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Middle Savannah River: An A/r/tographic Ecopedagogical Ethnography Experimenting with Rhizomatic Perspectives

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MIDDLE SAVANNAH RIVER: AN A/R/TOGRAPHIC ECOPEDAGOGICAL ETHNOGRAPHY EXPERIMENTING WITH RHIZOMATIC PERSPECTIVES

by

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Under the Direction of Daniel E. Chapman

ABSTRACT

This research is an experiment in perspective. Using the four commonplaces (Schwab, 1978), I practiced letting the Savannah River teach me what there is to know about the water, the land, the people, and the other entities that depend on ki through artistic, ethnographic, and ecopedagogical lenses. The ethnographic findings describe the social actors that depend on ki and give a voice to the River. The a/r/tographic findings display the River on a canvas map through two hundred years using paint, clay, photography, video, abstract acrylics, and fabric. Together, these methods contribute to a unique ecopedagogical journey. This word cloud provides a small window into the work.

INDEX WORDS: Dissertation, College of Graduate Studies, Georgia Southern University, Ecopedagogy, Ethnography, River as teacher, A/r/tography, Rhizome epistemology.

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by

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DEDICATION

This is dedicated to the one who made this possible.

This man has proven throughout the years that we share the same definition of commitment.

I love you.

Figure D.1, *Waiting*

ACKNOWLEDGMENTS

Andy, thank you for more than 30 years of adventure. You not only took over my responsibilities, but you also read and edited this document. Most importantly, you reminded me to enjoy this journey.

Lora Hydrick, thank you for traveling this journey with me.

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My girls (children, siblings, and friends), thank you for challenging me to be my best self.

Thank you to all my friends in education, who go to work every day with hope in their hearts. You listened to my ideas, helped with grammar, physically helped me build the art installation, and encouraged me when I was tired. There are too many to name, but you know who you are. If you listened to me even once, you are a part of making this project successful.

Many thanks to my committee:
Dr. Chapman: Thank you for remaining realistically optimistic and allowing me to guide the journey. You gave me the opportunity to experience intellectual freedom for the first time.
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Dr. Angela Rapkin: Manatee Community College Dean of Students (1986-1990), found me lost, pointed in a direction and guardrailled me to graduation. She kept me enrolled when my mother was ill and found scholarships when I could no longer work. She went beyond – she saw what I did not know existed in me and encouraged me to be courageous with my choices.

Mrs. Makos: Mount Vernon Middle School (1978), she was absolutely honest about life's challenges and opportunities. She inspired me to create my own path by earning an education. Her life was my example.

Mrs. Wren: Venice High School, (Geopolitics 1985-1986) opened the world in a class that connected economics, geography and politics and made me care about a world beyond my own.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

PROLOGUE

I have purposefully not included much of my own beliefs in the first four chapters as an attempt to allow the River to lead the research while I developed a scholarly document; however, you will find me in the last chapter. Chapter five is an honest evaluation of my beliefs now, though I am sure they will change as I live and grow. I am using a romantic lens for most of this work with the intention of attracting you to your own natural world. I am aware of the issues the Earth faces; however, I believe that the first step to caring for our planet is recognizing the worth and beauty that already exists.

You will find hopefulness throughout this text, despite the messages the media would have you believe. In Bruno Latour's (2017) *Waiting for Gaia*, he asks what we are to do when faced with ecological issues that are beyond our comprehension and possibly beyond recovery. Latour's body of work is evident throughout my project; his insight, intellect, and empathy are matched with his belief that creativity is a necessity in science and ecology. This tile, figure P.1, did not make it into the a/r/tographic findings of chapter five, but it represents joy, hopefulness, and excitement of spring. It is titled *Spring's Confetti*. I believe we must remain optimistic that our efforts will make a difference in time. You may ask yourself how in the face of global climate change, plagues, pollution, food scarcity, and water insecurity this is possible. In my very few years on this Earth, in universal time, not human time, I have witnessed possibility and spirit overtake detrimental destructions. I have seen students succeed in homes without water or

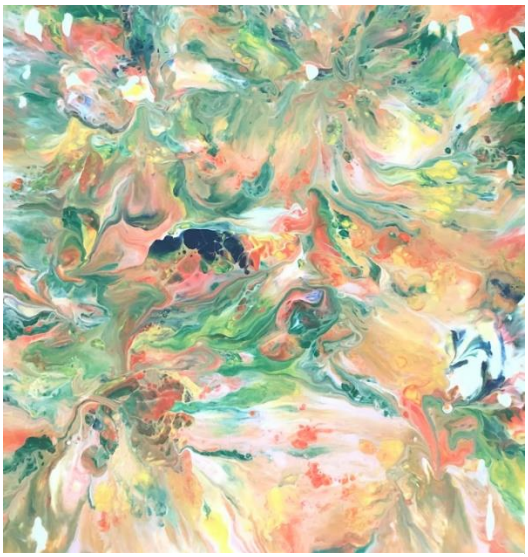

Figure P. 1, *Spring's Confetti*

power. I have witnessed the thriving life of a young woman with less than 3% chance of survival. I have raised children to adulthood who were predicted to fail physically and intellectually. My own siblings and I survived daily abuse and neglect for years and have gone on to have healthy and stable marriages with strong children. I have seen deserts reforested and Rivers returned to nature. I do not walk around with rose colored glasses, I come from a background of darkness, a world that most do not believe exists in the United States. Yet, I am here. I see humanity continue to fight for their children and their freedoms in the bleakest of places with monsters reigning over them. I am hopeful because I am here.

We could consider not being hopeful but to what means? As a thought experiment? Sure. Without hope the women and girls of Afghanistan should give up hiding underground to teach each other to read. That is what they must do now. The president of Ukraine should stop the fighting and give the tyrant what he wants - to take away any possibility of a free Ukraine with financial means of support. The Indigenous people of North America should be grateful for the uranium seeded water they have access to and stop trying to protect their heritage. The ocean may as well resign itself to becoming plasticated, hot, and acidic. While we continue to use it as a dumping ground. I could continue with this, but I know you get the point.

I am hopeful because people continue to work for the protection of others. It has happened throughout my life, even if the fight was not for me or my family, it was for my planet and my freedoms. This is not to say I do not recognize the sacrifices. I killed the animals for sustenance, without thanking them first - I know better now. I joined the military to protect America - I now understand there is more than freedom at risk. However, knowing what I know now about the treatment of citizens in the Middle East, especially the females, I may have gone for other reasons. I know my father left his homeland to follow a dream in America and my

mother was forced to marry him to save my life. I know most people, even in these United States, will not have the opportunities I have. Although I have worked hard nearly every day of my life to get here, others will do the same and struggle until the bitter end.

