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WHAT ELEMENTS AND PRECONDITIONS ARE NECESSARY
FOR A VIABLE, ADAPTIVE COMPACT?
A CATAWBA-WATEREE RIVER CASE STUDY

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfilment
of the Requirements for the Degree
Master of City and Regional Planning

by
Brennan Thomas Williams
May 2020

Accepted by:
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ABSTRACT

The purpose of this study is to determine the elements and preconditions necessary for a viable, adaptive water compact particularly with climate change. Legal and scientific scholars generally agree interstate water compacts are the solution to transboundary water resource governance. Earlier water compacts in the west tend to resolve the issue of water allocation (McCormick, 1994). This research suggests which elements are necessary for a viable interstate that addresses climate change. The elements derive from scholarly writings. Then, using semi-structured interviews, I answer whether the elements are present in a setting with a contentious history over an integral water resource between two states. Namely, the Catawba-Wateree River between North Carolina and South Carolina. After conducting interviews, the results provide insight into the obstacles to essential elements. Finally, I discuss the implications of the compact's absence and how alternative arrangements compare to a compact.

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CHAPTER ONE:
INTRODUCTION

Introduction

Interstate rivers are renewable resources which millions of people rely upon. In the past two decades, the southeast United States has experienced water stress that traditionally it has not faced in its humid climate. This has largely been caused by increasing water demands, drought and now climate change. However, because rivers stretch beyond political boundaries, meaningful and long-lasting regulation has been difficult. One solution has been to utilize interstate compacts – formal agreements between states – to unify water management across political boundaries. But water compacts are not a panacea. Concerns over compact durability and efficacy have been raised by scholars stating compliance with federal regulations and laws like the Endangered Species Act (Sherk, 2005) and unanimous decision-rules fail to solve contentious issues (Mandarano, Featherstone, & Paulsen, 2008).

Traditionally, interstate water compacts are widely used to allocate water amongst transboundary jurisdictions in the arid Western United States. As the humid Southeast experiences water stress caused by urbanization, drought, and climate change, legal and scientific scholars increasingly view compacts as viable organizational structures. This study uses semi-structured interviews and examines the Catawba-Wateree River to answer what elements are necessary for a viable interstate water compact in climate change. In Chapter 2, I survey the literature for the critical elements necessary for an adaptive compact. Chapter 3 I discuss my methods to identify participants for semi-

structured interviews and evaluating their responses. Then, in Chapter 4, the results of the participants' responses are discussed in three parts. First, the study finds the issues and constraints can be categorized as water availability, environmental, and regulatory issues. Second, the study examines the necessary elements to determine whether they are present in the current regulatory arrangement. Third, I discuss the compact viability responses.

In Chapter 5, I compare the participant responses and results to the literature review. Chapter 6 I discuss reflections on insights and implications about the participant responses. Finally, the study discusses the lack of state resources and analyzes the possibility of alternative regulatory arrangements compared to a compact.

Research Questions

Legal and scientific scholars generally agree interstate water compacts are the solution to transboundary water resource governance. Earlier water compacts in the west tend to resolve the issue of water allocation (McCormick, 1994). This research suggests which elements are necessary for a viable interstate that addresses climate change. The elements derive from scholarly writings. Then, by means of semi-structured interviews, I aim to answer whether these elements are present in a setting with a contentious history over an integral water resource between two states. Namely, the Catawba-Wateree River between North Carolina and South Carolina. After conducting interviews, the results provide insight into the obstacles to essential elements. Finally, I discuss the implications of the compact's absence and how alternative arrangements compare to a compact. The research questions are restated below. The first research question is discussed in Chapter 2.

- 1) What are the elements necessary for a viable interstate compact, particularly with climate change?
- 2) Are these elements present in a setting with a contentious history over an integral resource for two states?
 - a. If not, what are the obstacles to the essential elements?
 - b. What are the implications of the compact's absence?
 - c. How do alternative arrangements (informal/formal) compare to a compact?

CHAPTER TWO: LITERATURE REVIEW

Introduction

The first section of this chapter will provide transboundary surface water issues. The second section will provide three different interstate regulatory structures. Then, the third section will survey the three common interstate water management institutions, including interstate compacts, in the United States. The fourth section will provide the history, benefits, and criticisms of water compacts specifically. Then, the fifth section will provide the necessary pre-conditions for state agreements. Finally, the sixth section will provide the successful compact elements.

Surface Water Issues

Population growth is a source of conflict for common surface water resources. Water is vital for all processes of value to mankind. Making up 70 percent of the earth's surface, it is seemingly limitless. However, according to the United Nations, the earth's population is approximately 7.3 billion with perhaps 2 billion people living in areas with chronic water shortages (UN Population Division, 2016). As the population grows, competition for water usage grows as well. In fact, population growth is a direct determinant of increases in water demand for domestic uses (UN Population Division, 2016). Additionally, as water usage grows there is still a limited capacity to water supply. This means, water resources are, for all sense and purposes, limited to what is currently available in the system.

Apart from increased water demands resulting from additional water users, population growth also effects the types of water usage. There are eight different kinds of water usage: aquaculture; domestic; industrial; irrigation; livestock; mining; public supply; and, thermoelectric power (Richter, 2014). All of these uses are also competing with one another. However, as populations grow, demographics and economies change. These changes can reshape water usage. For instance, in areas with little urban land uses, the surrounding area may be used predominantly for agricultural use. If agricultural uses continue to grow, more industrial land uses may be needed to help process the larger quantities of agricultural product (e.g., processing plants and canneries). Then, other ancillary land uses manifest to support the employees of these new land uses. As these regions continue to urbanize, water needs will also change to meet the new and different types of water demand. However, not all changes in water use is necessarily more detrimental to water supply. Some water uses, like thermoelectric uses, allow all of the withdrawn water to reenter the original water source as return flow. Conversely, the portion of the water that is not returned to the original source is considered a consumptive use (Richter, 2014).

For the past century, the southeast United States has had a warm climate with ample water resources to meet demand. Recently, however, the region has seen dramatic population growth. Charlotte, North Carolina — a major city within the Catawba-Wateree watershed — for instance, has grown 71 percent from 2000–2018, totaling to 2.5 million people (U.S. Census Bureau, 2018). A growing population fosters a growing economy. The southeast region relies on water resources to maintain an economy that is

largely based on forestry, recreation, manufacturing, tourism, agriculture, power generation, fisheries and navigation (Ingram, Dow, Carter, & Anderson, 2013). Even global economic disruptions like the Great Recession did not disturb population growth in the region. Between 2000 and 2010, the Charlotte Metropolitan Statistical Area (MSA) grew 32.1% despite slowing national (MSA) average growth (U.S. Census, 2010). Therefore, the water withdrawals used to sustain a thriving economy, along with water shortages caused by drought are thus transforming the region into a water stressed one (Sun, McNulty, Myers, & Cohen, 2008).

Climate change is also stressing to the region. In the United States, the average temperature has risen more than two degrees Fahrenheit over the past 50 years and is projected to continue to rise (Karl, 2009; Carter et al., 2014). During that same time frame, precipitation has risen an average of around five percent (Karl, 2009). However, there are significant regional and seasonal climate differences in the United States.

For the southeast, during that same 50 year period where average temperature across the United States rose more than two degrees Fahrenheit, streamflow rates (the flow of water in a stream or river) showed increasing trends (Lins & Slack, 2005). This trend is a result of an increase in precipitation in the region (Groisman, et al., 2003). However, it is not clear whether a trend of increased precipitation will result in an increase in streamflow and water supply. This is because of the uncertainty of future land use changes and human water demands (Sun, McNulty, Moore Myers, & Cohen, 2008). Specifically, some climate models for the region show a declining streamflow relative to current conditions while others show an increase (Moreau, 2007). Because streamflows

are dependent on other variables beyond precipitation and because human intervention is largely unpredictable, there is no agreement on future water supply in the region. This lack of agreement creates uncertainty regarding proper measures to manage water resources in the Southeastern United States.

This section discusses two strains on water resources that were not contended with in the past. Further, it appears both population growth and climate change are not relenting in the basin. In the future, proper water management and planning is critical for a region believed to be water secure.

Interstate Water Resource Management Institutions

Contemplating water scarcity, states employ different institutions to regulate the withdrawal of water. There are three legal mechanisms available to regulate interstate water resources: equitable apportionment; interstate compact; and, Congressional allocation. Under traditional vertical federalism, there are arguments over who has authority to regulate water. Traditionally, the primary responsibility lies with the states; the federal government imposes regulations and manages water resources under its non-enumerated rights under the Commerce Clause of the constitution of the United States.

Equitable apportionment

The first mechanism is equitable apportionment. Although jurisdictional matters are not always clear, the Supreme Court of the United States has original jurisdiction over claims between the states (U.S. Const. art. III sec. 2 cl. 2). This litigation in the Supreme Court led to the doctrine of equitable apportionment; whereby, pursuant to findings by a special master, the court equitably apportions water between the interested states.

However, suits are resolved under federal common law, rather than allocation measures that govern in the respective states (Dellapenna, 2006). These results have been less than ideal. Because water resource litigation is so complex given its combination of technical, factual, legal and political elements, the Supreme Court urges parties to settle disputes between themselves (Sherk, 2005). In fact, in some instances, the court has explicitly urged states to form compacts (Mandarano, Featherstone, & Paulsen, 2008). As a result of said disputes' complexity, court decrees are often static and unworkable, failing to meet changing conditions in water resource management (Sherk, 2005; Mandarano et al., 2008). For these reasons, equitable apportionment is not considered the best option to regulate interstate water.

Interstate compacts

After prodding by the Supreme Court and concerns of possible loss of autonomy to the federal government (Dellapenna, 2006), state water officials, with the support of water users, utilized water compacts (Schlager & Heikkila, 2009). Interstate compacts are constitutionally authorized contracts between two or more states that are used to resolve disputes relating to the management and use of shared resources across state boundaries (Hardy, 1982; Bowman, 2004; Dellapenna, 2006). The Constitution further requires compacts between states to gain approval by Congress (U.S. Constitution, Art. I, sec. 10, cl. 3). Once approved, the compact becomes a federal statute that is binding on states as well as their citizens (Dellapenna, 2006). As such, a compact cannot be repealed without the consent of Congress, and all disputes regarding the interpretation of the compact shall be heard in the Supreme Court (Dellapenna, 2006).

Some scholars have further divided water compacts into two subgroups: interstate compacts and federal-interstate compacts (Mandarano et al., 2008; Zimmerman, 2012). Essentially, both compacts are the same. A federal-interstate compact allows for the joint authority between the state governments and federal government over the water resource (Mandarano et al., 2008) while interstate compacts are merely consented to by Congress, and the federal government is not necessarily a party to the agreement. Therefore, as laws of both levels of government, the compacts are binding on both the state and federal governments (Mandarano et al., 2008).

Congressional apportionment

Finally, under the Commerce Clause and affirmed by the Supreme Court, Congress has the authority to regulate and allocate water resources (Sherk, 2005; Dellapenna, 2006). The Commerce Clause states that Congress has the power to “regulate commerce with foreign Nations, and among the several States, and with the Indian Tribes” (U.S. Constitution, Article I, sec. 8, cl. 3). Although this clause does not explicitly give Congress the authority to regulate interstate waters, the Supreme Court has held that water is an article of commerce that is subject to regulation by Congress (Sporhase v. Nebraska ex. rel. Douglas, 1982). Further, in 1963, the Supreme Court held in *Arizona v. California* that Congress delegated this authority to the Secretary of the Interior to modify the statutory apportionment in water shortage events (*Arizona v. California*, 373 US 546, 1963). This fact indicates that perhaps federal administrative apportionment by the Secretary of the Interior is better than equitable apportionment mandated by the Supreme Court since Congress is more responsive to policy concerns

compared to the Supreme Court (Dellapenna, 2006). Further, Congress has apportioned interstate waters only twice (Clemons, 2004), and is considered “not politically attractive” and its use “remote” (Erhardt, 1992, p. 212).

In this section, I provided three legal mechanisms to regulate interstate water resources. The literature, and the courts, state equitable apportionment is not a preferable option since courts are reluctant to hear water disputes, and settlements tend to be awkward and static. Also, Congressional apportionment is not “attractive” and unlikely. Finally, scholars argue that interstate compacting is the ideal mechanism.

Water Compacts

Water compacts are interstate compacts limited to water resource issues. According to Noah D. Hall, “[o]ver 95% of the available surface freshwater resources in the United States are interstate in nature and governed by interstate water compacts” (2010). These compacts may simply prescribe water allocation, or they may govern complex adaptive governance. In this section I first describe the history of interstate compact jurisprudence as it is used to regulate transboundary river basins. Then, I discuss the general benefits and criticisms of water compacting.

Water compact history

Historically, interstate water compacts are used more frequently in the western United States. With a more arid climate and less precipitation compared to the rest of the country, competition for western water often spilled over state boundaries, inducing a more cooperative effort in water management. This cooperative sentiment was coaxed along in the early Twentieth Century when the federal government invested billions of

dollars in public infrastructure with the passage of the Reclamation Act of 1902 (Schlager & Heikkila, 2009). To ensure these monies, the federal government required states to settle their boundary disputes. As a result, the states decided rather than spend time in costly legal battles that excluded relevant water users, water compacts could provide certainty and security for all water rights holders (Schlager & Heikkila, 2009).

These compacts were very limited. Most western compacts were created before 1972, when “water managers seldom paid much attention to the water quality effects of their decisions or to the ecologically sound management of a water source, let alone of related resources” (Dellapenna, 2006, p. 58). Generally, compacts were limited to allocation rules for stream flows, ensuring downstream water users a defined share of water from rivers (Schlager & Heikkila, 2011; Mandarano et al., 2008). This would preserve any autonomy issues for each state to manage its own water resources.

Conversely, in the Eastern United States, the climate is far more humid and did not encounter the same water issues. However, the population growth in the past 50 years of major cities like Atlanta, Georgia and Charlotte, North Carolina started putting enormous demands on water supplies. Eventually, like the Western United States, these water disputes have started to cross state lines and brought contentious legal issues with them.

Water compact benefits

As previously stated, other institutions fail to address key aspects to promote successful water management. Generally, equitable apportionment is not a viable option. Judges are reluctant to settle disputes. Further, litigation costs considerable amount of

time and money. Separately, Congressional apportionment is lacking also. Although Congress is comprised of lay persons as well, Congress is more responsive to policy concerns contemplated by an activated electorate (Dellapenna, 2006). Further, by acting through the Department of the Interior, Congressional apportionment may be more informed by scientific study and experience.

Although interstate compacts require consent of Congress and each participating state, they become federal statutes if approved. Partnerships are shown to be more effective if formally adopted (Koontz, et al., 2004 & Thomas, 2003). As federal statutes, courts have held that compacts are protected from the challenge that states are usurping the powers of Congress. *Intake Water Co. v. Yellowstone River Compact Comm'n*, 769 F.2d 568 (9th Cir. 1985); cert. denied, 476 U.S. 1183 (1986). This also precludes Congress' ability to administratively modify appropriations, thus removing the powers of the Secretary of the Interior. Further, the compact cannot be repealed by one or both states without consent of Congress. Conversely, because an interstate compact is a contract between states, federal courts are limited in their ability to reform any existing compacts (*Oklahoma v. New Mexico*, 1991). And as a dispute amongst states, any action would take place with the Supreme Court since it is the court of original jurisdiction. Finally, because the governing body of a water compact derives its power from a federal statute, the body is considered a federal agency. As such, the body is required to prepare an environmental impact statement for any qualifying action in accordance with the National Environmental Policy Act 1969.

Water compact criticism

Although water compacts are more prevalent in the western United States, they are not a panacea for water management. In fact, Ostrom (1990) warns that a blueprint for one type of governance system cannot be applied to all environmental issues. Water resource management is a complex issue, and there is no quick fix. As Schlager and Heikkila (2009) note, there is a small contingent of scholars who question the capacity of compacts to manage interstate river systems. The literature argues that river compacts are “inflexible and rigid, unable to respond to new challenges, such as endangered species, intensive groundwater pumping, or water quality issues (Schlager & Heikkila, 2009; citing Giardot, 1989; Grant, 2003; Hasday, 1997; Sherk, 2005). But, Schlager and Heikkila also qualify their assertion with reliance on only one or two examples (2009).

Other scholars criticize water compacts’ inability to achieve comprehensive water management. First, compacts that require unanimous consent among members may result in a “watered-down” decision; where in an effort to pass a workable compact, certain, more contentious issues are omitted (Mandarano et al., 2008, p. 139). Second, most compacts were formed prior to 1972. These compacts, therefore, are far less capable of complying with federal laws and regulations that have increased since then (Sherk, 2005).

