DAMS AND FRIED GREEN TOMATOES: NATURAL HISTORY AND SENSE OF PLACE IN RIVER RESTORATION PROJECTS

by WILLIAM ALTON WHITE III

(Under the Direction of Laurie Fowler)

ABSTRACT

This thesis preliminarily ascertains community feelings about a dam that impedes the passage of imperiled fishes in Juliette, Georgia. My research indicates that there is currently significant resistance to the removal of the dam. Local opposition stems from feelings that the dam is integral to the historic identity of the town. Studies of other dam removal projects have shown that restored rivers can actually *increase* a community's attachment to past and place by enhancing local pride in and engagement with the river. These studies suggest that there may be methods for aligning a community's attachment to past and place with the goals of restoration, which might or might not include dam removal. This thesis builds on these methods by exploring the natural history of the Ocmulgee River and suggesting projects that could facilitate that alignment.

INDEX WORDS: Conservation, Restoration, Dam removal, Definitions of nature, Sense of place, Natural history, Ocmulgee River

DAMS AND FRIED GREEN TOMATOES: NATURAL HISTORY AND SENSE OF PLACE IN RIVER RESTORATION PROJECTS

By

WILLIAM ALTON WHITE III

B.S., The Georgia Institute of Technology, 2016

A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF SCIENCE

ATHENS, GEORGIA

2021

DAMS AND FRIED GREEN TOMATOES, NATURAL HISTORY AND SENSE OF PLACE IN RIVER RESTORATION PROJECTS

By

William Alton White

Major Professor: Laurie Fowler

Committee: Byron Freeman
Karen Miller Russell

Electronic Version Approved:

Ron Walcott
Vice Provost for Graduate Education and Dean of the Graduate School
The University of Georgia
August 2021

DEDICATION

This thesis is dedicated to my wonderful fiancé Luisa. Without her encouragement I never would have embarked on this journey. She has supported me during all of the late nights and early mornings since.

Acknowledgements

I would like to thank my advisor Professor Laurie Fowler for her continued encouragement in exploring adventurous and practical scholarship. Without her continuous input and support this would be a much poorer document. Enjoy retirement!

I would also like to thank my committee members, Dr. Byron Freeman and Dr. Karen Miller Russel for their willingness to oversee scholarship that combines so many disparate academic disciplines. I also thank my fellow lab mates in the Fowler lab

In addition, I thank Dr. Jesse Abrams, whose work in political and social theory for natural resource management sparked my interest in pursuing the topics covered in this thesis. Financial support was provided by the James E. Butler Fellowship in Ecology through the Odum School and The River Basin Center.

TABLE OF CONTENTS

INTRODUCTION

In 2019, staff from the Georgia Department of Natural Resources (DNR) approached the directors of the Odum School of Ecology's River Basin Center for assistance in identifying opportunities to protect and restore habitat for fish species in the upper Ocmulgee River, including the Atlantic Sturgeon and Shortnose Sturgeon, protected pursuant to the federal Endangered Species Act, the American Shad, a species of special conservation concern, and the Robust Redhorse, a state endangered species and candidate for federal listing. A subset of DNR's request was to preliminarily ascertain community feelings about a dam in Juliette, Georgia, and, if appropriate, explore the feasibility of its public purchase and removal. This concrete dam was originally built to power a grist mill in 1921 and was later retrofitted for hydropower generation. In 2015 the Federal Energy Regulatory Commission revoked the facility's hydropower license when the owner failed to erect a fish passage at the site, a condition of the license renewal. The dam has basically been abandoned since then. The owner has not responded to DNR's inquiries and as far as I know, has no plans to sell or remove the dam at this time.

My research indicates that there is currently significant community resistance to the removal of the dam. Local opposition stems from feelings that the dam is integral to the historic identity of the town. Studies of dam removal projects in Maine have shown that restored rivers can actually *increase* a community's attachment to past and place, however, by enhancing local pride in and engagement with the river (McClenachan et al., 2015). These studies suggest that

there may be methods for aligning a community's attachment to past and place with the goals of restoration, which might or might not include dam removal. This thesis explores that concept in an effort to advise DNR on how it might partner with the local community in conservation and restoration projects on the upper Ocmulgee River.

Chapter One focusses on the natural history of the river and its environs and the changes in surrounding land uses dating from the time of first European settlement to the present day. The purpose in creating this detailed narrative, the first documenting the changes over time of any southern river, is twofold. First, understanding historic ecosystems is crucial to their restoration, and this chapter begins to create a baseline of sorts. Second, this chapter may be useful in helping shift the perception of what "history" is in the context of the Juliette Dam. Humans have lived in Middle Georgia for over 14,000 years, and in only the last 150 or so has a dam been present on the Ocmulgee. This chapter strives to communicate the deep history of the region.

Chapter 2 explores local residents' definitions of nature and sense of place and their relationships to the Ocmulgee River and the Juliette Dam. This thesis begins with the assumption that what constitutes "nature" and "natural" are socially constructed, not objective truths. Sense of place is the strength of attachment that an individual feels to a place. In this chapter, I interviewed individuals either living or working in the town of Juliette to determine how these underlying value sets relate to their feelings about a potential dam removal. Although similar research has been conducted in other places, this is the first attempt to uncover these relationships in the Southeast. The chapter concludes with recommendations on how DNR might apply these findings in their future conversations with the Juliette community.

Chapter 3 makes practical recommendations to the Georgia DNR for pursuing restoration and conservation projects in Juliette and on the upper Ocmulgee. First, this chapter relays the recommendations of the local residents I interviewed for projects they wish to see on the Ocmulgee. Then it communicates the current status of other projects in motion in the Juliette area, most of which I was engaged in pursuant to my research, and how DNR has and should continue to leverage these projects to accomplish broader conservation goals. Finally, Chapter 3 discusses two projects that I created to communicate some of the information described in Chapter 1 to the broader public: an ArcGIS StoryMap on the natural history of Juliette and a prototype video game simulation I created that shows the historic landscape of the region.

CHAPTER 1

NATURAL HISTORY AND LAND USE CHANGE ON THE OCMULGEE RIVER: 1700 TO PRESENT

INTRODUCTION

Juliette is a small town in the lower Piedmont of Georgia, situated along the banks of the Ocmulgee River. The Ocmulgee is the dividing line between Jones County to the east and Monroe County to the west; thus Juliette straddles both counties. The Monroe County side is more developed and includes a small business district, while the Jones County side is less populous and is dominated by the Piedmont Wildlife Refuge. This chapter explores the natural history of the river and landscape surrounding Juliette beginning in the mid-1700s up to the present time. It details the land use changes that altered both the landscape and the river. This information is critical to any future restoration attempts in the Ocmulgee River, as it provides a reference point for modifications to channel structure and substrate, particularly in shoal habitat, and provides additional context for land use changes in the region.

It is important to note that by the time descriptions of the natural history of the region were first penned in the mid 1700s, during the time I characterize as “pre-European settlement”, the land was already greatly impacted by human settlement and the consequences of European contact with the New World. For example, early European explorers described extensive canebrakes in the floodplains of the Southeast. These likely existed only because they took over the fields that lay fallow as a result of Native American populations

devastated by Old World disease introduced by white explorers in the 16th and 17th centuries, beginning with Hernando De Soto's expedition in 1539. The Creek Confederacy of the 1700s rose in the collapsed shadows of the great Mississippian chiefdoms. The Creeks adapted to new ways of life as commercial hunters by the early 17th century, trading deer pelts with the English, French and Spanish. Later their societies continued to transform as they became commercial herders and farmers. The natural history of the Ocmulgee region is intimately and inextricably tied to the human history of the region, and neither one can be told without the other.

Pre-European – (1700 – 1805)

River

The Ocmulgee River is about 280 miles long, flowing from the Piedmont of Georgia in a general southeasterly direction until it meets with the Oconee River to form the Altamaha in the Coastal Plain. The word "Ocmulgee" referred to the name of a town originally located on the lower Chattahoochee River which had been moved to the banks of the Ocmulgee in Central Georgia by 1609 (Hally, 1994). James Adair, a trader who lived among Native Americans for decades, reported in 1775 that the town was destroyed by white South Carolinians around 1715 (Adair, 2013). The river kept the name and was described by a ranger traveling with James Oglethorpe in 1739 as the "Okmulge" (Hally, 1994).

Like many other southeastern rivers, the Ocmulgee is characterized by shallow shoals interspersed by deep pools in the upper Piedmont region, transitioning to a wide and flat river in the Coastal Plain (Wharton, 1978). Early explorer accounts detail rapid, clear streams in the Ocmulgee around present day Macon (Bartram, 1940), suggesting low turbidity. Those accounts seem to be corroborated by early settlers to the region, "it is an established fact that prior to

the denudation of the forest the water was clear, even during freshet periods" (United States War Department, 1913). Creek place names of streams and rivers in the region also communicate their clarity. "Okmulgi" town translates to "bubbling water", while the Chattahoochee translates as "stream with pictured rocks". The one river in the Southeast described as muddy by white travelers was the Mississippi River, which Creeks called *wiogufki* or "muddy water" (Ethridge, 2003).

These clear streams held an abundant amount and variety of fish. Southeastern streams are home to the highest species richness of fish in the country (C. N. Jenkins et al., 2015). Ninety per cent of all the mussel species in North America are in the Southeast (Ochs et al., 2007). In the Ocmulgee alone, 74 species of fish are native to the river (Straight 2009). Several of these species were almost certainly eaten regularly, including Atlantic and Shortnose Sturgeon, multiple species of catfish, Striped Bass, and various species of sunfish.

The shoals and rapids along the Fall Line of Georgia were exceedingly good fishing grounds. In the spring and early summer each year, Creeks congregated at their favorite fishing spots. In 1858 Thomas Woodward, remembering a time before the Creek Wars of 1813-1814, wrote that "[t]he Indians claimed half the river, and in spring or shad-catching time the Indians would flock from all parts of the nation in great numbers to the Ocmulgee. They could be seen at every shoal as high up the river as shad could run, down to the Altamaha, for the purpose of fishing" (Woodward, 1859). That spring was known as "shad-catching time" is evidence of both the fishes' great abundance and their importance as a staple in Creek life. Although most reports are of net fishing, the Creeks were also known to fish using a poison of buckeye root and clay. Benjamin Hawkins, whom George Washington appointed as "Indian Agent to the

Southern Tribes", reported on a particularly successful event, where fish along an eight-mile corridor on Limestone Creek in Alabama were killed, and the sixty to eighty people present carried armloads of fish home (Ethridge, 2003).

Mussels were also a staple in Creek diets. The best evidence for this is the large refuse piles of mussel shells, known as middens, that are found all across the Southeast. The most well-known middens on the Ocmulgee are in Macon, at the site of the Ocmulgee Mounds (Fairbanks et al., 2003). One interesting feature of these middens is that they tend to be stratified, with bands of large shelled species followed by smaller mussels and snails. This seems to be an unintentional side effect of Native Americans capturing and eating the largest mussels first, followed by smaller, less nutritious species (Rowe, 2020).

Landscape

The landscape around Juliette is currently similar to many other regions of the southern Piedmont, characterized by dense oak-hickory forests. Ecologists used to characterize these forests with low disturbance as "climax forests" (Wharton, 1978). This fit into a previous dominant theory of naturally-reproducing climax states and the "monoclimax", where systems were thought to naturally tend toward some final end state (Whittaker, 1953). Climax theories evolved as ecologists began to think of disturbance (fire, flood, climactic shifts, etc.) not as barriers to succession, but natural occurrences in a dynamic system (Sousa, 1984). This led to a shift in ecological thinking to current theories such as the "ball and cup" theory, where a system constantly revolves around some state, but because disturbance regimes are always shifting, it never reaches the proverbial "climax" (Lamothe et al., 2019). It is in this context that the natural history of the Juliette area should be examined.

Fire was an important disturbance in pre-European settlement ecosystems all along the Piedmont of the United States (Nowacki & Abrams, 2008). Juliette is no different in this regard. Accounts of the region during the 18th century describe wide grasslands broken up by widely-spaced oaks and pines (Bartram 1940). The area around Juliette probably fell in a transition zone between the longleaf pine (*Pinus palustris*) and wiregrass (*Aristida beyrichiana*) dominated ecosystem of the Coastal Plain, and the Piedmont grasslands, dominated by oak (*Quercus sp*.) widely-spaced on the landscape (Juras, 1997). Piedmont prairies support many species of grasses; a study in 2002 found 277 species of plants across five study sites associated with prairie habitat (J. E. Davis et al., 2002). Fire was crucial to the maintenance of these ecosystems; they started both naturally via lightning strikes, and anthropogenically by Native Americans to maintain hunting grounds and to corral game during hunts. The role of anthropogenic fire is hotly debated, and other factors such as soil composition, weather patterns and maintenance of grasslands by large herbivores should be considered (Noss, 2013).

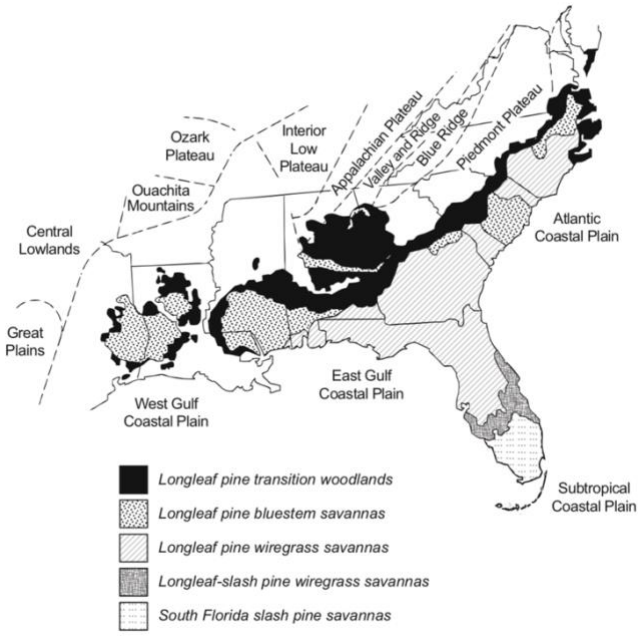


Figure 1.1: Map of plant communities across the Southeast. From *Noss, 2013.*

Modern georeferencing studies using witness trees seem to corroborate these accounts. One such study of the pre-European vegetation of Georgia found that canopy composition of the southern Piedmont was likely a codominant pine (*Pinus sp.*) and Post Oak (*Quercus stellate*) canopy, with Red Oak (*Quercus ruba*), Southern Red Oak (*Quercus falcata*) and hickory (*Carya sp*.) as subdominant (Tuttle & Kramer, 2005). A similar study of the Central Georgia Piedmont between the Ocmulgee and the Oconee found the region to be dominated by oak, pine and hickory species, with pine subdominant (Cowell, 1995).

The native Creeks may have planted and maintained groves of oak, hickory and other nut-bearing trees along the Ocmulgee, as they did at other towns in the Georgia Piedmont. These forests could be quite large. Hawkins describes a 2,000 acre stand that the Creeks managed outside of the town of Cussetta along the Chattahoochee. William Bartram, on his walks through the area, describes “clumps” of oak and hickory, which some historians believe to be evidence of cultivation (Ethridge, 2003).

Floodplain

Riparian vegetation alongside the Ocmulgee most likely consisted of extensive canebrakes, a virtually extinct ecosystem consisting of large stands of dense rivercane (*Arundinaria gigantean*). Explorers frequently mentioned rivercane when they wrote about travels through the Southeast. William Byrd, an explorer traveling the Piedmont region of North Carolina and Virginia, wrote about rivercane 12-16 feet high, and thick as a man’s wrist (Juras, 1997). The earliest references to cane date back to 1670 on the Wabash River when Father

Marquette describes a canebrake so thick that cattle traveling with the party had a hard time passing through it (West, 1934).

Figure 1.2: Remnant rivercane along the Ocmulgee River in Juliette, Georgia. Photo taken by the author, 2021.

Some of the stands were enormous. Benjamin Hawkins described a 3,000 acre stand along the Coosa River, and a 1,000 acre stand on the Chattahoochee (Ethridge, 2003). They were so dense that often the only way through was to hack a path with an axe. Because of its density, it was often a hideout for Creeks, runaway slaves, and other marginalized peoples (Stewart, 2007). Thomas Woodward stated that the Creeks wouldn't trade a canebrake for forty European style forts (Woodward, 1859). Native Americans used cane for everything from housing to weapons to medicines (Platt et al., 2009).

Canebrakes thrive in moderate disturbance environments. It is speculated that the vast amounts of cane seen by early explorers to the region were not ancient ecosystems but were

instead products of early encounters between Europeans and Native Americans. As Native American populations shrank rapidly in the face of European disease, cane sprung up in fallow bottomland fields that Native tribes in the Southeast left behind (Brantley & Platt, 1973; Stewart, 2007).

Canebrakes represented an important agricultural staple for early herders of free-range cattle in the colonial South. Dense stands of river cane were often the most nutritious food for cattle in all seasons. Creeks quickly adopted herding techniques from the European colonists, and by the 1750s and 60s, cattle were important possessions among the Creeks and were passed down as inheritance after death. This marked the beginning of the decline of large canebrakes. Cattle feeding on cane patches trampled the soil, damaging cane's rhizomes and therefore their method of reproduction. Herders moving in would often burn the cane in early spring, when new shoots appeared. Cane could not tolerate such regular burning and began to decline by the late 18th century (Stewart, 2007).

In addition to cane, a variety of other heterogenous vegetation flourished in southeastern Piedmont floodplains. Creeks and earlier Mississippian cultures used bottomlands and floodplains along major rivers in the lower Piedmont to grow a variety of crops, including beans, corn and squash (Saikku, 1996). It is estimated that agriculture fulfilled between 25 and 50% of southeastern Native Americans' sustenance needs.

Some of the largest trees in bottomland forests were probably not harvested. As John Lawson observed in North Carolina, felling them presented "too great an inconvenience" (D. E. Davis et al., 2006; Saikku, 1996). This, coupled with the importance of maintaining nut-bearing trees for dietary reasons, means that large swaths of bottomland forest were probably old

growth. Bottomland tree species in the Piedmont are typically dominated by river birch, sycamore, sugar berry and green ash along the riverfront, with bottomland oaks, box elder and sweet gum in the immediate vicinity (Wharton, 1978).

Early European Settlement (1804-1870)

Landscape

The Creeks moved east to the Ocmulgee River in the early 1700s to be closer to the English. By that point, a lucrative trade in whitetail deerskins between the Native Americans and the English led to close relations between the two peoples. By the American Revolution and the last quarter of the 18th century, those dynamics shifted. Reductions in deer populations, the loss of the English market for deer pelts, and the invention of the cotton gin by Eli Whitney in 1793 meant that cotton, and by extension land, was now the most valuable commodity the South could provide. Southern elected officials, land speculators and plantation owners began to push for the removal of the Creeks from the region (Ethridge, 2003). Cotton production in Georgia increased rapidly at the turn of the century, from 1,000 bales in 1791 to 21,000 in 1796, over one fifth of the U.S.'s total production (Haney et al., 2009).

Through a series of treaties from 1790 to 1804, the Creeks ceded land from the Ogeechee River to the west bank of the Ocmulgee River. There they remained until the 1821 Indian Springs treaty ceded the land between the Ocmulgee and the Flint (Coleman & Bartley, 1991). The Creeks remained in Georgia until 1825 when Creek leader William McIntosh ceded all remaining land in Georgia to Governor George Troup. McIntosh did not have a clear mandate from the Creeks to negotiate this treaty and he was killed soon after signing it (C. W. Williams, 1957).

White settlers quickly filled the region between the Oconee and the Ocmulgee through a series of three land lotteries between 1802 and 1806. The land became known as a rising cotton powerhouse. After the 1825 cessation, many landowners moved west to fertile lands beyond the Ocmulgee, leaving the already exhausted lands behind. By 1828, wood was in such dire supply that citizens in Putnam and Oglethorpe counties began to use ditches and hedges in lieu of rail fences (Bonner, 2009).

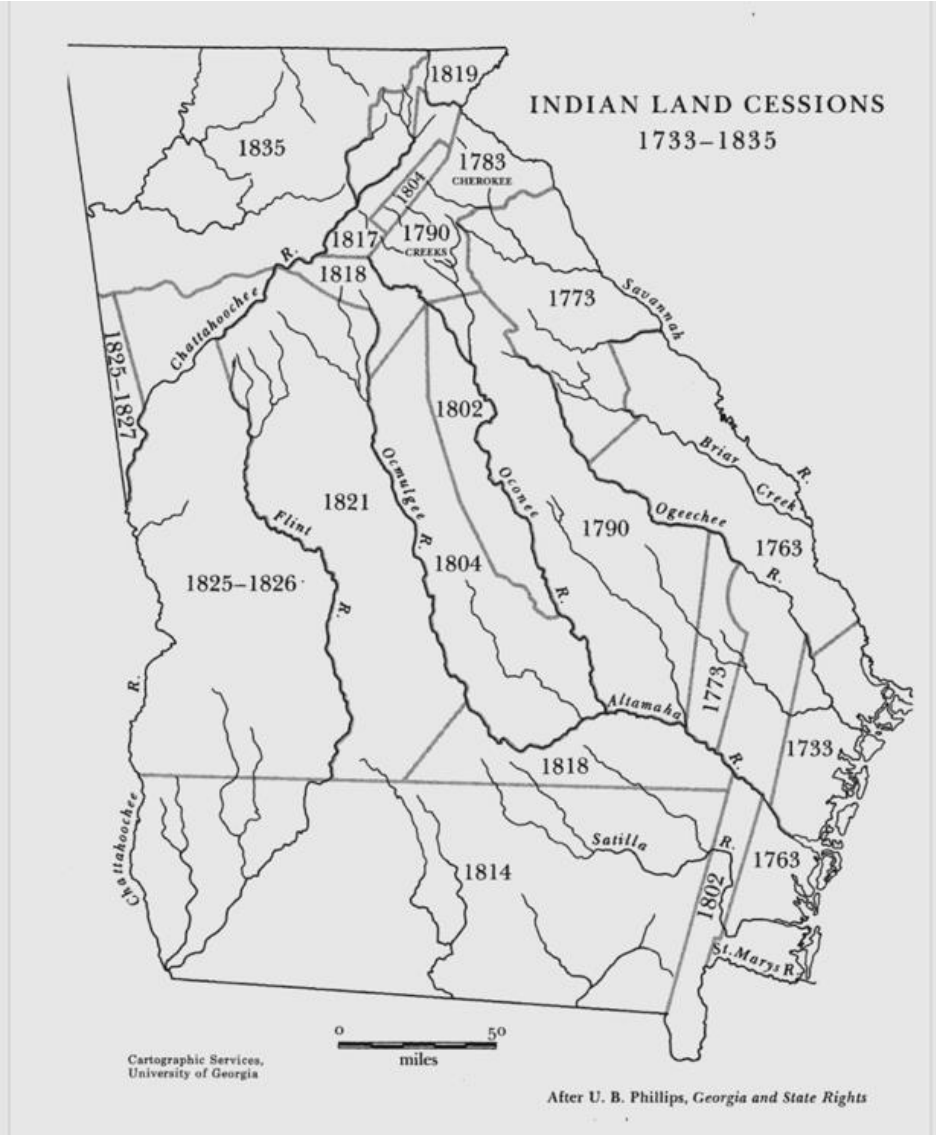
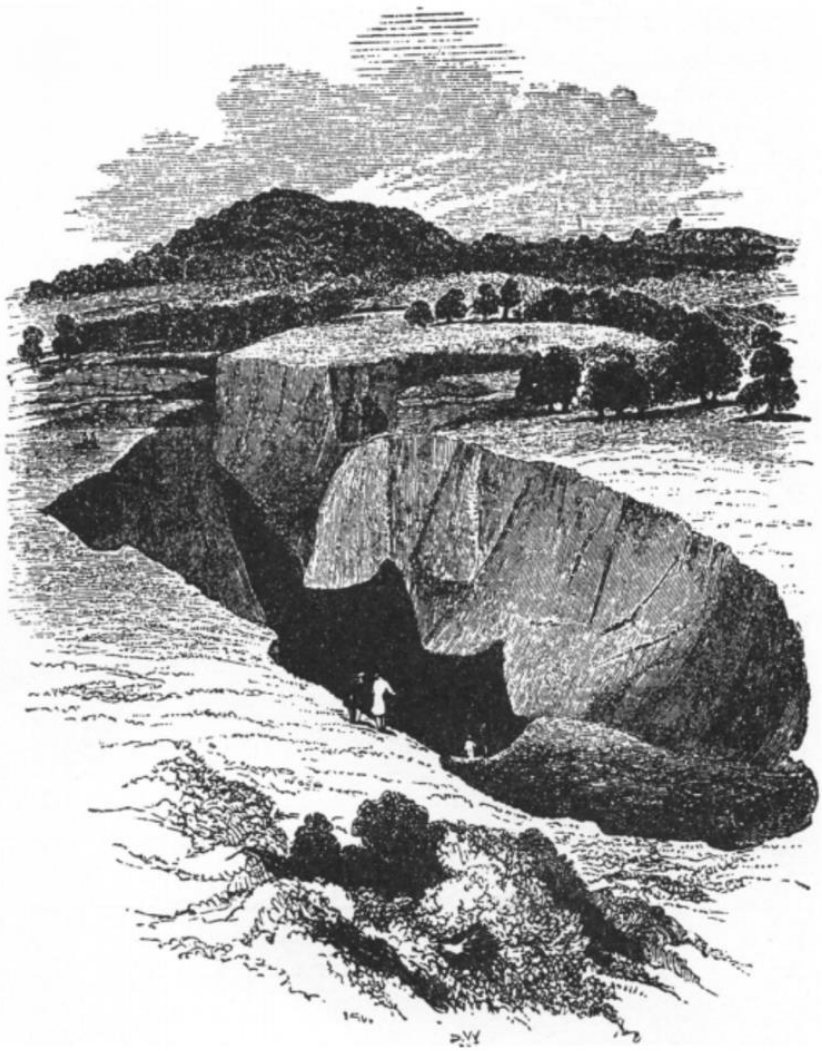


Figure 1.3: Native American Cessions. From *A History of Georgia*, 1991.

