	Apalachicola
Tom Swihart	Water Policy	Florida Department of Environmental Protection, Former Head of Water Policy	Apalachicola
Confidential	Hydro Power/Local Gov't	City of Chattahoochee	Apalachicola

Table 4: Sampling Frame (continued)

Name	Interest	Organization	Sub-Basin
Confidential	Local Gov't	City of Apalachicola	Apalachicola
Confidential	Water Resource Management	Northwest Florida Water Management District (NFWMD)	Apalachicola
Confidential	Water Resource Management	NFWMD (ret.)	Apalachicola
Confidential	Environmental and Conservation	Florida Department of Environmental Protection	Apalachicola
Confidential	Environmental Health	Florida Department of Health	Apalachicola
Confidential	Environmental and Conservation	Apalachicola National Estuarine Research Reserve	Apalachicola
Confidential	Environmental and Conservation	Florida Department of Environmental Protection	Apalachicola
Confidential	Environmental and Conservation/Water Quality	Florida Department of Environmental Protection	Apalachicola
Confidential	Environmental and Conservation	Center for a Sustainable Coast	At Large
Confidential	Federal Gov't	USGS	At Large
Confidential	Academia	University of Georgia (UGA) - River Basin Center	At Large
Confidential	Academia	UGA River Basin Center	At Large
Confidential	Academia	UGA River Basin Center	At Large
Confidential	Academia	UGA River Basin Center	At Large
Confidential	Academia	UGA River Basin Center	At Large
Confidential	Academia	UGA River Basin Center	At Large
Confidential	Academia	UGA River Basin Center	At Large
Confidential	Academia	USGS/UGA River Basin Center	At Large

Table 4: Sampling Frame (continued)

Name	Interest	Organization	Sub-Basin
Confidential	Water Law	University of New Mexico	At Large
Confidential	Academia	UGA	At Large
Confidential	Academia	UGA	At Large
Confidential	Academia, Water Economics and Policy	University of Florida (UF)	At Large
Dr. Chris Martinez	Academia	Associate Professor, UF Water Institute	At Large

APPENDIX B: Survey Respondents

Table 5: Survey Respondents

Code	Name	Interest	Title/Organization	Sub-Basin
1	Laura Hartt	Environmental and Conservation	Water Policy Director, Chattahoochee Riverkeeper	Upper Chattahoochee
2	Wilton Rooks	Recreation/Economic Development	Executive Vice President, Lake Lanier Association, ACF Stakeholders Executive Committee	Upper Chattahoochee
3	Confidential	Environmental/Urban Agriculture	Urban Agriculture Council	Upper Chattahoochee
4	Confidential	Community Development	Georgia Department of Community Affairs	Upper Chattahoochee
5	Glen Page	Water Supply	General Manager, Cobb County-Marietta Water Authority	Upper Chattahoochee
6	Confidential (snowball)	Water Supply	Cobb County-Marietta Water Authority	Upper Chattahoochee
7	Confidential	Water Resources Planning/Management	Confidential	Lower/Middle Chattahoochee
8	Tom Littlepage	Water Resources Planning/Management	Branch Chief, ADECA, Office of Water Resources	Lower/Middle Chattahoochee
9	Rick Jones	Local Gov't	Planning Director, City of Columbus	Lower/Middle Chattahoochee
10	Michael Thomas	Water Supply	General Manager, Clayton County Water Authority	Flint
11	Confidential	Environmental and Conservation	Confidential	Flint

Table 5: Survey Respondents (continued)