Table 1: Benefits and criticisms of water compacts

Benefits	Criticism
Expedient comparatively Cost effective Federal statutes More effective Revocation requires Congressional consent Official actions require Environmental Impact Statement	Resource specific Capacity to resolve complex conflicts Inflexible, rigid, and unable to respond to new challenges (i.e. water quality)

Pre-conditions Necessary for States to Compact Together

According to Weissert and Hill (1994), states are more likely to compact when it first, “serv[es] as a means for decreasing the cost of implementing shared views of a given problem” (p. 30). State affluence is a major factor when compacting (Bowman & Woods, 2008). However, states are more likely to cooperate according to how little money they have. That is to say, a poorer state views compacting as a way to expand capacity, while a wealthy state is more capable of a unilateral approach to water management. This also includes institutions, meaning that states with weaker fiscal and institutional capacity participate in compacting more frequently. However, participating states still require a minimum amount of resources in order to administer the compact (Bowman & Woods, 2008).

Secondly, Weissert and Hill (1994) point out that states are likely to participate in compacts when “the ability to compromise on an issue is not complicated by a strong single-state interest that is contrary to the interests of one or more other members” (p. 30). This usually happens with asymmetrical power claims. For instance, if an upstream state has more control of a river compared to a downstream state, there is little incentive for the upstream state to cooperate. This usually happens when an upstream state has more intense uses compared to downstream states. So long as the upstream water supply is spoken for and there is no reason or authority compelling the upstream state to allow more downstream flows, it is in the upstream state’s best interest to continue using the water as it sees fit with cooperating with the lower state.

State politics can also play a role in forming compacts (Bowman & Woods, 2008; Bowman, 2004). State politics generally control the actions of state government. Further, certain political ideologies have proclivities to cooperate, while others tend not to cooperate. For example, a state with a more liberal political leaning is more likely to sympathize with a larger role for government. A larger role in government can often translate as cooperation, and thus compacting. Conversely, a conservative political leaning may not sympathize with a larger role for government and may be less willing to cooperate or compact. However, it could also be said that a water compact could solve a social concern while also preempting the expansion of the federal government's authority on the states (Bowman & Woods, 2008). Therefore, providing yet another reason why a water compact may be beneficial for individual states.

Finally, the federal government can have effects on states' decisions to compact. As discussed before, interstate compacts have seemed to be a popular option amongst states due to their reluctance to give up sovereign powers. However, one study has found, in an ironic twist, that states do not form compacts for this purpose (Bowman & Woods, 2008). In fact, many states have voluntarily entered into agreements that seemed to dilute their own autonomy by devising its authority to a compact (Bowman & Woods, 2008). This implies that states prefer a voluntary, sharing of sovereignty, rather than preempting the federal government from usurping its power. Additionally, the study found that states that are located closer to one another are more willing to relinquish autonomy in an effort to solve social problems (Bowman & Woods, 2008).

Table 2: Characteristics affecting the likelihood of parties to compact

Characteristic	More likely to compact if...	Reasoning	Reference
Affluence	Less affluent	Attempt to spread the cost of implementing a shared view of a particular problem	(Bowman & Woods, 2008)
Asymmetrical Power Claims	Power claims are viewed approximately equal	A strong upstream state interest can empower a party to act unilaterally	(Weissert & Hill, 1994)
Politics	View a larger role in government favorably	A compact will inevitably bring about additional regulation, which is welcomed by those who desire more centralized government	(Bowman & Woods, 2008)

Successful Compact Elements

Successful compact implementation is difficult because of the mix of interacting variables. A successful compact must account for “severity and complexity” (DeMasters, 2014, p. 156), the size and diversity of stakeholders, and the “technical and organizational capacity of the implementing agency” (Scheberle, 2014, p. 46). While reviewing the different compacts and literature, a few compact elements have proven to help establish a successful compact. The elements are: 1) clearly defined natural hydrological boundaries; 2) a strong, adaptive commission; 3) flexible apportionment rules; 4) conflict resolution; 5) interagency coordination; and, 6) public participation.

Table 3: Elements of successful water compacts

Element	Reference
Clearly defined natural hydrological boundaries	(Ostrom, 1990), (Green & Perrings, 2014)
Strong, adaptive commission	(Schlager & Heikkila, 2011), (Muys, Sherk, & O'Leary, 2007), (Mandarano, Featherstone, & Paulsen, 2008), (Schlager & Heikkila, 2009), (Dellapenna, 2006)
Flexible apportionment rules	(Schlager & Heikkila, 2011), (Green & Perrings, 2014), (Hall, 2010)
Conflict resolution	(Muys, Sherk, & O'Leary, 2007)
Interagency coordination	(Margerum & Whittall, 2004), (Connick & Innes, 2003), (Hardy & Koontz, 2009)
Public participation	(Draper, 2007), (Gleick, 1998), (Palmer, Cardwell, Lorie, & Werick, 2013)

Clearly defined natural hydrological boundaries

A brief overview of common-pool resource theory will help demonstrate water compacts' role in water resource management. A common-pool resource is a natural or man-made resource system whose size or characteristics are sufficiently large enough that make it costly – but not impossible – to exclude potential beneficiaries from obtaining benefits from its use (Ostrom, 1990). Common examples of common resource systems include fisheries, forests and other natural resources like water. Resource systems are made up of a flow of core resources like fish, trees and cubic meters of water. A defining characteristic of common pool resources is the potential for congestion or overuse because units are subtractable or rivalrous, meaning that the consumption of one unit by a consumer prevents consumption by other consumers. Because core resources are rivalrous, removing too many core resources at any given time could deplete the core system. Or, conversely, resource systems are stock variables – or a quantity existing in

that point in time – that are capable, under favorable conditions, of producing an optimum amount of a flow variable without harming the stock or the resource system altogether. This distinction becomes important when resource systems are renewable resources and where replenishing rates can be determined.

Interstate rivers are common-pool resources. Excluding potential users is costly, and any water used or withdrawn is not available for other users to use (subtractable). Coordination and government allow users to protect and nurture the interstate river. This occurs through institutional arrangements. Institutional arrangements are “rules and property rights systems that guide, direct, and constrain people’s actions with respect to [common-pool resources]” (Schlager & Heikkila, 2011, p. 462 citing Ostrom, 2005). Generally, the institutional arrangement is set and guided by the water compact. The main objective of this institutional arrangement is to promote cooperation amongst interested states and water users while reducing, and sometimes resolving, user conflicts.

A compact shall encompass the natural hydrologic boundaries of the disputed water basin (Ostrom, 1990; Green & Perrings, 2014). Clear defined boundaries are important because it allows users to exclude “outsiders” so that those who are expending resources to manage a water basin can reap the benefits (Ostrom, 1990, p. 91). Additionally, excluding outsiders keeps those who do not abide by compact rules from further damaging the water basin and depleting its resources. At the very least, those who wish to provide for a water resource at all should be able to exclude others from access. Because, if not, and there are enough users and sufficient demand for access, the

withdrawal from a water resource by outsiders could extinguish any previously arranged benefit (Ostrom, 1990).

Apart from providing a clear boundary to help exclude certain users, another reason why the whole hydrologic boundary shall be considered is to establish benefit sharing (Green & Perrings, 2014). This further requires the basin to be managed as a single unit. As such, this shifts policy analysis away from the resource itself and the exclusion of users to the benefits of utilization. For example, Green and Perrings (2014) demonstrate:

a downstream state experiences frequent flooding and seeks to construct a reservoir, but the state's territory is mostly floodplain, so any reservoir would be shallow, have a large footprint, and store less water than a reservoir with a smaller footprint in a deep valley in the headwaters. In addition, downstream development would impede the migration of anadromous fish. At the same time, a canyon in an upstream state may be a more suitable location for a storage facility that would benefit the downstream state in the form of flood protection without imposing downstream physical barriers to fish migration. Upstream development would also cause significant environmental harm, harm which must be addressed if the SES [or social ecological system] is to be resilient. The upstream facility may be able to provide greater benefit (i.e. store more water) with potentially less cost (i.e. flooded land and evaporation). Then whatever benefits the downstream state reaps can be paid forward to the

upstream state, perhaps in collaborative measures to protect the upstream migration or as financial side payments. (pp. 187-188)

This example shows that the single unit hydrologic boundary provides benefit sharing that can be realized by all interested parties. Thus, common-source resource management does not have to be solely about excluding potential users, but if responsible and sustainable practices are maintained, the resource system can provide an optimal number of goods for users.

Commissions

Many compacts are established with an active government commission, generally made up of water officials, water users and appointed representatives. The commission's purpose is to administer water allocation rules; address problems and conflicts; and, engage in studies, monitor, and report on different water use and supply issues in the river basin (Schlager & Heikkila, 2011). Generally, commissions have been great at administering different defined rules. But water is stochastic, which means that water behaves in a random pattern that may be analyzed or measured statistically but may not be predicted precisely (Howe, 1979). Its physical characteristics (i.e. form as a solid, liquid or gas; or put another way, as ice, water or condensation) and physical location can be measured, however not with absolute precision. For example, it is not possible to determine with absolute precision how much water is flowing in a river at a given time because some water is changing form – from a liquid to a gas - during evapotranspiration, or it can be physically changing location as some water is lost as it seeps into the ground water. This fact, combined with issues of climate variability and population growth,

makes administering the river system very difficult, compounded by water issues that can change season to season, year to year, and decade to decade. Therefore, governing institutions like commissions must be flexible to react to variability (Muys, Sherk, & O'Leary, 2007). However, rather than upend these institutions with new compact negotiations or litigation every time problems arise, adaptive capacity can be built in with flexible policies (Schlager & Heikkila, 2011). In determining institutional adaptive capacity, it is important to discuss the vulnerabilities and then address how water compacts can provide adaptive, flexible alternatives.

A majority of compacts involve compact commissions to administer the terms of the agreement (Mandarano, Featherstone, & Paulsen, 2008). However, not all compact commissions are structured the same (Mandarano, Featherstone, & Paulsen, 2008). The most common structure consists of state commissioners, the participating states' governor or their representatives and a federal representative or advisor who are granted ultimate authority over the compact. Voting is generally based on unanimity provisions, whereby all members of the commission must agree before proceeding.

Unanimity provisions provide both benefits and drawbacks for commissions. As benefits, scholars argue unanimity “slows down the decision-making process, requiring extensive deliberation and consideration of all viewpoints. Over time, as people interact and learn of one another’s values and preferences, they devise solutions that better match the situation” (Schlager & Heikkila, 2009, p. 370). However, as a drawback, unanimity provisions have made it more difficult for decisions to be reached. From a logic perspective, these provisions provide a veto power for minority viewpoints, allowing

each actor to protect its interest at the expense of the majority opinion (Schlager & Heikkila, 2009, citing Buchanan & Tullock, 1962). In an interstate water compact context, Muys (2004) points out that unanimity allows upstream violators of a compact to stonewall discussions and negotiations in a commission while the violation continues to persist. Further, the unanimity rules may lead to inferior policy choices because parties may implement rules that are easily mutually agreeable rather than more intractable issues like water quality concerns.

Apart from unanimity provisions, another criticism of existing compacts is their lack of enough authority. A prime example of this insufficient authority is the original Great Lakes Basin Compact – also known as “let’s keep in touch” (Dellapenna, 2006; Hall, 2006). The compact consists multiple states, including Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin. Also, the compact creates a commission that includes a group of commissioners from each participating state that authorized it to “gather data and to make recommendations for various policies and programs” (Dellapenna, 2006, p. 62). However, the compact did not require any act of the commission to be binding on the participating states. The commission’s policies and programs were merely recommendations. This essentially provided a forum for the participating states to discuss any issues but did not obligate any of the members to comply with any policies set forth. Further, the compact provided for any member state to withdraw unilaterally by means of an act of its state legislature. Because of this lack of authority, the Great Lakes Basin Compact is commonly referred to as the “let’s keep in touch” precedent. Since then, the Great Lakes Basin ratified a compact that bans new

water diversions outside the basin (Great Lakes-St. Lawrence River Basin Water Resources Council, 2020). Limited exceptions may be allowed for communities near the basin. But member states use a consistent standard to review proposed uses of basin water.

Apportionment rules

As noted previously, adaptive capacity allows water compacts to address water's stochastic nature and climate change. Climate change will force water managers to encounter novel issues. Adaptive capacity may be implemented with allocation rules or apportionment rules. There are two types of allocation rules: fixed and proportionate. First, for fixed allocation rules there are an additional two strategies. One strategy allocates a specified amount of water to each interested state (Schlager & Heikkila, 2011; Green & Perrings, 2014; Bennett, Howe, & Shope, 2000). This allows upstream states to take their fixed allotment regardless of how much is left or how it affects remaining states. This fixed allocation strategy puts the downstream states at a disadvantage. Additionally, in times of water shortage like in droughts, upstream states can remain in full compliance while taking their full share of the water, while the downstream state could possibly fail to acquire its rightful share (Bennett, Howe, & Shope, The Interstate River Compact as a Water Allocation Mechanism: Efficiency Aspects, 2000).

A second fixed allocation strategy is called the minimum flow rule. The minimum flow rule requires an upstream state to deliver a specified amount of water to downstream states (Green & Perrings, 2014). Here, the upstream states bear the effects of hydrologic variability. During dry years, upstream states can decrease water demand from a shared

water source in accordance to administrative rules, but the state can still fall out of compliance if it fails to meet the minimum required flows. Although both fixed allocation rules provide water users a set allotment of water, with hydrologic changes, there is no guarantee that states can ensure compliance.

In order to spread the risk of water shortages beyond just upstream users or downstream users, proportionate allocation rules were created (Bennett & Howe, 1998). Again, proportionate allocation rules have been divided into two different strategies: fixed proportionate and variable proportionate. Under fixed proportionate allocation rules, each state is given a fixed amount of water. However, when stream flows drop below a certain specified level, separate low flow allocation measures are triggered. According to McCormick (1994), these measures have been easy for states to comply with and provide manageable resource management. However, during drier months, upstream users can be adversely affected similar to those in a minimum flow rule jurisdiction. This dilemma can lead to enforcement issues as well. For instance, users near the border of upstream states will illegally divert water (Brown, 2016). To them, it is difficult to see seemingly adequate amounts of water flow past their intakes.

Finally, variable proportionate allocation rules can be employed. This method defines water allocation by the amount of current water flows. This method is certainly more flexible than the other methods. However, scholars warn that current water flows are hard to manage and hard to predict with variable water flows caused by climate change (Bennett & Howe, 1998). As discussed before, there are different stochastic models that produce different results. And with actual flows failing to match up with

climate models, it becomes harder for upstream states to deliver appropriate water resources to downstream states.

The scope of allocation rules can also affect adaptability. The scope refers to the extent the rules apply. For instance, “when do compact rules apply, how much water do they apply to, and which water users are affected” (Schlager & Heikkila, 2011, p. 464)? Generally, when these allocation rules are created, they are derived from historical records. As stated above, the variability in climate makes predictions more difficult since they skew the historical record (Hall, 2010). Therefore, the units that trigger certain rules are sure to change. For instance, irrigation schedules that dictate how much water can be diverted are usually set to the different seasons. Typically, water diversion is more restrictive during irrigation season or during the summer season. As climate change continues its effects, the dates that delineate the seasons may no longer resemble the actual season (Schlager & Heikkila, 2011). For example, if irrigation season corresponds with the summer season, as warmer weather continues into the fall, farmers will want to continue water diversions outside of the designated seasons. This will then cut into the seasons where water conservation traditionally takes place to help replenish the water supply. Therefore, the scope of allocation rules may be vulnerable to climate change if they are dictated by the seasons rather than actual water availability.

Apart from the seasonality of the rule, the amount of water that the rule authorizes is important as well. In some jurisdictions the amount of specified water that is required for minimum flows is relaxed (Schlager & Heikkila, 2011). In these areas, the scope of the minimum flow applies to a range. For instance, the Big Blue Compact’s minimum

flow rule requires upstream Nebraska to deliver Kansas between 3 and 17 percent of the mean monthly flow (Schlager & Heikkila, 2011). This provides adaptive capacity for upstream users like Nebraska by giving policy makers discretion, but it could potentially put stress on downstream states like Kansas. However, interested parties should be careful not to allow too wide of a water cushion lest any benefits be lost.

Finally, users within the scope of allocation rules may affect adaptability. Quite often, new allocation rules only apply to new users or to existing users who wish to increase their water intake (Schlager & Heikkila, 2011). This was done in part due to equitable practices, but also because limiting rules to new users was believed to be easier to implement. However, even by limiting new rules to future users, hydrologic changes due to climate change could prove future regulations necessary to curb existing water users' allotments. Therefore, making curbing water supply for future uses may not be enough for existing demand.