As white settlers moved into the region, poor farming practices and logging led to widespread erosion across all of the eastern United States (Costa, 1975). Erosion was more severe in the South, owing to a multitude of differences from more severe rainfall patterns and steeper topography, to poorer farming techniques compared to other parts of the country. (Trimble, 1974). Some erosion was quite dramatic, quickly forming deep gullies and ravines in the wake of loosened soils. Sir Charles Lyle, visiting Milledgeville on the Oconee River in 1842, documented a deep gully with “a depth of 55 feet, about 900 in length and a width of from 20 to 100 feet” that formed in the span of twenty years (Lyell, 2011).



Ravine on the farm of Pomona, near Milledgeville, Georgia, as it appeared January, 1846.
Excavated in twenty years, 55 feet deep, and 180 feet broad.

Figure 1.4: The Lyell Gully. From Ireland, 1939.

By 1850, the land between the Oconee and Ocmulgee Rivers was described as, "[p]erhaps more completely exhausted than any other region in the United States." Residents complained of the high prices of firewood and fence posts. Many farms of several hundred acres across Middle Georgia had little or no hardwoods present at all (Bonner, 2009). By this

point in time, roughly 22.8 million acres of Georgia were farmland (Saikku, 1996), close to 60% of the current land area of the state.

River

There were early attempts to make the channel of the Ocmulgee River more navigable to reduce costs for the rapidly expanding cotton farming industry in the Piedmont. In 1817, the Georgia legislature passed an appropriation of funds for improvements to river navigation. It made funds available for the Ocmulgee, Ogeechee, Oconee, Altamaha, Savannah, Tugaloo, and Brier Creek. These first efforts were mostly small scale, including the removal of sand bars, snags and rocks, drawing the ire of many Georgians who wanted to see more extensive navigation improvements. Disenchantment with the program and with the state's first topographical engineer, Henry Fulton, led Georgia to switch focus to the development of roads during the late 1820s and early 1830s. River improvement projects continued to be sporadic and poorly planned until the Army Corps of Engineers took over operations in the 1850s (Barber & Gann, 1989). In 1852, Congress appropriated $10,000 for a series of surveys on the Ocmulgee, Savannah, Flint and Chattahoochee to determine the cost of removing obstructions to navigation (U.S.C. 32 § 104, 1852).

Cotton farming accelerated in the Piedmont during this time, driving soil loss. As erosion in the Altamaha watershed increased, residents living along the river were able to tell the river water's source based on its turbidity.

> "As late as 1841 residents on the Altamaha River could distinguish whether a freshet coming down the river originated in the Oconee or the Ocmulgee watershed by the color of the water. The cutting away of the forest bordering the Oconee had advanced

> considerably at this time, and when a local freshet occurred in this watershed the flow from same into the Altamaha was colored by the red clay held in suspension… As soon as the clearing of the lands took place on the Ocmulgee watershed the waters of this branch also became turbid." (*United States Congressional Serial Set*, 1912).

This is important because clean gravel bars with flowing water are vital spawning habitat for the state-listed Robust Redhorse (*Moxostoma robustom*), the federally endangered Atlantic Sturgeon (*Acipenser oxyrinchus*) and the federally endangered Shortnose Sturgeon (*Acipenser brevirostrum)*. Both redhorse and sturgeon spawn on shallow gravel bars because they provide a place for eggs to latch onto the substrate, and flowing water provides oxygen, disperses eggs and excludes predators (Grabowski, 2006; Musick, 2005). This is a common spawning strategy employed by riverine fishes, and the increase in turbidity almost certainly impacted the biomass of many fish species.

In the mid 19th century, the first of a series of dams was built at Juliette to power a grist mill. The first dams were made of logs which were replaced by a concrete dam at the same location in 1921 (Hopkins, 1982). This dam was the first true impediment to fish moving upstream and kept several anadromous fish species including shad and sturgeon from accessing valuable spawning habitat. It impeded and regulated downstream flow and stopped sediments from flowing downstream, starving the rich floodplains of new silt.

Figure 1.5: The Juliette Dam as seen from the Jones County bank. Photo taken by the author, March 2020.

Floodplain

If overgrazing from herding represented the beginning of the end for large canebrake stands, Eli Whitney's invention of the cotton gin in 1793 may have been the final death knell. By the late 1700s deer populations began to decline significantly, and furthermore the American Revolution meant the loss of the largest buyer of deer pelts in the Southeast, the English (Ethridge, 2003). During the colonial era, growers in South Carolina and Georgia experimented with cotton, but it was mostly on a small scale and coupled with other experimental crops like indigo and silk (Chaplin, 1991). The cotton gin and sudden boom in textile manufacturing in the United Kingdom suddenly made the rich lands of the Georgia Piedmont floodplains much more desirable.

Cane marked soils that were most productive for agriculture. When cotton and corn farming began to take hold in the region in the late 1700s, settlers began to clear cane to plant the crops, often targeting the largest and healthiest stands first because they were easy markers of fertile soil (Platt & Brantley, 1997). Settlers would cut and pile large amounts of cane, and once dry would burn it to create enough heat to kill any remaining rhizomes in the soil (Stewart, 2007). By the middle of the 19th century most of the canebrakes in the Southeast were destroyed.

Bottomland hardwoods not cleared for agriculture were often cleared for lumber. Lumber yards were typically situated along rivers for easy transportation of lumber. Technology advancements of railroads and steam-powered sawmills led to a doubling of logging rates in the Southeast in the 1850s (Saikku, 1996).

Later settlement – 1870-1940

Landscape

Erosion in the southern Piedmont seems to have peaked between the 1860s and the 1920s (Daniels, 1987). This is due both to the poor farming practices of the previous half century and an increase in logging during the post-Reconstruction era (J. G. Lewis & Wilson, 2007). After the conclusion of the Civil War, cotton became a major cash crop in Jones County and by 1909 constituted 44% of all farmland in the county, or roughly 18,000 acres (Long et al., 1914). Agricultural techniques were much the same as they were dating back to the mid-1800s. Fields were rarely if ever rotated and tended to be planted with cotton year after year. Cotton and other staple crops like tobacco and corn were clean-tilled, a process that almost entirely inverts the soil and leads to high rates of erosion (Trimble, 1985).

Soil exhaustion was staved off with heavy commercial fertilizer use, ranging from 100 to 600 pounds per acre, with most smaller tenants applying 150 to 200 pounds per acre, while more ambitious farmers used between 300-500 pounds (Long et al., 1914). For reference, in 2018 the University of Georgia College of Agriculture and Environmental Sciences recommended the application of between 60-105 pounds per acre of nitrogen fertilizer for cotton (Whitaker et al., 2018). This is mainly due to differences in the strength of the fertilizer. According to the 2018 Cotton Report, current popular fertilizer contains 18% nitrogen (Whitaker et al., 2018), while in 1914 most fertilizers used in Jones County were between 2 and 4% nitrogen (Long et al., 1914). Today's fertilizers are about 4.5 times more concentrated than the strongest fertilizers used at the beginning of the 20th century.

In 1915, the boll weevil (*Anthonomus grandis*) made its way to Thomasville, Georgia from Alabama. By the end of the year, it was reported in over 40 counties. Two years later it was present in every cotton-producing county in the state, and cotton production fell by 30% (Haney et al., 2009). All manners of control methods were tried, with the USDA finally settling on calcium arsenate, a toxic white dust sprayed over the crops. The USDA encouraged farmers to raise large clouds of dust in the night or early morning, so that dew would cause the poison to adhere to the cotton plants (Lange et al., 2009).

By the 1930s, a survey by the USDA classified much of the Georgia Piedmont as moderately to severely eroded (*Soils and men*, 1938). A soil map, produced by the US Department of Agriculture in 1913, classifies much of the region around Juliette, especially around the Ocmulgee River and surrounding streams, as eroded rough gullies (U.S. Department of Agriculture, 1913).

The 1930s marked the peak of landscape misuse in the region (Pederson & Carlson, 2009). A geologic study of the “Lyell gully” in 1939 found that it had grown to a size of 3.86 acres and a maximum depth of sixty feet (Ireland, 1939). In 1937, the Georgia Legislature created Soil Conservation Districts in an attempt to implement better farming practices in the region. Districts promoted the use of terraces, grassed waterways, improved pastures and other erosion control efforts. Prominent farmers in Monroe County supported the legislation (Pederson & Carlson, 2009). By the 1930s, the boll weevil, declining soil fertility and increased competition from international markets all combined to drive down cotton production in the state by 40% (Haney et al., 2009). This drove many farmers in Monroe County to switch to small dairy operations, and by 1945, 260 such operations existed (Pederson & Carlson, 2009).

Figure 1.6: Open pine woodland of Piedmont National Wildlife Refuge, Jones County Georgia. Photo taken by the author in March 2021.

Forest cover began to increase in 1937 as fallow fields were allowed to revert to forest (Pederson & Carlson, 2009). In 1939, the 35,000-acre Piedmont Wildlife Refuge was established in Jones County from farmland abandoned during the Dust Bowl era. Created through executive order by President Roosevelt, the refuge's mandates were to provide "refuge for birds and other wildlife (Hammond, 2010). Conservation-focused management, including prescribed burns, produced habitat that may look remarkably similar to historic forest regimes, with loblolly and shortleaf pines on the slopes and bottomland hardwoods. The refuge has become a haven for endangered species like the red-cockaded woodpecker, a habitat specialist adapted to open, mature pine forests (Ligon, 1970). Today, both Jones and Monroe County have 71-81% forest cover (Brandeis et al., 2014).

River

In addition to the unintentional changes to the river, the United States Army Corps of Engineers made deliberate alterations to the channels of the Ocmulgee and Oconee in an effort to improve their navigability. In 1875, in an effort to create a line of communication and cargo transport between the Mississippi River system and the southern Atlantic seaboard, the Corps surveyed every shoal along the Ocmulgee between Macon and Darien and the estimated cost of removing the shoals (*Report of the Chief of Engineers*, 1875). The planned southern route to the Atlantic would offload cargo at Guntersville, Alabama, the southernmost point on the Tennessee River. It would then be moved by rail to Macon, Georgia where it would then be loaded onto barges bound for Savannah or Brunswick. The report estimates that to make the Ocmulgee fit for such large-scale transportation, a minimum of 20,087 cubic yards of sand and 2,906 cubic yards of stone would need to be removed between Macon and Hawkinsville. The

report then goes on to detail additional measures that needed to be taken, including clearing stumps, logs, and sunken rafts. The report concludes that a total of 34 shoals or bars required improvement. The plan fell through, but it marks the first survey of the Ocmulgee.

Figure 1.7: Construction on the Ocmulgee River in Bibb County, near Macon, 1898. Notice the boulder size and stream width (Barber & Gann, 1989).

The 1878 Rivers and Harbors Act appropriated funds to improve the Ocmulgee River for transportation uses by increasing the controlling low water depths to an average of three feet. Additional funds were appropriated in the 1890 Rivers and Harbors Act (*Report of the Chief of Engineers, U.S. Army*, 1943). Major work on the Ocmulgee commenced in 1878 and lasted well into the 1930s. Between 1878 and 1912, the Army Corps of Engineers removed “80,400 snags and 6,200 stumps from the channel. There has also been removed from the banks 267,000

overhanging trees, logs, and maplings, and 4,600 trees were girdled. Thirty thousand cubic yards of stone have been removed from shoals and 20,000 cubic yards of sand, clay, and gravel from cut - offs, false points, and from shoals in the channel. Three thousand two hundred linear feet of training wall and spur dams and 11,000 linear feet of bank revetment have also been constructed" (*United States Congressional Serial Set*, 1912).

The report points out that prior to the commencement of work to remove "debris" from the shoal areas, the depth of any of the shoals rarely exceeded one foot. After the alterations, practically all regions of the Ocmulgee and the Altamaha had a controlling depth at or near three feet so that rafted timber could float from the upper reaches of the river downstream. These efforts were successful. Rafts could be floated for 20% more days in a year than they could before the improvements (*United States Congressional Serial Set*, 1912).

Figure 1.8: U.S. Snagboat *Ocmulgee* on a Georgia river, late 19th or early 20th century (Barber & Gann, 1989).

After 1912, work continued on the Ocmulgee. In the 1912 Rivers and Harbors Act, Congress appropriated $40,000 to the Army Corps of Engineers annually to maintain the 3-foot channel on the Ocmulgee, Oconee and Altamaha Rivers, and expand the low water depth to four feet where they could. In 1915, the Army Corps of Engineers reported that they had used a derrick boat to remove six rock shoals between river mile marker 148 and 152, roughly where Tobesofkee Creek joins with the Ocmulgee south of Macon, according to modern USGS river mile data. They removed 4706 cubic yards of rock, in addition to removing snags, clay, sand and

gravel. They improved a total of 3600 linear feet of channel to a low water depth of four feet (*Report of the Chief of Engineers, U.S. Army*, 1916).

The rock shoal removal work seems to have been completed by 1920. After that, the appropriated funds appear to have been used for snagging operations to keep the new channel clear. A study of Army Corps of Engineers reports shows that between 1878 and 1920, a total of 48,043 cubic yards of stone shoals were pulled out of the Ocmulgee. Additionally, 295,899 cubic yards of sand, clay, and gravel were dredged. In total, 21,177 linear feet of channel were improved, or roughly four miles of rock shoals (Engineers, 1915; *Report of the Chief of Engineers, U.S. Army*, 1916; *Report of the Chief of Engineers, U.S. Army*, 1919; *Report of the Chief of Engineers, U.S. Army*, 1920; *Report of the Chief of Engineers U.S. Army*, 1917; United States War Department, 1913).

Corps activity on the river continued into the 1930s, when, driven by the reduction of commerce using the river, they reduced their operations to routine maintenance work. Snagging operations continued in the Ocmulgee and Altamaha systems until the 1970s but declined significantly in the 1950s. The last snagging operation on the Altamaha system occurred in 1979 (Barber & Gann, 1989)

Figure 1.9: River boat along the Ocmulgee circa 1910 (*United States Congressional Serial Set*, 1912).

Although North American mussel decline is largely attributed to increasing sedimentation and land use change (Brim Box & Mossa, 1999), the direct removal of gravel bars and shoals also had a negative impact on mussel populations. In the middle of the 18th century, the Ocmulgee was home to eighteen mussel species. Three of those species are no longer found in the Upper Ocmulgee. One of these, the Altamaha Spinymussel (*Elliptio spinosa*), is federally endangered and close to extinction (Rowe, 2020).

Despite effort to remove shoal habitat from the Altamaha basin, Congressional fisheries reports still detail several shad fishermen employed in these basins. The 1898 report shows that 29,377 shad were caught in the Altamaha basin, and 1,503 shad were caught in the Ocmulgee during the three-month season of 1896. These efforts employed 526 fishermen in the Altamaha

basin (Stevenson, 1898). The evidence is corroborated by the 1899 fisheries report of the South Atlantic states. The report describes the top fisheries counties in Georgia, the fish species caught and the numbers of their catches. Glynn, Wayne and Mcintosh counties, all sited in the Altamaha River basin, are examined in more detail. In those three counties, fishermen caught 41,800 lbs. of shad and 64,000 lbs. of sturgeon. Additionally, in the estuaries, they harvested over one million pounds of oysters.

Table showing by counties and species the yield of the fisheries of Georgia in 1897.

Species.	Bryan.		Camden.		Chatham.		Glynn.	
	Lbs.	Value.	Lbs.	Value.	Lbs.	Value.	Lbs.	Value.
Alewives					25,000	$500		
Black bass	1,400	$98			3,200	224		
Cat-fish					154,500	2,085	300	$6
Channel bass					14,100	705	2,400	120
Croakers					11,900	395	5,300	215
Drum					8,300	412	1,500	45
Eels					5,000	100		
Flounders							4,300	180
Hickory shad	1,000	28			4,775	134	500	25
Mullet					32,000	510	10,500	260
Perch					3,600	140		
Sailor's choice							200	10
Shad	72,000	3,600	28,000	$1,300	642,600	38,880	1,750	105
Sheepshead					25,000	1,250		
Squeteague					20,400	1,020	26,800	1,120
Striped bass					4,000	280	1,200	60
Sturgeon			8,700	230	75,000	2,550		
Sun-fish	1,500	75			2,400	120		
Whiting					24,500	1,225	18,800	765
Shrimp					25,600	960	42,000	1,575
Crabs					40,100	1,000	34,560	864
Terrapins					20,290	7,045	7,850	2,548
Turtles					1,000	20		
Oysters			311,500	5,350	2,011,690	65,803	1,027,250	14,780
Clams					2,640	165		
Caviar			600	120	5,150	1,498		
Total	75,900	3,801	348,800	7,000	3,162,745	127,621	1,185,210	22,678

Species.	Liberty.		McIntosh.		Wayne.		Total.	
	Lbs.	Value.	Lbs.	Value.	Lbs.	Value.	Lbs.	Value.
Alewives							25,000	$500
Black bass							4,600	322
Cat-fish			2,800	$43			157,600	2,734
Channel bass			7,300	365			23,800	1,190
Croakers			900	45			18,100	655
Drum			4,500	135			14,300	592
Eels							5,000	100
Flounders			2,200	110			6,500	290
Hickory shad			1,500	75			7,775	262
Mullet			13,500	540			56,000	1,310
Perch							3,600	140
Sailor's choice			400	20			600	30
Shad	3,150	$225	15,250	915	24,800	$1,080	787,550	40,705
Sheepshead							25,000	1,250
Squeteague			7,450	372			54,650	2,512
Striped bass			3,800	190			9,000	530
Sturgeon			44,000	880	20,000	400	147,700	4,009
Sun-fish							3,900	195
Whiting			2,400	110			45,700	2,100
Shrimp							67,600	2,535
Crabs							74,660	1,864
Terrapins			6,645	1,661			34,785	11,254
Turtles							1,000	20
Oysters			56,000	776			3,406,440	86,709
Clams							2,640	165
Caviar			2,650	663	1,200	300	9,600	2,581
Total	3,150	225	171,295	6,900	46,000	2,380	4,993,100	170,605

Figure 1.10: Statistics of the fisheries of the south Atlantic states, 1899. Washington: Govt.

"Of the numerous rivers that receive large runs of shad, the following are the most important: Savannah, Ogeechee, Altamaha, Ocmulgee, Oconee, Satilla and St. Mary's. The first arrivals from the ocean are looked for soon after the 1st of January, and by the middle of the month a good run may be expected, the season lasting about three months. The bulk of the catch is taken by gill nets used within a few miles of the mouths of the rivers. The quantity taken through the interior is not large at any one place but is quite important in the aggregate.

More attention is being given to the sturgeon fishery than formerly. There is increasing demand, and high prices are received for sturgeon and its roe. The catch is made mostly between March and June" (Townsend, 1899).

The comments about sturgeon are particularly interesting. Both the Atlantic and Shortnose sturgeon are currently listed as endangered pursuant to the federal Endangered Species Act, due mainly to habitat loss and overfishing. Both are present in the Altamaha River basin. This report falls in the middle of the "Black Gold Rush", when sturgeon were harvested at enormously high rates both as meat and for their prized roe (eggs) (Riley, 2018). Harvests peaked in 1890 in the United States at around 3.3 metric tons. All populations in the U.S. crashed shortly thereafter (Waldman & Wirgin, 2008).

Floodplain

From 1878 to 1912, a significant amount of work was done to the banks of the river for the purposes of controlling flooding and to prevent meandering. For example, the derrick boat *Sapello* constructed a 125 foot retaining wall at Quinn's Rock Shoal using material removed from the shoal (Engineers, 1915). In 1911 the Lloyd Shoals Dam was completed by Georgia Power, which further regulated flow (Kamps, 1989). Constructions like these serve to disrupt

historic flooding disturbance regimes, leading to further declines in canebrake habitat (Brantley & Platt, 1973). Reduced flooding can also lead to a community shift in bottomland hardwood habitat from flood-tolerant species to more shade-tolerant species, increased stem density and decreased mean stem diameters (King & Keim, 2019).

Snagging operations carried out on the Ocmulgee affected both cane and bottomland hardwoods alike. Snagging affects stream morphology and channel stability (Shields & Nunnally, 1984) and indiscriminate snagging can change the timing, magnitude, and duration of floods (Mason et al., 1990). Such alterations were undoubtedly less impactful than the Lloyd Shoals Dam, but alterations in channel morphology and disconnections between the river and floodplain are often cited as main drivers in species composition shifts in bottomland hardwood forests (Gee et al., 2014; Jacobson & Faust, 2014; King & Keim, 2019).