You will hear and see hope because I am grateful. Grateful to have survived unreasonable circumstances. Grateful to build peace in my life and in my home. Grateful for a family that supports and cares for each other and the *other*. My gratitude is a daily practice that sustains me. The River reminds me to pay attention. This River reminds me of the beauty in the natural world that is just beyond the door. It may be a farther trip for some but the fractals in a leaf hold the beauty of a universe. The stars, planets, and galaxies in our night sky are just being, waiting for you to look up. Why shouldn't I have hope? I am a teacher and always have been. I see the future in our children and do my best to ensure they are prepared to make well-informed and conscientious choices.

When reading the Literature Review, you will find the tenets of ecopedagogy as headings. Keep in mind that each tenet is a node of rhizome epistemology that forms the foundation of this research. This is a multilayered, multidisciplinary approach to understanding how to build an ecopedagogical thesis. My background in technical writing is evident, but I hope you will experience my relationship with nature and the water. I am inspired by the words of Lisa Delpit (2006) in *Other People's Children*, in it she writes about the many ways we can learn from each other. I embarked on this project "to learn about the world, in short, by being still and opening myself to experiencing it. If I realize that I am an organic part of all that is, and adopt a receptive, connected stance, then I need not take an active, dominant role to understand: the universe will, in essence, include me in understanding" (p.92).

This project began years before I was aware of it. The Bloom of the Day project you will read about in chapter one, is a simple text thread sent to a student in the hospital. Photographs of nature for her to contemplate and immerse herself in while living in sanitized walls. I did not expect that I would find my way back to nature in a scholarly manner, but I am grateful for the opportunity. When you get to the art installation, be sure to bring ear buds or headphones. The sounds of the River are as important as the visual and need to be heard without background sounds. There are many more videos in pockets than the few presented on the canvas; perhaps you could set aside a few minutes to sit in a corner and go through them as an act of gratitude for the Earth. For me, these are mini meditations; they are reminders that I am a member of a living community. Throughout my research, I hope to ingratiate you to my portion of the River so that you will be inspired to protect all the water you encounter, for someday it will flow through you, past the osprey and sturgeon, the reeds and yarrow, and the cedar and sycamore we are working to protect.

CHAPTER 1

INTRODUCTION

Figure 1.1, *Hollow Home*

Water, in all its phases, allows life to evolve on this planet. It is taken for granted that in the closed system of Earth, we will never run out. The strong polar covalent bonds of hydrogen and oxygen hold far more together than water; it is a social phenomenon that is basic to every society and culture (Orlove & Canton, 2010). While it is true that Earth will not run out of water, only three percent of the water on Earth is fresh and a mere one percent of that water is safe for animal consumption and accessible to humans (U.S. Bureau of Reclamation, 2020). This photograph, titled *Hollow Home* figure 1.1, was taken only two miles from my own home. It is the year-round home for a variety of species that depend on the health of moving water. The lack of clean safe water globally is often cited as a cause for turmoil (UNESCO, 2021). It is so threatened that were it considered living it would be on the endangered species list. So, why are we not studying this in any science curriculum? The closest we come in the environmental sciences is memorizing the water cycle, in the Earth sciences is reading about pollution, but no curriculum connects the health of the water on this planet to its social and cultural origins or implications. The purpose of my research is to illuminate the multiple values of water in our society by treating it as an equal member with the

same rights to security and protection that we expect for the human population. This is not to say that the River should be counted as a conscious being, that is not the purpose of this dissertation. I will rely on Gaia Theory (Lovelock & Margulis, 2017; Latour, 2013; Latour, 2017) to support the rights of the River, and the principles of the rhizome as proposed by Deleuze and Guattari (1988) to connect ideas that may not have previously been associated with each other. I focus on the middle Savannah River, the area between the Clarks Hill dam and the New Savannah Bluff Lock and dam, and the communities that depend on the health of the River. I conducted an ecopedagogical a/r/tographic (artist/researcher/teacher) ethnography, which investigated the merits of this portion of the River as the foundation for the surrounding communities while producing an immersive dissertation.

Ecopedagogy is not new to the field of Curriculum Studies, it is the offspring of critical pedagogy that absorbed ecology, literacy, and global citizenship. The modern version of Ecopedagogy evolved from the research of Henry Giroux and Peter McLaren (1989), Joe Kincheloe and Shirley Steinberg (1998), and Paulo Freire (1970/2020). While the term first appears in a German text by Gerald de Haan (1984) in the German version of *Nature* magazine, I will refer to the English descriptions. It was used in English soon after de Haan by Marianne Gronemeyer (1987) who described it as the integration of environmentalism, politics, and education. Ironically, Ivan Illich also coined the term in 1987; however, his definition represented the systemization of global education that worked against sustainable living (1988). Illich's definition remains a warning against homogenization due to globalization but is not central to this research. My research is focused on the ecopedagogical tenets of biosensitivity, sustainability, ethics of care, ecoliteracy, and global citizenship. The science, pedagogy and philosophies woven throughout ecopedagogy were explored ethnographically and aesthetically

employing the methodology of a/r/tography where the artist/researcher/teacher adopts each lens individually and applies them as one.

A/r/tography was developed by Rita Irwin Ed.D., in the early 1980s as a means to disrupt traditional qualitative research and pedagogy standards. She describes it as a "practice-based research methodology dedicated to acts of inquiry through the arts and writing…setting art and graphy, and the identities of artist, researcher, teacher (a/r/t), in contiguous relations. None of these features is privileged over another as they occur simultaneously in and through time and space" (Irwin, Beer, Springgay, Grauer, Xiong, & Bickel, 2006, p. 70). Her definition is aligned with the rhizome as no node is prioritized over another. As a novice artist, I worked with a variety of mediums to ensure a holistic experience for the reader/viewer as well as myself. A/r/tography has been quietly growing acceptance as a qualitative methodology in the field of Curriculum Studies but has yet to reach the general student population; it is often used for art education research and among art therapy students. A/r/tography is supported as a qualitative methodology by Jan Jagodzinski (2017) who stated, "I see a/r/tography closer to a form of ethnographic action research … capable of coping with difference that circulates within a framework" (p. 270). Jagodzinski's words lead me to consider an ethnographic point of view and what innovative rhizomatic connections could be made between and within the two methodologies. In an effort to fulfill the principles of the rhizome, ethnography enhanced this research and ensured multiple lenses were used and a variety of internodal connections were made possible.