Conflict resolution

One of the main reasons for developing interstate compacts was an effort to implement predictability and water security between states. Another priority was to avoid time consuming and expensive equitable apportionment litigation in the Supreme Court. Therefore, in an effort to avoid interstate litigation in the Supreme Court, a compact commission should have adequate authority to enforce the compact obligations against the interested parties and to resolve others disputed under the compact. Because compacts are contracts, and procedures differ amongst them, this section draws heavily from the work the Utton Transboundary Resource Center at the University of New Mexico School

of Law and Muys et al.'s (2007) model compact. In 2000, the Committee on Energy and Natural Resources of the United States Senate designated the Utton Transboundary Resource Center to conference over 30 water experts and lawyers to address protracted shared water resources litigation between states. This experience yielded Muys et al.'s model compact which is cited by numerous scholarly articles.

Muys et al.'s (2007) model compact provides an administrative procedure for commission consideration of “(1) claims that a signatory party is not in compliance with one or more of its Compact obligations, and (2) disagreement or uncertainty over the interpretation of Compact language or Commission orders, regulations, or guidelines” (p. 93). First, when a signatory party is alleged not to comply, it has two options. One is to plead a force majeure defense; or, two, admit to the violation and engage in remedial action. A force majeure defense is a claim that something beyond the control of the commission took place that prevented the signatory party from complying with the compact. For example, for states that ascribe to a fixed allocation method, a force majeure defense would be one that a historic drought prevented a state the adequate amount of water to maintain downstream flows. The drought was beyond the control of the signatory party, and it should not be held liable for any violation. For the second option, if a state admits to a violation and implements remedial action, it would “relieve the party of any liability to any Commission member or its agencies, but not private parties, for any damages resulting from the violation” (Muys, Sherk, & O'Leary, 2007, p. 93). This type of administrative review encourages further cooperation amongst signatory

parties and thus, compliance. However, if the interested party wishes to challenge the dispute, the compact provides measures to hear the dispute internally.

Naturally, to provide real authority over violations, the compact provides sanctions for failure to resolve the compliance issue. Muys et al.'s (2007) model compact authorizes the commission to “suspend the party’s voting rights and the benefits of any projects or programs under the Compact” (p. 93). Further, if the signatory party still fails to comply, the commission may seek injunctive relief against the party and authorizes the other member states to seek damages in the Supreme Court.

The first administrative procedure provides relief and guidance for compliance issues. The second determines the protocol when there is uncertainty or disagreement regarding the interpretation of compact language or contested scientific data. In this case, signatory parties have a duty to first seek resolution of the dispute by the commission to see if the dispute may be resolved internally before seeking litigation (Muys, Sherk, & O'Leary, 2007). To dissuade parties from immediately seeking resolution in court, resolution seeking parties are obligated to pay all of the litigation costs of the parties who may later become involved in any litigation related to the dispute. This, potentially, could be all of the signatory parties since they could be affected by the dispute. As a result, legal bills could become prohibitively costly, forcing parties to exhaust all remedies as set out in the compact. This, by design, is to encourage good faith discussions regarding the issues until an agreement can be made amongst the parties.

If the commission cannot decide the matter, or the matter is not rectified within a reasonably defined time, best practices recommend attempted resolution by mediation or

arbitration that may be binding or non-binding. There is some concern by commenters of the model compact concerning the issue of uncertainty of whether to rely on arbitration or mediation (Muys, Sherk, & O'Leary, 2007). However, Muys et al. (2007) suggest that leaving this dispute resolution provision open may help move settlements of the dispute along. Then, once the commission has decided or all other dispute resolution remedies have been exhausted, signatory parties are free to seek litigation without the compact sanctions discussed above.

Interagency coordination, public participation, and collaboration

River basins are complex ecosystems and contemporary institutions that address natural resource management reflect this complexity. For example, stakeholders within a river basin consist of regulators from local, state, and federal agencies; utility companies; advocacy groups; recreation users; and private businesses from small scale with little to no effect to natural resources to industrial scale businesses. Many social scientists believe collaborative dialogue among stakeholders is the most productive way to address many complex and controversial policy questions associated with natural resource management (Margerum & Whittall, 2004; Connick & Innes, 2003; Hardy & Koontz, 2009). In the social sciences, collaboration is the process by which “parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible” (Gray, 1989). There are two aspects of natural resource management that can benefit from collaborative dialogue: interagency coordination and public participation. Public participation should be equitable, validated

by consensus, and represent all relevant stakeholders (Draper, 2007; Gleick, 1998; Palmer, Cardwell, Lorie, & Werick, 2013).

According to Margerum and Whital, allowing different parties to discuss different aspects of a problem has been beneficial in natural resource management for four reasons (2004). First, as natural resources become more valuable and more parties are competing for these resources, conflicts have predictably arisen. For the same reasons the Supreme Court of the United States believes the court is a poor forum for resolving water disputes, the interested parties involved in natural resource management often resolve conflicts through collaboration (Margerum & Whital, 2004). Second, as expert's understanding of natural resources deepens and is more specialized, there is an additional need to include more parties. In order for these parties to accomplish their goals, collaboration is necessary. Third, contemporary environmental problems are spread amongst a large group of people. For example, Margerum and Whital suggest issues like storm water runoff and habitat modification. These issues are not easily addressed by traditional regulatory measures. Because these issues are so diffuse, it is better to include a broad reach of participants to understand how these issues affect a diverse group. Finally, with so many different agencies and organizations tasked with solving natural resource issues, there is plenty of overlapping in responsibilities. Collaboration provides parties a framework and forum to explore differences and redundancies that may be overlooked (Margerum & Whital, 2004).

However, like certain elements are necessary for a successful water compact, when collaboration meets certain process criteria to a substantial degree, a large set of

beneficial outcomes may occur (Connick & Innes, 2003). Specifically, the certain process criteria are provided in the box below.

Process criteria for collaborative dialogue. (Connick & Innes, 2003, p. 180)

- Includes representatives of all relevant interests
- Is driven by a practical purpose and task shared in the group
- Is self-organizing
- Is engaging to participants as they learn and interact
- Encourages challenges to assumptions and fosters creativity
- Incorporates many kinds of high-quality information
- Seeks consensus only after discussions have fully explored issues and interests and
- Significant effort has been made to find creative responses to difference

Although there is plenty of research suggesting the benefits of collaboration, the approach also has its criticisms. First, there may be difficulty reconciling data provided by experts and anecdotal evidence provided by local lay persons. Second, members of the group may not consider downstream effects or basin wide cumulative effects (Margerum & Whitall, 2004). Third, there may be animosity managing ecological and scientific time frames and management and constituent time frames, which mean that the amount of time to provide benefits to a natural resource that is measurable may be too long for politicians' and voters' attention span or expectations (Margerum & Whitall, 2004). Finally, organizing so many interested parties for collaboration provides additional costs in time, operations, and finances (Margerum & Whitall, 2004).

Summary

Transboundary water issues should be addressed with interstate water compacts. Successful water compacts should include six characteristics. First, boundaries should

include natural hydrologic boundaries rather than strict political boundaries. Second, a strong and adaptive commission should be created and empowered to enforce collective decisions. Third, the compact should include adaptive allocation calculus to handle the complexities of changing water supply. Fourth, dispute resolution should be included to address implementation and compliance issues expeditiously. Fifth, interagency coordination and collaboration should provide multi-disciplinary analysis and decisions for complex issues. Finally, sixth, public participation should represent all relevant stakeholders, equitably, and validated by consensus. However, providing a complex structure to manage a competitive and variable resource across multiple political boundaries is difficult compared to the predictable and enforceable status quo.

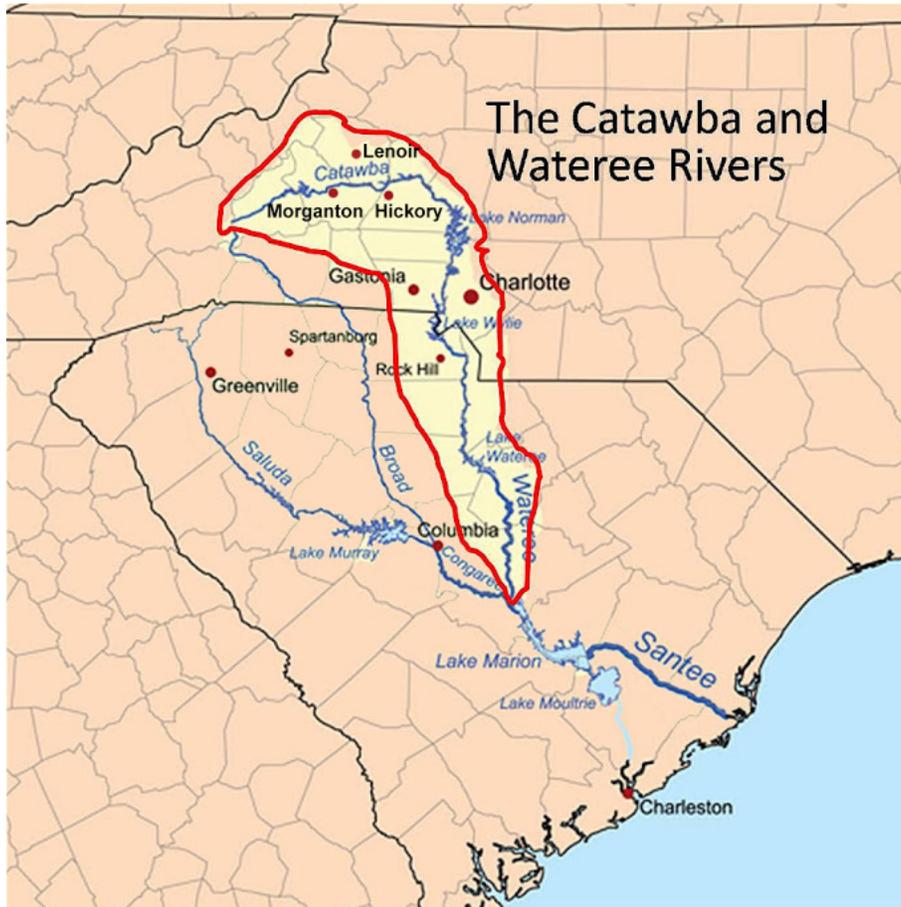
CHAPTER THREE: METHODOLOGY

Chapter 2 addressed the elements and preconditions necessary for a viable interstate compact. This chapter discusses whether these elements are present in a setting with a contentious history over an integral water resource for two states. I used a case study research method to answer the proposed research questions. A case study “investigates a contemporary phenomenon (the ‘case’) in its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident” (Yin, 2014, p. 2). This method is preferred in situations where: 1) the main research questions are “how” and “why”, or explanatory in nature; 2) the researcher has little or no control over behavioral events; and, 3) the focus of the study is a contemporary phenomenon (Yin, 2014). Further, explanatory research questions lend themselves towards case studies because operational or causal links that help explain general theories need to be treated over time, rather than mere frequencies or incidences like in experiments. The integral water resource selected as a case study is the Catawba-Wateree River. The Catawba-Wateree River was selected because it flows through two state jurisdictions that could benefit from transboundary cooperation to manage an integral natural resource to the region. Specifically, the two jurisdictions do not share regulatory comity and experience periodic severe drought events. Therefore, the river basin may benefit from an interstate compact and is discussed below.

Site Selection

The Catawba-Wateree River is an interstate river between North Carolina and South Carolina that begins in the Appalachian Mountains of western North Carolina and flows approximately 320 miles to the confluence with the Congaree River in Lake Marion in South Carolina. The headwaters of the Catawba-Wateree River extend from Grandfather Mountain outside Blowing Rock to the mountains in Ridgecrest, North Carolina. And, the water basin expands 5,000 miles of waterways, reaching 24 counties in two states. The Catawba River's name changes below Great Falls, South Carolina and becomes the Wateree River in Lake Wateree. The Wateree River flows approximately 80 miles until it reaches Lake Marion. The river flows through one National Wilderness Area at Linville Gorge, a National Park at Congaree National Swamp, the Catawba Indian Tribe, and through various state and local parks.

Figure 1: The Catawba-Wateree River basin



Most of the Catawba-Wateree River is dammed. 14 major dams create 11 large reservoirs that provide drinking water, water for industry, irrigation, hydropower, waste assimilation, flood control, transportation and recreation (Catawba Riverkeeper, 2016). The longest free flowing stretch of the river is 30 miles below Lake Wylie in South Carolina. More recently, the stretch was designated as a South Carolina Scenic River, and hosts the world's largest grove of Spider Lilies (Catawba Riverkeeper, 2016).

The Catawba-Wateree River is one of the most important and hardworking rivers in the United States serving over 2 million people (Catawba Riverkeeper, 2016).

Unfortunately, population growth has put severe strains on the river system. Further, water quality in many areas is impaired, and water shortages are becoming increasingly common due to drought, increasing demands for water and inter-basin water transfers. One important study has shown that by 2050, the water yield for many of the system's reservoirs may be reached (Catawba-Wataree River Basin Water Supply Master Plan, 2014). As a result, national advocacy group American Rivers has named the Catawba-Wataree River the most endangered river in the United States in 2008 and the fifth most endangered river in 2013 (Catawba Riverkeeper, 2016).

Over the years, both North Carolina and South Carolina have sometimes cooperated in efforts to address water quantity and quality issues along the Catawba-Wataree River basin, and sometimes have seemed to sabotage those efforts. Most recently, differences over water management came to a head in the Supreme Court of the United States in 2007. However, contention began years before then, along with periodic terms of cooperation. To start, in 1991, North Carolina enacted legislation allowing interbasin transfers (IBT) of water and created a review process for any adversely affected parties in the watershed (Davis, 2009). An IBT is the movement of surface water from one basin to another that is not returned to the original basin. Although IBTs can provide relief to drought-stricken areas, it can have adverse consequences for both the source river and the receiving river. For example, the source river experiences reduced water flows which downstream users and estuarine habitats depend on, among other adverse effects; while, the receiving river may promote energy consumptive and inefficient sprawl in an area that otherwise would not have the water resources to

facilitate high growth (Catawba Riverkeeper, 2016). This statute demonstrated the potential detrimental actions that could further stress the Catawba-Wateree River basin.

2003 was a year of cooperation as a publicly traded energy corporation with assets in both North Carolina and South Carolina, Duke Energy Corporation, initiated an inclusive and comprehensive planning process for its Federal Energy Regulatory Commission (FERC) relicensing application for the Catawba-Wateree Hydro Project (Payne, 2017). Cooperation continued through 2004. In an effort to address prolonged drought in the region, North Carolina and South Carolina created advisory commissions to monitor interstate river basins that included the Catawba-Wateree River basin. Particularly, the Catawba-Wateree River Basin Advisory Commission (Bi-State Commission) was created. Then finally, in 2006, Duke Energy completed its comprehensive planning process. As a result, 70 organizations consisting of municipalities, environmentalists, non-profits, private land owners and the Catawba Indian Nation, signed the Comprehensive Relicensing Agreement (CRA) which is “expected to unleash a wave of construction of recreational amenities” including \$16.1 million for land conservation, over \$4 million for public recreation amenities, 2,455 acres in conveyances and easements, flow releases from several dams along with water allocation protocols in times of drought and the establishment of an advisory commission to monitor the river basin (Henderson & Off, 2015).

Finally, in 2007 the parties failed to cooperate. In January, when the two states were purportedly attempting to form an interstate compact, North Carolina approved an IBT of 10 million gallons per day from the Catawba-Wateree River to accommodate

growth of two suburbs of Charlotte, North Carolina in the Rocky River basin (Dyckman, 2011). In an area experiencing explosive population growth, the IBT promotes the continuation of inefficient sprawl in Concord and Kannapolis where there is already a lack of water resources, while preventing water resources from reaching downstream Catawba-Wateree River basin users and habitat.

As a result, South Carolina halted all compact negotiations, and filed a *parens patriae* suit against North Carolina in the Supreme Court of the United States pursuant to Article III, Section 2, clause 2 of the United States Constitution. In its complaint, South Carolina argued that, as a downstream user, it is adversely affected by the “historic volume variability in the Catawba-Wateree’s natural flow” as evidenced by Duke Energy’s comprehensive planning study, along with prolonged droughts sustained in the region (*South Carolina v. North Carolina*, 2010). This was largely because North Carolina’s IBT statute only accounted for adverse effects within its borders and did not account for downstream states. Therefore, South Carolina sought equitable apportionment to ensure and maintain dependable flows for its users.