Today the canebrake ecosystem is estimated to exist at just 2% of its historic range and is considered critically endangered. The future of floodplains in the Southeast is uncertain for a variety of reasons, including water policies, land use changes, climate change, and exotic species, to name a few (King et al., 2009). Bottomland hardwoods have rebounded along with the rest of forest cover in the Southeast. However, it is becoming increasingly clear that fire played a large role in the maintenance of historic bottomland hardwood systems, and that disturbance is largely absent today (Gagnon, 2009). This too has led to shift in floodplain species composition to more shade- tolerant species, potentially making it difficult to reestablish a fire regime (Cash & Anderson, 2020).

Conclusion

The southeastern Piedmont forests of Juliette Georgia have undergone thousands of years of alterations. Mississippian cultures living in the region for thousands of years farmed in the floodplains and fished in the Ocmulgee. They altered the landscape through periodic burning practices and planting nut trees that they could eat. The arrival of Europeans brought disease that wiped upwards of 90% of the Native American populations out. By the time of William Bartram's passing through the region, the world would have already been radically altered from the one Hernando De Soto saw when he reached the vicinity of Macon in 1539.

The differences in the landscape between De Soto and Bartram appear to be nothing compared to the radical alterations that occurred just a few decades after Bartram described the beautiful Oakleaf Hydrangea (*Hydrangea quercifolia*). The movement of Europeans into the region in the half century between 1825 and 1875 represented the greatest changes to the landscape since man first saw the shores of the Ocmulgee. White farmers used the land quickly and to the point of exhaustion before moving onto unused land further west. They cut and burned cane in the floodplains and sold the bottomland hardwoods for timber.

The Ocmulgee, which for thousands of years flowed with clear water over shallow shoals for much of its length, became turbid. In an effort to facilitate commerce on the river, the Army Corps of Engineers removed snags from the bank, destabilizing the channel. Perhaps most damaging of all, they removed thousands of tons of rock from the shoals. Shoals which were important habitat for historically abundant and culturally important species like shad and mussels were either gone or irreparably damaged.

Today, Jones and Monroe County are largely forested, but the species composition has changed. Pine plantations and dense, shade tolerant forests have replaced the open woodlands, prairies, and fire-tolerant species of the past. Remnants of the Piedmont prairies now exist along moderately disturbed sites like powerline easements and roadsides. Canebrakes are virtually nonexistent. The Ocmulgee, as with many other rivers in the Southeast, flows with high turbidity. Many of the removed shoals will likely never be restored. Two dams on the river, at Lloyd Shoals and Juliette, impede fish from accessing upstream spawning habitat and starve the floodplain downstream of sediments.

BIBLIOGRAPHY

An Act making Appropriations for the Improvement of certain Harbors and Rivers, 32 U.S.C § 104. (1852). https://www.loc.gov/law/help/statutes-at-large/32nd-congress/session-1/c32s1ch104.pdf

Adair, J. (2013). The History of the American Indians: Particularly those Nations Adjoining to the Mississippi, East and West Florida, Georgia, South and North Carolina, and Virginia. In *Cambridge Library Collection - North American History*. Cambridge University Press. https://doi.org/DOI: 10.1017/CBO9781139583602

Barber, H. E., & Gann, A. R. (1989). *History of the Savannah District U.S. Army Corps of Engineers*.

Bartram, W. (1940). *The travels of William Bartram*. New York : Facsimile library, exclusive distributors: Barnes & Noble, Inc., 1940. https://search.library.wisc.edu/catalog/999829749902121

Bonner, J. C. (2009). *A history of Georgia agriculture, 1732-1860*. University Of Georgia Press.

Brandeis, T. J., McCollum, J. M., Hartsell, A. J., Brandeis, C., Rose, A. K., Oswalt, S. N., Vogt, J. T., & Vega, H. M. (2014). *Georgia Forests, 2014*. https://gatrees.org/wp-content/uploads/2020/01/Georgias-Forests-5-Year-Report-2014.pdf

Brantley, C. G., & Platt, S. G. (1973). Canebrake Conservation in the Southeastern United States. In *Bulletin* (Vol. 29, Issue 4). https://www.jstor.org/stable/3784141

Brim Box, J., & Mossa, J. (1999). Sediment, Land Use, and Freshwater Mussels: Prospects and Problems. *Journal of the North American Benthological Society*, *18*(1), 99–117. https://doi.org/10.2307/1468011

Cash, J. S., & Anderson, C. J. (2020). Feasibility of Igniting Prescribed Fires in Bottomland Hardwood Forests. *Journal of Forestry*, *118*(6), 555–560. https://doi.org/10.1093/jofore/fvaa029

Chaplin, J. E. (1991). Creating a Cotton South in Georgia and South Carolina, 1760-1815. *The Journal of Southern History*, *57*(2), 171. https://doi.org/10.2307/2210413

Coleman, K., & Bartley, N. V. (1991). *A history of Georgia*. The University of Georgia Press.

Costa, J. E. (1975). Effects of agriculture on erosion and sedimentation in the Piedmont province, Maryland. *Bulletin of the Geological Society of America*, *86*(9), 1281–1286. https://doi.org/10.1130/0016-7606(1975)86<1281:EOAOEA>2.0.CO;2

Cowell, C. M. (1995). Presettlement Piedmont Forests: Patterns of Composition and Disturbance in Central Georgia. *Annals of the Association of American Geographers*, *85*(1), 65–83. http://www.jstor.org/stable/2564279

Daniels, R. B. (1987). Soil erosion and degradation in the southern Piedmont of the USA. *Land Transformation in Agriculture*, 407–428.

Davis, D. E., Colten, C. E., Nelson, M. K., Saikku, M., Stoll, M. R., & Allen, B. L. (2006). *Southern United States: An Environmental History*. ABC-CLIO. https://books.google.com/books?id=kZsqfbPPHRcC

Davis, J. E., McRae, C., Estep, B. L., Barden, L. S., & Matthews, J. F. (2002). Vascular flora of Piedmont prairies: Evidence from several prairie remnants. *Castanea*, *67*(1), 1–12.

https://www.jstor.org/stable/4034311?seq=1#metadata_info_tab_contents

Devine-Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. *Journal of Community and Applied Social Psychology*, *19*(6), 426–441. https://doi.org/10.1002/casp.1004

Devine-Wright, P. (2013). Explaining "NIMBY" Objections to a Power Line: The Role of Personal, Place Attachment and Project-Related Factors. *Environment and Behavior*, *45*(6), 761–781. https://doi.org/10.1177/0013916512440435

Engineers, U. S. A. C. of. (1915). *Report of the Chief of Engineers U.S. Army*. U.S. Government Printing Office. https://books.google.com/books?id=5CNJAQAAIAAJ

Ethridge, R. (2003). *Creek Country : The Creek Indians and Their World*. The University of North Carolina Press. http://ebookcentral.proquest.com/lib/ugalib/detail.action?docID=837903

Evans, J. M., & Gambill, J. (2016). *Tybee Island Sea-Level Rise Adaptation Plan*. https://doi.org/10.13140/RG.2.1.3825.9604/1

Gagnon, P. R. (2009). Fire in Floodplain Forests in the Southeastern USA: Insights From Disturbance Ecology of Native Bamboo. *Wetlands*, *29*(2), 520–526.

Gee, H. K. W., King, S. L., & Keim, R. F. (2014). Tree growth and recruitment in a leveed floodplain forest in the Mississippi River Alluvial Valley, USA. *Forest Ecology and Management*, *334*, 85–95. https://doi.org/10.1016/j.foreco.2014.08.024

Grabowski, T. B. (2006). *Reproductive Ecology and Seasonal Migrations of Robust Redhorse (Moxostoma robustum) in the Savannah River, Georgia and South Carolina* [Clemson University]. https://www.nrc.gov/docs/ML0905/ML090550607.pdf

Hally, D. J. (1994). *Ocmulgee archaeology, 1936-1986.* University of Georgia Press.

https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=cat06564a&AN=uga.9914496313902959&site=eds-live&custid=uga1

Hammond, A. (2010). *Piedmont National Wildlife Refuge Comprehensive Conservation Plan*. https://www.fws.gov/southeast/planning/PDFdocuments/PiedmontFinal/Piedmont Final CCP.pdf

Haney, P., Lewis, W., & Lambert, W. (2009). *Cotton Production and the Boll Weevil in Georgia: History, Cost of Control, and Benefits of Eradication*.

Ireland, H. A. (1939). "Lyell" Gully, a Record of a Century of Erosion. *The Journal of Geology*, *47*(1), 47–63. https://doi.org/10.1086/624736

Jacobson, R., & Faust, T. (2014). Hydrologic connectivity in Floodplains, Northern Missouri - Implications for Management and Restoration of Floodplain Forest Communities in Disturbed Landscapes. *River Research and Applications*, *30*(3), 269–286. https://doi.org/10.1002/rra.2636

Jenkins, C. N., Van Houtan, K. S., Pimm, S. L., & Sexton, J. O. (2015). US protected lands mismatch biodiversity priorities. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(16), 5081–5086. https://doi.org/10.1073/pnas.1418034112

Juras, P. (1997). *The Presettlement Piedmont Savanna A Model For Landscape Design and Management*. University of Georgia.

Kamps, D. M. (1989). *Jackson Lake: Response to Nutrient Reduction* (Vol. 643).

Keeney, R. L. (1996). *Value-Focused Thinking*. Harvard University Press. https://books.google.com/books?id=WtNASm7O3fQC

King, S. L., & Keim, R. F. (2019). Hydrologic Modifications Challenge Bottomland Hardwood

Forest Management. *Journal of Forestry*, *117*(5), 504–514. https://doi.org/10.1093/jofore/fvz025

King, S. L., Sharitz, R. R., Groninger, J. W., & Battaglia, L. L. (2009). The ecology, restoration, and management of southeastern floodplain ecosystems: A synthesis. *Wetlands*, *29*(2), 624–634. https://doi.org/10.1672/08-223.1

Klein, V. A. (2015). *The Nature of Nature: Space, Place, and Identity on the Appalachian Trail*.

Lamothe, K. A., Somers, K. M., & Jackson, D. A. (2019). Linking the ball-and-cup analogy and ordination trajectories to describe ecosystem stability, resistance, and resilience. *Ecosphere*, *10*(3), e02629. https://doi.org/10.1002/ecs2.2629

Lange, F., Olmstead, A. L., & Rhode, P. W. (2009). The impact of the boll weevil, 1892-1932. *Journal of Economic History*, *69*(3), 685–718. https://doi.org/10.1017/S0022050709001090

Lewis, J. G., & Wilson, C. R. (2007). Forests. In M. MELOSI (Ed.), *The New Encyclopedia of Southern Culture* (pp. 74–78). University of North Carolina Press. http://www.jstor.org/stable/10.5149/9781469616605_melosi.17

Ligon, J. D. (1970). Behavior and Breeding Biology of the Red-Cockaded Woodpecker. *The Auk*, *87*(2), 255–278. https://doi.org/10.2307/4083919

Long, D. D., Crabb, G. A., Brinkley, L. L., Allen, R. T., & Grimes, E. J. (1914). *Soil Survey of Jones County Georgia*. https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/georgia/jonesGA1914/jonesGA1914.pdf

Lyell, C. (2011). A second visit to the United States of North America. In *A second visit to the United States of North America.* https://doi.org/10.5962/bhl.title.50870

Mason, R. R., Simmons, C. E., & Watkins, S. A. (1990). *Effects of Channel Modifications on the Hydrology of Chicod Creek Basin, North Carolina, 1975-87*.

Musick, J. A. (2005). Essential fish habitat of the Atlantic sturgeon Acipenser oxyrinchus in the southern Chesapeake Bay. In *VIMS Special Scientific Report* (Issue 145). https://www.vims.edu/GreyLit/VIMS/ssr145ocr.pdf

Noss, R. F. (2013). *Forgotten grasslands of the South : natural history and conservation*. Island Press.

Nowacki, G. J., & Abrams, M. D. (2008). The Demise of Fire and "Mesophication" of Forests in the Eastern United States. *BioScience*, *58*(2), 123–138. https://doi.org/10.1641/B580207

Ochs, C. A., Capello, H. E., & Wilson, C. R. (2007). Aquatic Life, Freshwater. In M. MELOSI (Ed.), *The New Encyclopedia of Southern Culture* (pp. 29–36). University of North Carolina Press. http://www.jstor.org/stable/10.5149/9781469616605_melosi.7

Pederson, D. C., & Carlson, S. E. (2009). *Soil Survey of Monroe County, Georgia*.

Platt, S. G., & Brantley, C. G. (1997). Canebrakes: An Ecological and Historical Perspective. In *Source: Castanea* (Vol. 62, Issue 1). https://www.jstor.org/stable/4034098

Platt, S. G., Brantley, C. G., & Rainwater, T. R. (2009). Native American Ethnobotany of Cane (Arundinaria spp.) in the Southeastern United States: A Review. *Castanea*, *74*(3), 271–285. https://doi.org/10.2179/08-023r2.1

Report of the Chief of Engineers, U.S. Army (Issue pt. 2). (1916). U.S. Government Printing Office. https://books.google.com/books?id=y0ItAAAAIAAJ

Report of the Chief of Engineers, U.S. Army (Issue pt. 2). (1919). U.S. Government Printing Office. https://books.google.com/books?id=z0UtAAAAIAAJ

Report of the Chief of Engineers, U.S. Army (Issue pt. 2). (1920). U.S. Government Printing Office. https://books.google.com/books?id=iU0tAAAAIAAJ

Report of the Chief of Engineers, U.S. Army (Issue v. 1, pt. 1). (1943). U.S. Government Printing Office. https://books.google.com/books?id=yRNPAAAAIAAJ

Report of the Chief of Engineers (Issue pt. 2). (1875). U.S. Government Printing Office. https://books.google.com/books?id=3itRAAAAYAAJ

Report of the Chief of Engineers U.S. Army. (1917). https://books.google.com/books?id=rf4WAQAAIAAJ

Riley, T. (2018). *Atlantic Sturgeon Bibliography - 2010-2018*. https://doi.org/10.25923/f224-yn64

Rowe, M. (2020). *Conversation With A Georgia DNR Malacologist [Telephone Interview]*.

Saikku, M. (1996). Down by the Riverside: The Disappearing Bottomland Hardwood Forest of Southeastern North America. *Environment and History*, *2*(1), 77–95. http://www.jstor.org/stable/20722999

Shields, F. D., & Nunnally, N. R. (1984). Environmental Aspects of Clearing and Snagging. *Journal of Environmental Engineering*, *110*(1), 152–165. https://doi.org/10.1061/(asce)0733-9372(1984)110:1(152)

Soils and men. (1938). U.S. Dept. of Agriculture.

Sousa, W. P. (1984). The Role of Disturbance in Natural Communities. *Annual Review of Ecology and Systematics*, *15*(1), 353–391. https://doi.org/10.1146/annurev.es.15.110184.002033

Stevenson, C. H. (1898). *Report of the United States Commissioner of Fish and Fisheries for the Fiscal Year Ending June 30th, 1898*.

Stewart, M. A. (2007). From King Cane to King Cotton: Razing Cane in the Old South. In *History* (Vol. 12, Issue 1). https://about.jstor.org/terms

Townsend, C. H. (1899). *Statistics of the fisheries of the south Atlantic states, 1899*. https://penbay.org/cof/cof_1899_10.pdf

Trimble, S. W. (1974). *Man-induced soil erosion of the Southern Piedmont*. *2*(1), 90–91. https://doi.org/10.1016/0305-7488(76)90171-7

Trimble, S. W. (1985). Perspectives on the History of Soil Erosion Control in the Eastern United States. *Agricultural History*, *59*(2), 162–180. http://www.jstor.org/stable/3742382

Tuttle, J., & Kramer, E. (2005). *Georgia Presettlement Vegetation Reconstruction*. https://www.researchgate.net/publication/276058451_Georgia_Presettlement_Vegetation_Reconstruction_-_GA_DNR_Pilot_Project_-_2005

United States Congressional Serial Set (Issue v. 6207). (1912). U.S. Government Printing Office. https://books.google.com/books?id=eO5GAQAAIAAJ

United States War Department. (1913). Annual Reports of the Secretary of War. In *Government Printing Office*. https://books.google.com/books?id=VwsSAAAAYAAJ

Waldman, J. R., & Wirgin, I. I. (2008). Status and Restoration Options for Atlantic Sturgeon in North America. *Conservation Biology*, *12*(3), 631–638. https://doi.org/10.1111/j.1523-1739.1998.97041.x

Weldon, M. (2011). A Short History of Environmentalism in the United States. In *Fundamentals of Practical Environmentalism* (pp. 9–24). Continuum International Pub. https://doi.org/10.1201/b10986-3

Whittaker, R. H. (1953). A Consideration of Climax Theory: The Climax as a Population and

Pattern. *Ecological Monographs*, *23*(1), 41–78. https://doi.org/10.2307/1943519

Williams, C. W. (1957). *History of Jones County, Georgia, for one hundred years, specifically 1807-1907.* J.W. Burke Co.

Woodward, T. S. (1859). *Woodward's reminiscences of the Creek or Muscogee Indians, contained in letters to friends in Georgia and Alabama,*. Barrett & Wimbish, Book and general job printers.

CHAPTER 2

SENSE OF PLACE AND DEFINITIONS OF NATURE IN RIVER RESTORATION PROJECTS

INTRODUCTION

Debates over the removal of obsolete dams are plagued with unstated value judgements that frustrate the potential for understanding different viewpoints, and possibly, developing a mutually satisfactory resolution. Proposals to remove dams can stall or halt completely because of stakeholders' different interpretations of reality, knowledge and truth. In order to facilitate communication between policymakers, agencies and the public, it is necessary to understand their underlying belief sets and perceptions of nature.

In order to study these value sets, I created a framework combining concepts from place identity theory and social constructivism. I hypothesize that an individual's opinions on dam removal will be related to the following factors: 1) their definitions of what factors constitute "nature", and 2) the strength of their attachment to a) Juliette and b) to the Ocmulgee River. Understanding the dominant themes in place identity and construction of nature can have important implications for policymakers when communicating about and eliciting public response to complex restoration projects.

Dams are a ubiquitous part of the human experience, and for thousands of years people have altered natural flow regimes to meet water, power and recreation needs. In the United States alone it is estimated that there are over 2 million edams, with the vast majority being small (<50 acre feet) (Graf, 1993). Dams typically have an effective operational life span of

approximately 50 years (Hansen et al., 2020; Johnson & Graber, 2002). The period for dam building in the United States peaked in the 1950s, and today many of these dams have outlived their functional usefulness (Joyce, 1997). These obsolete structures have significant upkeep costs, and many are considered public health hazards. Low head dams are considered exceptionally dangerous for recreational swimmers and paddlers, so much so that they are infamously known as “drowning machines” (Kern et al., 2015). Additionally, abandoned or neglected infrastructure is prone to failure, which can have catastrophic effects to people downstream.

There are also ecological costs associated with dam construction and maintenance. Dams act as a hard barrier for many fish and mussel species and can make access to upstream habitat difficult or impossible (Graf, 2001). Dams also trap upstream sediment, alter the geomorphology of the river bed, impede or regulate natural environmental flow regimes, and restrict trophic and geospatial nutrient transfer through an aquatic system (Kondolf, 1997; Maavara et al., 2015). For these reasons, ecologists, conservationists and policymakers have increasingly turned to dam removal as a cost-effective form of aquatic ecological restoration (Born et al., 1998) and in many cases dam removal has resulted in substantial ecosystem recovery (Bellmore et al., 2017). Given the ecosystem services associated with a free-flowing river (McClenachan et al., 2015) and the costs of repairing obsolete dams, in many cases the decision to remove a dam seems logical and straightforward. Yet time and again, removal advocates are met with stiff opposition (Fox et al., 2016; Magilligan et al., 2017; Sherren et al., 2017).

Why are dam removal proposals met with vehement opposition when presented to the

public? What groups of people align against dam removal, and do underlying values inform the way they feel about the proposal?

To answer these questions, I utilize social constructivist and place identity theories to understand and explain how identity construction informs group membership and advocacy for policy change. I chose these theories specifically because they shed light on often unstated or implicit value assessments that can then create conflict in restoration or conservation debates.

I apply these theories to the potential removal of a run-of-the-river dam in Juliette, Georgia. Juliette is a small historic mill town built on the banks of the Ocmulgee River in central Georgia. The Juliette Dam is important both for cultural and for ecological reasons. The dam acts as a cultural and historic touchstone as it has been present in Juliette in one form or another since the mid 19th century, and its construction is closely tied with the town's founding. Additionally, the dam featured prominently in the popular 1991 movie *Fried Green Tomatoes* and is thus now a tourist attraction.

It is also ecologically significant. It is the first barrier for diadromous fish in the Ocmulgee-Oconee-Altamaha river system. Federally listed American Shad (*Alosa sapidissima)*, Atlantic Sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) and the state-listed endangered Robust Redhorse (*Moxostoma robustum)* are all species of special concern in this system. Much like the famous Columbia River and Alaskan salmon runs, these fish have traditionally used the full river system as spawning habitat. Because it is difficult or impossible for fish to pass the Juliette dam, several species gather in the shoals at the base of the dam. As a result, the Juliette Dam has become a favorite local and regional fishing spot for Striped Bass (*Morone saxatalis*), Spotted Bass (*Micropterus punctulatus*), Shoal Bass (*Micropterus catarctae*), and a variety of catfish

species (*Ictaluridae sp*.). The Spotted Bass (this species is likely *Micropterus henshalli,* or Alabama Bass), Shoal Bass, and Flathead Catfish (*Pylodictis olivaris*) are introduced species in the Ocmulgee.

The American Shad is a diadromous species that spawns the Ocmulgee River below the Juliette Dam. Traditionally, this species uses entire river systems during spawning, either spawning in tidal freshwater or after long upriver migrations (R. E. Jenkins & Burkhead, 1994). Shad eggs require water velocities that keep them suspended in current during incubation, usually 4-6 days at 15-18°C (Facey & Van Den Avyle, 1986). Although eggs can withstand high turbidity, larval mortality is high when exposed to suspended sediment concentrations higher than 100 mg/l for longer than 96 hours (Facey & Van Den Avyle, 1986). Thus, shad require long stetches of moving water followed by relatively clear water so larva can effectively survive. The Juliette Dam, by excluding shad from the clean, clear shoal habitat upstream of the dam, limits the distance that eggs can travel before they reach the relatively slower moving, more turbid waters of the lower Ocmulgee. A study of shad's response to dam removal on the Neuse River in North Carolina found that shad's primary spawning grounds moved 14km upstream of the previous spawning site (Bowman, 2001).. Similarly, the Robust Redhorse and the Atlantic Sturgeon are negatively impacted by the Juliette Dam. The former requires clean, relatively large gravel bars for spawning (Straight & Freeman, 2013), while the sturgeon's eggs require clean hard substrate, to which they adhere (R. E. Jenkins & Burkhead, 1994). The Juliette Dam cuts off prime spawning habitat for both species.

Roughly 15 miles upstream of the Juliette dam lies the Lloyd Shoals Dam, which stands at the confluence of the Yellow, Alcovy and South Rivers. It still operates as a hydropower dam

and is undergoing a relicensing process with the Federal Energy Commission which began in 2019. The current project license is set to expire in 2023. The reservoir created by the dam is 4,750 acres (O'Mara et al., 2021).