The ethnographic branch of this research is two-fold and guided by traditional ethnographers, Paul Atkinson (2014), Sarah Pink (2013) and Charlotte Aull Davies (2012) as well as those who focus solely on bodies of water, Paul Little (1999), John Wagner & Jerry Jacka (2018), and Kyle Hearn (2021). The work of Joseph Schwab's (1969, 1978) 'four commonplaces' will inform my research and provide an additional node of connections to the field of Curriculum Studies. Schwab's (1969) *The Practical: A Language for Curriculum* describes the role and value of his 'four commonplaces' including the importance of milieu. In an attempt to practice ecopedagogy and better understand the milieu of the middle Savannah River, I positioned the River as the teacher rather than simply the subject matter. With this lens in mind, I conducted an ethnography on the River, to discover what could be revealed. The field of Curriculum Studies encompasses ethnography and ecopedagogy, which include cultural studies and other components relevant to my research. My interests lie in discovering how micro areas of research - nodes - can contribute to the entire field and inspire other students to conduct additional research that is outside of the accepted tradition. This brings me to the use of the word node. Node is the anatomical bulb where nutrients are stored and sent throughout the rhizome; I refer to this area as an intersection of understandings. This is the diagram of a rhizome of ginger (Britannica, 2023), figure 1.2. It is not the intersection of constructive waves or a computer network but a botanical place of growth, nutrition, birth, genetic coding, and a safe place to store nutrients when necessary. A node is a place of neural and nutritional communication, but also capable of standing alone and building an independent organism. It is a point to hold on to or from which to leap. Do not get caught up in the industrialization of the

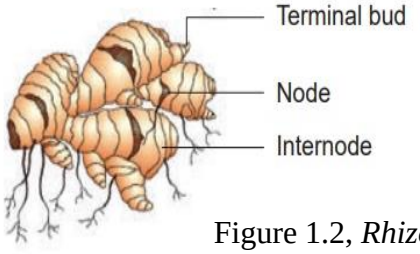

Figure 1.2, *Rhizome*

term by technological society. Let it be what it is, a place to rest, gather oneself, and from which to grow beyond. This experimental research served as an antidote to the positivism found in the scientific method. There is value in isolating a variable and examining its effect on the participants when new medicines are being tested or a device is being evaluated, but our education system is, or should be, considering the holistic student and the community in which they are members. If we still believe that the education system is in place to foster humans who can function and contribute positively to our society, then we must integrate education with the future of society in mind. Scientific evidence is introduced to support my assertions throughout this endeavor but is not the foundation of the study.

I engaged the River as the teacher and allowed the water to lead the research. Some of the research focused on power structures. Societies are built around power structures; those with the resources have the power and those without are at best ignored and at worst oppressed. Today, as in the past, the controller of natural resources wields power. What if the resource itself (water, soil, gas, coal, trees) had rights? I focused on water in this dissertation, but other members of nature deserve the effort and attention of an investigation as well.

Building off critical theorists, David Orr (1992) and Fritjof Capra (1997) coined the term 'ecoliteracy' to describe an understanding of earth's systems in order to create sustainability practices in education. This term quickly entered the environmental science classroom and became a way to describe the reciprocal relationship between ecology and humanity. Chet Bowers (2001) and Richard Kahn (2007) independently developed their own planetary responsibility frameworks and together expanded ecoliteracy, ecojustice, ecology, and critical consciousness into what is now recognized as ecopedagogy. Ecopedagogy now includes global communications via the internet to promote the responsibility of the Earth's welfare, ecojustice,

planetary citizenship, care, and participatory dialogue. Ecopedagogues expect each other to freely share educational resources, as well as grow the body of knowledge. I envision ecopedagogy as a space where the community, humanity, ecology, economy, aesthetics, and the academy share responsibility for the planet and for the future. It is where dialogue and mutual respect for the needs of society are balanced with the long-term health of the planet; a place where the biota and abiota are in symbiotic homeostasis. While this may seem unattainable on a global scale, it is possible in communities and could spread as members of society disseminate and recognize that we must find feasible solutions to ensure a habitable planet for future generations. The work we do today will not serve us.

"A society grows great when old men plant trees

in whose shade they know they shall never sit."

Greek Proverb

While addressing my own assumptions regarding the multitude of values surrounding the Savannah River, I wondered what would be revealed about a community if an ethnography were conducted on the River as the subject instead of the object? Ethnographies have been conducted for centuries under the umbrella of anthropology. For the most part, ethnography is focused on a small community or group of people; however, I sought a new perspective. With the River as the subject, I hoped to uncover how it has been affected and continues to be affected by the development of the local region. There are a few international examples of ethnographic research on bodies of water, but none in the Southeastern United States and very few in the Americas. Most of the research focused on the injustices done to the indigenous communities that live along the river systems. I covered the historical evidence of the displacement of the Creek and

Westo Indians in the Central Savannah River Area (CSRA) and conducted a contemporary ethnography of the area that combined traditional and non-traditional components. “Ethnography studies the production of everyday life by often ‘othered’ people analyzed at the level of meaning, social structure, power relations and history” (Atkinson, 2001, p. 481). It is my contention that considerations for the welfare of the River have been subsumed by political and economic decisions and therefore, the River has become the *other*.

Personal Connection

Until recently I had not taken the time to ponder the value of nature to my sense of balance in the world. I originally intended on researching ‘military children as third culture kids’ (Useem and Downie, 1976) or the ineffectuality of traditional curriculum on traumatized students (Bender & Sims, 2007). Perhaps the isolation of COVID lockdown gave me the amount of time I needed to pay attention, inspired by *Songs in the Key of Healing Hope: Listening as Soul Care* (Lake, 2021), I reconsidered my place on this planet and in the school system. I spent days in the peacefulness of my backyard digging in the garden and listening to the birds. I took the time to notice the benefits of the natural world and make connections throughout my life. As I look back, I realize that I have always relied on nature to find peace, balance, and safety. This inquiry was ignited after researching the *Curriculum of Nature* as outlined by John Amos Comenius (1673/1901) in his *School of Infancy.* His philosophy of nature studies wades deep into religion but focuses on a holistic view of education and learning from our surroundings. As a very young child my happiest memories are of climbing the redbud trees in the backyard. I can clearly remember the fresh smell and gritty texture of the mud while creating magnificent mudpies with rocks and feathers for decorations. The smell of tomato blossoms conjures my Nonna to my side, pointing out which fruit to pick for the sauce and which to leave for later. The

shade from the fragrant eucalyptus tree on the side of the house was the most tranquil hiding spot on the property and I often brought branches into the house.