After North Carolina filed its answer to South Carolina’s complaint, the Supreme Court eventually granted certiorari. Additionally, Duke Energy and the Catawba Water River Water Supply Project filed motions as interveners, which the Court granted. However, the discussion of intervenors is outside the scope of this research, but they should be noted as parties to the action. The Court then appointed the Special Master, who decided if South Carolina could demonstrate enough harm, it was entitled to

equitable apportionment. Upon this decision, both parties began discussing settlement arrangements.

In response to settlement arrangements, the Bi-State Commission decided to use the CRA that was created during the Duke Energy FERC relicensing application process, as a first step for settlement negotiations (Settlement Agreement, South Carolina v. North Carolina, No 138, Orig., 2010). As a result, all parties agreed to establish a cooperative environment to share the Catawba-Wateree River equitably, while reducing costs to taxpayers and ratepayers alike and providing a “model for regional cooperation” (Settlement Agreement, South Carolina v. North Carolina, 131 S. Ct. 855 (2010) (mem.) (No. 06-138)). Then, after the settlement agreement essentially adopted the CRA and was approved by all necessary parties, the case was dismissed by the Supreme Court of the United States on December 14, 2010.

Data Collection Methods

After I chose the integral transboundary water resource, I selected a qualitative interviewing method to describe whether the conditions existed for a water compact. An interviewing method allows for further investigation beyond whether the conditions discussed in Chapter 2 are present. Here, the respondents discuss the quality of the conditions that are present. For example, Chapter 2 discusses the need for a commission. Interviews allow respondents to discuss how often the commissions meet, if commissions are beneficial, and opportunities for further improvement.

I identified participants for interviews in three main ways: internet searches for articles interviewing different stakeholders and parties involved with compact attempts

and resolutions, identifying stakeholders and signatories of the 2006 Comprehensive Relicensing Agreement (CRA), and snowball sampling. The CRA is the most informative in identifying potential participants. As discussed in the previous section, Duke Energy negotiated with 72 community stakeholders to determine how the resource was to be used. Consequently, Appendix B of that document was used to identify participants. Those 72 community stakeholders were then categorized into seven groups: advocates, governments, homeowner’s associations, non-governmental organizations, private businesses, private citizens, and utilities. These categories were created to ensure that different perspectives and opinions are included across all stakeholders. Additionally, Table 4 below shows the actual participants compared to the total possible participants per category. I successfully secured 11 meaningful participants for this study. First, I will discuss the shortcomings and gaps associated with my participant pool, and then I will discuss the successes.

Table 4: Community stakeholder categories and participants

Category	Total Possible Participants	Actual Participants
Advocates	9	2
Governments	37	4
Homeowner’s Associations	5	0
Non-Governmental Organizations	8	2
Private Businesses	3	0
Private Citizens	5	0
Utilities	5	3
TOTAL	72	11

As a shortfall, I was unsuccessful in interviewing participants from three categories: homeowner's associations, private businesses, and private citizens. After many attempts, private citizens and businesses did not respond to email and phone calls. However, I was successful contacting a homeowner's association president and member. But, after many communications, the two potential participants felt they did not have much to offer and did not participate.

I also attempted to contact private businesses. The private businesses represented manufacturing industries with substantial water withdrawals from the Catawba-Wateree River. However, they did not respond to any requests. Additionally, the private citizens did not respond to requests to participate. The private citizens that were contacted are listed in the Appendix B of the CRA. They were identified as property owners adjacent to the river or one of the lakes and reservoirs. Without participation from stakeholders from these three categories — homeowner's associations, private businesses, and private citizens — certain perspectives are not included in the results. Specifically, private businesses may provide a perspective for those who derive a direct economic benefit from the river. Additionally, private citizens and homeowners with property on the river may provide a perspective from those who experience intrinsic benefits from the river but may also experience decreased property values depending on the height of the water. Finally, Duke Energy refused to participate. I was successful in making contact and arranging an interview with a Duke Energy representative. However, the representative declined to participate after I sent potential interview questions.

Although not all of the categories of community stakeholders participated, 11 of the possible 72 participants agreed to share in a meaningful interview. I use the term meaningful because one interview consisted of a director of a state agency who could only speak briefly for 15 minutes. Because of the brevity of the conversation, the interview is not included in any conclusions. Additionally, I did conduct interviews with others who provided background knowledge. I did not include these interviews since they did not have direct experience with the *parens patriae* case or relicensing process.

I successfully interviewed participants from four of the stakeholder categories: advocates, governments, non-governmental organizations, and utilities. The governments, with four participants, is the largest category. Of the four participants, two participants represent executive agencies in North Carolina and two participants represent executive agencies in South Carolina. All four participants have experience in the relicensing process. These participants offer technical knowledge and experience related to regulating the natural resource. As will be discussed in Chapter 4, most perspectives ruminate on the lack of resources to manage the Catawba-Wateree River. It is important to note elected officials, representatives from the Catawba Indian Nation, or FERC representatives did not participate in interviews.

The next largest participant category is the utility category with three participants. Notably, Duke Energy declined to participate in the interviews. The three participants include water suppliers. All three of the water suppliers have direct experience with the Water Management Group. Additionally, one of the participants served in a leadership role in the Water Management Group. The perspectives of the utility group largely

focused around issues providing water to customers as demands continue to increase over time.

I was also successful conducting interviews with two community stakeholders in the advocates category and the non-governmental organizations category. The two advocate interviews were conducted with environmental advocate organizations who participated in the FERC relicensing process. The two participants advocate and educate others to protect the Catawba-Wateree River basin. One of the non-governmental organization participants was a contributor to the collaboration of stakeholders to inform an agreement for the CRA. The participant is viewed as a mediator who brought the different stakeholders together to address different parties' concerns in the relicensing process. Finally, the other non-governmental organization participant provides regional planning needs for local governments along the Catawba-Wateree River.

Because human participants are involved in the research, potential participants and interview questions were reviewed and approved by the Institutional Review Board of Clemson University. Furthermore, participants provided informed consent before contributing and received a list of potential interview questions upon request. Participants were then contacted by phone and/or email. Finally, phone interviews were scheduled, and generally lasted between 45 minutes to an hour and a half.

I conducted semi-structured interviews to further ensure different perspectives and opinions. Certain questions are structured to compare answers between different categories of stakeholders and participants (Appendix A). The structured questions derive from the elements and conditions that are necessary for a successful compact.

Specifically, eight categories of questions were designed to assess the necessary preconditions. See Table 5 for a description of the general interview structure.

Additionally, each question category has multiple iterations to encourage participant answers (Appendix A). However, interviews remained semi-structured to allow for flexibility and continuity in reaction to participant’s answers.

Table 5: Arc of semistructured interview questions

General	Specific
Interviews started with participants discussing general issues associated with the Catawba-Wateree River.	“What kinds of issues or problems are affecting water distribution?”
Questions about whether interested parties are committed to solving issues associated with the river basin.	“In your opinion, are sufficient time and resources being spent by interested parties/states to address water distribution issues and management? How so?” “How have parties demonstrated their commitment to these issues?”
Questions about whether allocation rules for in-flow streams are addressing user needs.	“Should allocation rules be more flexible or more stringent to address new issues? Why?” “How do the allocation rules and regulations promote or discourage solutions to your issues?”
Questions about what type of constraints are preventing the states from unifying under a compact.	“What are the major threats preventing parties from coming together?”
Questions about collaboration.	“Do you feel everyone has been included?” “How might your experience working with different groups and stakeholders be improved?”

General	Specific
Questions about the authority of the river basin governance.	“How is the commission empowered?” “What has been your experience while dealing with the commission?” “What issues have the commission helped resolve?”
Questions about the sharing of resources amongst stakeholders and agencies.	“What are your feelings regarding sharing data and information with other sources?” “What issues exist when gathering and sharing data and information?”
Questions about the adequacy of forums for the public comment.	“How do groups and stakeholders collaborate and cooperate? What are the forums through which they do so, and how is the accessibility to the(s) forum(s)?”
Questions about the viability of an interstate water compact for the Catawba-Wateree River.	“How effective do you think the current settlement agreement manages water allocation on the Catawba-Wateree River? Would a water compact be more effective?” “Is a water compact for the Catawba-Wateree River a possibility?”

Data Analysis Methods

In order to analyze the qualitative data, I used two cycles of values and pattern coding. Coding is “a researcher-generated construct that symbolizes or translates data and thus attributes interpreted meaning to each individual datum for later purposes of pattern detection” (Saldana, 2014). Prior to the interviews, each participant agreed to audio recording. After concluding each interview, the recordings were then transcribed. Each transcription was then manually coded. Coding was conducted manually rather than using coding software for two reasons. First, it was difficult to learn coding methods and the

requisite software simultaneously. Second, the associated software is an additional cost to the research. Finally, it is important to acknowledge that I am the only coder in this study. Intercoder reliability is not evaluated. Intercoder reliability refers to the “extent to which two or more independent coders agree on the coding of the content of interest with an application of the same coding scheme” (Cho, 2011). Therefore, the content is biased towards my values and patterns.

Each transcript went through two cycles of coding. First, I used values coding. Values coding reflects a participant’s “values, attitudes and beliefs, representing his or her perspectives or worldview” (Saldana, 2014, p. 131). It was used to discern whether the necessary elements existed on the Catawba-Wateree River and provide insight to the effectiveness of a water compact. Value coding yields phrases rather than individual datum. Therefore, I conducted a second cycle of coding to help focus the data.

For the second cycle, I used pattern coding. Pattern codes are “explanatory or inferential codes, ones that identify an emergent theme, configuration, or explanation” (Saldana, 2014, p. 236). In this instance, I used pattern codes to condense the phrases produced during the first cycle value codes into manageable analytic units and ultimately, themes. Finally, I derived themes from the codes closely aligned with the different categories of questions that were arranged in the question matrix. However, I found the codes helped align the unstructured questions and dialogue with those predetermined themes.

Although coding is a popular method to analyze qualitative data, it also has criticisms. Unlike quantitative data, coding qualitative data is not an appropriate pathway

to arriving at statistical descriptions of a large population like the users of a regional water source (Saldana, 2014). Rather, coding provides a framework in managing, deciphering, and assigning a meaning to individual datum. Therefore, this method provides a degree of objectivity to a subjective research method.

CHAPTER FOUR:

RESULTS

The literature review in Chapter 2 revealed the necessary elements for a viable interstate compact, particularly with uncertain outcomes associated with climate change, and these include: 1) clearly defined natural hydrological boundaries; 2) a strong, adaptive commission; 3) flexible apportionment rules; 4) conflict resolution; 5) interagency coordination; and, 6) public participation. The interview results determine whether these elements are present on the disputed Catawba-Wateree River, and if not, they help to identify the obstacles to establishing those preconditions and supporting the essential elements.

Issues, Constraints, and Successes Associated with the Basin

At the beginning of each interview, participants were asked to identify issues and constraints associated with the Catawba-Wateree River basin. The responses are divided into three themes: 1) water availability, 2) environmental, and 3) governmental and regulation. The themes derive from the coding methodology discussed earlier. The themes are further divided into subthemes and discussed below. First, for water availability issues, the results suggest the majority of government representatives interviewed are concerned about competing water users and longevity of the water resource. Utilities are largely concerned about water longevity.

Second, the environmental issues contemplated climate change and drought. Eight participants discussed climate change, but not all participants are concerned about climate change. Drought is a very important issue with 10 participants stating it is the impetus for

transboundary regulation for the river. Third, the subthemes for governmental and regulatory issues include the evolution of public participation during the relicensing process and after the process and the lack of state resources. These subthemes clarify the substantial issues as multiple, competing water users, resource longevity, drought, public participation, and state resources.

Table 6: Issues and constraints associated with the Catawba-Wateree River basin

Water Availability	Environmental	Governmental/Regulatory
Multiple/competing users Water allocation/longevity Urban growth	Coal ash Drought Climate change	Lack of regulatory resources States differ in regulatory approach Involvement of state agencies Private company holding the operation license Public participation

A common issue discussed amongst participants is water availability, and specifically, the lack of water. A significant water availability issue is the number of users the Catawba-Wateree River serves who require the water for competing reasons. Six of the eleven interviewees stated competing users is an issue associated with the basin. Three of the six participants represent government agencies. The remaining three consisted of a utility, an environmental advocate, and a non-governmental organization. As discussed in Section 3.1, the river serves over 2 million people as well as multiple commercial users. And, those users' needs for the water is needed and consumed in different ways. According to 2011 figures provided in the 2014 Water Supply Master Plan, one percent of water withdrawals are used by the industrial sector, 11 percent is made up of agricultural and irrigation withdrawals, and 39 percent consists of

withdrawals for power generation. That leaves almost 50 percent of withdrawals for public water supply. Apart from water withdrawals, some water users desire to leave flows running down the river rather than impounded in a lake or reservoir. These users prefer free flowing water for recreation and ecological flows. One environmental advocate participant described, “there’s competing interests as far as keeping those lake levels high.” And, there’s a real issue with attempting to balance all the different interests.

Another issue discussed by the participants that affects these competing water issues is urban growth. Three participants (an environmental advocate, a government representative, and a non-governmental organization) noted urban growth and population as an issue in the basin. A representative from a non-governmental organization stated, “we expect our region, the Charlotte area, to double in population in two or four decades.” The Catawba River provides water supply, most notably, for the city of Charlotte, North Carolina. Charlotte is the most populous city in the state of North Carolina and is the 22nd most populous city in the United States with almost 2.5 million people according to 2016 American Community Survey data. With the additional urban growth, there is less water remaining for other water users.

Water allocation and the longevity of the water supply was a common topic within the water availability theme. Six of the eleven participants commented on water allocation, longevity, and supply issues. However, those six participants represented two interviewee categories, utilities and government agencies. As a water provider, it is no surprise the utilities were concerned about water availability. Specifically, many of the

participants discussed how one of the main functions of the Water Management Group was to study how to “ensure the river stays a reliable source of water as far into the future as they can” amongst competing interests.

The environmental theme refers to issues that affect the river as an ecosystem. Two participants, an environmental advocate and a government agency representative, discussed specific topics that affect water quality like coal ash impoundments located near the river to more broad topics that affected water availability like climate change. The issue of climate change is interesting depending on which interviewee category discussed the topic. Eight participants commented on climate change. The three utility representatives believe that climate change is well addressed with the Water Management Group. Specifically, the representatives stated the Water Management Group looks at water forecasting dependent upon variables like less precipitation and increased evapotranspiration which they reassess every five years. Four participants discussed climate change issues and acknowledged the limitations of water management under uncertainty. Although the Water Management Group uses climate change modeling, three government agencies and one environmental advocate acknowledged that global climate models do not scale perfectly to smaller geographical locations.

One issue that was common amongst participants was the discussion of drought. Almost every participant discussed drought as an issue within the basin. The only participant who did not discuss drought was a representative from a non-governmental organization who was involved in organizing public participation and outreach. The other ten participants specifically discussed how drought was the main driver to bring

stakeholders and interested parties together to solve water supply issues, and how cooperation was necessary to maintain competing water uses in times of short supply. One non-governmental agency stated that the Water Management Group have drought issues “nailed down.” However, two government agency representatives stated drought issues require further study, particularly related to climate change and variability.

Finally, the last theme is governmental and regulatory issues. Within this theme, participants discussed the lack of regulatory resources, jurisdictions differing in their approach to water management, lack of involvement by state governments, and public participation. Seven of the participants expressed concern over the lack of resources state agencies possess to regulate the river basin. One government participant shared that agencies lacked enough manpower to make it to meetings. While managing several river basins within each state, it is too difficult for agencies to accomplish day-to-day work on top of attending meetings with different stakeholders and interest groups. The two environmental advocates who are concerned with the lack of state leadership commented the states do not have the “capacity” and that the “utility has stepped up to play the role that the state agency should be playing.” Further, two utilities shared that the states look to the utilities and the Water Management Group to “come together and help manage” the river basin.

Additionally, four participants discussed how the two states differ in their regulatory approaches. For instance, South Carolina regulates surface water withdrawals, while North Carolina does not. All three of the utilities commented on these issues while trying to regulate the basin across state boundaries. Also, two environmental advocates

and two non-governmental organizations expressed they would like to see more involvement by the states to regulate the basin. Particularly, the environmental advocate participants are concerned with a private corporation being the licensee to operate the reservoirs rather than the government.