Code	Name	Interest	Title/Organization	Sub-Basin
12	Woody Hicks	Environmental and Conservation	Hydrologist, Jones Ecological Center, ACF Stakeholders Executive Committee	Flint
13	Ted Hoehn	Environmental and Conservation	Florida Fish and Wildlife Conservation Commission (FWC)	Apalachicola
14	Tom Swihart	Water Policy	Florida Department of Environmental Protection, Former Head of Water Policy	Apalachicola
15	Confidential	Environmental and Conservation	Apalachicola National Estuarine Research Reserve	Apalachicola
16	Confidential	Federal Gov't	USGS	At Large
17	Confidential	Academia	UGA River Basin Center	At Large
18	Confidential	Academia	UGA River Basin Center	At Large
19	Confidential	Agriculture	GA Center for Urban Agriculture	Flint
20	Dr. Chris Martinez	Academia	Associate Professor, UF Water Institute	At Large

APPENDIX C: Interview Participants

Table 6: Interview Participants

Code	Name	Interest	Organization	Sub-Basin
1	Laura Hartt	Environmental and Conservation	Water Policy Director, Chattahoochee Riverkeeper	Upper Chattahoochee
2	Wilton Rooks	Recreation, Economic Development	Executive Vice President, Lake Lanier Association, ACF Stakeholders Executive Committee	Upper Chattahoochee
3	Confidential	Community Development	Georgia Department of Community Affairs	Upper Chattahoochee
4	Glen Page	Water Supply	General Manager, Cobb County-Marietta Water Authority	Upper Chattahoochee
5	Tom Littlepage	Water Resources Planning, Management	Branch Chief, ADECA, Office of Water Resources	Lower/Middle Chattahoochee
6	Rick Jones	Local Gov't	Planning Director, City of Columbus	Lower/Middle Chattahoochee
7	Michael Thomas	Water Supply	General Manager, Clayton County Water Authority	Flint
8	Confidential	Environmental and Conservation	Confidential	Flint
9	Woody Hicks	Environmental and Conservation	Hydrologist, Jones Ecological Center, ACF Stakeholders Executive Committee	Flint
10	Tom Swihart	Water Policy	Florida Department of Environmental Protection, Former Head of Water Policy	Apalachicola
11	Dr. Chris Martinez	Academia	Associate Professor, UF Water Institute	At Large

APPENDIX D: Interview Questions

1. In your opinion, is the Georgia Water Stewardship Act (WSA) powerful enough to propel the State of Georgia, and Metropolitan Atlanta, out of a ‘culture of consumption’ towards a ‘culture of conservation’? Why or Why not?
2. Do you believe that the WSA provides the toolkit necessary to cause a shift toward sustainable water resources management in the Metropolitan Atlanta region? Why or why not?
3. Would you consider Metropolitan Atlanta’s use of water as one that “*supports the ability of human society to endure and flourish into the indefinite future without undermining the integrity of the hydrological cycle or the ecological systems that depend on it?*” Please explain.
4. The ACF Water Wars is an unprecedented 20 plus year battle over the water in the basin. What sort of institutional mechanisms are in place, or need to be put in place, to prevent, alleviate, and resolve the current dilemma? What might need to change to prevent future water resources planning and management problems in the ACF?
5. The breakdown in the negotiations between GA, FL, and AL have been attributed to a breakdown in trust among the parties. Do you agree? If so, how did this mistrust happen? If not, then why do you think the parties cannot come to an agreement?
6. Do you believe the WSA will be effective in restoring trust between GA, FL, AL?
7. Will the legislation be effective in helping to resolve the Water Wars? How effective?
8. How do you address the omissions of agriculture and the power industry (power plants) from the requirements of the WSA?
9. In your opinion, what policy actions need to be implemented in order to augment the power of the WSA and of Metropolitan Atlanta’s Metro Water Plan, if any? If so, what agency/governing body should implement these actions?