My childhood abruptly ended at the age of seven when my father unexpectedly passed. With five children under eight years old, my mother quickly remarried a violent man with two children and my new life was filled with terror. I found safety and solace in the woods and parks around our new neighborhood and took the long way home most days. Still interested in how traumatized students learn but understanding the role of the Institutional Review Board (IRB), I moved away from researching children. Furthering my stepfather's control, my family moved onto a farm, seven miles beyond the city limits. The isolation was overwhelming, but I found connections with the animals and the soil itself. This experience led me to research the effects of isolation on curriculum (Davis, 1987; Novotney, 2019; Noordegraaf-Eelens, Kloeg, & Noordzij, 2019), but I did not have a clear idea as to how to go about this. On the farm, I taught myself how to survive mentally by watching the plants and animals in the bitter cold of Ohio's winters and the blistering sunshine during the summer harvest of alfalfa. I watched and waited patiently as leaches fell off my calves after walking the horses through the spring fed pond to cool off. I grew empathy watching ewes mourn the stillbirth of a lamb and dependability waiting for foals to fall. I learned how to remain calm and keep others calm while struggling to pull calves. Oh, and I learned the 'facts-of-life' in the spring when Quarter horse and Appaloosa studs were brought to our pastures in exchange for our Santa Gertrudis bull. I yearned for the sheer joy of being alive while watching goat kids jump on everything, including each other. The years spent on the farm were filled with the most valuable lessons of life when I was able to pay attention. I next considered how we build resilience in our students (Duckworth & Quinn, 2009), but then

the world decided that educators should stick to a script written by parents, and that seemed like an impossible task to complete in five years.

Not too long after my high school graduation I joined the U.S. Air Force, married, gave birth to twin girls and followed military orders around the country. Each move allowed me to experience nature in its seasons of beauty, grief, and renewal. As you look outside you may see a lovely tree or peaceful body of water, but in fact, a multitude of processes are taking place just beneath the surface. These processes are opportunities for connections for humanity and especially our children. Having known nature as a child, I was determined to ensure my own were able to create the same relationships. Fort Ord in Monterey, California (mapped in the QR code, figure 1.3) was the most unique duty station we shared. Weekly we would load the kids and dogs in a large kayak and 'clean up' Monterey Bay. The sea lions were curious about the dogs and greeted us with toothy barks. The puffins that migrate through the bay in the summer have no fear of humans and allow close views on the jetties. The Monterey Bay Aquarium Research Institute held monthly whale watching tours with research scientists; on these days I pulled the girls from school to see what is only possible from a large vessel with expert trackers. They were able to ask questions all day to leading researchers in their fields. Their inquisitions, although I am sure annoying at times, spurred conversations that may have otherwise been overlooked as too basic. Fort Ord was decommissioned in 1994 and returned to nature and the animals quickly followed. It is now a state park and the dunes have been converted to a trail system. There were days the students were not permitted to play outside due to a bear or mountain lion or a rafter of turkeys on the playground. This was the perfect

Figure 1.3, *Map of Monterey, California*

opportunity to learn about these animals and their habitats, but the teachers went on with their state mandated curriculum, unable to adjust for learning opportunities under the State School Board of California's educational rules and constricted timelines. I knew they felt constrained by their curriculum when notes came home in book bags that said, "Please ask your child about our visitors today, they can find books on them at the local library". I considered researching State Boards of Education or the Department of Defense Education system and how military children are treated as unnecessary appendages (Buddin, Gill, & Zimmer, 2001; Engel, Gallagher, & Lyle, 2010), but then I would have to work with the IRB from Georgia Southern and the military's version of the same institution. After a little research, I found that the military does not permit any research it does not initiate or fund. It was at this point that I decided to avoid the IRB altogether and conduct theoretical research; I was still considering isolation but also realizing how valuable nature had been to my survival and sanity.

We were able to spend three consecutive years at Fort Carson, in Colorado Springs, Colorado and took full advantage of year-round access to the Rocky Mountains and the foothills. This is where I was able to teach my girls to respect nature from the fragile lichen to the apex predators, who are not humans. They learned to make loud noises on the trails and leave no trace behind. We helped clean up after windstorms and flash floods and planted trees after wildfires; they were taught by strangers that this is every able person's responsibility. They heard from others that blame and fault do not serve to heal the Earth and to focus on what they could contribute. We watched the sunrise every morning on the mountains and grew to appreciate the time it took to the sky to transition from orange to blue. Having remembered this, my focus narrowed to what I could access and what was immediately at risk.

After a few years in Colorado, we headed to Florida where the girls learned to fish in fresh and saltwater. They hunted for shark's teeth along the coast and fossils in the bed of the Peace River in the dry season. On one kayak trip up the Myakka River, we noticed a bull shark stalking us; at least 10 miles from open water this was not unheard of but was unusual. Although exciting, it became an opportunity to practice calm and steady behavior and speaking while under duress for all of us. One winter, we traveled to the Crystal River to swim with the manatees huddled up for warmth in the 72-degree water released from a nearby nuclear power plant. Water became the focus of our life in Florida; these memories contributed to seeking out water for our retirement home. Water is again central to my life. Living on the Savannah River, I am greeted daily by the sound of hawks, buntings, and frogs. As the sun rises, the riverbanks often fill with fog for the first hour until the sunshine evaporates the mist leaving behind a new River every day.

From Florida we soon transferred to the Washington D.C. area where we learned together to navigate the public transportation system. We spent our weekends at the National Zoo, National Botanical Gardens, and the Smithsonian Museum. Before we could visit the entire museum, our time in the area was cut short by the events of September 11th. My husband was deployed within weeks, and we were transferred to Fort Gordon in Augusta, Georgia. For at least the first year of the doctoral program at Georgia Southern University I wrestled with addressing the many moves of military children and describing them living in 'exile' (He, 2010). It was difficult to let go of this idea as I had already committed many hours to researching.