Finally, public participation was a popular topic amongst participants. In the case of the Catawba-Wateree River, public participation takes place at two different times. First, is during the FERC relicensing phase. Four participants lauded the work accomplished to reach consensus amongst the entire watershed and take part as signatories in the Comprehensive Relicensing Agreement discussed broadly in section 3.1, and more specifically in section 4.1. However, seven participants also discussed the lack of public participation allowed during the Bi-State Commission meetings, and during the Water Management Group meetings. Utility participants stated that these meetings were open to the public. However, others countered that, although open to the public, there is little opportunity for the public to participate or provide feedback during these meetings.

Although not specifically asked, participants also discussed successes associated with the basin. One success was the sharing of data and information. One participant shared:

“we share a lot of data about consumption and water withdrawal, but we also share a lot of information of how we’re doing things. Things like water audits and nonrevenue water analysis. We have worked on resiliency issues, sharing data about backing each other up type

capabilities. So, I haven't seen any reluctance or hesitancy on anyone's part to share openly and freely.”

Another key success participants discussed was the accomplishment of the Water Management Group. Specifically, many participants shared that they felt the state government and state agencies should be more involved with regulating the river. In the state authority's absence, almost everyone agreed that the Water Management Group has filled the void due to lack of governmental participation.

Elements Present

The following sections summarize the results from relevant document review and of the responses provided by interview participants. Because the necessary elements of clearly defined natural hydrological boundaries is established at the basin scale, it is not discussed in this section.

Strong, adaptive commission

As discussed earlier, successful compacts require commissions that have sufficient authority and adaptive capacity. The Catawba-Wateree currently has two entities that function jointly as a commission: the Catawba Wateree Basin Advisory Commission (Bi-State Commission) and the Catawba-Wateree Basin Water Management Group (Water Management Group). Both provide overlapping objectives like providing guidance and recommendations to local, state, and federal bodies, providing a forum to discuss issues in the river basin, promoting communication between stakeholders in the river basin, and undertake studies. However, both also have distinct roles as a product of their composition.

The Bi-State Commission consists of 15 members. Eight of those members are members of the legislature — four North Carolina legislators and four South Carolina legislators — while the others are appointed by the legislatures, except for the President of Duke Energy. Further, the General Assembly of either North or South Carolina did not give the Bi-State Commission direct authority to regulate the Catawba-Wateree River. As noted by one of the regulators who participated in the study, the Bi-State Commission may influence through the legislative process indirectly. Because the Bi-State Commission is made up of current legislators, those members can introduce legislation to benefit the Catawba-Wateree River, but the Bi-State Commission itself does not have the authority to implement planning measures for the river basin.

Recently, although the Bi-State Commission may have the indirect authority to regulate the river basin, many of the participants noted that the Bi-State Commission did not have the “political appetite” or the “political will” to enact water legislation. The Bi-State Commission has met 33 times since October 2005, meeting about two or three times a year, and is seen by many of the participants as “inactive” and “hardly operational”. However, some participants view the infrequency of meetings as evidence that the current regulatory scheme for the river basin has been largely successful.

Of the two commissions, the Water Management Group is viewed as a true success. Nine of the 11 interviewees shared this sentiment. Specifically, at least one participant from each of the community stakeholder categories expressed satisfaction with the Water Management Group’s role. This included environmental advocates and government agencies. Eligible members of the Water Management Group consist of

water utilities that withdraw 100,000 gallons per day or more of the Catawba-Wateree River. Although many of the objectives the Bi-State Commission and the Water Management Group overlap, the Water Management Group is praised for filling in the gaps left open by the Bi-State Commission. Particularly, nine of the eleven participants stated the Water Management Group provides the technical expertise to the Bi-State Commission. One example of their expertise is the Water Supply Master Plan (Catawba-Wateree Water Management Group, 2014). The plan, along with its associated amendments, provides long-term water projections for 2065, evaluations of options to extend available water supply, and coordination of hydrologic modeling. Although the Water Management Group provides critical technical information for the river basin, implementation of recommendations is not guaranteed to be adopted. Furthermore, even if the Bi-State Commission wishes to adopt the recommendations, any new policies must be made law by both state legislatures. Therefore, even though the two groups provide more authority than the “let’s keep in touch” approach of the Great Lakes Basin Compact, the river basin may lack sufficient authority to navigate climate variability and other long-term water issues.

Flexible apportionment rules

As discussed in the literature review, successful water compacts generally allocate or apportion water in two ways: fixed or proportionately. The Catawba-Wateree River is managed by a rather sophisticated, fixed water allocation scheme. Under the proposed Comprehensive Relicensing Agreement (CRA) which was approved by FERC, the water is apportioned according to different schedules that govern a range of interests from

maintained reservoir levels and recreational flows to flows supporting public water supply and drought. The CRA divides the apportionment rules into three categories: reservoir elevation levels, flows, and the Low Inflow Protocol.

First, water is apportioned to maintain reservoir levels. Each of the 11 reservoirs or lakes on the Catawba-Wateree River are to maintain, in good faith, a set elevation of water within a prescribed range. The maximum water elevation indicates how high the water level is when completely full, or full pond, measured from sea level. The range is different for each reservoir and can vary depending on the month, as shown below in Table 7.

Table 7: Reservoir levels

Lake Norman (Full Pond is 760.00 ft above mean sea level)			
Month	Normal Minimum (ft.)	Normal Target (ft.)	Normal Maximum (ft.)
January	93	96	100
February	91	94	100
March	92.26	95.26	100
April	93.65	96.65	100
May – October	95	98	100
November	93.98	97	100
December	93	96	100

Additionally, in order to promote fish spawning at Lake James, Lake Norman, Lake Wylie, and Lake Wateree, the CRA provides for a Spring Reservoir Level Stabilization Program (Program) in consultation with both the North Carolina Wildlife Resources Commission and the South Carolina Department of Natural Resources. Because reservoir surface water elevations fluctuate seasonally and even daily, near shore wildlife may struggle to spawn due to amount and quality of shallow water shoreline

habitat (Final Environmental Impact Statement for Hydropower License, 2009).

According to the Environmental Impact Statement to relicense the hydroelectric project, the fluctuations in surface water elevations for the previously mentioned lakes is particularly dramatic given the size of the reservoirs. Therefore, in order to protect and maintain the delicate shoreline habitat, the Program provides more stable reservoir levels from “early spring through early summer, reducing the risk of reservoir level decreases during the spring/early summer spawning season.” (Final Environmental Impact Statement for Hydropower License, 2009, p. 155). Finally, the Program may be triggered in three instances. First, when surface water temperatures reach 65 degrees Fahrenheit for four consecutive days. Second, if bass spawning is observed by a licensee of the CRA. And third, if bass spawning is observed by either the North Carolina Wildlife Resources Commission or the South Carolina Department of Natural Resources.

The second category for apportionment rules is the flow articles. The flow articles resemble what is discussed in the literature review and is further divided into five parts. The first is recreational flows. Recreational flows provide a minimum amount of water in order to provide activities like fishing from boats or watercrafts and paddling. The CRA provides flow schedules for five reservoirs, whereby each reservoir is to provide a minimum amount of water unless schedules are interrupted by low water, emergency protocols. An example of a recreational flow schedule is provided below. Additionally, one time a year in March, an Annual Recreational Flow Schedule Planning meeting is conducted with different stakeholders and government agencies to establish and improve recreational flow releases.

Table 8: Recreational flow schedule

Wylie Development Recreational Flow Schedule				
Dates (inclusive)	Days / Description	Flows (at or above) (cfs)	Hour Start	Hour End
Apr 1-Apr 30	Last full weekend – Saturday and Sunday	3,000	10:00 am	4:00 pm
May 1-Jun 15	Each Friday, Saturday and Sunday plus Memorial Day	3,000	10:00 am	4:00 pm
Jun 16-Jul 15	Each Friday, Saturday and Sunday plus Independence Day	6,000	10:00 am	4:00 pm
Jul 16-Aug 31	Each Saturday and Sunday	6,000	10:00 am	4:00 pm
Sep 1-Sep 30	Each Friday, Saturday and Sunday plus Labor Day	6,000	10:00 am	4:00 pm
Oct 1-Oct 31	Each Saturday and Sunday	3,000	10:00 am	4:00 pm

Apart from recreational flows, the CRA also provides for minimum continuous flows. Minimum continuous flows are the minimum amount of water that is required to be released from hydroelectric development. These flows must be maintained at six different hydroelectric developments in order to protect aquatic habitats and water quality downstream. Each hydroelectric development shall maintain the minimum continuous flows in accordance with the Flow and Water Quality Implementation Plan (FWQIP) along with specified minimum continuous flow schedules. The additional requirement of the FWQIP provides resiliency in aquatic habitats and water quality by outlining

measures and modifications to maintain water quality standards to be implemented at certain times. Modifications include schedules to install new aerators to replacing existing powerhouses.

Table 9: Minimum continuous flow schedule

Great Falls-Dearborn Development		
Month	Long Bypassed Reach	Short Bypassed Reach
	Minimum Continuous Flows (cfs)	Minimum Continuous Flows (cfs)
Jan - Feb 14	450	100
Feb 15 – May 15	850	100
May 16 - Dec	450	100

Even with minimum continuous flow standards to protect aquatic habitats and water quality, the CRA provides additional protection with the Wylie High Inflow Protocol. When there is available water inflow, the protocol allows for additional flows to protect aquatic habitats downstream. Under the Wylie High Inflow Protocol, if the median flows from November 1 through January 31 at three different streamflow gages are at or above 105 percent the same period of record, then the flows shall increase from 1,100 cfs to 1,300 cfs. Additionally, while operating under the protocol, if the median flow for any of the gages falls below the February median period of record, then the flow shall be reduced to 1,100 cfs on April 1.

Next, the fourth of the five flow articles are flows supporting public water supply and industrial processes. According to the 2014 Catawba-Wateree River Basin Water Supply Master Plan, nearly two million depend on the Catawba-Wateree River for drinking water, power generation, industrial processes, crop and livestock, recreation, and other uses. To that end, the Master Plan focuses on future water use withdrawal and

return projections for public water and wastewater suppliers, Duke Energy, industrial users, and agricultural and irrigation uses. In order to protect and prolong water supply for those uses and for water withdrawers, the CRA provides for flow releases at three different developments to help support downstream water withdrawer requirements.

The article is designed so that licensees are required to maintain prescribed flow releases at particular points on the river. These points are measured in river miles, starting at the confluence of the Wateree and Congaree rivers and traveling upstream. For example, the CRA provides “at River Mile 120, at least 600 cfs continuous minimum flow and approximately 1,000 cfs for a continuous 16-hour period each day for the Bowater Pulp and Paper Mill.” This rule is designed to maintain a minimum volume of water — 600 cfs and 1,000 cfs — for a particular withdrawer — the Bowater Pulp and Paper Mill — measured at a particular point on the river — 120 miles up the river from the confluence of the Wateree and Congaree rivers.

Finally, although many of the articles of the apportionment rules provide very rigid standards and hard numbers to meet, the last article of the flow rules provides flexibility and adaptation in times of low flows. These rules are built into the Low Inflow Protocol (LIP). Its goal is to take staged actions in order to prolong the exhaustion of the river’s water supply long enough to allow for precipitation to restore reservoir levels, streamflow, and recharge groundwater. The LIP provides procedures to reduce hydro-electric power generation when triggered by periods when there is not enough water flowing into the reservoirs to maintain normal operations. During these times, the flow provided for hydro-electricity generation is diverted to maintain what the CRA refers to

as “electric customer needs” and instream flows. Although many of the electronic customers within the Catawba-Wateree basin get their electricity via hydro-electric generation, the Catawba-Wateree river also provides cooling water for several coal-fired and nuclear plants as well. Because hydro-electricity generation does not require water for cooling, in times of low flow, water is diverted to maintain other sources of electricity.

When inflow is not adequate to meet regular reservoir levels and demands for water, the first trigger, as discussed, is to gradually reduce hydro-electricity generation. If water levels continue to drop to the prescribed level, a Stage 0 – Low Inflow Watch begins, where the Catawba-Wateree Drought Management Advisory Group, consisting of water officials and agencies, meet more frequently and flows from Lake Wylie are reduced to a prescribed rate. As rates regress, various stages are declared, whereby calling for greater water reductions and allowing for more usage of water reserves.

In review, the apportionment rules for the Catawba-Wateree river consist of fixed rules that allow for adaptive capacity. Reservoirs are to be kept at a fixed level measured in height; stream flows are to be kept at a fixed rate measured in cubic feet per second; and, even the LIP is triggered at fixed water levels measured in cubic feet per second.

During the interviews, when participants were asked about the performance of the apportionment rules, responses were positive. First, many participants did not have a comment when specifically asked about the rules. In fact, only one interviewee responded regarding the apportionment rules that are set by the CRA. The interviewee was an advocate who stated that issues “really only arrived during the low flow periods when

they're competing interests. But, since [the CRA] has been in effect since 2008, [the Low Inflow Protocol had been pretty effective at managing water." This could be construed to mean that the rules were functioning as designed and there was nothing to critique. Additionally, it could mean that the river has not been too stressed where these rules haven't really come into effect or played a major role.

Second, when participants did respond to the question, answers gravitated to two policy concerns that are outside the scope of the CRA: interbasin transfers and North Carolina's lack of surface water withdrawal permitting. For interviews, five of the eleven interviewees discussed either the lack of surface water withdrawal permitting in North Carolina and/or interbasin transfers. Further, four of those five interviewees possessed technical skills where they felt comfortable responding to the question. They represented utility and government interviewee categories. Although both responses complemented issues contemplated during the *Parens Patriae* case, participants responded that they have largely been resolved through the relicensing process. Specifically, interbasin transfers are more coordinated between the two states and amongst the Catawba-Wateree and Yadkin-Pee Dee river basins as well.

Conflict resolution

As discussed in the literature review, a major priority when establishing interstate compacts is to avoid time consuming and expensive equitable apportionment litigation in the Supreme Court. The CRA provides for dispute resolution in an effort to remediate issues without resolving to litigation. This section is separated into three steps: consultation, consensus, and remedies. First, consultation requires any aggrieved party to

first notify the licensee, in this case, Duke Energy. After notice is given in accordance to provisions set out in the CRA, a meeting is held, and the parties are to engage in good-faith negotiations to settle the dispute for at least 45 days.

The second category is consensus. Barring a sanctioned extension, after the consultation period lapses, and upon resolution of the dispute, all parties alleging a dispute shall inform the remaining parties of the CRA agreement. Finally, in order to reach a consensus on the dispute, the resolution shall have unanimous support by all the disputing parties without opposition from any other party to the agreement.

The final category, remedies, provides for actions if the parties cannot reach a consensus after the consultation period. The remedies are split into remedies depending on whether dispute derives from provisions in the CRA that are also incorporated into the license issued by the FERC or from provisions that reside solely within the CRA. For those provisions that are not included in the license, disputes may be handled in court.

For the provisions that are also included into the FERC license, the aggrieved party may petition the FERC to enforce the article in the agreement in question. If the FERC enforces the action, that enforcement is the only remedy allowed. In the event the FERC declines to enforce the provision in the license or the FERC does not act within a prescribed reasonable amount of time, then the aggrieved party may file for a petition for a rehearing with the FERC and pursue any other available remedy, including mediation or litigation.

Interagency coordination

As our understanding of natural resource management deepens, methods for managing resources becomes sophisticated and complex. As discussed in the literature review, collaboration is a popular management method, and interagency coordination is imperative to successful natural resource management. According to Margerum and Whital (2004), interagency collaboration is beneficial in four ways. First, it helps resolve conflict. Second, collaboration is necessary to manage the additional parties required as resource knowledge becomes more specialized. Third, as water issues continue more diffusely, collaboration is needed to coordinate a large group of people. And, finally, collaboration amongst agencies is required to reduce overlapping responsibilities.

The settlement agreement between North Carolina and South Carolina (Agreement) that resulted after the *parens patriae* case addresses some of the interagency coordination and collaboration ideals directly. First, the states agreed broadly to promote comity, or the voluntary recognition of procedures of one state by the other, and reciprocity. Specifically, the states agreed if either state requires the other state to provide information or follow procedures, it should impose the same demands on its agencies and departments. Although broad, the Agreement recognizes the importance of collaboration and interagency coordination between the two states and their agencies.

Additionally, the Agreement promotes interagency coordination for two specific issues. First, the Agreement requires the states to conduct an update to the Catawba-Wateree River Basin Water Supply Study every ten years. Additionally, agencies of both states shall participate in any planning for the ten-year study. And second, the Agreement

requires coordination between agencies when permitting IBTs. In fact, the Agreement enumerates elements to promote interagency coordination when establishing new IBTs.