The Juliette Dam

The history of the town and dam can be traced back to Archibald Leary and Gideon Johnson, who in 1839 had the idea of building a commercial grist mill on the west bank of the Ocmulgee. The mill was completed in 1845. Wilson Leary, Archibald's brother, bought Gideon Johnson out of his share, and the two brothers opened the Leary Grist Mill. The present concrete dam was built by the Juliette Milling Company in 1921, at the same location as at least four previous log dams (Hopkins, 1982).

The Juliette Milling Company operated at the location from 1906 until 1965. Slowly, demand for corn meal began to dissipate in relation to the trend of urbanization in Georgia and Georgians began to eat more flour than cornmeal. Additionally, the arrival of new steam and gas-powered mills began to out-compete traditional grist mills because they could be placed in urban centers instead of along fall lines (Thompson, 1953, pp. 342-346). By 1957 this proved too much for Juliette, and the commercial grist mill closed. The mill was retrofitted to support cotton mill operations, but this only prolonged the life of the mills by a few years. In 1965, cotton textile operations ceased as well. The Juliette Mills closed, and the community slid into a long decline (C. W. Williams, 1957).

In 1985, the Federal Energy Regulation Commission (FERC) granted a minor license to the City of Forsyth for the East Juliette Hydropower project. In 1994, FERC approved the transfer of the license from the City of Forsyth to PK Ventures, and shortly after from PK

Ventures to the Eastern Hydroelectric Corporation due to an acquisition between PK, Tampa Pipeline Company and Eastern Hydro. Robert Rose is the principal of all three companies (Eastern Hydroelectric Corporation, 2014).

In 2002, FERC amended the hydropower license to approve an additional powerhouse on the west side of the river (Eastern Hydroelectric Corporation, 2002). There were several conditions to the approval, most important of which was the requirement that the project include fish passage in order to allow American shad and other anadromous fish access to their historic spawning grounds.

Eastern Hydro filed a plan to construct a fish lift in 2006 and stated that the lift would be operational by March of 2007. The lift would work by feeding fish into a hopper, which would then be raised vertically to the top of the dam, where the fish would be released into the reservoir. The lift was never constructed.

In 2011, Eastern Hydro developed a plan with Georgia DNR, FERC, National Marine Fisheries Service, and the Fish and Wildlife Service to construct a fish ladder instead of a fish lift. A fish ladder allows fish to move up an inclined plane via several steps of either partial or full impediments to slow water and allow fish to rest in eddies. In December 2012, FERC approved the fish ladder plan with some modified designs.

Throughout 2013, Eastern Hydro missed a series of deadlines in filing for permitting. This includes issues with the construction schedule, fishway operation plan, and a stated difficulty in obtaining a water withdrawal permit from the Georgia DNR. Eastern Hydro also stated that it did not agree with the recommended fishway effectiveness monitoring protocol, which included tagging passing fish, video monitoring, and tracking the upstream habitat of

fish. Eastern Hydro stated it would instead manually count fish passing through during the spawning season and also requested more time to consult with agencies.

FERC granted the request for more time but set a deadline for August 19, 2013 for Eastern Hydro to file its revised fishway protocols. Eastern Hydro missed this deadline. When FERC issued a Compliance Order, Eastern Hydro provided a revised construction schedule, a proposal to discuss fishway effectiveness and a copy of the draft water withdrawal permit. They did not provide any documentation showing consultation with agencies or a schedule for submitting these plans to the Atlanta Regional Office (Eastern Hydroelectric Corporation, 2014).

On October 16, 2014, FERC revoked the license to the East Juliette Hydroelectric Project because Eastern Hydro failed to construct fish passage on the project. The Order Revoking License states:

> "Fish passage facilities were first required by the license in 2002. The record clearly demonstrates Commission staff's and the agencies' intensive efforts over the last twelve years to achieve this goal. It is equally clear that these efforts have met with steady resistance from the licensee… To date, the licensee has failed to fulfill, or make any meaningful progress toward fulfilling, these requirements. It filed a construction schedule with the Commission's Atlanta Regional Office that on its face could not be met. It never submitted its revised fishway design to the Atlanta Regional Office for review and never developed the required fishway effectiveness protocols in consultation with the agencies. We have no reason to believe that Eastern Hydro intends to comply" (Eastern Hydroelectric Corporation, 2014).

American Rivers and the Altamaha Riverkeeper filed a joint comment on the proceedings, stating that they would oppose any revocation that failed to hold Eastern Hydro accountable for a full decommissioning of the project facilities owned by the licensee, such as the pumphouse, generating facilities and other infrastructure. This, they stated, would pave the way for future fish passage installation and anadromous fisheries projects on the Ocmulgee (American Rivers and Altamaha Riverkeeper, 2014). They also urged FERC to consider a range of alternatives to accompany the environmental analysis of a potential revocation order, including partial/ full decommissioning of project facilities, decommissioning the Juliette Dam, and installing long term fish passage.

FERC, in its revocation order, addressed these comments, stating that it does not typically impose additional requirements such as the removal of project facilities in license revocations for licensee's that have already demonstrated noncompliance, as these requirements are generally ineffective. Additionally, it claimed it did not need to conduct an environmental analysis, as compliance actions are categorically exempt from the NEPA process (Eastern Hydroelectric Corporation, 2014).

The National Marine Fisheries Service (NMFS), the US Fish and Wildlife Service (USFWS) and the Georgia Department of Natural Resources (DNR) also filed public comments on the proposed license revocation. Both NMFS and USFWS supported the revocation decision. The Georgia DNR recognized the history of noncompliance but urged FERC to continue to pursue a resolution within the current license (Eastern Hydroelectric Corporation, 2014). Both NMFS and USFWS stated that fish passage at the Juliette Dam is among the highest priorities for sustaining anadromous fish stocks in the Altamaha basin (NMFS and USFWS, 2010). Likewise, the Georgia

DNR stated that fish passage is a significant component of larger range-wide efforts to provide quality spawning habitat to anadromous fishes (GA DNR, 2010).

In November of 2014, the Friends of the Juliette Dam, filed papers to become a nonprofit corporation representing "the interests of the community of Juliette, Georgia and others who live nearby and enjoy the benefits of the Juliette Dam, which include scenic beauty, recreational opportunities and economic benefits." That same month the organization filed a Motion to Intervene on behalf of the Eastern Hydroelectric Corporation and requested a rehearing on the revocation order. FERC denied this request.

Although no federal or state agencies proposed to remove the dam or have the authority to do so without purchasing the dam, the Juliette residents felt that the future existence of the dam was in jeopardy (Friends of Juliette Dam, 2014). An opinion piece in the Monroe County Reporter stated, "[t]he idea of the federal government ordering the destruction of the Juliette dam for the sake of a fish ladder or fish spawning has been met with anger by locals who have benefitted greatly from the dam" (McMurray, 2015). Another story from the newspaper stated, "[Eastern Hydroelectric] was told that if it did not build a fish ladder, the dam would be torn down" (Glidewell, 2015).

In 2015, many residents of Juliette held a "Save the Dam Spring Fling" (Henry, 2015). According to one of the residents, "So we're trying to keep Juliette alive the way it was. That's why people come; for the history." They hoped to raise money in order to build the fish passage required by FERC and keep the dam.

The Frameworks

Constructivists believe in a "constructivist epistemology", that knowledge and truth claims

are not objective facts, but instead are socially constructed (Moon & Blackman, 2014). What constitutes valid knowledge is a subject of great interest to constructivists, who believe that valid knowledge adheres to a series of cultural, spatial and temporal rules. These rules are tied to and driven by their particular social contexts. While this scholarship often overlaps with the philosophical tenants of relativism, the idea that no objective reality or truth exists, that does not mean that constructivist scholarship always has relativist underpinnings. Dickens makes this distinction through "strong and weak" constructivism (Proctor, 1998). Strong constructivism denies the importance of an objective reality to the human experience. Weak constructivism allows that all knowledge is socially constructed, but that certain knowledge is in fact objective in that it has withstood the test of time. Constructivism allows researchers to critically examine knowledge taken for granted in public discourse and tease out the historic narratives and contextualization behind truth claims.

Constructivism in this context allows me to explore ideas related to related to various stakeholders' perceptions of nature and the value they place on scientific expertise traditionally characterized as objective knowledge. Opposition to restoration and conservation projects often stems from disagreements over definitions, the validity of different types of knowledge, and whose knowledge should count the most. What is natural? What is "expert knowledge"? Who gets to decide the fate of land (and water)? These are all central questions to constructivists. Nature is socially constructed, and the definitions and connotations around nature have shifted throughout history (Weldon, 2011). As Cronon points out in his seminal essay on the construction of wilderness, "The removal of Indians to create an 'uninhabited wilderness'—uninhabited as never before in the human history of the place—reminds us just

how invented, just how constructed, the American wilderness really is" (Cronon, 1996). When closely examined, the real-world implications for this seemingly esoteric concept are immense. In considering restoration proposals across the globe, the relative benefits of different constructions are constantly debated. Restoration is a value-laden science and is constructed from a certain series of perspectives (Darby & Sear, 2008). Defined by ecologists, restoration is the process of assisting the recovery of an ecosystem that has been damaged or destroyed (Clewell et al., 2004). What constitutes a damaged or destroyed ecosystem is subject to debate and can be a source of conflict in dam removal projects (Sneddon et al., 2017).

As an example, consider a constructivist study of the Chicago Wilderness restoration project, a massive effort to restore degraded public forest to historic prairie in the greater Chicago area (Helford, 2000). One consistent argument raised during the course of public debate was the definition of nature. Restorationists saw nature as unbiased and scientific, where the only valid form of nature was the prairies and open woodlands historically present in the area, and dense woods were perceived as "degraded" and "overgrown". Meanwhile, project opponents often felt that their versions of nature were being excluded, with one critic stating, "What's so special about prairies?" These conflicting views of nature combined with debates over the role and relative importance of "expert" knowledge led to an intractable dispute that stalled the project. Restorationists characterized the opposition as "misguided, overly emotional, uneducated, unscientific, and NIMBYist" (Helford, 2000). Critics of the project felt that "the restorationists never really wanted a dialogue. They wanted to persuade the public and teach but not listen". As Helford points out, the act of restoration establishes an ideological framework for identifying whose ideas of nature count and whose don't. The

restorationists' failure to recognize their own biases and value sets inherent in their "advocacy science" caused critics of the project to feel excluded and denigrated, as if their knowledge was unwanted and unworthy. When restorationists fail to recognize their "ideal nature" is based on social constructs, they are doomed to engage in the same ineffective one-way public outreach employed in the Chicago Wilderness project. When restorationists think "if we could only make them understand, then they would agree with us," they are ignoring important political aspects of their work. Only when true compassionate discourse occurs can these issues be avoided.

Place identity theory represents a subset of social constructivism that explores an individual's connection to a landscape. Place identity has its roots in psychology (Proshansky, 1978) but it is now also used to explore social-ecological phenomena as well (Wester-Herber, 2004). According to Hauge, "Place-identity is a substructure of self-identity, much like gender and social class, and is comprised of perceptions and comprehensions regarding the environment" (Hauge, 2007). It is the construction of a narrative through memories and emotions, both individual and shared, that creates a sense of belonging with a landscape or objects in that landscape. Landscapes then, are a reflection of cultural identities of the proverbial us, rather than the natural environment, "who we were, who we are, and who we hope to be at this place and in this space" (Greider & Garkovich, 1994).

In the context of land use and restoration decisions, place identity can express itself in opposition to change (Devine-Wright, 2009). Change can reveal bonds between an individual and a place that are typically latent, leading to feelings of anxiety, loss, and a sense of displacement. Simply put, when individuals build a positive connection to a place through

individual and shared emotions and memories, the removal of that object constitutes a threat to those individuals' wellbeing.

The strength and depth of an individual's or community's bonds with a place, sometimes called emotionality, can range from sensory delight to long lasting deep emotional bonds. It is the most individualized of all human-environment relationships, and therefore can be a source of conflict (D. R. Williams & Patterson, 1999). An additional source of conflict could also be the relationship between existing emotional bonds and the perceived consequences of a project (Devine-Wright, 2013). If the perceived outcomes of the project threaten existing emotional bonds, its proposal is more likely to elicit a negative reaction in the community. In Juliette, if positive attachment to place is tied to the Juliette Dam and removing the dam threatens those emotional bonds, then the literature predicts vehement opposition to removal, particularly if emotionality is high.

On the other hand, studies have also shown that ecological restoration and integrity can lead to an enhanced sense of place (Poe et al., 2016). Poe argues that the ecosystem services that scholars typically think of as provisioning or recreational services, such as harvesting fish, also contribute to creating a sense of place. A study in Maine found that a restored alewife (an East Coast diadromous fish species) fishery led to an increased sense of place and well-being, as well as a collective remembering of past states of abundances. "The process of restoration appears to have triggered a reversal of this shifted baseline, with an increased expectation both for the productivity of natural systems and the ability of community action to achieve conservation success" (McClenachan et al., 2015). Motivation to restore a place (be it river or otherwise) hinges on the public feeling a sense of high attachment to the place and low

satisfaction with the current state of that place (Mueller, 2011). In a dam removal context, this would mean the public has a high attachment to the river and the provisioning, recreational and cultural benefits it affords, while having low satisfaction with the current state of those resources.

Both constructivism and place identity are particularly important in relation to restoration and conservation projects. When restorationists fail to account for differences in definitions of nature and the public's attachment to their version of nature, they run the risk of alienating important stakeholders, which can result in a halt or demise of the project.

Putting it All Together

Because place identity theory is an offshoot of constructivist philosophy, nesting the two within a coherent framework is not difficult. Both work within the same epistemology because they both deal with the construction of narrative to create meaning and truth. For constructivists, it will be specifically about the meanings behind the concepts of nature and natural. For place identity theorists, the focus will be on the individual and shared sense of belonging people feel about a landscape and objects within it. For a restoration project to succeed, policymakers will need to recognize and navigate the complex belief systems and emotional connections stakeholders share with a place.

Research on the underlying roles of construction of nature and place identity in dam removal debates exists, (Fox et al., 2016; Magilligan et al., 2017) but not in the southeastern U.S.. Those constructions may be different in the rural Southeast than in the Northeast or Pacific Northwest where the lion's share of dams have been removed (Hand et al., 2018; Loomis, 2002; Magilligan et al., 2017). In the case of Juliette specifically, I hypothesize that an

individual's opinions on dam removal will be related to the following factors: 1) their understanding of the meaning behind the concepts of "nature" and "natural" and 2) their level of attachment to the Juliette Dam and the town of Juliette. I also hypothesize that each of these opinions could be regionally significant, indicating both a North-South divide and an Urban-Rural divide, though this hypothesis will fall outside of the scope of my study.

Methods

Between June of 2020 and March of 2021, I conducted interviews with 12 individuals with connections to Juliette and the Ocmulgee River. My original goal was to interview between 20-25 members of this small community of roughly 3,000 people. Similar studies have included around 18 interviews. Ultimately, I conducted interviews until "theoretical saturation" was reached. While there are multiple definitions of theoretical saturation, Given defines it as the point at which "new data do not contribute new themes or patterns to the analysis process" (Given, 2015). There were also practical limitations to the sampling given the constraints of the SARS COVID-19 pandemic of 2020. Initial contact was made over the phone and many subjects were hesitant to be interviewed by a stranger. Interviews were ultimately conducted via video calls, phone calls, or in-person following social-distancing protocols.

I started with three individuals who owned businesses in Juliette that I found by calling online business listings. New participants were found via the "snowball method", where interviewees suggested additional individuals. Interview times ranged from 45 minutes to over 120 minutes. The original interview guide was informed by a literature review of similar studies relating to place, identity and nature (Klein, 2015).

Interviews were semi-structured and focused on the individual's history with Juliette,

their definitions of nature and how those definitions relate to the Juliette Dam. Participants were subsequently asked to identify whether they considered themselves a part of the Juliette community, what places in Juliette they considered to be most important to them (and to explain their choices) and how they use the Ocmulgee River. Finally, I asked participants to suggest recommendations for how to improve their enjoyment of the Ocmulgee River. I asked the interviewees about their perceptions of the Georgia DNR to gauge views on "expert opinion" within the community. Interviews were supplemented with local news stories about the town and the dam, as well as opinion columns on the Juliette dam and its rumored removal.

The interview transcripts and supplementary material were then transcribed and inductively coded using Atlas.ti. Participants were coded as having a "high attachment to place", "moderate attachment to place" or "low attachment to place." Individuals classified as "high attachment" are recognized town leaders who grew up in Juliette or the surrounding area. They have significant childhood memories associated with the town, the river and the dam. Those with a "moderate attachment to place" are those who have moved to the Juliette area, who have significant memories associated with the river and dam but do not consider themselves a part of the Juliette community. Individuals with a "low attachment to place" are those who do not consider themselves a part of the Juliette community, do not live in the community and who use the Ocmulgee for recreational or business purposes.

All interviews were coded inductively to discover dominant discourses surrounding personal definitions of nature. Significant themes were found using code co-occurrence and word cloud analyses. I created networks exploring the relationships between attachment to place and willingness to remove the dam. I created additional networks to illuminate

relationships between individual's definitions of nature and their feelings about the Juliette Dam.

Results

Of the twelve individuals interviewed, seven did not want to see the dam removed. Two individuals were for removal, and three indicated that they were open to removal. Three participants made contradictory statements saying that while they would hate to see the dam go, they would not miss it much because it does not mean much to them. I classified these individuals as anti-removal, as their first response was a desire to not see the dam removed.

All participants saw the dam as important to the town but differed on the predicted effects of removal. Individuals who favored removal of the dam saw it as an opportunity to improve the scenery and potentially create a new economic driver for the town. Participants who did not favor removal saw it as a threat to community cohesion. Strength of attachment to place was significantly correlated to how interviewees feel about dam removal.

The stronger an individual's attachment to place, the more likely they were to object to dam removal. Both participants who favored dam removed had low attachment to Juliette. Instead, they had higher attachment to the Ocmulgee River. They saw removal as a positive for the town through improving the scenery and exposing shoals buried under sediment above the dam.

> "You'd have a wonderful cascading shoal there, right in the middle of Juliette that could be enjoyed both… from looking at it and from getting out in it" – Participant E

The one individual with low attachment to place who indicated their openness to removal had no strong attachments to either Juliette or the Ocmulgee River.

Individuals with moderate attachments to place were most likely to be open to removal, though two did indicate that their first reaction is to preserve the dam. These individuals did not have significant childhood memories associated with the dam. Arguments against removal were associated with other values, such as the beauty of the dam or its perceived usefulness.

> "I'm going to vote in favor of the dam. I think I mean like I said, I like the dam. Just personally I think I like looking at it" – Participant A

> "I think it serves a very definite purpose. For the most part it's a very useful and good purpose. I think it would be weird if there was say some huge political movement to remove the dam… But if someone provided a very legitimate argument, you know, and they could prove that there was no use for the dam and that it was actually hindering nature or something, I'd listen to them. But for now, I think it would be weird" – Participant C

Finally, all four of the individuals classified with a high attachment to place did not favor dam removal. All four had significant memories associated with the town, dam and river. The dam played a significant role in the identity and history of the town, and removing the dam is perceived as a loss of that history.

> "I guess in peoples' minds, they see the dam as a part of history that we want to hold onto... And in the early days, you know we talked about the bridge being a toll bridge in the early days, a nickel or a dime... was a lot of money. And a lot of people…. would not pay… to come across the bridge. They would walk across the dam to get from one side to the other. And both sides had ball teams, and so... if you didn't have a dime to go across the bridge, you'd walk the dam to get to play ball over on… the other side of the

river" – Participant L

The removal of the dam was associated with feelings of loss and worry for the future of the town of Juliette. If the dam were removed, the town might no longer exist.

Researcher: "If [the dam] were to be removed, how do you think it would change the experience of living in Juliette?"

Participant L: "Well, if the river changed dramatically, I think that would change the whole complex of the situation of living here... I can see a dirt bed out there that has no attraction… to anybody. I think if the river were destroyed in some way, it would destroy people wanting to be a part of the community."

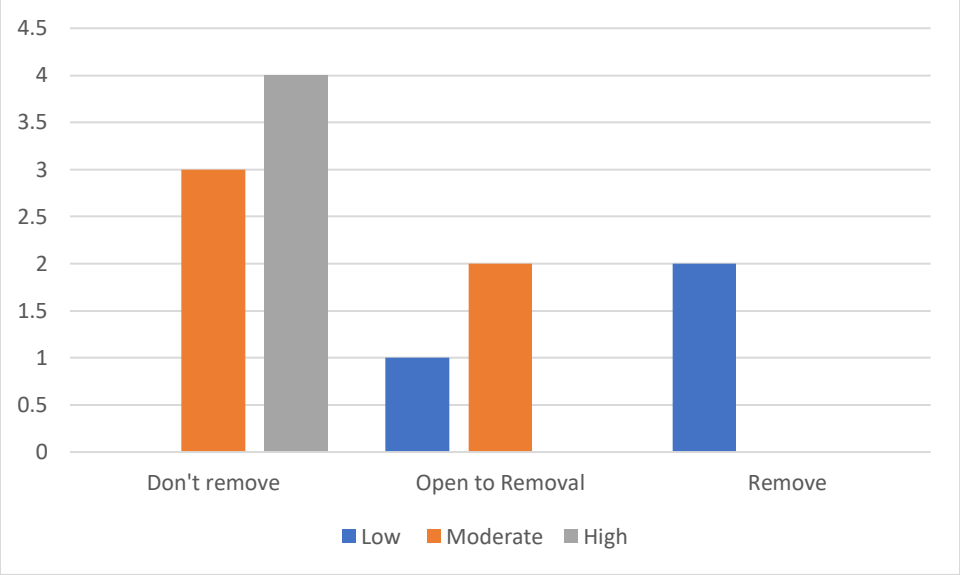


Figure 2.1: Strength of Attachment and Feelings about Dam Removal.

Discussion

I start this section by exploring how my interviewees responded to my questions about their definitions of "nature" and "natural" and how these influenced their views on dam removal. Then I address how their responses regarding two separate issues—their attachment

to the town and their attachment to the river—impact their viewpoint on dam removal. I conclude with recommendations on how DNR's ongoing engagement in the upper Ocmulgee may ultimately influence the community's perception of nature and their attachment to the river and their perceptions of restoration efforts. This document is primarily intended to help the Georgia DNR assess the *feasibility* of restoration projects in Juliette. I am not personally advocating for dam removal. Instead, I am advocating for open discussion and examination of the full suite of options available for the Juliette Dam, from no action, to erecting structures for fish passage, to partial removal to full removal and for restoration efforts that do not involve the dam but protect spawning and other sites critical to the viability of the imperiled fish species.

Definitions of Nature

An individual's perceptions of nature are weakly correlated with how they feel about dam removal. There are a total of ten general characteristics of nature noted by respondents: 1) as a general lack of human presence or structures, 2) providing a feeling of peace, 3) as an entity that needs to be cared for by humans, 4) as a sense of traditional culture norms 5) in a Judeo-Christian context, 6) as a lifestyle or way of living, 7) as a lack of ability to control their surroundings, 8) as an ability to interact with the wildlife around them, 9) as cruel or unfeeling, and 10) as everything, both human and nonhuman, and all structures that exist. Participants often define nature in several different ways throughout the course of the interview, and interestingly often mix ideas of nature with notions of ethical human behavior.