We had no intention of calling the South our permanent home; however, the proximity to the Atlantic Ocean and Appalachian Mountains held us in place. Once I started coaching the local Cross-Country team, I discovered a multitude of trails around Georgia and was able to

make the time to hike after the end of the season. I found a few dense patches of woods and swamps near my home, as well as a large lake created by the Army Corps of Engineers in 1954. While reading about exile communities, I happened upon an article on forest bathing and nature therapy (Hansen, Jones, & Tocchini, 2017) and knew I was on the right path. As a newly minted River resident, I spend my free time learning the rhythm of this River. As our home was being built, my dearest friend's daughter, a former runner of mine, was diagnosed with Acute Myeloid Leukemia and given less than a three percent chance of survival. I visited daily and watched her body dissolve; she reminded me to go outside and run in the woods for her. When we hugged, she would smell my hair to see if I was in the garden that morning. Quickly she was so fragile that she was not permitted to eat fresh fruits or vegetables and could not have any plants in her room. As she appeared to succumb to the treatments, I was asked to shower and wash my hair before I came so I would not accidentally bring pollen into the room. It was then, out of desperation, I began my Bloom of the Day project. I sent a photograph or video clip every day to Mary Catherine (MC) to remind her of the beauty and peace that awaits her outside of the sterilized walls of her room. I am still sending them; in September of 2023 she will reach five years in remission. She reminded me how important that simple daily act was to her. I realized then that we have turned nature into a scientific study and disconnected ourselves from its inherent value to our lives. This tiny seed of a thought led me to this research.

I could have read about resilience, patience, tenacity, responsibility, citizenship, and many other lessons in a text, but I learned them all from participating in the world of nature. By witnessing and living it, I was able to absorb, practice, learn, and teach my own children. My life experiences are evidence that nature education, specifically our responsibility to nature studies, can and should integrate the students' lived experience. Those of us who have been paying

attention have learned more than we know; it goes unnoticed until we are invited to recognize our connections to nature. Ecology and Earth Sciences will be enriched by a multidisciplinary approach that includes qualitative methodologies with the purpose of growing planetary citizens. I practiced this multidimensionally to discover new methods of application. I imagined that some of my ideas would translate well into an integrated project and others would not. I intended on including all the work produced, even if it appeared to be disconnected, so that others could consider my ideas and perhaps add nodes to this rhizome. While much of the work is seen in chapter five, there are many pieces of art that are not included in the publication solely due to the amount of space each takes up digitally.

Review of literature, Theoretical Frameworks, and Philosophy

Comenius' *Curriculum of Nature* (1673/1901), while intriguing, is a narrow religious path and I was looking for something holistic that was neither religious nor pure science. I found ecopedagogy while looking for an environmental curriculum that focused on responsibility and human connection to nature. Having already researched the benefits of forest bathing and a strong scientific background, I knew my theoretical framework needed to include but not be limited by science. Ecopedagogy is inclusive of science, philosophy, history, culture, politics, economics, and many other factors. During Candidacy Exams, I was advised to investigate Gaia Theory and Bruno Latour's ideas on the connections between science and art. The combination of science and philosophy, in Gaia Theory, captured my interest and I continued down that path. As I added nodes to my now extensive rhizome, I pondered what else could possibly reveal itself.

Gaia Theory

First conceived by James Lovelock in 1972, the Gaia hypothesis sought to explain how living organisms form a symbiotic relationship with the abiotic factors of the environment. He later published his ideas in *Gaia: A New Look at Life on Earth* (1979). In his text, Lovelock proposed that Earth could be viewed as one large living system that self regulates and seeks physical and chemical homeostasis. Even though Lovelock was a respected chemist who worked with the Jet Propulsion Laboratory designing experiments to look for evidence of life in the atmospheres of other planets, his theory was dismissed by his peers. He blamed this dismissal on the name of his theory after the Greek Goddess of the Earth - this did not help his cause. His peers felt the theory was emotional and religious based on the name only. It was not until Lynn Margulis (1999), a microbiologist, joined his team that scientists took note of the possibilities within the hypothesis. Margulis' expertise in microbes and their effects on the environment helped to explain how the atmosphere, hydrosphere, and lithosphere are interconnected by 'set points'. In her book, *A New Look at Evolution*, she explains the mechanism of homeostasis by the biota on this planet and how each unknowingly contributes to the balance.

Once multiple predictions of Lovelock's were found to be true: Mars is lifeless (1988), biogenic gasses transfer elements from the ocean to the land (1971), forests are a part of global climate regulation, climate regulation through cloud albedo linked to algal gas emissions (1987), oxygen has not varied more than five percent over the past 200 million years, and many other examples, the scientific world began to pay attention to Lovelock (Harvard, 2020). Gaia Theory is now taken into consideration within philosophical, academic, and environmental science circles. While the Gaia hypothesis is now accepted as a theory, it is fully understood by very few scientists who work in isolation with single variables. One unnamed scientist called it

Copernican waiting for its Newton (Hamilton, 1997) - it is still waiting. Gaia Theory is a node of this rhizome that allows the reader to consider ideas that are not fully understood but serve a purpose to lead to other understandings, this is an accepted practice within the 'precautionary principle' (O'Riordan & Cameron, 2013).

The Rhizome

The purpose of this research is to tell the story of the middle Savannah River using an ecopedagogical framework. To generate innovative discourse, I integrated non-traditional components by employing the principles of the rhizome metaphor as outlined by Giles Deleuze and Felix Guattari (1988) in *A Thousand Plateaus: Capitalism and Schizophrenia.* A rhizome is antithetical to the tree in nature. Where the tree has a distinct trunk that leads both vertically to the leaves that produce the energy for growth and towards the roots that sustain and anchor the tree, the rhizome has non arboristic entry and exit points. Any point in a rhizome is in a state of in-between, constantly seeking the next node. Although the Savannah River may appear linear it is just a thread of the much larger rhizomatic water cycle, watershed, and water regime. The rhizome resists chronology: Although it is possible to identify the older and younger nodes by their number of connections, it serves no purpose for each node is of equal importance. The Savannah River is no more important than any other body of water on this planet; it is my focus due to its accessibility.

Giles Deleuze was one of the most prolific French philosophers during his lifetime (1925-1995), he focused on multiple targets throughout his career but remained strong in his rejection of Heidegger's proposal that metaphysics has met its end (Villani, 1999). As a self-proclaimed metaphysical philosopher, Deleuze wanted his readers to be challenged intellectually to the point of being uncomfortable. It was his belief that it was in this space of discomfort that

transcendence was possible (1968). Further neurological research has shown that a state of perturbation can foster innovative thought. As a scientist, I practiced this discomfort by not relying solely on science to reveal the River. Deleuze was introduced to Felix Guattari in May of 1968 as French academia was rebelling against the government's response to civil unrest. They worked and wrote together producing multiple texts integrating nature, geology, biology, psychology, and cultural systems. It is from this synthesis that the rhizome metaphor evolved.