Although the Agreement provides a stage to begin interagency coordination and collaboration, the state legislative bodies of North Carolina and South Carolina enacted statutes to create entities to promote interagency coordination. As discussed previously, Strong, adaptive commission, each state enacted enabling legislation to create the Bi-State Commission. The Bi-State Commission is charged with creating an actual forum for certain stakeholders and state agencies to communicate, coordinate, educate, undertake studies, and collaboratively provide recommendations for integrated water management. Membership of the Bi-State Commission consists of scientific experts from the various state agencies and of state legislatures. Here, the goal is to have the experts with data inform the decision and policy makers. By providing this forum, many experts, with specialized information, can come together to share information in order to reduce overlapping responsibilities and hopefully reduce any potential conflict.

Additionally, the CRA, and more specifically, the LIP provides interagency coordination. The LIP requires state agencies to convene during specific hydrological conditions. Although tasked with the immediate and specific goal of reducing water stress, this coordination brings together officials with very specialized knowledge to reduce the likelihood of water stress in the area.

Although multiple forums are established for interagency coordination, participants generally felt there were issues with coordination. Participants associated with the Water Management Group (three interviewees from the utility category)

generally felt positive about coordination. The Water Management Group, consisting of water suppliers on the Catawba-Wateree River, believes there is plenty of coordination and sees itself as advocates of the river to the Bi-State Commission. Further, the Water Management Group provides the knowledge base and technical expertise for the Bi-State Commission rather than state regulators.

The other participants who are not members of the Water Management Group acknowledge the benefits and the role the Water Management Group serves. However, the participants have stated that the Water Management Group is an exclusive group, with little participation from the public and other groups. This included participants from each category except for the utility category. All of the government participants acknowledged that the Water Management Group did not “represent the interest of other groups.” The participants continued that the states needed to provide more leadership. Particularly, participants (including government participants) said state agencies need more resources, funding, and involvement in order to attend meetings and be more involved in the process. Although many participants felt the states needed more involvement and participation, the consensus amongst all participants was that the Water Management Group does a great job in filling in the gap left open from a lack of state regulation.

Public participation

Another necessary condition for a successful water compact is public participation. In 2008, Duke Energy’s license to operate the 13 hydroelectric dams on the Catawba-Wateree River was set to expire. In order to obtain a new license from FERC,

the company sought public input and collaboration under FERC's, at the time, new alternative licensing procedures to strengthen and continue its partnership with stakeholders within the basin. The alternative licensing procedures encourages a more collaborative process. Before licensees may seek to file for a new license, FERC must grant permission. FERC must conclude licensees satisfy two conditions before granting permission. First, a reasonable effort must be shown in contacting all resource agencies, Indian tribes, advocacy groups, and others affected by FERC's decision (Ayer, 2001). And second, FERC must conclude that a consensus of those contacted feel the alternative procedures are appropriate. Specifically, public input was sought to balance the needs between energy generation and environmental and recreational needs.

To help with the process, Duke Energy sought the aid from the Catawba-Wateree Relicensing Coalition (Coalition). The Coalition helped organize and coordinate the 160 stakeholders who eventually signed the CRA, which, as previously discussed, consisted of private citizens, advocacy groups, state resource agencies, and the Catawba Indian tribe as required by FERC.

While interviewing participants regarding the collaboration of the project, there seemed to be different answers depending on the stage of the project. Four interviewees stated that collaboration was positive during the relicensing phase. The four participants were directly involved in the relicensing process as either signatories or worked in the process of building consensus for the CRA. Two of the participants were environmental advocates. One environmental advocate stated, "[... Duke] did something that not many companies in their position would have done. And that is they worked with the

communities to integrate into their relicense process certain measures that benefit the community [...]. They made their application to FERC look attractive by doing that. There's no question." Another participant from the government interviewee category stated that the number of signatories is an indication of how well the public was included and collaborated in the relicensing process. Finally, although Duke Energy decided not to participate in an interview, their representative touted the awards they received for public engagement during the relicensing process.

However, attitudes tended to change amongst different participant groups regarding the amount of collaboration after FERC granted the license to Duke Energy. Particularly, although the Water Management Group is viewed as a success, many participants indicated the group is exclusive; it allows only 18 water suppliers with intakes in the river and Duke Energy to participate. However, one utility participant acknowledged that the public is allowed to attend meetings, and in some instances, they may be able to participate in discussions. He also explained that the Water Management Group incorporates an advisory committee to guide the water suppliers. The Water Management Group's website states, "The purpose of the Advisory Committee is to hear about plans and activities of the CWWMG and to provide feedback as individuals from an external perspective to the officers and members about general direction, governance, strategy, planning and other aspects supportive of the CWWMG's mission. As the committee is strictly advisory in nature, none of the members are asked to commit or speak on behalf of their respective organizations or employers, but to provide a unique perspective when appropriate" (The Catawba Water Management Group, 2020).

After I conducted the interviews, it appears that the necessary components for a successful compact are in place with the current CRA, but an interstate compact was never adopted. Therefore, there are additional variables that are impeding a compact. I believe the interviewee's responses about the lack of sufficient state resources and the lack of political will is the impediment.

Summary of the elements present and their implications

In summary, it appears the necessary preconditions for a successful compact exist on the Catawba-Wataree River. The comments and implications for each precondition is summarized below in Table 8. First, the Bi-State Commission and the Water Management Group function as a commission. Specifically, the Bi-State Commission members are politicians who do not have legislative authority over the river, but the members can lobby other politicians to influence legislation if necessary. The Water Management Group is the pride of the basin and provides technical expertise and planning for the river.

Second, the CRA uses fixed water allocation rules that prescribe reservoir levels and flow rates. Additionally, for adaptive capacity, the CRA uses the LIP to provide for low water, emergency events. Third, the CRA supplies provisions for aggrieved parties to remediate issues without litigation. Participants did not comment on conflict resolution. Therefore, it is believed there are not serious issues with operations or management of the river.

Fourth, interagency coordination occurs in the basin. The Agreement promotes comity and participation between the states through different forums and policies. The

Water Management Group is a great resource, but participants perceive the states should be more involved. Finally, Duke Energy is praised for its inclusion and public participation during the relicensing process. Since receiving the license, participants that are not members of the Water Management Group stated that public participation is seldom.

Table 10: Participants’ comments about the necessary preconditions for a successful water compact and their implications

Necessary precondition	Comments	Implications
Strong, adaptive commission	Satisfaction with the Water Management Group’s role Bi-State Commission as “inactive”, “hardly operational”, and lacking “political appetite	Infrequency of Bi-State Commission meetings is evidence of success Two bodies that have the responsibilities of a strong, adaptive commission Power to change policy, but no guarantee to carry out action
Flexible apportionment rules	LIP is adequate during drought Larger contentious water distribution issues are resolved	Drought events are the major concern which are largely resolved with the CRA
Conflict resolution	Participants did not comment on conflict resolution	Suggests general consensus with the resource management
Interagency coordination	Utility participants expressed positive feedback for the Water Management Group Others acknowledge the Water Management Group work, but felt it did not represent the interests of other groups Not enough resources from state agencies	The Water Management Group is mainly concerned with utility issues rather than the overall public Lack of state agency and decision maker resources implies acceptance of a private utility managing the public resource

Necessary precondition	Comments	Implications
Public participation	Satisfied during licensing process, but left wanting after the license was approved	Public participation and feedback is a token to ensure application approval from FERC

Viability of a Compact

Finally, one important standard question each participant was asked was whether they thought a water compact would be viable for the river basin. Each participant unanimously answered that a water compact would not be viable for the basin. Across all participant groups, each participant indicated that the “pieces are there” and that the FERC process is performing well. Particularly, participants stated that the Water Management Group fulfilled many of the functions that viable water compacts possess. Although the environmental advocates in the group indicated a water compact would be ideal, they also believed the current arrangement operated similar to a water compact. It is believed that further refining of the process to develop a ratified water compact would be too costly and local water issues needed to be addressed first. Additionally, participants indicated the lack of political appetite or great conflict to ignite more localized water regulation efforts, let alone a water compact. Therefore, even those participants that support the benefits of a water compact, believe that a water compact is not viable currently.

CHAPTER FIVE: DISCUSSION

In the previous chapter, participants provided insight into the current management regime's progress. The current arrangement operates similar to a compact although some participants indicate a compact is ideal for the Catawba-Wataree River. However, there are details that are absent that may optimize the system. In this chapter, I discuss the elements that the literature explains are critical for compact success, and whether those elements are present in the current arrangement. Additionally, I provide observations regarding further optimization of water management in the Catawba-Wataree River system.

Comparison Between the Literature Review and the Results

Although a water compact was never formed between North Carolina and South Carolina, many of the pre-conditions necessary to align an agreement are in place to create a regulatory regime that operates similar to a water compact. These pre-conditions are described in Chapter 2.

Satisfying necessary pre-conditions for agreements

One pre-condition from the literature is decreasing the cost of implementing shared views of a given problem (Weissert & Hill, 1994). Weissert and Hill contend that states are more likely to cooperate in order to expand capacity. As the participants indicated, Duke Energy desires to maintain their license to operate the impoundments on the Catawba-Wataree River to protect their investments into the river system and ensure

revenue. To that end, Duke shall comply with FERC regulations along with state and local regulators to ensure they are an attractive licensee.

The states, according to the participants, lack the capacity to fully regulate the river system. For example, participants stated issues like lack of time, staff, resources, and political will prevented regulatory agencies in both North and South Carolina from reaching the capacity necessary to regulate the Catawba-Wateree River. Therefore, the two states do not protest Duke Energy's efforts in extending that capacity and remaining licensees to operate the impoundments. Finally, although Weissert and Hill (1994) spoke of states forming agreements, other non-governmental agencies may be able to expand capacity issues.

A second precondition discussed amongst the literature was asymmetrical power claims where one party doesn't dominate with a strong single state interest (Weissert & Hill, 1994). Again, as participants indicated, the two states do not seem to have a strong interest over the other. Specifically, South Carolina demands an equitable proportion and is concerned with Interbasin Transfers in North Carolina. And arguably, North Carolina possess a more dominant position since they are located upstream. But, with Duke Energy's impoundments located in both states, there is a common issue amongst both states which makes an agreement more plausible. Therefore, Duke Energy's interest in both states balances the power claims between the states and supports an agreement concluded between all three parties.

Third, Bowman and Woods suggest that state politics play a role in agreements between states. Specifically, they discuss how political ideologies may shape

cooperation. Historically, both North and South Carolina are conservative states that believe in a limited role for centralized government. Participants indicate that the two states are not interested and do not have the political appetite to regulate the Catawba-Wateree River. These responses are consistent with the literature. Because of the legislators' lack of political appetite and Duke Energy's willingness to provide plentiful and necessary resources, the two states have allowed Duke Energy to drive much of the regulation conversations. Ultimately, this had led to an agreement between the parties, but it also allows a for-profit utility company to steer most of the provisions of the agreement.

Finally, although a water compact ultimately wasn't ratified, the participants in this study indicated that many of the literature's pre-conditions necessary for bi-state cooperation are present.

Successful compact elements

Again, although a formal water compact has not been reached between North Carolina and South Carolina, the current water management regime created as a result of the *parens patriae* suit and during the FERC relicensing process, the Comprehensive Relicensing Agreement utilizes many components of a successful water compact.

Natural hydrological boundaries that are clearly defined

First, the literature suggests that natural hydrological boundaries shall be clearly defined. Specifically, the literature speaks to exclusion of outsiders (Ostrom, 1990) and benefit sharing (Green & Perrings, 2014). The Comprehensive Relicensing Agreement includes all of the water utilities withdrawing surface water from the river. In the case of

the Catawba-Wateree River, it is important to define the users of the resource. By including all water utilities and water withdrawers, water users can ensure benefits of the resources expended to protect the river. Additionally, it is unlikely that there will be free riders who would extinguish the water or deplete the river of its resources. Further, by including all impoundments and dams on the Catawba-Wateree River, benefit sharing can be established. Managed as a single unit, dams may be utilized optimally to protect the resource during low-flow periods.

Strong and adaptive commission

Second, the literature discusses the necessity for a strong, adaptive commission. Particularly, a strong and adaptive commission consists of administering water allocation rules; addressing problems and conflicts; engaging studies and monitoring and reporting issues; flexibility to react to variability; and, adaptive capacity. There are two commissions that help manage the Catawba-Wateree River. Each are primarily advisory in nature. First, the Bi-State Commission is purely advisory. It is not charged with many of the qualities the literature contemplates. However, as many of the participants indicated, it can help to address problems and conflicts. Because the Bi-State Commission consists of legislative members of the General Assembly of both North Carolina and South Carolina, it can influence policy of each state to help address higher level problems and conflicts between the two states. However, this arrangement lacks the adaptive capacity and flexibility to react to variability that is needed for adequate water management. For instance, other legislative representatives may be more concerned about

their own constituents to provide the political capital to solve issues experienced within the Catawba-Wateree River basin.

Additionally, participants indicated that the Bi-State Commission does not meet frequently. Although there may not be a large political appetite to immediately solve issues, with infrequent meetings, there is not an adequate forum to exchange information and ideas regarding the status and plans for the river basin. Finally, participants also indicated that because the Bi-State Commission is largely made of legislators, the timing of legislative sessions does not provide adequate time or capacity to meet regularly or even fill occupancies as representatives leave office.

Although the genesis of the Bi-State Commission was to provide a forum for North Carolina and South Carolina representatives to discuss cross-jurisdictional issues regulating the Catawba-Wateree River, the Water Management Group was created to fulfill the duties of a successful commission that the literature contemplates. One of the first provisions of the CRA obligated North Carolina and South Carolina to cooperate with the Water Management Group to conduct and update a water supply study every ten years. As discussed in the literature, the Water Management Group monitors river flows and levels and provides scientific expertise to decision makers like the Bi-State Commission. Further, participants stated that the Water Management Group provides the necessary technical advice to regulate the river basin and fills the void left open from the Bi-State Commission.

Another characteristic of ideal commissions the literature discusses is the authority for a commission to administer allocation rules of the agreement. Although the

minimum flows and levels are explicitly stated in the CRA, they are not solely administered by the Water Management Group or the Bi-State Commission. Instead, they are administered by the FERC licensee, Duke Energy, and the terms of the CRA. Therefore, according to the CRA, the allocation rules are explicit, and all parties or signatories are on notice. However, a commission does not administer the rules. Rather, each party monitors the levels and has recourse via the FERC license if the terms of the license are not met.

Additionally, the literature considers a commission to address problems and conflicts. Although neither of the two commission can resolve conflicts and issues directly, the Water Management Group can identify issues and advise the Bi-State Commission. With its scientific expertise, the Water Management Group is charged with providing analysis and data to decision makers. Therefore, it can only identify issues within the river basin. However, the CRA does provide conflict resolution which will be discussed as a separate item.

Finally, the literature discusses flexibility to react to variability and adaptive capacity. Within the CRA, it is hard for the commissions to react to variability because there is not much adaptive capacity. Dellapenna warns against insufficient authority and the “let’s keep in touch” approach to water management (2006). Under the CRA, the two commissions are purely advisory. Specifically, however, the Bi-State Commission may provide indirect authority since its members consist of legislators. Though, without high policy issues, participants discussed that the Bi-State Commission’s role has tapered off recently.

Additionally, the Water Management Group is also an advisory commission. As such, it does not have the authority to change any operation rules when faced with variability challenges. Thus, the Water Management Group mainly serves as a forum to share research and to discuss issues that it may later share with the Bi-State Commission. Finally, although the two commissions of the CRA lack the adequate authority to provide adaptive capacity, this does not mean that the current regulatory scheme does have the aptitude to respond to variability in the river basin. Rather, these necessary characteristics are executed by other means in the FERC license agreement which will be discussed in the coming sections.

Flexible apportionment rules

As a third element, the literature discusses the necessity for flexible apportionment rules. Specifically, there are two types of apportionment rules: fixed and proportionate. The CRA relies heavily on fixed rules. For instance, the CRA maintains schedules for minimum flows to provide recreational uses and environmental flows for ecological stability. Further, the CRA dictates the maintenance of minimum elevations at each lake on the river system to ensure certain volumes. Finally, the CRA does not provide for standards or exceptions for additional water withdrawals. The literature critiques fixed rules since they do not provide the necessary adjustments for variability like hydrologic changes from events like drought or parameters for new water users on the system.

Although the literature critiques fixed rules and the CRA relies heavily on prescribed flows and elevations, the CRA does allow for proportionate allocation rules

via the Low Inflow Protocol (LIP). As discussed in Chapter 4, the LIP calls for reductions in hydro-electric production and empowers the Catawba-Wateree Drought Management Advisory Group (DMAG) to meet and make decisions regarding impoundment management. This flexibility beyond the fixed rules allows water managers to respond to variability. Participants did not provide feedback about the rules or their performance. However, it should be noted that there have not been major triggering events since the rules were approved.