The most common characteristic of nature noted is the concept of a lack of human presence or structures. Nine of the twelve participants define nature in this way at some point

in the interview. Interestingly, while many participants define nature in a variety of ways, individuals who favor dam removal only define nature as a lack of human structure.

> "Nature encompasses everything that developed on this Earth outside of our hands. So that includes us, and it includes things that aren't living like water and rocks and soil and - and magma and all of the things that go into the processes of our natural world" – Participant E

These individuals have no difficulty drawing a line between what they consider part of the natural world, and what is unnatural.

> "I have a hard time under my base definition of what nature is saying that the dam is natural because it was not there to begin with. It's your farm fence. It's been built. It had to be created by man" – Participant I

Believing in a single perception of nature and being certain of the differences between the natural and unnatural were the largest differences between participants who wished to remove the dam and others. Interviewees who advocate for restoration think of nature as the absence of a large human presence.

Definitions of nature became more variant among people who are either open to dam removal or who want to remove the dam. Nature to these individuals incorporates not only the nonhuman world, but also the feelings, lifestyle and duties of a person in such an environment.

> "Natural is growing up, jobs, family, and wanting to achieve in life." – Participant D

The most common definitions of nature among the three people classified as open to removal are related to how they experience and interact with their environment. Participant C and Participant K both live along the river and define nature in similar ways. For them flooding is a

real concern, and perhaps the driving factor in their perception of nature as an inability to control their environment.

> "That to me is the biggest difference [when] defining what nature is. The person is not so much in control… on a day-to-day basis" – Participant C

> "But just the whole natural aspect of it, you know, that's what I like… [W]e as man think we can control everything…. The water always wins. That's what I like" – Participant K

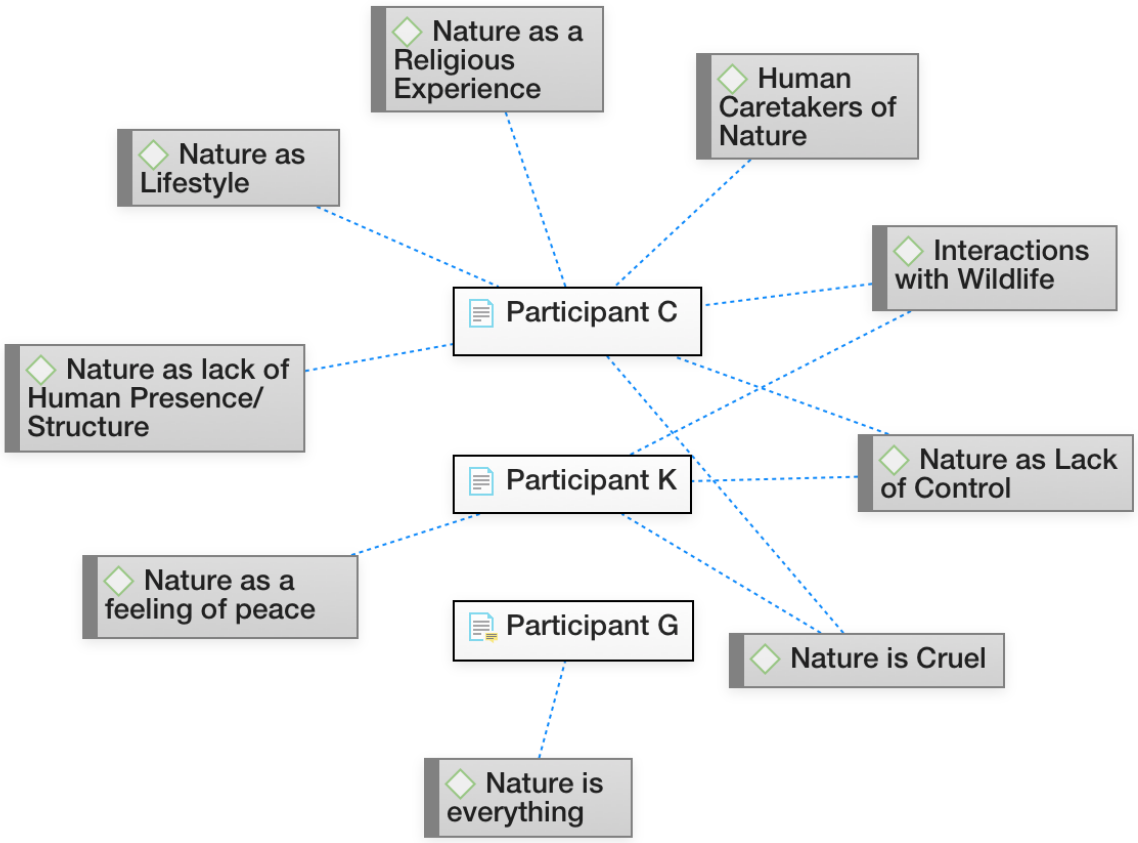


Figure 2.2: Characteristics of nature among those who are open to removal.

People who do not favor dam removal also have the most anthropogenic views of nature. The most popular perception of nature is still related to an absence of human structures, but this is deeply intertwined with concepts relating to "natural living", feelings of

peace, and Judeo-Christian concepts of man's place in nature.

> "I would define nature as being able to walk out here, on your own property, or your own business - not having any restrictions… Just a peaceful atmosphere" – Participant J
>
> "…[N]ature is just something that God put here for us to enjoy" – Participant F

For many of these participants, the world was more natural at an earlier point in time in their personal history. This is both because technology has changed how they perceive people interacting with the world, and because people have changed how they interact with the world.

> Researcher: "So things were more natural when you were a kid?"
>
> Participant F: "Oh Yeah.... We just didn't have all that stuff… You learn to make up stuff on your own. And you just lived with it... We're living in a plastic world now."

Participants I interviewed who do not wish to see the dam removed often define nature as a lack of change in the environment, or only small changes over a long period of time. Juliette is perceived as natural because the town has stayed small, and many of the families are the same ones the participants grew up with. The Juliette Dam is also considered natural because it has been a staple in the community for so long.

> "I just got so used to the dam being here that to me it's… part of nature now." – Participant F.

Participants who define nature as a traditional way of life find changes in the way the world operates to be unnatural. People coming to the area to float in the reservoir created by the Juliette Dam are "getting back into nature" by participating in traditional interactions with the natural world.

> "And if they broke the dam that would be gone. You'll take things like that away from

> the public, I consider that nature... When you're floating down that river, you got Mother Nature on both sides of you. You got wildlife on both sides of you. And you're getting back into nature when you come down that river. It's only for a few miles and for a few hours, but hey at least you're not on the streets. You're not getting in trouble" – Participant J

A human's role in these conceptions of nature is to help take care of the world around them and keep the environment the same as it was when they were growing up. This includes cleaning up litter, following wildlife harvest laws, and generally, "treating nature with respect".

> "I'm just hoping that the people I leave the buildings to are going to… keep it natural" – Participant F
>
> "[People's role is] to try to preserve and take care of, enjoy, appreciate… Admire what God has created" – Participant L

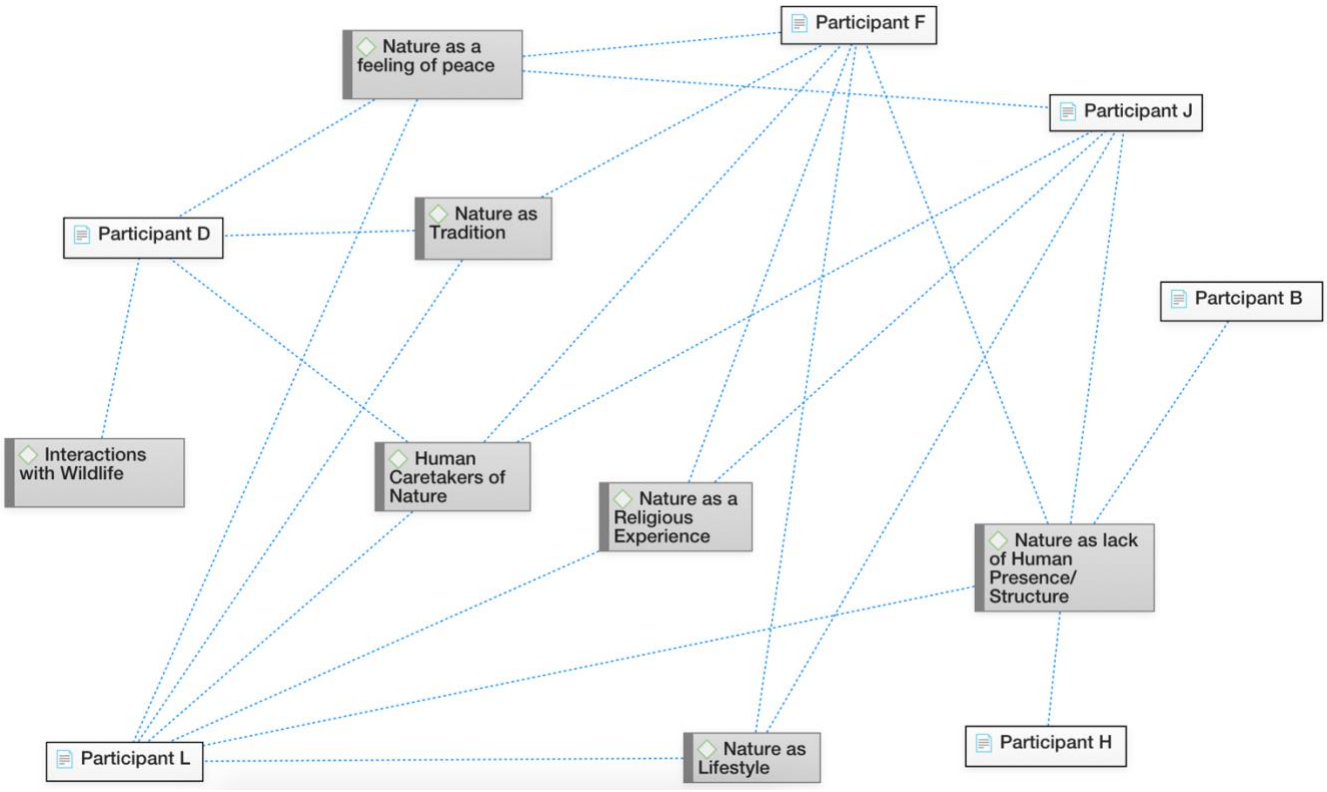


Figure 2.3: Definitions of nature among participants who did not favor dam removal.

These definitions of nature relate to the removal of the Juliette Dam in a variety of ways. Individuals with a strict sense of nature as biologically- centered are more likely to support dam removal. Only one participant who defined nature in these terms ("as a lack of impervious surface") does not favor dam removal. The reasoning this participant gave is that it would most likely not happen and pursuing removal could potentially hurt efforts on other environmental issues in the region. Those classified as open to removal are associated with expanded definitions of nature, largely centered on the individual's interactions with the natural world. Those who did not favor dam removal held an anthropogenically-centered view of nature. Nature is not only the absence of humans but framed in a particular social context of "right living" and peace.

Arguments For and Against Removal

Participants named four distinct arguments in favor of removal. The most common argument is tied to creation of habitat and benefits for wildlife, particularly shoal bass and shad. The second argument is that the dam is unnatural. Participants who favor dam removal see it as unequivocally unnatural, something that does not belong in the river and that should be removed to bring the area back to a historically natural state. The third argument for removal is that the exposed shoals would be an aesthetic benefit to the town. Finally, individuals who favor dam removal argued that it would be beneficial for recreational fishing.

Participants who made the final argument conceded that there would be a group of fishermen who would be upset by this, particularly people who, “did not know how to fish the river.” Fish typically stack up below the dam, crowding together and making fishing easy. The fishing groups most likely to support removal, both advocates and critics of removal said, were hard core bass fishermen who prized the shoals above and below the river.

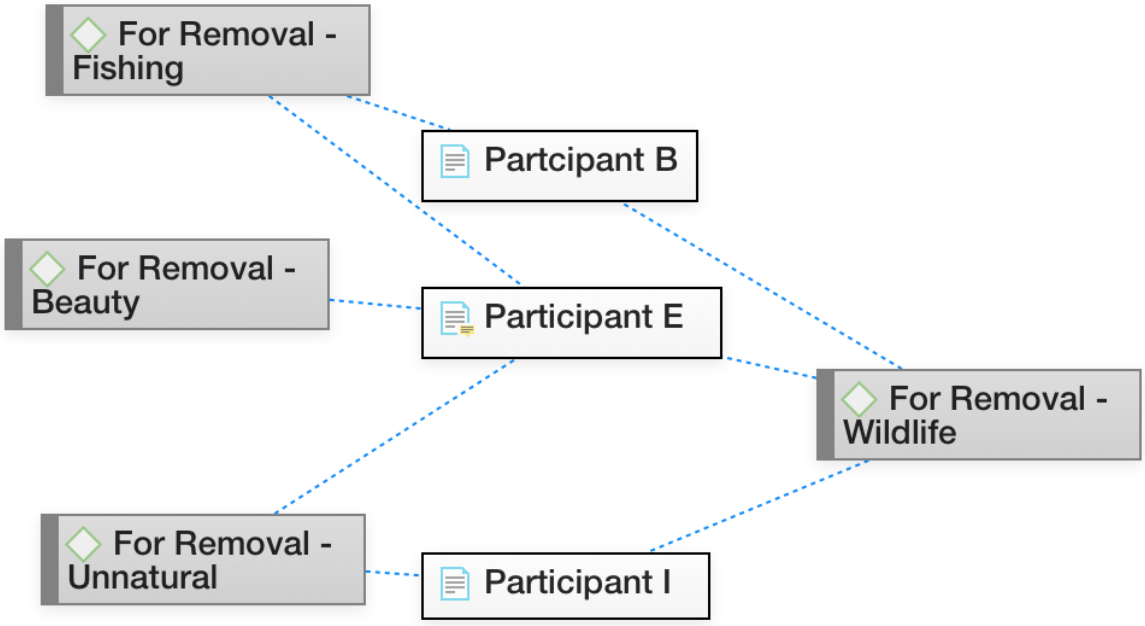


Figure 2.4: Distribution of arguments for removal.

We classify nine total arguments against removal. They can be found in Figure 7 below. The most common argument is that destroying the dam would destroy the identity of the town of Juliette.

"It's part of this generational experience of the space, and how you become tied to it. When you talk about removing something that is so important to the community, I think that's where you're going to have that adverse reaction" – Participant B

Participants with high attachments to place often specifically cited the fear of destruction of community when presenting arguments against removal.

"I think personally it would devastate this community. It would disintegrate this community if they break that dam… You can ride across that bridge over there and see 50 people out there swimming [in Juliette Mill Pond immediately above the dam] .... in

Mother Nature... Swimming in something that is man-made, but on a God-made river" – Participant J.

Another popular argument among participants was the pointlessness of removal. The main thrust of the argument is that tearing down the Juliette Dam would not benefit striped bass or shad, because just a few miles upstream is the Lloyd Shoals Dam, which still generates hydropower for Georgia Power. Shad and striped bass, the argument goes, can spawn downstream of the Juliette Dam just as well as they could spawn above it, and at any rate they could not travel much further upstream before they would be stopped anyway. This led to a feeling of distrust among residents opposed to removal, as they suspected an ulterior motive from nebulous agencies.

"So why tear down this dam so that… shad can get up there?... Why? They said to spawn but they can spawn at the back of this dam… just as good as they could up there in my opinion." – Participant D.

Figure 2.5: Distributions of arguments against removal, ranging from purple for the most common argument for removal (4 interviewees) to green for the least common (1 interviewee).

Sense of Place and Restoration Projects

I found a significant relationship between strength of place attachment and lack of support for dam removal. Individuals with a high attachment to the Juliette community and who had formative memories associated with the Juliette Dam did not support dam removal (4). Those with a moderate attachment to place typically had a higher attachment to the river

than the dam or town, and were more likely to be open to removal, though two participants stated that they did not support dam removal (5). Of the 3 participants classified as having a low attachment to Juliette, two supported dam removal and one was open to removal.

All participants thought that the dam was important to the town of Juliette. However, those who favored removal saw it as a net benefit to the town, while those who did not support removal saw it as a threat to their community. Because the dam is perceived as integral to the community, its potential removal threatens established place meanings, leading those with a high attachment to place to oppose removal (Stedman, 2002).

Similar studies have found that place attachment can be a driving factor in opposition (Devine-Wright, 2009, 2013; Verbrugge & van den Born, 2018). In our case, strong feelings of place attachment to the dam coupled with high satisfaction with the current state of the dam, suggests that any attempt to change the status quo is likely to be met with a high degree of opposition.

Moreover, different types of meaning ascribed to a place can have an impact on the types of desired outcomes for an environment (Smith et al., 2011). In a study of a dam removal proposal in New Brunswick, Reilly et al. (2019) found two distinct expressions of place meanings, the tangible and the intangible. Tangible place meanings are defined as properties of the location (“what does this place afford me?”), and are relatively objective, such as the aesthetic or ecological value of a place. Intangible meanings are subjective and personally or socially constructed. When the intangible meanings attached to a place are perceived as threatened by a proposed project, opposition can become intensely emotional (Reilly et al., 2019).

We can think of many of the arguments for and against removal as expressions of these place meanings. Many of the arguments for removal were tied to tangible place meanings. Future ecological services, aesthetic value, and fishing benefits are all expressions of tangible place meanings. People who identify with tangible meanings may be less likely to participate in a public debate, regardless of their viewpoint, than those who identify with intangible place meanings (Kil et al., 2014).

In contrast, several of the arguments against dam removal are expressions of intangible place meanings. Many of the participants, regardless of their stance on the proposed project, recognized the dam as integral to the town, community and residential identity. For many longtime residents it plays a quintessential role in forming intangible place-based relationships. Positive memories such as walking across the dam, swimming in the reservoir, and learning to fish in the river below the dam, all contribute positive place attachments that drive feelings of loss in individuals with high emotional bonds. The high emotionality associated with the dam predicts a high degree of opposition to any proposal of removal.

High emotionality is also associated with a past version of the dam that no longer exists. In both my interviews and in a community meeting that took place after my interviews were completed, locals and river users complained about the safety of the dam and the Juliette Dam access point present on the Jones County side. As the dam is no longer used or maintained, this is not likely to improve. Future prospects for hydropower produced at the site are also low as the costs associated with a relicensing process do not justify the minimal amount of power it produces. As the dam continues to degrade, public satisfaction with its current state is likely to decrease. As stated above, restoration is more likely to be embraced when the community has

a high attachment to the place and a low attachment to the current status of that place. If presented multiple opportunities to examine the realities of the present state and future of the dam, the community may find that their satisfaction with the dam is lower than previously thought. The community may also find that there are options for preserving some of the dam structure to accommodate historic and tourist values while still allowing for fish passage. This could occur by removing only a small section of the dam, or by leaving certain sections of particular importance intact, such as the pump house or sections that appeared in *Fried Green Tomatoes.* Visualization of the full suite of restoration and fish passage options will be critically important to the creation of open dialog.

Several arguments against removal demonstrate a misunderstanding of the goals of restoration and fish passage on the Ocmulgee River. For example, a common argument against removal is the "pointlessness" of it because of the presence of the Lloyd Shoals Dam just upstream. Removal of the Juliette Dam would not only provide anadromous fish access to an additional 15 miles on the main stem of the Ocmulgee River, but also the Towaliga River, gaining in total 50 miles of additional spawning habitat. Additionally, because of the actions of the Army Corps of Engineers (detailed in Chapter 1), much of the premium spawning habitat below Macon is no longer available. A second common argument is that the river would "dry up" if the dam were removed. This can be countered with visualizations of what an undammed river might look like, and historic accounts of the shallow, clear shoals of the Upper Ocmulgee. Similar computer visualizations on Tybee Island, Georgia facilitated support for a sea level rise adaption plan (Evans & Gambill, 2016). Local leaders could also be taken to see the effects of dam removal in other places in the region, such as the Chattahoochee in Columbus, and discuss

the restoration process and resulting opportunities with leaders of those communities. These discussions can help stakeholders tap into the values of aesthetic beauty and recreation opportunities they have expressed. Thus, some arguments against removal, especially those that appeal to the tangible place meanings of recreation, aesthetics, and economic resources, can be addressed by directly addressing the goals and probable outcomes of particular restoration projects.

In areas where restoration projects may threaten closely held identities, emotional conflict is very likely to arise. Resource managers should take into account the complex relationships that exist between community, individual, and place when proposing management projects. Failure to do so often leads to emotional conflict and a stalemate of the conversation. Perhaps most seriously, it traps resource managers into a limited conceptual framework, where the human-environment relationship is reduced to user and resource exploited (D. R. Williams & Patterson, 1999). Such thinking fails to account for the rich tapestry of meaning imbued on a landscape, leading to degradation in the relationships between humans and the environment.

Definitions of Nature

My results show a correlation between an individual's definitions of nature and their stance regarding the potential removal of the Juliette Dam. The most significant findings are: 1) participants who favor dam removal define nature solely through the lens of an absence of human presence, and 2) a general trend of defining nature from biocentric terms to increasingly anthropogenic terms as individuals are more averse to dam removal.

Nature and naturalness are contentious concepts and difficult to define. Hull and

Robertson established three broad definitions of naturalness: (1) as an environment as it existed at a previous point in time, (2) as a state of the environment which exists absent of human modification, and (3) as associated with a slow, "natural" rate of change (Hull & Robertson, 2000). My interviewees expressed concepts of nature that fit within all three of these broad definitions, but the details within these competing narratives changed depending on the individual's stance on removal.

My participants, regardless of their views on dam removal, often describe naturalness as a previous point in time. For those that support dam removal, this means a time before "significant human intervention" on the landscape. The world was more natural when people occupied a perceived "natural" ecological niche ("we are eating things and things are eating us"), and the world became unnatural when humans began to alter their environment. For participants who do not favor dam removal, the world is often described as natural at some point in their own lifetime, in a time when people were perceived as living in a more "traditionally natural" fashion.

Similarly, nine out of the twelve participants view nature as an absence of human modification or structure. Interestingly, the definition is similar across all responses. A high amount of human modification to the environment, framed as cities, impervious surface, cars and parking lots, is perceived as unnatural. A low or moderate amount of modification is considered to be more natural to our respondents, framed as organisms or processes that develop outside of human control, or even as "getting away from it all".

Finally, the concept of "natural" change to the environment is interesting. It helps explain some of the participants' resistance to change in the environment around them, and

how the river's current state with the dam in place could be seen as natural. Tearing down the dam would lead to an upheaval in their experience of the river, expressed in some interviews as a fear of the river "drying up". The rapid pace of change to the river structure posed by dam removal is unnatural. It does not fit into the timeframe for "natural" change. This extends beyond the strictly biological to the social fabric of Juliette as well. There is a desire to see the town stay the same, or "natural". A natural Juliette is one where not only the buildings remain the same, but also the people who live, work and visit the town.