APPENDIX D: Interview Questions (continued)

10. Georgia Governor Nathan Deal has proposed a \$300 million reservoir program in order to quench North Georgia's water needs through increased supply. Is this program of increased supply using additional reservoirs a solution to North Georgia's water problems?
11. With regards to environmental, social, and economic sustainability, is this reservoir program a sustainable solution for Georgia and the ACF basin as a whole?
12. With regards to equity, who should pay for these reservoirs? New development? Those within Metro North Georgia Water District's boundaries? Those within certain counties? Or residents of the State of Georgia?
13. Peter Gleick talks about a "soft path" vs. a "hard path" for water resources management, with the "soft path" representing demand-side solutions and adaptive management that allows for incremental changes to policy to incorporate new data and models whereas the "hard path" represents more supply-side solutions (i.e., more reservoirs, inter-basin transfers, etc.). Which path do you believe Metropolitan Atlanta (and North Georgia) is on? Do you believe the WSA or the Metro Water Plan will have a significant impact on this "path"?
14. Do you think Georgia's water problems can be solved by a "soft" path approach?
15. Can Georgia continue driving down a hard path towards long term water sufficiency?
16. What might be the consequences (environmental, economic, social) of pursuing a hard path?
17. The passage of GA's 2008 Comprehensive Statewide Water Management Plan established Regional Water Councils to develop local water plans, including estimates of current and future water needs, water resource assessments, and best management practices. How successful do you believe these councils will be in managing GA's water resources in the coming years?
18. What sort of clout do these councils have? Are they merely a recommending body? What has their impact been since 2008?
19. Given the recent push for supply side management (roughly a dozen proposals for new basins under consideration vs. the legislated provisions in WSA (water systems must submit water loss audits, submetering, high efficiency fixtures, etc.), which route will be most *economically* sustainable for the state? Which is most cost effective?

APPENDIX D: Interview Questions (continued)

Recently the Metro Water District published several amendments to the Water Supply and Water Conservation Plan for Metropolitan Atlanta.

- a. Each water provider must identify methods to reduce water loss in an expedited fashion based on knowledge of the distribution system. The previous goal targets communities with water losses greater than 10%. These communities will cut the difference between their water loss and 10% in half by 2035 (for example, a water provider with a 16% water loss would reduce water loss by 3% by 2035).
- b. Implement a program to convert older, inefficient toilets to high-efficiency toilets (HET) in multi-family homes (e.g. apartments, townhomes, and condominiums).
- c. Develop a point of use leak detection program to notify customers of possible leaks using the most appropriate meter technology.
- d. Adopt an ordinance or policy to meter private fire lines in commercial buildings to identify and reduce improper water use.
- e. Provide sufficient funding and staffing to implement the required water conservation measures.
- f. Adopt a water waste policy or ordinance to reduce outdoor water waste. Non-compliance with such provisions may be treated as a municipal code violation. Violators should be warned and could potentially be subject to monetary penalties or termination of water service.

20. Do these amendments contain enough “teeth” to be truly effective in conserving enough water to chart a sustainable future for Metropolitan Atlanta?

A joint study completed in 2010 by American Rivers and the Upper Chattahoochee Riverkeeper concluded that the Water Stewardship Act contains four mandated measures that should save approximately 23.4 million gallons of water per day (MGD) in metro Atlanta by 2035. These are:

1. Stop leaks in the water utility distribution pipes.
2. Price water to encourage efficient use.
3. Retrofit all buildings with water efficient fixtures.
4. Landscape to minimize waste.

To put this in context, a savings of 23.4 MGD represents about 3.5% of the water demand in metro Atlanta during the 2000s and only 2.1% of the demand anticipated in 2035, based on figures prepared by the Metro Water Planning District.

APPENDIX D: Interview Questions (continued)

21. Does this information change your perception of the effectiveness, or potential effectiveness, of the WSA?
22. Which of the proposed additional measures would be most cost effective for Metropolitan Atlanta?
23. Which of the proposed additional measures is the most politically feasible for Metropolitan Atlanta?
24. Which of the proposed additional measures is the most socially acceptable?
25. Are the currently legislated for changes (via the Metro Plan and WSA) sufficient?
26. Can any more reasonable actions be taken?
27. Does Metropolitan Atlanta bear any responsibility to reduce water use more than the currently anticipated reduction of 2-3% using the calculations above?