Participants with technical backgrounds believe the rules provide plenty of relief and act as a “safety valve”. Further, during the Catawba-Wateree River’s normal times of operation, other participants did not have criticisms or issues with the designation of the allocation rules. Outside of the CRA, the Water Management Group helps address variability indirectly. The Water Management Group’s charge to provide research, monitoring, and water modeling insights helps decision makers address water variability efficiently.

The DMAG’s charge is to provide flexible allocation rules during water variability and shortage. However, the parties involved in the DMAG should be noted. According to the CRA, the DMAG consists of representatives from North Carolina and South Carolina regulatory agencies, the United States Geological Survey, and owners of large water intakes on the river system. Large water intake owners consist of public water suppliers, industrial users, hydropower users, and agricultural users. Most of the owners provide service for the public at large, while some are private enterprises. And, although

it is reasonable and helpful to have the owners of large water intakes deciding intake reductions, these owners may prioritize their own interests over resource conservation.

Conflict resolution

As discussed in the literature review and in Chapter 4, the major catalyst for interstate compacts is avoiding time consuming and expensive litigation. The CRA's dispute resolution provisions are separated into categories of consultation, consensus, and remedies. Participants do not provide insight or feedback regarding the agreed upon dispute resolution. This may be the result, like other elements discussed in this chapter, of a lack of pressing issues that stress the system and test the separate management mechanisms of the CRA. Therefore, conflict resolution is in place on the river system, but it is unclear how well it operates.

General Observations and Significance of the Results

After reviewing the literature, documents, and participant responses three main observations become quite clear. First, there is a lack of state resources. One participant stated:

“From where I sit, our biggest problem, we don't have enough staff to get to all of the meetings. It's just kind of a lack of resources. We would like to get out and do more one-on-one with different groups and different things. I just don't have the resources to do it – the manpower. [...] We're involved with basin-wide planning, basin-wide modeling, a number of activities we can help compliment what we are required to do.

[...] It comes down to a lack of resources. That's my biggest problem right now.”

This sentiment is a common theme amongst participants. However, many other participants stated that Duke Energy fills the void of state resources. Specifically, a separate participant commented:

“I don't think states are providing sufficient resources. What had happened is we had a water utility step up and play the role of that state agency should be playing. So, they really are playing the lead role in this in water management for that basin rather than it being the state of North Carolina or South Carolina. I think that Duke Energy has done a good job of it and created a good process, but I don't think that process is there because of the leadership of either state.”

It is not necessarily bad for a publicly traded company like Duke Energy to lead the water management process and hold the license to operate the 11 impoundments on the Catawba-Wateree River. In fact, participants indicated that Duke Energy is managing the resource well. However, the river is a public resource. As such, participants reasoned the public sector is better suited to manage the resource. In large part, a publicly traded company may be more tempted to make profit motivated management decision rather than prioritizing the public. In this particular case, each state legislature has failed to provide adequate resources to their associated regulating bodies to manage the river basin within their borders. This allowed Duke Energy to fill the regulatory gap to adequately address river basin issues.

Finally, although many participants indicated that it is ideal for the state to provide regulatory management, Duke Energy is not operating the resource without government oversight. The company did have to apply to relicense their operations through FERC. Although FERC is a federal agency and does not have direct experience with the Catawba-Wateree River like North Carolina and South Carolina's regulatory agencies, it still provides safeguards to operate the public resource.

The second observation is the lack of public participation. Initially, during the establishment of the CRA, public participation and general consensus amongst a large group of stakeholders was a major goal. In fact, the Catawba-Wateree Relicensing Coalition, the partner created to help lead public input and collaboration efforts, garnered national awards for their work. One participant stated regarding these initial efforts:

“Before the settlement agreement was signed, we had regular meetings with stakeholders. And they only listed 600 [stakeholders to the Catawba Relicensing Agreement], and we would bring in national experts, and we would do trainings in all manners on how to negotiate, what other licenses looked like. And those forums were extremely well attended and tended to be well reviewed and they made a huge difference in what happened in the license and the settlement.”

These efforts were instrumental in FERC permitting Duke Energy a license to operate the Catawba-Wateree Project. However, participants indicated the forums set up to manage the river do not focus on public inclusion as heavily. One participant who interacted with both the Water Management Group and the Bi-State Commission stated:

“I would say the Water Management Group is really the one that’s the whole key to this collaboration and really getting the cooperation. Now, the accessibility to that group is maybe a little more limited than some would like because it’s really just the water users of the — the main water users and the water withdrawers. So, folks that are using the Duke projects, Duke, that type of thing. It really doesn’t pull in some of the more citizen type groups and that type of thing, the wildlife type agencies. So, if you are kind of interested in public water and kind of the big users, I think it’s great. If you want to include some of the smaller type folks, there’s kind of a void there for that.”

This account shows the forums and commissions are designed to include the major water users. It stands to reason that these users have a better understanding and technical expertise to operate projects that can easily alter the behavior of the river. However, the resource is a public resource, and other interests should be included in decision making.

Another participant explained how the Water Management Group includes the public:

“We created an advisory committee of folks who are outside of [the Water Management Group] that have diverse interests in the various aspects of the river and lake management. And they are helping us focus on the right issues and giving us input and feedback into what we’re doing. So, they’re helping steer the work of the Water Management Group.”

However, the advisory committee, according to the Catawba-Wateree River Basin Water Supply Master Plan, largely consists of various Council of Governments, associated marine commissions, and state agencies. Specifically, the committee does not include any of the citizen type groups that one participant stated were left out of the two commissions. Further, when asked about accessibility to either commissions, the participant stated, “The meetings are open meetings. We always have visitors and folks attending. The folks who participate who aren’t members that come as visitors are often allowed to participate in the discussion and conversation. The feedback is welcome.”

Conversely, one participant who represents the community stated that there is not a forum that “allows for non-bias and ethical transfer of ideas.” Further, the participant questioned:

“the table is invitation only. And, can you really say that there’s an open forum and open knowledge transferred between parties if you have to be invited to sit on a certain commission or invited to sit in a certain group?”

Water resources are complex systems and require multiple fields of discipline to manage adequately. While the water suppliers and large withdrawers possess the technical expertise to manage the resource, water’s stochastic characteristics make it difficult to measure the resource based on limited outputs like water elevation. Certainly, the general public may lack the technical ability to provide high level policy decisions. However, they can provide performance feedback that may be overlooked by quantitative measures. Additionally, if groups could utilize the expertise of the Catawba-Wateree

Relicensing Coalition to teach stakeholders how to negotiate during the relicensing process, the coalition could also be used further to teach the public how to provide meaningful feedback to the either commission.

Finally, although significant stakeholders did not participate in interviews, the last observation is unanimous amongst participants: a water compact is not viable for the Catawba-Wateree River. Delph Carpenter, the Colorado lawyer who bore the idea of a compact as a means to settle water disputes outside of litigation, stated, “any river question could be settled by any group of men with all of the facts in their possession who were honestly bent on reaching an agreement” (Carr, 1943). In the case of the Catawba-Wateree River, a water compact is not viable because an agreement has already been made. As discussed in Chapter 5, the participants unanimously stated that an interstate compact serving the water resource is not viable. This is because participants believe “there is no pressing issues”, there lacks “intense debate over water rights”, or “there isn’t the political will.”

When there were pressing issues, intense debate over water rights, and political will, interested parties of the Catawba-Wateree River began the process which eventually produced the CRA. At that time, which is further discussed in Chapter 3, the pressing water right issues started with prolonged drought events and the interbasin transfers (IBT). According to the participants, these issues are addressed by the settlement agreement and the new FERC license. Specifically, the settlement agreement resolved outstanding IBT concerns, and the CRA and relicensing process provided adequate

minimum flows, the Low Inflow Protocol for drought events, and a 40-year term which provides predictability and understanding amongst all of the parties.

Even if all of the concerns regarding resource management are not completely addressed, there is little political will or motivation to solve issues. At the time of the agreements, there was adequate political will. One insight the research yields is the necessity for political will to reach an agreement. Although prolonged drought certainly produces stress for water suppliers and users, the participants with more technical knowledge and familiarity with the genesis of the agreements shared that IBT issues were not a major concern. Specifically, one participant shared an anecdote regarding the necessity of political will where officials from South Carolina believed it may be politically advantageous to take legal action against North Carolina over equitable apportionment. This threat certainly provided the impetus for negotiations. However, it was not enough for a meaningful agreement.

As discussed, North Carolina and South Carolina are reluctant to provide resources to regulate the Catawba-Wateree River. However, the Catawba-Wateree River is an unique transboundary water resource since one publicly traded electric utility, Duke Energy, owns and operates all 11 impoundments. Consequently, during the dispute between North Carolina and South Carolina, Duke Energy's license to operate the 11 impoundments was to expire and they were beginning the relicensing process. In order to provide a compelling relicensing application to FERC, Duke Energy was positioned to provide a meaningful agreement and regulatory scheme that may not have gained traction if the dispute remained between the two states.

The results suggest that when there is conflict surrounding a transboundary water resource where traditional regulating bodies may not have the capacity or the political will to manage the water resource in a meaningful way, the FERC licensing process may allow for meaningful water resource solutions when a water compact may not be a viable option.

Discussion of the Research Questions

In Chapter 1, two research questions were presented. The first: what are the elements necessary for a viable interstate compact, particularly with climate change? Because an interstate compact is a contract between states, the next chapter, the literature review, discusses the necessary preconditions to have parties come together under a shared agreement. Those preconditions are: 1) the ability to decrease the cost of implementing shared views, 2) the absence of asymmetrical power claims, and 3) similar political ideologies. As discussed, the state agencies do not have the adequate resources to adequately manage the Catawba-Watauga River as a water supply source. While Duke Energy has a financial interest to ensure the operation of its 11 impoundments and cannot risk losing control of this resource. Therefore, the three parties', North Carolina, South Carolina, and Duke Energy, cooperation allows each to share the resources to adequately manage the river.

Further, as an upstream resource, North Carolina seems to have a stronger position compared to South Carolina when it comes to an agreement. However, Duke Energy's presence in both states balances any power claims amongst the states. Finally, North Carolina and South Carolina historically have always operated under conservative

ideology and politics. Specifically, the two states ascribe to a limited regulatory approach when it comes to governing. This attitude allows for an agreement to maintain Duke Energy's position as the FERC licensee for the 11 impoundments rather than providing the state government to manage the public resource.

After establishing that the two states have the necessary preconditions for an agreement, Chapter 2 discusses the necessary elements for a viable interstate compact. Those elements are: 1) natural hydrological boundaries, 2) a strong and adaptive commission, 3) flexible apportionment rules, 4) conflict resolution, 5) interagency coordination, and, 6) public participation. This chapter contemplates the elements and discusses whether the elements are present in the regulatory system.

The research suggests that the elements are present for a successful interstate compact. However, elements like an adaptive commission and public participation could be improved. Specifically, the authority of the commission is limited by the explicit terms of the CRA and the LIP. As variability like climate change is introduced, disagreements amongst the terms may only be resolved through a complaint to FERC. Additionally, the public participation awards that were endowed during the relicensing process did not carry over to the implementation of the CRA. Specifically, the research findings suggest that there are limited participation opportunities for the public during Water Management Group meetings and Bi-State Commission meetings.

Part two of the second research question asks what are the implications of the compact's absence? Table 9 provides a comparison between the FERC relicensing process generally and the benefits of a compact. The management structure for the

Catawba-Wateree River affects several categories listed in Table 9. The categories are legal, process, inclusion, biological, institutional autonomy, and changed circumstances. In the absence of a compact, the river basin is regulated under the FERC license, or CRA more specifically. Notably, the license is approved for terms between 30 and 50 years, which can be revoked. A compact is a contract between states with the binding effect of federal statute that may last in perpetuity. The other implications consider performance.

Two major implications of a FERC license is the issue of institutional autonomy and changed circumstances. First, a license limits the state autonomy. States agencies will provide certifications for water quality to FERC at time of permitting and may request conditions on operability to ensure compliance with federal statues like the Clean Water Act and Endangered Species Act. Then, the operation is managed by the Licensee and regulated by FERC, a federal agency that may be far removed from the basin. A compact allows for cooperative horizontal federalism principles. According to Hall, cooperative horizontal federalism is an “approach in which states jointly develop common minimum legal standards (substantive and/or procedural) to manage a shared resource but leave the individual states with the flexibility and autonomy to administer those standards under state law (2006, page 406). Without a compact, there is no mechanism to compel both states to provide shared management of the Catawba-Wateree River. Although the two states communicate cooperative issues through the Bi-State Commission, the states are not compelled to enact any resolution reached by the parties.

The second implication is changed circumstances. The literature states that interstate compacts may be flexible enough to incorporate predicted conditions (Hall,

2010) and reverse course in the event of hydrological error (DuMars & Seeley, 2004). Conversely, FERC has denied condition requests to include climate change and its impacts, finding that FERC is “not aware of any climate change models that are known to have the accuracy that would be needed to predict the degree of specific resource impacts and serve as the basis for informing license conditions” (FERC, 2009). Additionally, FERC will not approve adaptive management provisions unless outer limits are defined (Doremus, Buehring, & Gerhart, 2007). For example, FERC will include adaptive water allocation measures if a range is provided. Lastly, environmental quality provisions cannot be included if they are not known at the time of license application.

Therefore, the lack of a compact implies that a regulatory scheme for a shared resource is limited to a maximum of 50 years, adaptive management principles designed to adjust with hydrological and climate models are limited, and state authority shall be limited to compliance issues.

Table 11: FERC relicensing and compact benefits comparison

	FERC	Compact
Legal	License Approved for 30 – 50	Federal statute May last in perpetuity
Process	Applicant chooses one of three prescribed licensing processes	Negotiated by states, help from the federal government, and enacted by Congress
Inclusion	Higher collaboration addresses more resources and are more likely implemented (Ulibarri, 2015) Higher or lower levels of collaboration does not affect relicensing times (Ulibarri, 2018). Study plan meetings with all stakeholders are approved by FERC (Federal Energy Regulatory Commission, 2020).	May include federal government as partner May include formal and informal organization
Biological	Rely on traditional hydrologic and biological-response analysis (Gowan, Stephenson, & Shabman, 2006) & (Stephenson & Shabman, 2001) Addressed at end of license term (Schramm, Bevelhimer, & DeRolph, 2016) Improves only if federal and state agencies understand system (Blumm & Nadol, 2001) Shall give equal consideration to development and environmental values (16 U.S.C. § 797(e))	Required to meet minimum federal standards Parties may negotiate stricter standards and implementation Flexible terms may address environmental impacts quicker Comity amongst states along with federal government improve water quality
Institutional Autonomy	Top-down approach Susceptible to administrative agendas	May include cooperative horizontal federalism principles (Hall, 2006) Allow flexibility and adaptiveness in implementing both federal and state functions (Featherstone, 2001)

	FERC	Compact
Changed Circumstances	Does not include climate change: 1) inaccuracy of climate models 2) lack of nexus between conditions and operations (Viers, 2011). May not maximize environmental benefits if issues are unknown at license issuance (Madani, 2011). Adaptive management terms shall define outer limits	May use current real-time data, and the benefit of predicted future conditions (Hall, 2010). May revise in the event of a fundamental computer or hydrologic error (DuMars & Seeley, 2004)

Finally, part three of the second research question asks how do alternative arrangements (informal/formal) compare to a compact? The participants in this study suggest the CRA is a satisfactory alternative to a water compact. Table 10 compares the CRA to a compact and demonstrates why the CRA may be preferable to a compact on the Catawba-Wateree River. Generally, a compact is the ideal arrangement to manage transboundary water resources. The Catawba-Wateree River, as determined by interviewees and participants, provides conditions where the resource management rules put in place under a FERC license may be an acceptable alternative to a compact. This is attributed to the fact that Duke Energy has a vested financial interest in the operation of the impoundments with significant resources compared to the willingness of North Carolina and South Carolina to provide management resources.

Here, I use the same six categories used in Table 11 to compare how the CRA performs as an alternative arrangement to the preferred compact. First, the legal implications of a compact are superior to the CRA. As a license, the CRA is subject to revocation and is approved for only forty years. The issues with revocation do not solely lie with the parties and signatories of the CRA. Rather, FERC, as a political body, may be

subject to political agendas and rule changes that could disrupt resource management. Alternatively, a compact is enforceable as a federal statute in perpetuity. This ensures predictability for the signatories and interested parties. Therefore, a compact's legal stability is advantageous compared to the CRA.