These competing concepts of nature, and their relation to restoration projects, can be better understood when viewed through the lens of "images of nature". An image of nature is a three dimensional construct consisting of a person's beliefs about how the natural world operates, normative values judging nature, and aesthetic components of the beauty of nature (Buijs, 2009a; Keulartz et al., 2004). Buijs proposed five different images of nature that combined the beliefs, values and aesthetic impressions into distinct conceptions of the natural world. 1) The Wilderness Image: sees nature as strictly opposed to culture. Only those places seen as "pristine" are natural. Emphasis is placed on systems as a whole over individual species or organisms. 2) The Autonomy Image: nature operates independent of culture. This image values the individual over the system, and as a result may protest restoration projects that value one species or state of nature over another. 3) The Aesthetic Image: Nature is valued for its beauty and recreational opportunities and should be managed to enhance the beauty and ease of interaction with the natural world. 4) The Inclusive Image: Everything is nature, with no discernable difference between the anthropogenic and biocentric worlds. 5) The Functional

Image: focuses on the utilitarian values that nature provides, and advocates desire for nature to be intensely managed.

In our study, the Wilderness image predominates among individuals who wish to see the dam removed while the Aesthetic and Functional images prevail in those who argue against removal. Conflict can arise when those competing definitions of nature are not fully explored in early phases of a project proposal (Buijs, 2009b). Restorationists need to think of the value sets underlying project proposals rather than "objective" goals of the project (Keeney, 1996). Those objective goals are in fact value-laden perceptions for how nature should operate and mankind's role in creating that nature.

Recommendations for future dam removal discussions

Both my study and the literature suggest that conversations about the future of the dam and its importance to the surrounding area need to occur organically within the community before any proposals to remove the dam are considered. No governmental agency or conservation organization has the authority to move forward with dam removal without the consent of the dam owner. Unfortunately, the Juliette community perceived the dam relicensing process as a play for dam removal.

> Researcher: "Going back to the idea of nature or people in relation to Nature where's the line for you between what is natural and what is not natural?"
>
> Participant F: "I'll have to say this, I'm a firm believer that the Lord created everything. It's all natural but it's just sometimes that man-made messed up the natural part… A good example is this river right here. There was a group not too long ago that wanted to

> break this dam here and put it back to its natural state. Which that meant that the people in this area would not have been able to have boating and fishing because once you break a dam, you know, you got a stream of water, you don't have a river."

Rumors that "some group" wanted to remove the dam put the conversation on adversarial footing from the start. Instead of opening a two-way dialog, the community felt that the future of the dam was already decided, and they needed to fight against it. The best way to rectify this situation now is for DNR and partners in restoration to be transparent—to share with the community their goals for protecting shoal habitat immediately below Juliette Dam and for exploring possibilities for fish passage to allow migration upstream of the dam. Other studies have found that the perceived suddenness of removal as a goal contributes to an enhanced adverse reaction (Magilligan et al., 2017). Over time, as the Juliette community becomes more familiar with, and perhaps proud of, the history of the Robust Redhorse, Shad and Sturgeon on the Ocmulgee, and efforts by the southeastern states' natural resource departments and conservation organizations to protect these fish, dam removal may become a part of the discussion. DNR and other agencies must demonstrate they are seeking public input, not trying to push a "removal only" agenda.

Dam removal proposals call into question the role of expert knowledge in restoration projects. Conflicts over what kind of knowledge should "count" when weighing arguments for and against removal acts as a center of conflict between agencies and local opponents to removal. As Sneddon et al. found, "Residents confronting removal projects often unite behind 'common sense' understandings of environmental conditions that are far removed from expert

scientific knowledge when that knowledge contradicts their established positions" (2017). This sentiment was mirrored in my own findings, with one participant complaining,

"I've been up there when the water was going over that dam and I've seen the shad… They go right on up. It's not big enough to stop them. It wasn't any problem. You can catch shad on upriver, so that reason for taking the dam out was false, you know? They just wanted to take it out. But it didn't stop those shad" – Participant F

DNR should create both informal and formal opportunities to hear from the community about their experience and scientific knowledge of the river and its resources and to explore misperceptions of both agencies and the local communities. These are also opportunities to build tangible and intangible place meanings associated with the river. Community science projects such as a DNR-sponsored public Robust Redhorse sampling and/or spawning viewing area, can lead to an enhanced attachment to the Ocmulgee River and teach the public about the wealth of nongame species present in the river. These activities can be framed as "taking care of nature" and align with underlying community values. Supporting and publicizing the National Park Service's efforts at Ocmulgee Mounds to highlight the rich history of human habitation in the region can illustrate the alignment of the community's historical values with those of conservation groups. In Tidewater, Virginia, politicians hold an annual shad fry (Nickens 2016). A similar tradition in Juliette could build awareness for shad and create intangible place meanings through positive memories associated with shad and the Ocmulgee River.

In order to address concerns and effectively communicate with the public, agencies and advocate groups should employ social science techniques when communicating about dam removal. Particularly, utilizing social norm theory and community-based marketing strategies could be fruitful for creating useful narratives and communicating the benefits of dam removal (Johnson & Graber, 2002). Social norms theory argues that there are a series of unwritten rules, or social norms, that govern human behavior (Stern, 2018). Two particularly important types of norms are Descriptive and Injunctive social norms. Descriptive social norms are perceptions of acceptable behavior within a given situation, while Injunctive social norms are the agreed upon standards within a social group (Stern, 2018). We can identify the dominant descriptive and injunctive norms within a target demographic, then craft messages that highlight themes that align with the dominant norms.

For example, in Juliette two injunctive norms influencing people's ties to the Juliette Dam are the beauty of the dam and the historic value of the dam. Messages could be crafted that highlight the beauty of the undammed river, coupled with rendered visualization that allows people to get a better idea of what an undammed section may look like. Messages could also specifically detail how the historic value of the dam might be preserved via various removal options and signage and connect an undammed Ocmulgee with the deep history of the region detailed in Chapter 1. Finally, messages should be filtered through descriptive norms of the target demographic. For example, if the populace is inherently distrustful of outsiders, then messages might be better received if they came from a trusted leader in the community.

Community based social marketing strategies are similar to those of social norm theory, but differ in that they focus on the community as a whole rather than the individual (Johnson &

Graber, 2002). The four steps to a successful social marketing campaign are: identifying barriers to adoption of a desired behavior, designing a program to overcome the barriers, piloting the program, and evaluating the results (McKenzie-Mohr, 2000). In the case of the Juliette Dam, potential barriers to removal may be the ties to childhood memories, fishing access, perceived economic benefit or perceived beauty of the dam. Once barriers are identified, the messaging can work to directly address and systematically remove as many barriers as possible. This requires a deep understanding of the target community and the nuanced barriers to adoption.

The literature also suggests that the idea to remove the dam may need to be promoted by local actors within a community first, rather than by perceived outsiders (Brummer et al., 2017; Johnson & Graber, 2002). There also should be a strong ecological argument for removal (Magilligan et al., 2017), which can also highlight other shared values, such as aesthetic beauty and recreation benefits.

In conclusion, dam removal is more likely to be supported by a community that has a high attachment to the river and a low satisfaction with the current state of the (dammed) river. This is likely to occur where natural resource agencies and other conservation partners have engaged in projects facilitating access to and use of the river over time and helped create public appreciation of its natural history and the ecosystem services it provides. When a consideration of dam removal is imminent, studies should immediately begin to more broadly assess the community's attachment to the current state of the dam and determine their vision of and for the river. Discussions should be structured to result in full disclosure of the goals and values of both the restoration advocates and the local community and include multiple opportunities for developing consensus on both goals and strategies. Arguments for removal

should be ecologically strong and resonate with the values of the community. Once strong community support is evident, studies can commence to determine dominant norms and craft messaging. Proposals and messages presented or endorsed by local leaders is best, and removal may become more difficult if the idea seems sudden or proposed by outsiders.

Removal of the Juliette Dam is not currently viable. There is no indication that the current owner has an interest in selling the dam or in removing the dam himself at this time. Furthermore, the immediate community's ties to the Juliette Dam currently seem to outweigh their ties to the river itself and restoring its natural flow. As the dam and the public access it provides continue to deteriorate, and public awareness and appreciation of the natural history of the river and its environs grow, public sentiment may shift toward some form of restoration. DNR and its partners ongoing conservation and education efforts, including protection of current shoal habitat, educational activities and resources regarding the long and rich natural and human history of the region, sponsorship of citizen science projects, and ongoing community engagement will be instrumental in facilitating community attachment to the river.

Conclusion

In this study I interviewed individuals with ties to the community of Juliette and the Ocmulgee River. I found that there is a significant relationship between an individual's strength of attachment to the Juliette community and their feelings about dam removal. Conversely, most of the respondents had a much lower attachment to the Ocmulgee River. The stronger a person's ties to the town of Juliette, the less likely they were to wish to support dam removal.

This is likely because locals have developed strong intangible place meanings associated with the dam, and its potential removal threatens those positive place meanings.

An individual's definitions of nature were only weakly related to how they felt about dam removal. Individuals who favored removal defined nature solely as a lack of human presence or human-built environment. Many other participants also defined nature in this way, but they also expanded their definitions to include personal feelings, and ideas about "right action." People who did not favor dam removal were the most likely to also define nature in through an anthropogenic lens and to believe that nature should be managed and taken care of. They were also the most likely to associate nature with traditional conservative values for how people should behave ("acting natural").

My findings add to the growing body of literature advocating for the importance of considering both stakeholders' attachment to place and their definitions of nature when creating a dialogue around a restoration project. This consideration is necessary to expose the values each party brings to the table and to create a common language for discussing these values. Failing to do so can lead to a stalemate in conversation or worse, a failure to move forward on a restoration project that ultimately all parties would agree is beneficial.

BIBLIOGRAPHY

American Rivers and Altamaha Riverkeeper, Motion to Intervene and Comments and Recommendations by American Rivers and Altamaha Riverkeeper on Order Proposing Revocation of License (August 18, 2014)

Born, S. M., Genskow, K. D., Filbert, T. L., Hernandez-Mora, N., Keeper, M. L., & White, K. A. (1998). Socioeconomic and institutional dimensions of dam removals: The Wisconsin experience. *Environmental Management*, *22*(3), 359–370. https://doi.org/10.1007/s002679900111

Bowman, S. W. (2001). *AMERICAN SHAD AND STRIPED BASS SPAWNING MIGRATION AND HABITAT SELECTION IN THE NEUSE RIVER, NORTH CAROLINA* [North Carolina State University]. https://repository.lib.ncsu.edu/bitstream/handle/1840.16/2537/etd.pdf?sequence=1

Brummer, M., Rodríguez-Labajos, B., Nguyen, T. T., & Jorda-Capdevila, D. (2017). "They have kidnapped our river": Dam removal conflicts in catalonia and their relation to ecosystem services perceptions. *Water Alternatives*, *10*(3), 744–768. https://doi.org/10.15488/2217

Buijs, A. E. (2009a). *Society and Natural Resources Lay People's Images of Nature: Comprehensive Frameworks of Values, Beliefs, and Value Orientations*. https://doi.org/10.1080/08941920801901335

Buijs, A. E. (2009b). Public support for river restoration. A mixed-method study into local

residents' support for and framing of river management and ecological restoration in the Dutch floodplains. *Journal of Environmental Management*, *90*(8), 2680–2689. https://doi.org/10.1016/j.jenvman.2009.02.006

Clewell, A., Aronson, J., & Winterhalder, K. (2004). SER International Primer on Ecological Restoration. *Society for Ecological Restoration*.

Cronon, W. (1996). The Trouble with Wilderness: Or, Getting Back to the Wrong Nature. *Environmental History*, *1*(1), 7. https://doi.org/10.2307/3985059

Darby, S., & Sear, D. (2008). River Restoration: Managing the Uncertainty in Restoring Physical Habitat. In *River Restoration: Managing the Uncertainty in Restoring Physical Habitat*. https://doi.org/10.1002/9780470867082

Devine-Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. *Journal of Community and Applied Social Psychology*, *19*(6), 426–441. https://doi.org/10.1002/casp.1004

Devine-Wright, P. (2013). Explaining "NIMBY" Objections to a Power Line: The Role of Personal, Place Attachment and Project-Related Factors. *Environment and Behavior*, *45*(6), 761–781. https://doi.org/10.1177/0013916512440435

Evans, J. M., & Gambill, J. (2016). *Tybee Island Sea-Level Rise Adaptation Plan*. https://doi.org/10.13140/RG.2.1.3825.9604/1

Facey, D. E., & Van Den Avyle, M. (1986). *Species Profiles: Life Htstories and Environmental Requirements of Coastal Fishes and Invertebrates (South Atlantic): AMERICAN SHAD*. https://core.ac.uk/download/pdf/11019423.pdf

Fox, C. A., Magilligan, F. J., & Sneddon, C. S. (2016). "You kill the dam, you are killing a part of

me": Dam removal and the environmental politics of river restoration. *Geoforum*, *70*, 93–104. https://doi.org/10.1016/j.geoforum.2016.02.013

Gagnon, P. R. (2009). Fire in Floodplain Forests in the Southeastern USA: Insights From Disturbance Ecology of Native Bamboo. *Wetlands*, *29*(2), 520–526.

Gee, H. K. W., King, S. L., & Keim, R. F. (2014). Tree growth and recruitment in a leveed floodplain forest in the Mississippi River Alluvial Valley, USA. *Forest Ecology and Management*, *334*, 85–95. https://doi.org/10.1016/j.foreco.2014.08.024

Given, L. M. (2015). *100 Questions (and Answers) About Qualitative Research*. SAGE Publications. https://books.google.com/books?id=dfeRBgAAQBAJ

Glidewell, D. (2015, March 26). Juliette committed to protecting scenic dam. *Monroe County Reporter*.

Graf, W. L. (1993). Sustaining Our Water Resources. In *Sustaining Our Water Resources*. https://doi.org/10.17226/2217

Graf, W. L. (2001). Damage control: Restoring the physical integrity of America's rivers. *Annals of the Association of American Geographers*, *91*(1), 1–27. https://doi.org/10.1111/0004-5608.00231

Greider, T., & Garkovich, L. (1994). Landscapes: The Social Construction of Nature and the Environment. *Rural Sociology*, *59*(1), 1–24. https://doi.org/10.1111/j.1549-0831.1994.tb00519.x

Hand, B. K., Flint, C. G., Frissell, C. A., Muhlfeld, C. C., Devlin, S. P., Kennedy, B. P., Crabtree, R. L., McKee, W. A., Luikart, G., & Stanford, J. A. (2018). A social–ecological perspective for riverscape management in the Columbia River Basin. *Frontiers in Ecology and the*

Environment, *16*, S23–S33. https://doi.org/10.1002/fee.1752

Hansen, H. H., Forzono, E., Grams, A., Ohlman, L., Ruskamp, C., Pegg, M. A., & Pope, K. L. (2020). Exit here: strategies for dealing with aging dams and reservoirs. *Aquatic Sciences*, *82*(1). https://doi.org/10.1007/s00027-019-0679-3

Hauge, Å. L. (2007). Identity and Place: A Critical Comparison of Three Identity Theories. In *Architectural Science Review* (Vol. 50, Issue 1, pp. 44–51). Taylor & Francis Group . https://doi.org/10.3763/asre.2007.5007

Helford, R. (2000). Constructing nature as constructing science: Expertise, activist science and the public conflict in the Chicago Wilderness. *Restoring Nature: Perspectives from the Social Sciences and Humanities*.

Henry, S. (2015, April 17). Juliette residents hosting 'spring fling' to save historic dam. *41NBC/WGMT*.

Hull, R. B., & Robertson, D. P. (2000). The language of nature matters: We need a more public ecology. In *Restoring nature: Perspective from the social sciences and humanities* (pp. 97–118).

Ireland, H. A. (1939). "Lyell" Gully, a Record of a Century of Erosion. *The Journal of Geology*, *47*(1), 47–63. https://doi.org/10.1086/624736

Jenkins, R. E., & Burkhead, N. M. (1994). *Freshwater fishes of Virginia*. American Fisheries Society.

Johnson, S. E., & Graber, B. E. (2002). Enlisting the Social Sciences in Decisions about Dam Removal. *BioScience*, *52*(8), 731. https://doi.org/10.1641/0006-3568(2002)052[0731:etssid]2.0.co;2

Joyce, S. (1997). Is it worth a dam? In *Environmental Health Perspectives* (Vol. 105, Issue 10, pp. 1050–1055). Public Health Services, US Dept of Health and Human Services. https://doi.org/10.1289/ehp.971051050

Keeney, R. L. (1996). *Value-Focused Thinking*. Harvard University Press. https://books.google.com/books?id=WtNASm7O3fQC

Kern, E. W., Hotchkiss, R. H., & Ames, D. P. (2015). Introducing a Low-Head Dam Fatality Database and Internet Information Portal. *JAWRA Journal of the American Water Resources Association*, *51*(5), 1453–1459. https://doi.org/10.1111/jawr.12289

Keulartz, J., Van Der Windt, H., Swart, J., Keulartz, J., Windt, H. V. D., & Swart, J. (2004). Concepts of Nature as Communicative Devices: The Case of Dutch Nature Policy. In *Environmental Values* (Vol. 13).

Kil, N., Holland, S. M., & Stein, T. V. (2014). Place Meanings and Participatory Planning Intentions. *Society & Natural Resources*, *27*(5), 475–491. https://doi.org/10.1080/08941920.2013.842274

Klein, V. A. (2015). *The Nature of Nature: Space, Place, and Identity on the Appalachian Trail*.

Kondolf, G. M. (1997). Hungry water: Effects of dams and gravel mining on river channels. In *Environmental Management* (Vol. 21, Issue 4, pp. 533–551). https://doi.org/10.1007/s002679900048

Loomis, J. (2002). Quantifying recreation use values from removing dams and restoring free-flowing rivers: A contingent behavior travel cost demand model for the Lower Snake River. *Water Resources Research*, *38*(6), 2-1-2–8. https://doi.org/10.1029/2000wr000136

Maavara, T., Parsons, C. T., Ridenour, C., Stojanovic, S., Dürr, H. H., Powley, H. R., & Van

Cappellen, P. (2015). Global phosphorus retention by river damming. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(51), 15603–15608. https://doi.org/10.1073/pnas.1511797112

Magilligan, F. J., Sneddon, C. S., & Fox, C. A. (2017). The Social, Historical, and Institutional Contingencies of Dam Removal. *Environmental Management*, *59*(6), 982–994. https://doi.org/10.1007/s00267-017-0835-2

McClenachan, L., Lovell, S., & Keaveney, C. (2015). Social benefits of restoring historical ecosystems and fisheries: Alewives in Maine. *Ecology and Society*, *20*(2). https://doi.org/10.5751/ES-07585-200231

McKenzie-Mohr, D. (2000). Promoting sustainable behavior: An introduction to community-based social marketing. *Journal of Social Issues*, *56*(3), 543–554. https://doi.org/10.1111/0022-4537.00183

McMurray, R. (2015, January 15). Don't destroy Juliette's dam. *Monroe County Reporter*. http://www.mymcr.net/opinion/don-t-destroy-juliette-s-dam/article_f0772f35-dd1d-558c-8e01-d1778648628c.html

Moon, K., & Blackman, D. (2014). A Guide to Understanding Social Science Research for Natural Scientists. In *Conservation Biology* (Vol. 28, Issue 5, pp. 1167–1177). Blackwell Publishing Inc. https://doi.org/10.1111/cobi.12326

Mueller, K. B. (2011). *IMPLICATIONS OF SENSE OF PLACE FOR RECOVERY OF ATLANTIC SALMON AND OTHER IMPERILED FISHES*.

NMFS and FWS, NMFS and FWS requesting that FERC take immediate action requiring the Eastern Hydroelectric Corporation to comply with the terms of its operating license and

immediately install fish passage at the East Juliette Hydroelectric Project under P-7019 (2010), https://elibrary.ferc.gov/eLibrary/docinfo?document_id=13838690

Nickens, T. E. (2016, April). Fishing for Votes. *Garden & Gun*. https://gardenandgun.com/feature/fishing-for-votes/

O'Mara, C. R., Deo, N., Creamer, A., Layman, S., & Meaushaw, H. (2021). *Lloyd Shoals Project Study Progress Report for 2nd Season*. https://www.georgiapower.com/content/dam/georgia-power/pdfs/company-pdfs/LS-2nd-Season-Study-Progress-Rpt.pdf

Poe, M. R., Donatuto, J., & Satterfield, T. (2016). "Sense of Place": Human Wellbeing Considerations for Ecological Restoration in Puget Sound. *Coastal Management*, *44*(5), 409–426. https://doi.org/10.1080/08920753.2016.1208037

Proctor, J. D. (1998). The social construction of nature: relativist accusations, pragmatist and critical realist responses. *Annals of the Association of American Geographers*, *88*(3), 352–376. https://doi.org/10.1111/0004-5608.00105

Proshansky, H. M. (1978). The City and Self-Identity. *Environment and Behavior*, *10*(2), 147–169. https://doi.org/10.1177/0013916578102002

Reilly, K. H., Adamowski, J. F., & John, K. (2019). The role of place meanings in opposition to water-related infrastructure projects: The case of the mactaquac dam, new brunswick, canada. *Ecology and Society*, *24*(4). https://doi.org/10.5751/ES-10811-240429

Ryan Bellmore, J., Duda, J. J., Craig, L. S., Greene, S. L., Torgersen, C. E., Collins, M. J., & Vittum, K. (2017). Status and trends of dam removal research in the United States. *Wiley Interdisciplinary Reviews: Water*, *4*(2), e1164. https://doi.org/10.1002/wat2.1164

Sherren, K., Beckley, T. M., Greenland-Smith, S., & Comeau, L. (2017). How provincial and local discourses aligned against the prospect of dam removal in New Brunswick, Canada. *Water Alternatives*, *10*(3), 697–723.

Smith, J. W., Davenport, M. A., Anderson, D. H., & Leahy, J. E. (2011). Place meanings and desired management outcomes. *Landscape and Urban Planning*, *101*(4), 359–370. https://doi.org/10.1016/j.landurbplan.2011.03.002

Sneddon, C. S., Magilligan, F. J., & Fox, C. A. (2017). Science of the dammed: Expertise and knowledge claims in contested dam removals. *Water Alternatives*, *10*(3), 677–696. www.water-alternatives.org

Stedman, R. C. (2002). TOWARD A SOCIAL PSYCHOLOGY OF PLACE Predicting Behavior From Place-Based Cognitions, Attitude, and Identity. In *ENVIRONMENT AND BEHAVIOR* (Vol. 34, Issue 5).

Stern, M. J. (2018). *Social Science Theory for Environmental Sustainability* (Vol. 1). Oxford University Press. https://doi.org/10.1093/oso/9780198793182.001.0001

Straight, C. A., & Freeman, B. J. (2013). *Status and Assessment of Robust Redhorse (Moxostoma robustum) in the Broad River System, Georgia. Robust Redhorse captured at a spawning shoal in the Broad River, 2007*.