The metaphoric rhizome of Deleuze and Guattari has six basic principles with which it is characterized. Principles one and two, connectivity and heterogeneity are inseparable, the authors describe the relationship as "any point of a rhizome can be connected to any other and must be" (Deleuze & Guattari, 1988, p. 7). These apparent random connections increase diversity and therefore, the health and resilience of the rhizome. Deleuze and Guattari were adamant about the need and nature of connectivity for the survival of the rhizome. The desperation in the quote is clear in the tangible need for survival. The physical rhizome, the root, the radical, must have a life to which it delivers nutrition. This is true for the brain, thoughts, humanity, the spirit, and all other objects that have a life force. It also appears true for abiotic entities. Weather systems do not exist without the Coriolis Effect and seasons do not exist without the tilt of the earth. Water is not distributed throughout the planet without a variety of connections; for that matter, drought does not occur without new associations or developments. Lovelock would suggest that each of the non-living entities is affected by and affects the whole of Gaia. Ideas, human, and other living beings in isolation serve no purpose and soon wither away, but those with connections, even distant, harmful, or tenuous connections survive. I explored the heterogeneous intersections that contribute to the stress and success of the middle Savannah River and to the systems that

rely on it. I intended to reveal how the connections to the area and the ruptures have affected the River and the region as a whole. These changes are evident on the canvas in chapter five.

The third principle of the rhizome is that of multiplicity. According to the definition created by Deleuze and Guattari, "it is only when the multiple is effectively treated as a substantive, 'multiplicity', that it ceases to have a relationship to the One as a subject or object… A multiplicity has neither subject nor object, only determinations, magnitudes and dimensions that cannot increase in number without the multiplicity changing in nature" (1988, p.8). This study illustrated multiplicities that are only possible in this place and this space at this time. The intersection of the River, the people, the other biota and abiota form unique connections that are individual assemblages. I am interested in what wonders we take for granted simply because we have forgotten the beauty that surrounds us daily. I also questioned who lives nearby yet does not have access to this River or has been displaced by 'progress'.

Further evidence that multiplicity lies in relationships or the space between connections of the rhizome and is dependent upon freedom is found in the reading of Paulo Freire's (1996) *Pedagogy of the Oppressed*. In it he discusses the power of fear to overwhelm and hold captive not only the oppressed but also the oppressor. He recognized that love is more powerful, "Why deny it, I was afraid of freedom, I am no longer afraid" (1996, p.19). Although he is appealing to the masses to lean into love and let go of fear, he is attempting to create rhizomatic connections that will allow his people to unchain themselves. I bring this into the research as further justification for focusing on the beauty of nature. It is not necessary to incite environmental fear to instigate others to notice and care for the world around them. Freire found that even when the system officially breaks down those who are accustomed to oppression will seek the safety of what they know. Freire taught the responsibility of "learning to perceive social, political, and

economic contradictions and to take action against the oppressive elements of reality" (Freire, 2020, p. 4). Freire deeply believed that education should increase humanity and should be available to all who seek it. In his later works, he acknowledged that critical theory was limited in scope to class and social issues that did not include sustainability or environmental matters. His work was continued posthumously by his wife who published his acknowledgement of the multiplicity each human forms with nature and each other forming unique connections (Freire, Macedo, & Freire, 2015).

As I kayaked down the middle Savannah River, I was creating new multiplicities with the land and the water and the living beings of the water. The sound of my ore dipping into the water reverberated into the reeds, the pedals and rudder disturbed the flow of the river in new ways. I have already noticed that the ospreys closest to my home use my kayak as a hunting partner and are often successful at catching fish after I pass through. The cormorants and egrets are slowly growing braver around me. Although I know the course of my trip, many unknowns lay along the path ahead.

Unarguably the dams along the Savannah River have caused ecological problems, but they have also created multiplicities. The dams may also be the most literal representation of principle four: Asignifying rupture, "a rhizome may be broken, shattered at a given spot, but it will start up again on one of its old lines, or on new lines" (Deleuze & Guattari, 1988, p. 9). The flow of the River remains in the shadow of its natural course; the multiple dams have ruptured nature's lines, but the flow continues. In some areas the River has found new paths, in others it has evolved in a predicted manner, in yet other areas it floods for reasons not understood by the geologists and engineers. What is most interesting to me is the creativity that asignifying rupture allows; biologists would call this diversity a necessity of success. The communities and the River

have designed new ways to succeed, those designs not only built multiplicities but also continue to build relationships between nature and those who depend on it. One must consider the implications of those new relationships from multiple perspectives.

Without using the same terms as Deleuze and Guattari, Donna Haraway refers to this separation at unnatural joints as a disruption when she expresses concern for the growing body of scientific knowledge and how it has been obtained and integrated into society, "...struggles over an equally new and disruptive technoscientific object of knowledge, namely 'life itself.' Life as a system to be managed…" (1997, p. 174). Haraway questions our ability to manage life, knowledge, the Earth, our own beings, and species, and goes on to question how the understanding of science has manipulated its way into all other aspects of life. It is important to restate that the scientific lens was employed throughout this investigation as a node in the rhizome; it was not considered more valid or more important than any other lens. Using Haraway's writings as a warning against positivist, essentialist, scientific research, I introduced information gathered through a variety of modalities to better understand the nature of this portion of the River.

Principles five and six, cartography and decalcomania, could be addressed individually as principles of the rhizome; however, together they create a multiplicity and are a more effective tool for learning. Deleuze and Guattari do not define either principle but rather, describe them in relation to each other. "The rhizome is not amenable to any structural or generative model. It is a stranger to any idea or genetic axis or deep structure... it is a map and not a tracing" (Deleuze & Guattari, 1988, p. 12). I practiced the principles together throughout my methodology as I investigated the factors that created the River community. My artwork added new layers onto the map of the historical and current flow of the River. In art, decalcomania is the practice of tracing

or layering decals and the applique of clay or material on a base structure. It is an ancient art that Deleuze and Guattari adopted into the rhizome to describe how information can be layered onto older information recreating the map of knowledge and relationships. In the fictional story of the cartographer, T.S. Spivet, the young man explains the value of his maps. “A map does not just chart, it unlocks and formulates meaning; it forms bridges between here and there, between disparate ideas that we did not know were previously connected” (Larson, 2009, p. 138). These words of the author, through the voice of a teenager, have the wisdom of an elder with the optimism of youth. It is a connection that is unexpected and disjointed. I used modern and historical maps of the River to display the ruptures and decalcomania that have taken place since the area was first noted in historical texts. Most of the changes were made by the U.S. Army Corps of Engineers; however, changes were made with the permission of the powerful at the expense of those without power - including the River. Taking the River’s social power into consideration is a ‘line of flight’ I adopted for this research; this allowed me to take an opportunity that is unavailable if I only considered the River as a simple resource.