Second, the process of creating and initiating consensus to establish a FERC license like the CRA is more favorable. Because compacts are contracts between states and other interested parties, there is not a mandated process to help parties reach consensus in the public interest. If the states reach an agreement to enter the resource management relationship that is consented by Congress, a compact is established. The CRA utilized the traditional licensing process which provides specific steps for compliance. This process consists of a three-stage consultation with stakeholders prior to filing. Prior to filing, Duke Energy produced a document describing the project along with the existing and proposed operations and made it available to the public and relevant agencies and Indian Tribes. After a joint meeting, stakeholders provide comments. Then Duke Energy performed all required studies and provided those to the public and relevant stakeholders. Duke Energy then filed their application with FERC whereby FERC approved the license along with conditions in the public's interest. Although there may be some flaws in the traditional licensing process, the process does provide a system for the public and relevant stakeholders to participate. Therefore, since the establishment of a compact does not provide minimum requirements for providing public and management expertise, the CRA may be preferable to a compact.

Third, regarding inclusion, a compact may have an advantage compared to the CRA. A compact has the flexibility to allow more inclusion throughout the resource management arrangement. But as considered during the process category, the CRA provides for inclusion during the application stage as prescribed by the FERC. However, participants noted that although public participation was adequate during the licensing stage, public participation afterwards suffered. Therefore, a compact may not have prescribed inclusion mandates, but an ideal compact may provide for superior inclusion throughout the arrangement.

Fourth, biological issues like water quality are better managed using a compact compared to the CRA. The CRA does provide measures to ensure compliance with minimum state and federal water quality requirements. A compact may provide for additional, flexible measures that could address biological needs sooner. Additionally, it could provide for updating plans for vulnerable species that may not be federally recognized.

Fifth, the institutional autonomy category is a considerable advantage for a compact. The CRA does not provide for additional comity amongst states. For instance, North Carolina does not regulate surface water withdrawals while South Carolina does. Additionally, North Carolina allows for interbasin transfers although *parens patriae* case settlement requires consultation between the states when considering transfers. The Water Management Group provides technical guidance for the basin, and participants are encouraged by their work. However, the Bi-State Commission does not have the political appetite to implement any additional management measures or meet as a group. Finally,

as participants expressed, the states are willing to allow the privately-owned utility to provide resources and manage the river basin, and to cede autonomy.

A compact may allow for cooperative horizontal federalism. These principles could allow for Duke Energy to intervene to manage their significant investment in the basin and allow agencies that are charged to protect the public interest. Also, cooperative horizontal federalism could incorporate federal agencies to assist and provide comity amongst all governing parties. This could provide additional funding to relieve participants concern with the lack of public agencies managing the resource. However, a compact will not be established without the consent of the states. Because of the lack of political willingness to engage in this process, it does not appear a compact is likely. Therefore, I suggest the FERC licensing process, as demonstrated by the CRA, could be a workable alternative to the superior compact option.

Sixth, and finally, a compact is favorable to deal with changed circumstances like climate change. The CRA provides for varying conditions. The Computer Hydro Electric Operations and Planning Software (CHEOPS) developed by Duke Energy is a simulation model that assesses the system's capacity to support regional water supply during extended drought periods over the next 50 years. The Water Management Group uses this model to guide water forecasts and updates are required every ten years. Also, another tool used during times of drought is the LIP. Although these dynamic tools help in changed circumstances in the river basin, it only addresses extreme drought scenarios and how they relate to water supply and does not account for larger implications due to climate change.

A compact could utilize more flexible and adaptive measures like real time data to benefit future conditions. Also, with flexible commission rules, a compact could provide for expedient ways to adjust hydrologic models or decisions in the event of errors.

After comparing the CRA and a potential compact, it still remains clear that a compact is preferable to the FERC licensing process. As the literature suggests, this is largely due to the flexibility, predictability, and adaptability of a negotiated compact. However, this is only the case if interested parties exercise the recommended guidelines and principles for property transboundary water management. One area the FERC hydropower licensing process excels is the prescriptive measures to ensure collaboration and public input when establishing the management arrangement. Additionally, the FERC licensing process could provide an adequate arrangement during the very limited circumstances whereby the states do not have the capacity or desire to regulate a particular transboundary river basin like the Catawba-Wateree River.

Table 12: How the CRA compares to a compact

	CRA	Compact
Legal	40 years Subject to revocation	Perpetuity Federal statute Renegotiated or amended at any time
Process	"Enhanced" Traditional Licensing Approach Prescribed by statute	Agreement by states and interested parties Consent by Congress
Inclusion	Catawba-Wateree Relicensing Coalition held 16 conferences to organize 70 signatories Duke Energy worked with 160 stakeholders representing 85 organizations Participants satisfied with initial public involvement Token public involvement after license approved	Include federal government in decision making Accommodate additional water withdrawals Include formal and informal representation
Biological	Meets state water quality certifications Monitoring plan established with state agencies Protection plan for endangered and threatened species Shoreline management plan to protect scenic quality and riparian habitat	Negotiate stricter standards and how to implement them Flexible terms to address environmental impacts State and federal comity to improve water quality
Institutional Autonomy	Approved by federal government (FERC) States do not have authority to regulate across borders Water Management Group provides technical expertise Bi-State Commission provides forum if policy decisions are needed No political appetite to change	Provide cooperative horizontal federalism Basin specific minimum standards
Changed Circumstances	Water Management Group's forecasting uses CHEOPS model Low inflow protocol	Use current real-time data Implement predicted future conditions Allow revisions to address fundamental computer or hydrologic error

Limitations and Bias

In conducting my research, I encounter limitations to my research design. One limitation to my research was the challenges securing interviews with participants. As a novice researcher in the field of natural resource management, my initial contact with potential participants started with cold calls and emails. I started with a phone call since email addresses were not provided for all potential participants from Appendix B of the CRA. If an email address was provided or discovered, I attempted to follow up and introduce myself by email. After three failed attempts to make contact over phone and two failed attempts by email, I ceased contact. Most of the potential 72 potential participants did not return requests for interviews.

Once I successfully contacted some potential participants, a few did not feel comfortable participating. This was mainly due to two reasons. First, the potential participant felt they would not be helpful. This was the response mainly from those who participated in the FERC relicensing process but did not have the technical knowledge or understanding of the relicensing process. These potential participants mainly represented the private business, private citizens, or homeowner's associations categories. Therefore, the research is limited from participants in these categories. The second reason potential participants declined to participate was because they did not have enough information to the process or there was someone else in the organization that was more integral to the relicensing process. This group of potential participants consisted of members of the government and utility categories as referenced in Table 13.

Table 13: Potential participants not comfortable with interviews

Reason	Categories
Not helpful	Homeowner’s associations, private businesses, and private citizens
Not enough information	Utilities and governments

The environmental advocates were the most willing to participate along with non-government organizations that represented the general public. After conducting interviews with participants in these categories, snowball sampling was advantageous. Since the advocate participants worked directly with the other categories during the relicensing process, they were able to provide direct contact information or could initiate contact with others who may have been reluctant to participate on my behalf. This led to additional interviews with utilities and provided leads with legislative representatives that were part of the relicensing process or members of the Bi-State Commission. Ultimately, I was unsuccessful in securing interviews from political entities or members of the General Assembly.

Apart from failure to make contact with desired participants, a significant challenge was convincing the key stakeholder to participate. With snowball sampling, I was successful making contact with a Duke Energy representative, but they ultimately declined to participate after reviewing potential interview questions. Specifically, the representative felt the semi-structured questions (Appendix A) “pre-supposes that water management on the Catawba is still very contentious.”

This study was limited by the difficulty securing interviews. Another limitation to qualitative research is bias. Recognizing bias is critical to qualitative studies. To

eliminate bias, many qualitative researchers attempt to present their data as quantifiable as possible. I do not attempt to eliminate bias. Rather, in this section, I will disclose and acknowledge the research bias in this study. Because this research relies on interviews from stakeholders who have different perspectives on the management of the Catawba-Wateree River basin, it is important to acknowledge the participants possible subjectivity.

Knowing stakeholders hold different perspectives, it is important for me as a researcher to diversify response by interviewing participants who represent different interests. For example, it was easier to conduct interviews with environmental advocates who felt strongly about preserving the Catawba-Wateree River as a public, environmental resource. Only two participants represented environmental advocacy organizations. But, their values, views, and responses were different from the utility group participants. The utilities are interested in consumption of the resource in a sustainable way. Because the utility companies and the environmental advocacy organizations may have different ideas about the consumption of water and its sustainability, it is important to collect different perspectives. I was successful in interviewing three utility companies. Although I was unsuccessful in collecting responses from a major stakeholder, Duke Energy, I was able to collect responses from the same pier group.

Although I aimed to reduce bias by completing interviews with different participants across different stakeholder categories, there is also the potential for omission bias. Omission bias refers to “instances in which someone or something is erroneously excluded from consideration when they or it should have been included” (Lavrakas, 2008). Three groups or potential participants were not included in the research

because they did not respond to requests to participate or they declined to participate. The groups consisted of legislators from both North Carolina and South Carolina, Duke Energy, and the Catawba Indian Nation. Without members of the respective states' legislatures, conclusions were made without collecting information regarding their experienced political pressures. Additionally, without participation from Duke Energy, there was not a chance for a stakeholder with a substantial investment to provide feedback and rationale for their choices in managing the Catawba-Wateree River. Finally, I never received responses from the Catawba Indian Nation.

CHAPTER SIX: REFLECTIONS

This section provides insights and implications into the Catawba-Wateree River management arrangement and the responses from participants. As discussed, Duke Energy is a privately-owned corporation with shareholders. In *The Social Responsibility of Business is to Increase Profits*, Milton Friedman (1970) holds that a firm's main responsibility is to its shareholders, and the goal of the firm is to maximize returns to shareholders. This ownership theory is in conflict with managing public resources like the Catawba-Wateree River. For public goods, North Carolina and South Carolina are better suited to manage the river basin under the public trust doctrine. The public trust doctrine is the principle that the state should hold certain natural resources like water, fish, and wildlife for the benefit of the public (Sax, 1970).

Here, the states have abdicated its public trust obligation to Duke Energy. Participants, including environmental advocates, praised Duke Energy and the Water Management Group for their efforts in resource management. However, they are excluding input from the public. Participants commended public participation during the relicensing phase. But this participation is a token to bolster Duke Energy's relicense application to FERC. Study participants also stated participation in the Water Management Group and other decision-making bodies is exclusive. This is a substantial flaw in the current governing arrangement.

Further, there is evidence to suggest that the public participation during the relicensing phase had more sinister implications. Payne (2017) suggests "The entire

stakeholder process appeared designed – given the exorbitant number of meetings – to be primarily to wear other stakeholders down.” With increased meetings, the public may feel disenchanted and disengage in the process. Therefore, even with initial public participation, the current arrangement lacks critical input from the general public to help govern the natural resource.

CHAPTER SEVEN: CONCLUSIONS

Conclusions

This work developed insights into the elements necessary for a viable, adaptive interstate compact to manage climate change. Further, this work tested the presence of the elements in a setting with a contentious history over a water resource between North Carolina and South Carolina. The study found that the CRA and FERC license provided (1) an adaptive commission, (2) adaptive apportionment rules, and (3) interagency coordination. However, the commission could be improved with more direct authority over enforcement and compliance with decisions. A major limitation the alternative regulatory arrangement is the lack of public resources and public participation. Ultimately, the results found that the CRA provides an adequate alternative arrangement when there is a lack of political will and resources to manage a vital shared resource.

Recommendations

Although the results from the research provided very positive feedback regarding the current interstate regulatory scheme between North Carolina and South Carolina, the research yields three recommendations. First, the Bi-State Commission could be amended to allow an official from FERC to serve on the commission. Because FERC only has three commissioners that are charged with regulating natural gas, electricity, oil, and hydropower (Federal Energy Regulatory Commission, 2019), the Bi-State Commission member should be a staff member or some other delegated official of FERC. Further, research suggests that the Bi-State Commission does not have much appetite to meet.

Therefore, it is suggested to allow for a FERC representative to serve on the Water Management Group. By including a FERC representative, the Bi-State Commission and the Water Management Group may establish direct channels of communication with regulators and could provide clarity and predictability to a complex permitting and regulatory process.

A second recommendation is to improve public participation during forums. A common claim amongst participants was that there was little opportunity to participate amongst either of the two forums. One participant countered this point by stating that all meetings were open, and that participation is encouraged. However, the format of these forums consists of agendas which could preclude direct public involvement. Further, participants also stated there is a steering committee to help inform committee members. But this still does not account for direct input.

Because the river basin, a public resource, is not managed by the public government, it is suggested to provide a mechanism to allow for public input. Specifically, without dramatically altering the current regulatory scheme, the two forums could provide a public comment period on each agenda. This would allow members of the public to speak directly to decision makers and perhaps allow follow up and dialogue between the two parties.

Finally, the main recommendation goes beyond the Catawba-Wateree River basin. Rather, this basin can serve as a model for other jurisdictions throughout the United States. Because transboundary disputes are protracted and costly, the FERC licensing process can provide a more expeditious and cost-effective alternative to

interstate compacting. Especially in regions where local governments do not have the resources to manage an interstate river, the FERC licensing model does allow for many of the same elements for best natural resource management and oversight while not over taxing the local government.

Further, the FERC licensing process may protect self-governance and sovereignty concerns for states without opening the ratification process to national politics and ideologies if the parties sought approval by Congress to form an interstate compact. However, all of the elements that are necessary for successful compacts are still required. For example, it is beneficial to have one licensee with plenty of resources like Duke Energy if the local government is not able to license holders. The only element to change between the compact process and the licensing process would be the ratification process and the recognition of federal law. Therefore, it is recommended that jurisdictions should use the FERC licensing process that utilize elements of successful compacts when local governments do not have the adequate resources to manage transboundary natural resources like the Catawba-Wateree River.

Suggestions for Future Research

The research questions for this study were designed to examine what elements are missing to form a compact between two states that seemed ripe for a compact. The research revealed that the major obstacles were limited resources and indifferent political will. But the relicensing process provided a very satisfactory result for the participants. Therefore, future research should be dedicated to other transboundary basins that are regulated by FERC licenses. Also, the research suggests that public participation during

the relicensing process was very strong. In fact, the campaign received many awards. This process was encouraged as an alternative to the traditional FERC relicensing process. Therefore, future research should be dedicated to efficacy and viability of improving the relicensing process. Or, specifically, future study is warranted to determine the benefits amongst each of the different relicensing processes: integrated, traditional, and alternative licensing.

APPENDIX:
INTERVIEW QUESTIONS

1. Currently, what problems exist in managing water distribution on the Catawba-Wateree River?
 - a. What kinds of issues or problems are affecting water distribution?
 - b. How is the shared water source managed between the two separate states?
2. Are the parties committed?
 - a. In your opinion, are enough time and resources being spent by interested parties/states to address water distribution issues and management? How so?
 - b. Do you feel your issues are being addressed? How so?
 - c. How have parties demonstrated their commitment to these issues?
3. Should allocation rules be more flexible or more stringent to address new issues? Why?
 - a. What issues remain a problem in the flexibility of the allocation rules?
Why? (Advocate)
 - b. How do the allocation rules and regulations promote or discourage solutions to your issues?
4. What are the major external constraints?
 - a. What are the major threats preventing parties from coming together?
 - b. What issues exist in overcoming these constraints?

5. Collaboration

- a. Do you feel your issues are being heard and considered? (Non-government)
- b. Do you feel everyone has been included? (Government)
- c. How might your experience working with different groups and stakeholders be improved?

6. How is the commission empowered?

- a. What has been your experience while dealing with the commission?
- b. What has the commission failed to achieve? Why?
- c. What issues have the commission helped resolve?

7. Are parties sharing information and data?

- a. What are your feelings regarding sharing data and information with other sources? (Government)
- b. What issues exist when gathering and sharing data and information?
- c. How do you feel working and sharing with other groups and stakeholders?

8. Is there a proper forum?

- a. How do groups and stakeholders collaborate and cooperate? What are the forums through which they do so, and how is the accessibility to the(s) forum(s)?
- b. What are the physical, timing, etc. impediments to bringing stakeholders and parties together? What has improved this coordination?

9. How viable do you think a water compact would be for the Catawba-Wateree River? Is a water compact likely?
- a. How effective do you think the current settlement agreement manages water allocation on the Catawba-Wateree River? Would a water compact be more effective?
 - b. Could a water compact on the Catawba-Wateree River solve these issues? Why or why not?
 - c. Is a water compact for the Catawba-Wateree River likely possibility?

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