Verbrugge, L., & van den Born, R. (2018). The role of place attachment in public perceptions of a re-landscaping intervention in the river Waal (The Netherlands). *Landscape and Urban Planning*, *177*, 241–250. https://doi.org/10.1016/j.landurbplan.2018.05.011

Weldon, M. (2011). A Short History of Environmentalism in the United States. In *Fundamentals of Practical Environmentalism* (pp. 9–24). Continuum International Pub.

https://doi.org/10.1201/b10986-3

Wester-Herber, M. (2004). Underlying concerns in land-use conflicts - The role of place-identity in risk perception. In *Environmental Science and Policy* (Vol. 7, Issue 2, pp. 109–116). Elsevier. https://doi.org/10.1016/j.envsci.2003.12.001

Williams, D. R., & Patterson, M. E. (1999). Environmental psychology: Mapping landscape meanings for ecosystem management. In H. K. Cordell & J. C. Bergstrom (Eds.), *Integrating social sciences and ecosystem management* (pp. 141–160). https://www.fs.fed.us/rm/value/docs/environmental_psychology_mapping_landscape_meanings.pdf

CHAPTER 3

FUTURE CONSERVATION PROJECTS IN JULIETTE, GEORGIA

INTRODUCTION

This chapter focuses on suggestions for how the DNR can move forward with conservation projects in Juliette, and how to align these projects within a larger strategy to promote restoration where appropriate. First, I set forth and explore the suggestions for recreation opportunities made by participants I interviewed pursuant to Chapter 2. By promoting these projects, the DNR can introduce more people to the beauty, solace and fun the river provides and increase public trust in and appreciation for conservation. Next, I describe conservation and recreation project proposals currently in motion in and around Juliette (most involving projects that started after my research began, including those I helped with), how these relate to my findings in Chapter 2 and where future work might be needed. Finally, I describe two resources that I created for the purpose of disseminating the land use change research covered in Chapter 1. My hope is that these two resources may be used to help the community understand and value the pre-dam history of the Ocmulgee River and Juliette and cultivate attachment to the river and the natural environment of the region.

Suggestions for recreation opportunities

There are three broad amenities that residents I interviewed would like to see on the Ocmulgee River: increased public access points, education opportunities for river users, and

reducing the unpredictability of Lake Jackson releases. Other miscellaneous suggestions by Ocmulgee River users and Juliette residents of Juliette are covered at the end of the section.

Increasing Public Access

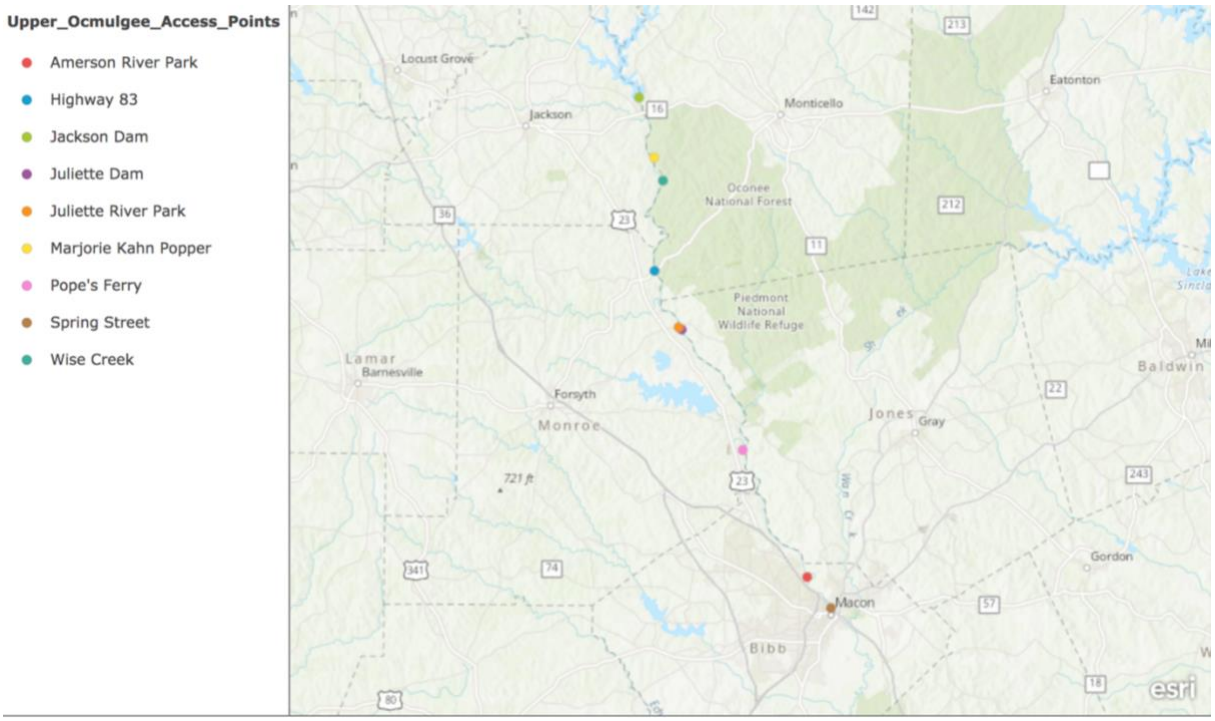


Figure 3.1: Public Access Points along the Upper Ocmulgee. Map created using ArcGIS Online.

The Ocmulgee River flows out of Lloyd Shoals Dam at Lake Jackson for 42 miles before reaching Macon. This upper section of the Ocmulgee is defined by shallow shoals and calm stretches. Just downstream of the Towaliga's confluence with the Ocmulgee, about 19 river miles south of the Lloyd Shoals Dam, the river encounters the Juliette Dam. before continuing another twenty-three miles to Macon. People use the upper section of river for fishing, tubing, recreational boating, canoeing, kayaking, and swimming. Commercial uses on this section are guided fishing trips, canoe and kayak trips, and tubing.

There are nine access points in the Upper Ocmulgee: Jackson Dam (river mile 241.3), Marjorie Kahn Popper, Wise Creek (river mile 236), Highway 83 (river mile 226), Juliette River Park (river mile 222.7), Juliette Dam (river mile 222), Pope's Ferry (river mile 212), Amerson River Park and Spring Street (river mile 198.7). (Georgia Department of Natural Resources, n.d.). The average distance between access points is 4.73 miles. In contrast, on the Ocmulgee Water Trail which stretches from Macon to Lumber City, the average distance between access points is 8.62 miles (Georgia River Network, 2018). The longest stretch between two access points along the upper section is between Pope's Ferry and Amerson River Park, which stretches for roughly 9.18 miles in one direction. For kayakers, it may take roughly 4.5 hours traveling 2 miles/hour to reach the take-out point.

One of the most common requests from participants interviewed in Chapter 2 is the inclusion and maintenance of additional public access points, particularly between the Juliette Dam and Macon. They felt that more access was the simplest way to improve recreation opportunities on the Ocmulgee. Increasing public access also increases public attachment to the river, which may lead to additional public support for conservation projects.

"There's only one other public entrance and it's in Juliette. It's on the Jones County side below the spillway. So, there's one, and then there's not another public [one] until you get down to like Dame's Ferry or Pope's Ferry" – Participant K.

Some new access points suggested by participants include within the Piedmont Wildlife Refuge, on the Towaliga River and between the Juliette Dam and Pope's Ferry. A potential location for a new boat ramp might be parcel number J29 00 013 in Jones County. The land is

already owned by the Georgia DNR and is located roughly halfway between Pope's Ferry and the Juliette Dam access point (222).

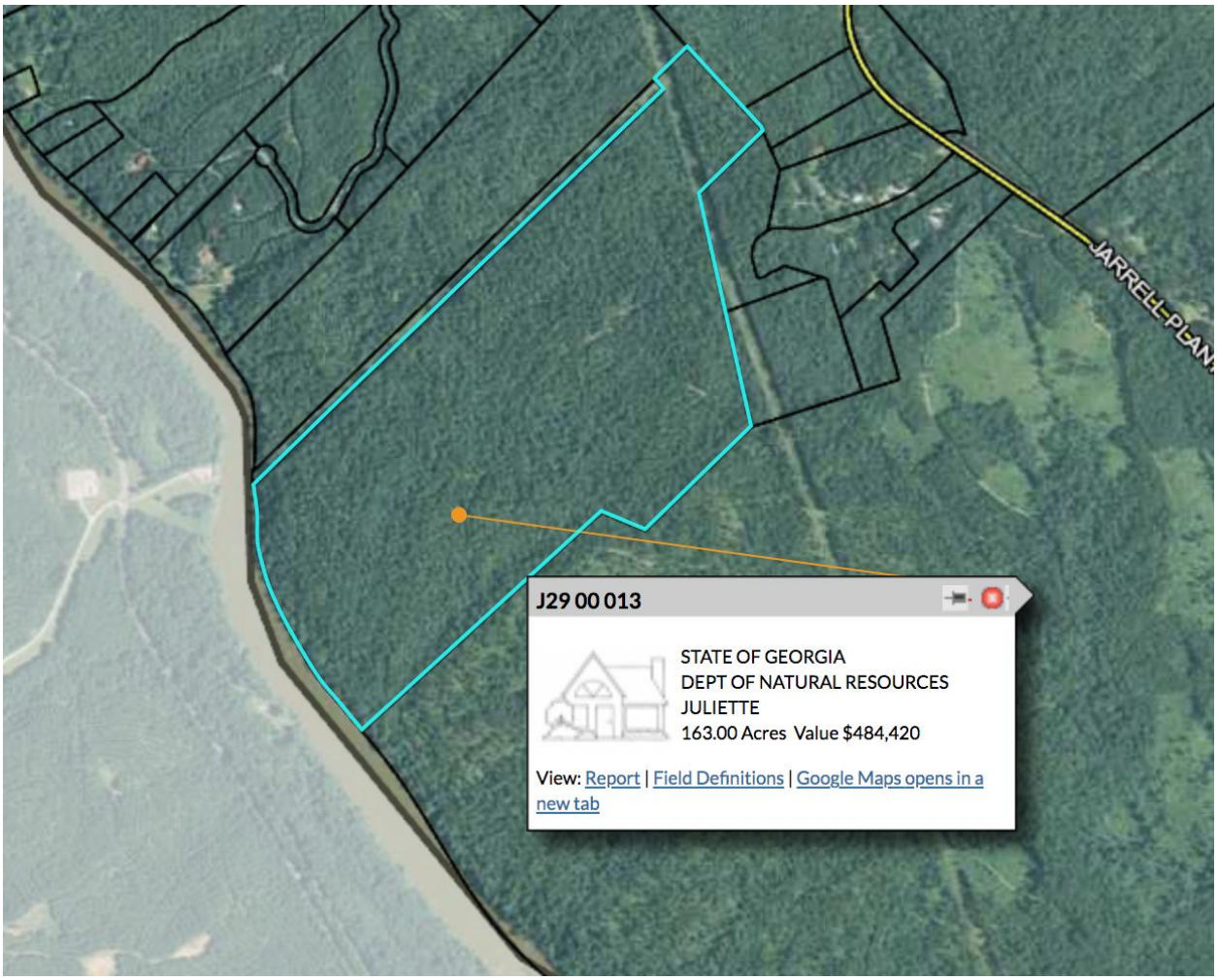


Figure 3.2: Potential public access location on the Upper Ocmulgee River. The location is suggested because it is already owned by the Georgia DNR.

Some Juliette residents were concerned about more public access changing the character of the community, specifically about the perceived party atmosphere created at these sites, and worried about the noise and for the safety of visitors. Some also stated that the Juliette area is family oriented and did not want new groups of tourists visiting who were less interested in maintaining the status quo atmosphere there.

"But then there comes another problem. You've got problems there too because some of these public ramps turn out to be party sites" – Participant H.

Users were also concerned about the maintenance of existing access points. In a community meeting in Jones County, they stated that the current Juliette access point, located just below the Juliette Dam on the Jones County side of the river, was difficult to use because of the state of disrepair. The road leading to the site is full of deep ruts, making it difficult for smaller cars to access. This access was supposed to be maintained by Eastern Hydroelectric Corporation, but since the revocation of the hydropower license they have not made an effort to maintain the site. It is also not well marked, and if a user does not know the region, they may not understand that the area is a public ramp, which discourages use.

Increasing education

The residents of Juliette recommended areas where educational resources would be helpful. First, fishermen wanted increased education for how to identify freshwater game species and where to fish for particular species. Second, residents often spoke of the need for increased public safety awareness. Finally, all users of the river spoke about the need for increased access to information regarding Lake Jackson's release schedule.

Fishermen wanted to see more education on fish species present in the river. Two fishermen wanted to see workshops on the differences between game species that can be caught in the Ocmulgee. The general consensus among shoal bass fishermen is to decrease limits for shoal bass and increase limits for spotted bass but said that many people who fished along the Ocmulgee probably could not tell the two species apart.

"The number one thing that can help fishermen on the Ocmulgee is just education… Here's what you can catch in the river. Here are effective ways to do that. Here are the places you can access to do it and here are the folks that you can call if you don't want to do it by yourself" – Participant E

Workshops in this vein could include information on how to safely process fish and guidelines on consumption frequency for different species on the Ocmulgee. For example, in Juliette the Georgia DNR recommends that largemouth bass longer than 16 inches should not be eaten more than once a week because of methylmercury contamination (Georgia Department of Natural Resources, 2021). However, this information can be difficult to find for a fishman who is not explicitly looking for it. I have seen fishermen string six or seven bass on a line to take home and eat at the Juliette Dam. These workshops would provide an opportunity to briefly but strategically introduce fisherman to nongame fish species, such as the Robust Redhorse and efforts to protect it as well as some of the native history of the area. An ancillary benefit of the workshops is that they could also help create a sense of community among fishermen on the Ocmulgee, which participants also desired.

There are two areas where safety can be improved on the Ocmulgee through public education. Residents talked about the increasing popularity of tubing and boating in Juliette along the Ocmulgee. Many recreational users are from Macon and Forsyth. A common complaint among locals is that these visitors do not understand the length of time required to float from one access point to another. Several people living along the river told stories of tubers trapped between the Juliette Dam access point and Pope's Ferry, hours into a float, with

several more hours to travel before reaching a boat ramp. They have had to help people off of the river and drive them back to their cars.

"A lot of people just don't know where to get in and what's funny is they don't even know where to get out. We get a good bit of traffic at our house over the summer and we'll get these people who will get out… They'll ask us 'Hey, how much longer do we have until the next boat ramp?'" – Participant C

Three other people told me similar stories, and two others told me about the general ignorance of out-of-town river users. Given the frequency with which I heard these stories, people getting trapped between access points must be a fairly common occurrence. A document showing public access points along the Upper Ocmulgee is not easy to find. The one document I did find which detailed this stretch of river was by the Georgia Department of Natural Resources and was out of date, thus not listing the Marjorie Kahn Popper or the Amerson Ferry River Park access points (Georgia Department of Natural Resources, n.d.). This is a public safety issue. Prolonged exposure to the hot sun while recreating in freshwater can cause severe dehydration, sun burn or hypothermia (World Health Organization 2003). A potential remedy to this situation is to place signage at current popular put-in sites for tubers and boaters, warning them of the it takes to reach the next take-out location. This is especially important for tubers, who may be particularly ignorant of rivers in general. A second remedy for this situation is to create a comprehensive, up-to-date list of public access points and place it online. I have done this and placed it online though ArcGIS for people to use. The link is https://arcg.is/1Harn40, and can be embedded into other web pages.

Signage could also communicate basic information about river mechanics, flow rates, and hazards. Some users have a surprising level of ignorance about river mechanics, which could be a safety issue. One anecdote I heard was of a river user who thought that the Ocmulgee was similar to an amusement park ride.

"One lady actually was surprised when I told her… she said, 'You mean it doesn't take me back here?' She's ridden those lazy rivers… [that] takes you back to where you were" – Participant I

Signage should also be placed at the top of the Juliette Dam warning recreational users that they are reaching the edge of the dam and risk going over the top of it. Recreational boaters and tubers have flipped over the dam, falling approximately ten feet before hitting rocks or water below. In 2020 alone there were two reported instances of people going over the Juliette Dam. Luckily only minor injuries have been reported in all cases, but that could easily change in higher water or by falling over at a particularly unlucky spot and hitting the sharp rocks at the bottom. Signage should be large enough to easily read from the Juliette Mill Lake put-in, warning users of the dam's edge and the dangers of falling to the other side.

Finally, a significant safety hazard present on the river is the unpredictability of water levels. Georgia Power does not release water from Lake Jackson on a regular schedule, and users downstream receive no warning of rising water. River users spontaneously complained about the lack of warning when interviewed, and several cited safety as a pressing concern.

"There's no schedule, and there's no sort of online place where you can go… saying we're about to open up… [T]here's no alarm or siren system… That in and of itself is very sketchy and something that bothers me a lot." – Participant E

Two potential solutions for this issue could be: 1) placing warning systems downstream of Lake Jackson and/or 2) posting a daily schedule online so that users can anticipate when water levels will change. Being caught in sudden increases in water levels while swimming or boating in the Upper Ocmulgee can be dangerous, especially when these increases are divorced from weather events that change the levels naturally and predictably.

A potential remedy would be to post a tentative schedule of releases online on the Georgia Power website. Georgia Power already uses a tool that posts dynamic river levels and tentative generation schedules for the Chattahoochee River – The Dynamic River and Lake Levels Tool (DRLT). The DRLT posts real-time discharge information in cubic feet per second (CFS), current lake elevation, and a tentative hourly generation schedule for the next two days. Such information, although subject to change, would be beneficial for users on the Upper Ocmulgee. With high variance in the frequency of releases, even tentative schedules would better allow users to plan for different water levels.

Miscellaneous suggestions

During the interview process, several miscellaneous suggestions for improving recreation on the river were made. These suggestions are:

1. Increased enforcement of fishing laws along the Ocmulgee River.

One of the shoal bass fishermen complained that he had never seen a DNR official patrolling rivers, checking licenses, etc. He speculated that this could be because officials cared more about fishing on public lakes than they did about river fishing. The other explanation, he speculated, was that it was more difficult to maneuver on the Upper Ocmulgee, and with comparatively few fishermen on this stretch of water, it was not worth the effort. It is likely that

the DNR directs its scant resources to more populous areas where fishing and public safety law violations are more likely to occur.

2. More robust DNR presence at existing public access points, particularly Amerson River Park and the Juliette Dam.

Several river users stated that they would like to see a more active presence from DNR game officials at existing public access points. They complained that rowdy boaters posed a danger to themselves and others by recklessly speeding on the Ocmulgee, but there was rarely a DNR presence to deal with the situation before it got out of hand. They did state that DNR was quick to respond to issues, but patrols were too infrequent to act as a significant deterrent to reckless action.

Similarly, residents living in East Juliette expressed concerns with the safety of the public access point below Juliette Dam on the Jones County side. They complained that the access point is unsafe and wanted a stronger law enforcement presence at the location. One of the participants I interviewed said that they never visit the area unless they are carrying a weapon, fearing “sketchy” individuals who frequent the location for reasons other than river access.

3. More frequent litter pickup at all public access points, but particularly at the Juliette River Park and the site immediately below the Juliette Dam.

This may be less of a DNR issue and more of an issue for Jones and Monroe Counties and the Juliette community. Recreational users complained that the Juliette River Park’s waste baskets are not emptied frequently enough, and that it made them feel like the park was “trashy”. Litter cleanup along Juliette Road, leading from I-75 to Juliette is already an issue of some concern for the community (Glidewell, 2016). The Juliette River Club is a community

organization based in Monroe County and dedicated to cleaning up the Ocmulgee around Juliette. Working with organizations already in place would make any additional efforts more effective.

Currently the Altamaha Riverkeeper picks up trash on a semi-regular basis, however it is not frequent enough to keep the area litter free. Residents of East Juliette complained that within two weeks of litter pick up, the area is filled with trash again. The Juliette River Club could potentially help here to increase the frequency of litter pickup at this location.

4. A dedicated parking area for busses at the Amerson River Park, separate from individual cars.

A user who brings large groups of individuals to Amerson River Park stated that they were worried about parking because of the lack of dedicated large vehicle parking spaces. They said that the lack of available parking is a reason they do not frequently take visitors to that lot, particularly on weekends. With so many families with young children present at Amerson, there is always a fear that they will be injured by a large bus trying to maneuver in tight spaces.

Current Conservation and Recreation Project Proposals

This section details some of the projects that DNR and other conservation and restoration advocates could pursue as part of a larger public engagement strategy. First is the creation of a workshop for recreational fishermen along the Ocmulgee. Second is the proposal by Jones County to acquire property downstream of the Juliette Dam for a public park and river access site. Finally, I suggest a survey to continue to gauge the recreation needs of users on the Ocmulgee and residents of the Juliette region.

Workshop

A workshop offered to recreational fisherman would help encourage the development of tangible and intangible place meanings to the Ocmulgee that could lead to increased support for conservation projects. It would teach fishermen about the differences between species found in the Ocmulgee River, how to identify them, where to catch them, and laws and limitations surrounding them. It would also raise awareness about safely processing fish and consumption guidelines for fish caught at different locations on the river. Finally, it provides an opportunity to develop DNR's ties with recreational fishermen and provides a method for the fishermen to develop a sense of community. Although a variety of outfitters, community groups and agencies could host the workshop, because the main thrust of the workshop is to raise awareness for consumption guidelines, game species identification, and regulations surrounding fishing in the Ocmulgee, as well as introduce the subject of conservation of nongame freshwater species such as the Robust redhorse and the Altamaha Spinymussel, seems appropriate that the Georgia DNR would host.

The most obvious location for this workshop would be somewhere within the Juliette community. Jones County is considering a purchase of riverfront property just downstream of the Juliette Dam. This would be an ideal location because it would allow for some hands-on learning opportunities such as wading in swift shoal habitat, basic river safety, or even fly-fishing lessons. An alternate location could be the Piedmont National Wildlife Refuge Visitor's Center. Managed by the United States Fish and Wildlife Service, the 35,000-acre Piedmont Wildlife Refuge borders the Ocmulgee River on the Jones County side, and completely

surrounds East Juliette. The visitor's center is a large building often hosts groups, and reservations can be made months in advance.

These workshops could take place on an annual or semi-annual basis, aimed at new users to the area. I envision the workshop lasting roughly three hours, followed by light refreshments and networking. I have attached a basic sample agenda to the appendix of this chapter.

There are several potential partners that the Georgia DNR could team up with to spread the word and help organize the workshop. Fishing groups and outdoor companies along the Ocmulgee are a good place to start. The fly-fishing company Peach State Fly Fishing is a subsidiary of Ocmulgee Outfitters, an outdoor and apparel store based out of Macon. They run guided fly-fishing trips on rivers throughout the state, but they specialize in shoal bass along the Flint and Ocmulgee Rivers. They would be a good place to begin looking for small business partners. A second business partner could be All Season's Guide Service, a fishing guide company operating on Lake Juliette. Although they might not fish the river, many of their clientele might, or might benefit from learning consumption and processing guidelines. Finally, Ocmulgee Outdoor Expeditions, a canoe trip company for sections of the Upper Ocmulgee, could be a third small business parent. Although they are not focused on fishing, they are an outdoor recreation company along the Ocmulgee, and basic river safety might be beneficial for some of their clientele who wish to become more involved on the Ocmulgee. Other partners could include the Altamaha Riverkeeper, the Ocmulgee Water Trail Partnership, Jones County Board of Recreation, and Monroe County Board of Recreation.