An interesting conceptualization of the rhizome is the “lines of flight” (Deleuze & Guattari, 1988, p. 89) and the freedom of thought that it not only permits but encourages. As I delved into various aspects of the ethnographic process, created art, and conducted the kayak expedition, I expected to follow original lines of flight as well as well-worn paths. This a/r/tographic (artist, researcher, teacher) immersion allowed me to become a participant in the culture of the River. It is this immersive experience I hoped to share with my readers. Bruno Latour (1996) focused his work on nature on the relationship between the natural world and cultural/social worlds. As one of the originators of the Actor-Network theory (ANT), a type of rhizome, he thought that everything was in a constant state of flux. Latour’s concept of flux

creates an original node for my rhizome as it is in concert with Lovelock's (1974) predictions of Earth as a self-regulating system seeking homeostasis. Practicing connection and asignifying rupture in every new situation, innovations occur. Challenging the European lens, Bruno defines non-human actors as equal participants to humans (2011), I integrated these points of view through the lens of ethnographic ecopedagogy.

Tenets of Ecopedagogy

Prehistoric, Paleoindian, and agrarian societies did not require an environmental curriculum because the hunters, gatherers and farmers only survived by paying close attention to the needs of the land and the Earth's circulatory system, the water cycle. They learned the behavior of clouds, predicted the weather, the behavior of plants and animals, and predicted the severity of seasons based on life experience. The onset of the industrial age and the decrease in human mortality rates forced many people to move into the cities for employment, as a result, we lost our connection to the land. The efforts of the Romantics allowed the population to revive their bond with nature without the backbreaking work, but the environmental damage continued in the name of profits and progress. My time spent on the farm included a Friday night pot-luck meal before the weekly grange hall meeting where every able-bodied person within a given area was expected to attend. Experienced farmers taught the younger ones which insects were affecting the crops and how to address the damage, when and how to spread compost and fertilizer, as well as many other ecological lessons. The elders worked out plans to share the cost and labor of expensive rental combines and whose children would help with harvest and plantings. All our farms were less than 100 acres where neighbors depended on each other. Once industrial farming was introduced to the area those of us with family farms were on our own and

many farms were forced to sell, including ours. My connection to the soil was severed and we moved into town.

The modern concept of environmental education grew out of the first Human Environment Conference in Stockholm, Sweden in 1972, but it was not until the Earth Summit in Rio de Janeiro, Brazil in 1992 that the foundational pieces and motivated people came together. Paulo Freire (1996), Henry Giroux (1989), Peter McClaren (1989), Shirley Steinberg (1998), and Joe Kincheloe (1998) had already laid the foundation with their work in Critical Pedagogy and Critical Consciousness, while Wendel Berry (1977/2015) kept agrarian life in the literature and shows like *Mutual of Omaha's Wild Kingdom* (Meier, 1963) held our interest on television. In primed circles, the field of Ecopedagogy diverged from Critical Pedagogy and became its own tributary within the Curriculum Studies discourse. David Orr (1992) and Fritjof Capra (1983) added a layer of ecoliteracy onto the concept of the planetary citizen. With the multiple nodes connecting to form the framework of the seminal text by Francisco Gutierrez and Cruz Prado (1999) *Ecopedagogy and Planetary Citizenship*. Since that publication Chet Bowers (2002) has been consistently writing about ecojustice, reminding the reader to be wary of the unavoidable hegemony that is interwoven in globalization. Richard Kahn (2010) and many others have added to the depth and direction of the field. Writers continue to practice ecopedagogy; Ted Toadvine's (2009) contemporary environmental philosophy intersects with phenomenology, as "a richer, multifaceted philosophical investigation of nature" (p. 6). His work and many others continue to advocate for the wellness of the Earth through a critical yet optimistic lens that "lends support to the hope that there could actually be, at least in philosophical terms, a viable and productive response to the ecology crisis of our times" (Toadvine, 2009, p. 255). I agree with this statement but also believe that there is hope in practice and not just in theory.

Chet Bowers and Richard Kahn have heavily influenced my research. As the most prolific writer in the field of ecopedagogy, Bowers has been publishing for over two decades. His warnings on the dangers of globalization and industrialization strike out against progressives and align with my own belief system. Bowers, and I, are wary of the exponential growth of technology. It is yet unclear as to the extent and damage by assimilation that has already occurred by other cultures. What is known is the vulnerability that arises when diversity is lost in culture, nature, and society. Bowers clearly warns against the Westernization of the world as our codes are propagated throughout the internet. Chet Bowers is as heavily invested in the education system as I am; he stated the need to teach our students to think in an ecological intelligent way…thinking in terms of relationships and their connectivity while maintaining focus on awareness of the present (Bowers, 2010). He has also clearly reminded his readers to value the knowledge of the past, "ecological thinking also has other characteristics. These include an emphasis on understanding the history and diversity of cultural influences on events" (Bowers, 2010, p. 13). I continue to read the work of Chet Bowers to gain a fuller understanding of his knowledge, but insofar as I have read, we share the same beliefs. I depart from Chet Bowers in my optimism. His work is generally cautionary and focused on the negative aspects of the mistakes that have been made without attention given to the lessons learned from those mistakes.

Richard Kahn, on the other hand, is more hopeful that humanity will find a way to remediate the damage from past mistakes and educate our children not to repeat them. Kahn is nearly as prolific as Bowers but focuses on the possibilities. His work with teachers in the classroom keeps him grounded. I believe that it is this connection to children and the profession in action that allows him to remain hopeful. He is fully aware of population growth, industrialization, resource exploitation and extinction events, yet remains focused on what can be

done. His optimism matches mine; we are choosing to remain positive and work on the future. In his *Critical Pedagogy, Ecoliteracy, & Planetary Crisis: The Ecopedagogy Movement* (Kahn & Kahn, 2010) Kahn states, "educators are already doing good work…worthy of exploration by those concerned with educating for sustainability" (p. 15). The fact that he acknowledges the effort that is already taking place in the classroom makes me appreciate his writing even more.