Finally, publicizing the workshop should be a top priority after an agenda is created. Publicizing can occur through the various small business partners. Additionally, securing writeups in the Monroe County Reporter, the Jones County News, and the Macon Telegraph would greatly further public knowledge of the event. Contacting Facebook groups such as the Peach State Kayak Anglers would be another promising avenue. Additionally, placing the information on Georgia DNR's social media and creating an event in Facebook/Instagram could allow the DNR to get rough headcounts for the workshop. An effective social media campaign will combine information about the workshop with the value sets uncovered in Chapter 2 to facilitate the creation of new intangible place meanings.

Establishment of a county park along the Ocmulgee River in Juliette (Jones County side)

In the Spring of 2021, students in the University of Georgia's graduate Interdisciplinary Environmental Law Practicum course assisted Jones County in identifying whether there was public support for a county park adjacent to the Ocmulgee River just downstream of the Juliette Dam and subsequently identifying funds for acquisition. Besides providing recreational amenities not currently available to the East Juliette community, the park could promote an enhanced attachment to the river and could be used to host a variety of educational, conservation and restoration projects.

In the first public meeting hosted by Jones County regarding East Juliette's recreation needs, residents complained about the decrepit nature of the current public access present at the Juliette Dam. The road is full of potholes, and people destroy property at the location. This access was to be maintained by Eastern Hydroelectric Corporation, but since the revocation of the hydropower license the company has not maintained the site. It is also not well marked,

which discourages use. A boat ramp placed at the proposed park just downstream would help solve some of these issues.

The park would also serve conservation purposes. The Georgia DNR has voiced their support for the project, writing that using the land as a passive park is a proactive movement toward conserving the only known spawning location for Robust redhorse in the Altamaha basin from future poor land management. DNR could also have a presence at the park by hosting workshops and conducting citizen science projects from the location. Residents present at the public meeting stated that they would like to see educational signage present at any public park. Signage could include information from Chapter 1 to promote recognition and protection of endangered ecosystems such as canebrakes. An observation stand where school children could watch (and hear, through a microphone) the spawning of Robust Redhorse in the adjacent shoals would likely be popular. A graduate student of the 2020 Environmental Law Practicum contacted teachers in the region to assess the need for more educational resources. The teachers stated that they would relish an opportunity to teach the natural history of the river, and its basic biology and ecology. Details of her findings can be found in the Phase II Feasibility Study produced by the 2020 Environmental Law Practicum for the Georgia DNR. This park could provide that opportunity. A large building already present on the property could house an interpretive center and educational resources I describe at the conclusion of this chapter. It could also serve as a public meeting space which is currently lacking in Juliette.

The East Juliette community suggested they would appreciate amenities such as paved walking trails, a playground, and a picnic area at the site. These new resources could attract

new users to the river, generating a strong sense of attachment as well as support for future conservation and restoration.

Jones County plans to fund the acquisition through a Georgia Outdoor Stewardship Program Grant (GOSP). The GOSP is the result of the 2018 legislative session, where the Georgia General Assembly passed House Bill 332 and House Resolution 238. During the 2018 General election, Georgia voters passed the amendment with 83% support. The bill created the Georgia Outdoor Stewardship Fund, a grant program funded through redirecting 75% of current sales taxes on the sale of outdoor recreation equipment. The purpose of the grant is to fund activities for the protection and preservation of conservation land.

Public Recreation Survey

As part of the 2020 graduate Interdisciplinary Environmental Law Practicum class, two classmates and I created a survey to assess the knowledge level of conservation issues in the Juliette area and user's willingness to participate in potential restoration efforts. Our original aim was to determine the key actors in the area and driving factors associated with the support of and opposition to restoration projects in the region, building off of previous research on dam removals in the northeastern United States (Magilligan et al., 2017). Though my interviews in Chapter 2 explores this at greater depth, a survey allows for input from a broader range of the public, if not deeper analysis into underlying motivations. We wanted the survey to inform future conservation and restoration work on the Ocmulgee. A copy of the survey is included in the appendix of this thesis.

After consulting a subject matter expert in survey construction, we opted to frame the survey through closed-scale questions, as that would give us the most valuable quantitative

data. This includes questions asking the participant to rank their level of agreement on a five-point scale, as well as items asking participants to describe their level of familiarity on a three-point scale. Question length was kept to 17, with an additional open-ended question asking for feedback on the survey and any additional comments. The survey was not field tested; however, it took researchers roughly five minutes to complete the survey, and it is expected that other individuals might take 5-10 minutes to complete.

There were three basic thrusts to the survey. First, to identify the recreation activities people participate in on Ocmulgee River and their frequency. It explored the respondents' familiarity with special species of concern on the Ocmulgee: the American shad, Atlantic sturgeon and Robust redhorse. Finally, it explored the importance of the Juliette Dam to the town of Juliette, and residents' feelings about the dam in relation to the river. Much of this information, particularly people's feelings about the dam, were explored in Chapter 2, with dominant themes parsed there. But the wide coverage afforded by a survey may uncover some additional themes and recreation needs that the necessarily smaller sample size of semi-structured interviews missed.

Because of the rural nature of the locale and the average age of the people of Juliette, a distribution strategy for a physical version of the survey will be necessary. This is best done in a multipronged approach. First, surveys can be spread door to door to individuals who live in Juliette and along the Ocmulgee River. Surveys can also be distributed at major thoroughfares, places of business, and recreation areas, such as the Whistlestop Café, the Juliette River Park, and the Juliette Dam. Finally, local events, community meetings, and festivals present a good opportunity for additional distribution. In particular, the Fried Green Tomato Festival, which

typically occurs during the fourth weekend in October each year, would be a good place to start.

Though our survey was not distributed in 2020 as planned due to limited public contact during the coronavirus, Jones County and the Georgia DNR intend to combine our questions with more specific questions focusing on the amenities the community wants to see at the proposed Jones County park downstream of the Juliette Dam in a survey to be conducted in the summer and fall of 2021.

Other education efforts

As part of an overall engagement strategy to promote conservation efforts, I have created two educational resources for public consumption. These resources are intended to combine the information found in Chapter 1 with the community values of place, space and history in a way that is easy to understand. They are meant to instill a pride in the deep history and rich biodiversity of the Ocmulgee and Juliette, in the process aligning the community's attachment to place found in Chapter 2 with conservation goals.

The first is an ArcGIS StoryMap that walks users through the historic landscapes of Juliette including the animals and plants that can be found there. ArcGIS is a GIS (Geographic Information Software) mapping software from ESRI and is used by a variety of industries to create and analyze mapping data. StoryMaps are online tools for ArcGIS users to build stories using mapping data. They are hosted by ArcGIS for free and are searchable by the public. Using historic soil survey maps georeferenced to modern GPS data, the StoryMap I created shows users the types of plants that could exist in that location based on the soil type. A potential use for the StoryMap in the future is as an information module in a museum or exhibit about the

historic state of the Ocmulgee River. The StoryMap aims to align the community's value in the region's history I found in Chapter 2 with the environmental history detailed in Chapter 1. Hopefully the information will help people begin to understand the long history of an ecologically rich undammed Ocmulgee River. This may make people more accepting of the historic state that restoration aims to recreate. This does not need to be solely a passive educational resource. Groups such as the Altamaha Riverkeeper or the Georgia River Network could actively communicate this information through social media platforms. Much of the information is already distilled to be easily digestible on the site, and could be communicated via Twitter, Instagram, and Facebook to large amounts of followers in the region.

The second educational resource I created is a small video game dedicated to presenting the historic Juliette landscape. This game aims to give a visualization to the information gathered in Chapter 1 so that people can better grasp the large environmental changes that the region has undergone. I created this game using the Unity game engine. I imported heightmap data of Juliette to produce an accurate topographic 3d landscape of Juliette. Then I imported assets and matched them to information found in soil maps built for StoryMaps and reference photos from the Piedmont Wildlife Refuge to build a somewhat accurate composition of the historic plant landscape.

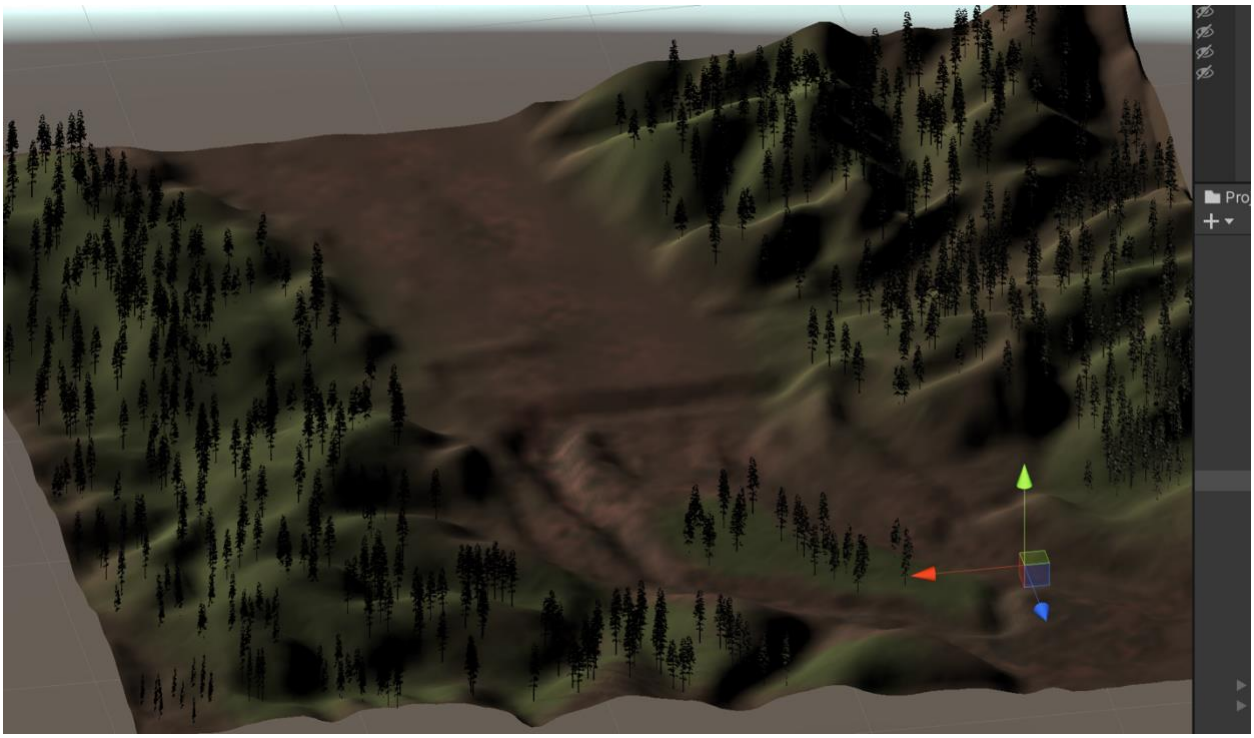


Figure 3.3: Early renderings of the Juliette topographic landscape. The topography in this screenshot is accurate to the present day.

I could not find perfect species assets in all cases. Many historically accurate species models were not available, and I do not have the skill to create them myself. However, the goal was to give an overall impression of the look of the landscape for the general public, not perfect historic accuracy. Namely, I wanted to communicate the widely spaced pines and oaks coupled with a variety of grasses, which is very different from the densely forested areas currently surrounding much of Juliette. Finally, I used a first-person camera with realistic walking animation to give the user the simulated ability to move around the space and explore the visualization.

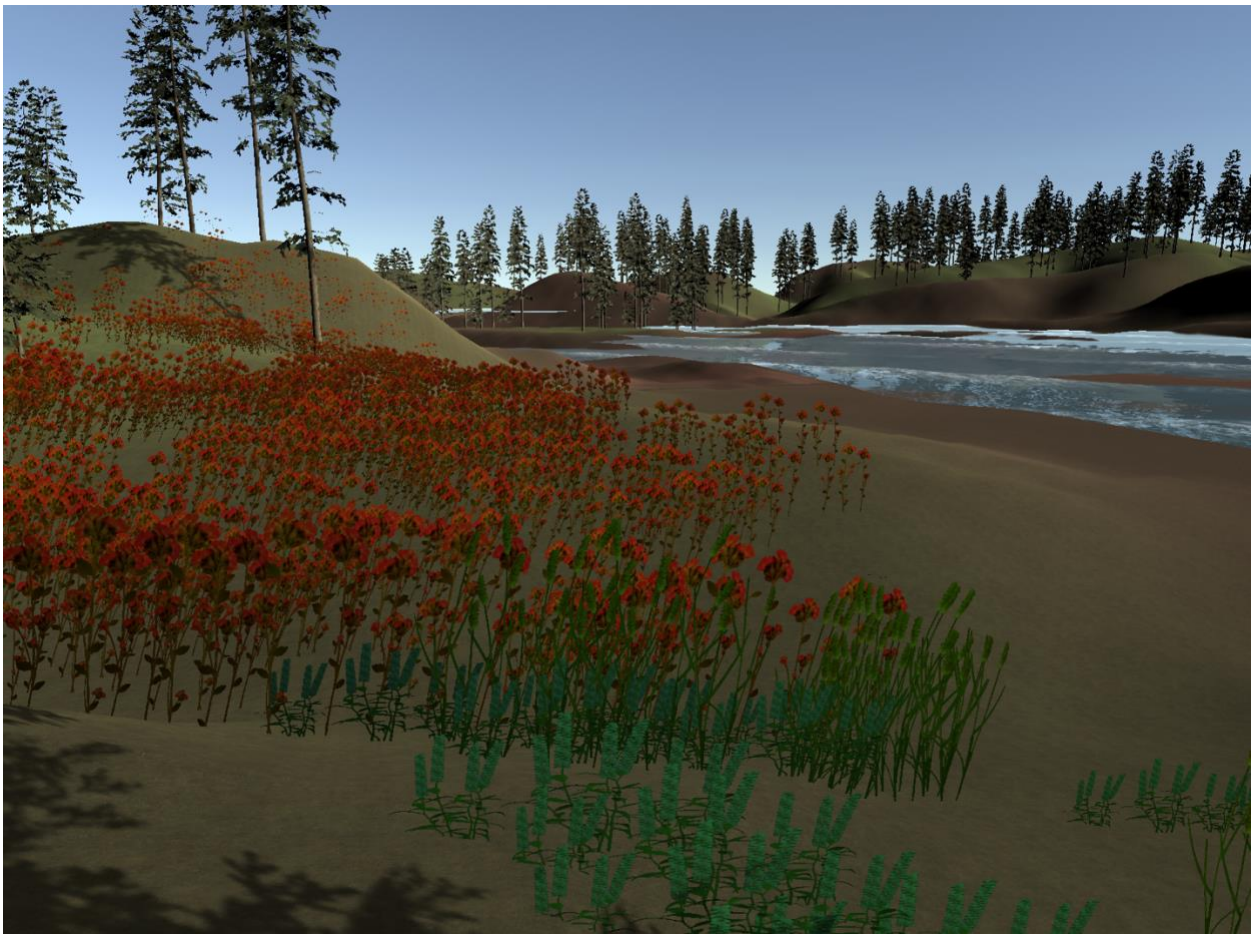


Figure 3.4: First person view of an early rendering of the Juliette landscape with placeholder plant species present.

Visualization outside of traditional maps and technical data can produce more lively discussion about alternate states of an environment (J. L. Lewis & Sheppard, 2006). Moreover, 3D visualization techniques are considered crucial to the communication of land use changes over time (Aguirre-Bravo et al., 2006). Video game technology can be used to help tackle visualization challenges that scientists face (Lv et al., 2013) and have been used to recreate historic towns and landscapes (Deggim et al., 2017). This type of visualization also promotes the enhanced attachment to place and history that could lead to more willingness to participate in protecting it through conservation and restoration projects.

The game is intended to be played on a computer and should be able to be accessed and downloaded for free. I envision this as a companion to the ArcGIS Storymap, where a reader can see some of the more technical data and information projected onto a medium that allows for alternate explorations. The game and StoryMap could be placed on a computer in a future interpretive center at the location that Jones County is attempting to purchase. A method for downloading the game will be present in the Appendix as well.

Conclusion

This chapter proposes some additional projects that the Georgia DNR, other agencies and advocacy groups should be involved in to promote broader public engagement in conservation and restoration. This chapter takes concepts from both Chapter 1 and Chapter 2 and combines them into a series of practical recommendations for how to align the Juliette community's underlying values and place attachments with DNR's conservation goals. Bringing more people to the river by providing additional public access and recreation sites and sponsoring educational opportunities, can increase attachment to the river and enhance public support for restoration projects. Finally, the educational resources I created align the community's value of history with the environmental history found in Chapter 1.

Each recommendation in this section can be considered a piece of a larger strategy of engagement to increase public appreciation and support for the resources of the Ocmulgee River. Pursuing these projects, either ad hoc or systematically, has the added benefit of enhancing public trust in the Georgia DNR and conservation organizations.

This thesis aims to reveal the values of the community of Juliette as they relate to the restoration of natural resources and presents methods for creating an ongoing dialogue to

forge consensus on conservation and restoration. I started by developing a history of land use changes and river use in the region. Then I conducted interviews to disclose the Juliette community's underlying beliefs and values informing their feelings about the Juliette Dam. Finally, I suggest some projects that the DNR and others can engage in that may help shift the public's perceptions of restoration and increase willingness to participate in these projects. These are long term solutions that aim to build trust and promote an enhanced attachment to past and place through engagement with the rich history and biological diversity of the Ocmulgee River.

BIBLIOGRAPHY

Aguirre-Bravo, Pellicane, C. ;, Burns, P. J. ;, Draggan, D. P., & Sidney. (2006). *Monitoring Science and Technology Symposium: Unifying Knowledge for Sustainability in the Western Hemisphere*. 558–564.

Deggim, S., Kersten, T. P., Tschirschwitz, F., & Hinrichsen, N. (2017). *SEGEBERG 1600-RECONSTRUCTING A HISTORIC TOWN FOR VIRTUAL REALITY VISUALISATION AS AN IMMERSIVE EXPERIENCE*. https://doi.org/10.5194/isprs-archives-XLII-2-W8-87-2017

Georgia Department of Natural Resources. (n.d.). *Guide to Fishing the Upper Ocmulgee River*. Retrieved April 26, 2021, from https://gadnr.org/sites/default/files/wrd/pdf/river-prospects/upper_ocmulgee_guide.pdf

Georgia Department of Natural Resources. (2021). Georgia sport fishing regulations. In *Georgia Department of Natural Resources*. http://www.eregulations.com/wp-content/uploads/2020/12/21GAFW-VLR3.pdf

Georgia River Network. (2018). *Ocmulgee River Water Trail*. Georgia River Network. https://garivers.org/water-trails-and-paddling/ocmulgee-river-water-trail/

Glidewell, D. (2016, September 14). Juliette River Club hears from its legislators. *Monroe County Reporter*

Lewis, J. L., & Sheppard, S. R. J. (2006). Culture and communication: Can landscape visualization improve forest management consultation with indigenous communities? *Landscape and*

Urban Planning, *77*(3), 291–313. https://doi.org/10.1016/j.landurbplan.2005.04.004

Lv, Z., Tek, A., Da Silva, F., Empereur-mot, C., Chavent, M., & Baaden, M. (2013). Game On, Science - How Video Game Technology May Help Biologists Tackle Visualization Challenges. *PLoS ONE*, *8*(3), e57990. https://doi.org/10.1371/journal.pone.0057990

Magilligan, F. J., Sneddon, C. S., & Fox, C. A. (2017). The Social, Historical, and Institutional Contingencies of Dam Removal. *Environmental Management*, *59*(6), 982–994. https://doi.org/10.1007/s00267-017-0835-2

McClenachan, L., Lovell, S., & Keaveney, C. (2015). Social benefits of restoring historical ecosystems and fisheries: Alewives in Maine. *Ecology and Society*, *20*(2). https://doi.org/10.5751/ES-07585-200231

Organization, W. H. (2003). *Guidelines for safe recreational water environments.* World Health Organization.

APPENDIX A

JULIETTE SURVEY

1. Are you currently a resident of Juliette?
2. How long have you lived in Juliette?
3. What is your occupation?
4. Do you own, run, or manage a business based out of Juliette?
5. Do you own property within one mile of the Ocmulgee River?
6. What are the activities you have done in or around the Ocmulgee in the last 12 months? (Please check all that apply)
    - Fishing
    - Tubing
    - Kayaking
    - Picnicking
    - Hiking/Walking
    - Wildlife Viewing
    - Other:
7. How often do you engage in activities on the river?
    - Less than 1 time a month
    - 1-3 times a month
    - 3-5 times a month
    - 5-10 times a month
    - More than 10 times a month
8. On a scale of 1-5, with 1 being strongly disagree and 5 being strongly agree, please respond to the following statements:
    - Juliette has adequate outdoor recreation opportunities.
    - It is easy to participate in outdoor recreation in Juliette.
    - There are enough walking trails in Juliette
    - There are enough boat ramps in Juliette.
    - It is easy to access the Ocmulgee for recreation opportunities.
    - Dams positively impact fisheries.
    - Dams negatively impact fisheries.
    - The most important feature of a river is its natural beauty.
    - The most important feature of a river is the history it conveys.
    - The most important feature of a river is the ways people can interact with it.
9. How familiar are you with the fish species American shad?
    - Very Familiar
    - Somewhat Familiar
    - Unfamiliar

10. If you consider yourself familiar, how did you become familiar with the American shad? Please check all that apply.
    - I have caught it
    - Family/Friends taught me about the fish
    - I have eaten it
    - I learned about it in school
    - Other:
11. How familiar are you with the sturgeon?
    - Very Familiar
    - Somewhat Familiar
    - Unfamiliar
12. If you consider yourself familiar, how did you become familiar with the sturgeon? Please check all that apply.
    - I have caught it
    - Family/Friends taught me about the fish
    - I have eaten it
    - I learned about it in school
    - Other:
13. How familiar are you with the fish species robust redhorse?
    - Very Familiar
    - Somewhat Familiar
    - Unfamiliar
14. If you consider yourself familiar, how did you become familiar with the robust redhorse? Please check all that apply.
    - I have caught it
    - Family/Friends taught me about the fish
    - I have eaten it
    - I learned about it in school
    - Other:
15. On a scale of 1-5, with 1 being strongly disagree and 5 being strongly agree, please respond to the following statements.
    - I feel safe around Juliette Dam.
    - I feel safe recreating in the reservoir above the dam. (Its own question)
    - I feel safe in a boat above the dam.
    - I feel safe recreating below the dam.
    - I feel safe in a boat below the dam.
16. On a scale of 1-5, with 1 being strongly disagree and 5 being strongly agree, please respond to the following statements.
    - Juliette dam is important to the history of Juliette.
    - The dam is an important part of the continued economic health of Juliette.
    - The dam should be considered a natural part of the river.
    - The Juliette dam is an important tourist attraction in Juliette.
17. Are there additional outdoor recreation amenities you would like to see that are not currently in Juliette?

18. Please add any additional comments here:

APPENDIX B

JULIETTE STORYMAP AND GAME

Juliette StoryMap

This website is hosted by ArcGIS and can be accessed by traveling to the url: https://arcg.is/1rrXT10.

Juliette Game

Until the game is ready for public consumption, I will continue to host it on my own computer. It should be able to be sent via file. To get access to the game, the requester should contact me at:

William White

121 Heartwood Drive, Cataula, GA, 31804

Phone: 706-905-1255

Email: waw1118@yahoo.com

In the future, it may also be hosted via GitHub, but at this time that is not feasible.