The implications of ecopedagogy are influenced by authors and philosophers. Of the utmost importance to Freire (1968) was the decolonization of science while Gutierrez and Prado (1999) sought the recognition of the global citizen. Moacir Gadotti and Angela Antunes (2005) cite the Earth Charter's principles of ecological design and applications as a framework for all nations as indigenous and spiritual leaders focus on the world's acceptance of interdependence and our investment in relationships between community, ecology, and culture. The decolonization of science remains at the forefront of my exploration. I focused on international research, not limiting myself to Western concepts, and historical documents that include the Native Americans from the region. I also actively sought out indigenous knowledge and female voices to balance the heavily white male dominated literature. I hope that introducing aesthetic methods into this scientific investigation adds to the decolonization of the material and makes it accessible to a greater population. I have referred to a variety of works by Bruno Latour throughout this project; however, *Waiting for Gaia: Posthumanism in Art and Science* (2011) is especially influential as I believe it contributes to the decolonization of science as well as aesthetically responds to cultural and environmental challenges. Latour is one of the few authors who validates and connects artistic responses to global science issues. The Earth Charter was written with extreme care and is woven throughout my research. I have also begun to incorporate

it into class projects. While those projects cannot become a part of this dissertation, I do have plans for further research and possible publication later.

Ecopedagogy has moved into the mainstream in the last decade as climate change and the scarcity of natural resources has reached more affluent areas. Contemporary Curriculum Studies scholars (Bowers, 2001; Kahn, 2007; Jardine, 2000; and others) call for the development of a critical understanding of cultural assumptions with special attention paid to industrial and consumer dependence. They remind us that both language and metaphor need to reflect the reality of the current crisis. Where theorists recognize ecopedagogy as an assemblage of phenomenology, science, realism, idealism, perception, and intellectual consciousness; the practitioner recognizes the need to find a balance between self-sufficiency and consumerism without losing intellectual capital. Obviously one study will not fully dissect all these implications; however, I did attempt to address each while attending to the main tenets of the theory. For decades, ecopedagogy was considered an idealistic utopian project with the goal of building relationships between humans and the environment. Most environmental education curricula are anthropocentric; however, "ecopedagogy is based upon a planetary understanding of gender, species, kingdoms, formal, informal, and non-formal education" (Antunes & Gadotti, 2005, p. 136). The central dogma of ecopedagogy includes sustainability, biosensibility, the ethic of care, and pedagogy of place. In many ways ecopedagogy is based on Gaia Theory without naming it specifically. Each tenet will serve as a node in the rhizome that will be revealed throughout this investigation**.**

The term, sustainability, has become common in our language. It has been adopted by corporations in their advertising to attract more environmentally conscious buyers to make them feel justified in their consumption. This is not the intention of sustainability in ecopedagogy.

First and foremost is the awareness of the difference between wants and needs at the individual level through the global level. The *Earth Charter* (2000) states the definition as a goal to "adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being" (retrieved from earthcharter.org, 23 June 2022). Although ecopedagogy presented years after the death of President Theodore Roosevelt, he was keenly aware of the need to protect the Earth's natural resources for the future. Roosevelt created the national park system and personally saw that over 200 national forests were placed under permanent protection. This was done by sacrificing Indigenous lands and culture. An honest look at the President's influence on the Native Americans is available in his many biographies; however, that is not a focus of my study. His effect on the non-human world is my focus as it directly impacts the storyline. Teddy Roosevelt was strongly influenced by some of the Romantic authors and artists that will be addressed in the methodology section within chapter three.

Many contemporary writers are dedicated to the preservation of Earth; however, few fall directly in line with the framework of ecopedagogy. Angela Antunes and Moacir Gadotti (2005) have written extensively together and independently on sustainability and sustainability pedagogy. Christina Marouli (2021) entered the field in the last decade and is focused on the integration of sustainability in the environmental science curriculum, while Stefan Grigorov (2009, 2011) has recently entered the field as an advocate of peace studies as they intersect with sustainability education. His interest in Green Theory as a means of dialogue is shared with Maria Norat, Alfonso Herreria, and Francisco Rodriguez (2016). Each of the authors/activists cites Fritjof Capra (1983,1996, 1997, 2004, 2010, 2014) as a major contributor to their understanding of the cycles of the Earth and the fragility of its resources.

The delicate equilibrium of Earth's systems went unthreatened by humans for over four billion years. It was not until the Industrial Revolution in the 1700s that our species began to do more damage than could be repaired naturally. While the Curriculum of Nature can be traced back as far as John Amos Comenius (1592-1670), a philosopher and theologian from what is now known as Czechoslovakia, it was neither taught nor practiced in industrializing nations. In some references, Comenius is considered the father of modern education and it is widely accepted that Maria Montessori was impacted by his experiential approach to the education of children (Cubberley, 1920; Kilpatrick, 1914; Lang, 1965; Peltzman, 1998). The value of experiencing nature while young is central to developing biosensibility; however, during the Industrial Revolution children were pulled out of school to work in factories. Biosensibility is the ecopedagogical equivalent of biosensitivity with one caveat; biosensitivity is a way of living respectfully of the other living species in the ecosystem (Tait, 2018) where biosensibility includes the entire planet and the non-living members. Biosensibility is a spiritual component of ecopedagogy that requires the practitioner to embrace the value of the planet as a singular entity.

Indigenous American and Australian peoples are considered biosensible due to their appreciation of the non-living members of their communities (Schweninger, 2008). In *Sand Talk* (2019), Tyson Yunkaporta walks the reader through the impact of the land and water on his community and culture. In *Other Destinies* (1994), Lewis Owens, a Choctaw and Cherokee, states "Native American writers are offering a way of looking at the world that is new to Western culture. It is a holistic, ecological perspective, one that places essential value upon the totality of existence, making humanity equal to all elements but superior to none" (p. 29). Aldo Leopold's (1949/1989) *A Sand County Almanac* outlines how to recognize and care for the land and water as if they are a living part of the ecosystem. Leopold's *Land Ethic* (1949) is globally recognized

as a holistic approach to wilderness management and still referred to today by conservationists and foresters (Wohlleben, 2016). The Druids, Buddhists, Wicca, and Pagan religions all refer to the Earth, wind, water, and fire as contributing and cooperating members of the planet. Religion is often a divisive factor that prevents outsiders from listening to other points of view, but the artwork from a religion is much more accessible to the 'othered'. Knowing how valuable visual information can be, the Romantics invited viewers and readers to visit their versions of nature. Many environmental writers include works of art in their writing in order to reach non receptive readers in a less aggressive manner. Yunkaporta includes a personal work of art and its origin as the introduction of each chapter. This piece of him shows that he is willing to open up to his readers and invites them to do the same.

The Romantic movement was an artistic response to the Enlightenment in Europe. These acts of biosensibility were presented as a return to nature in art and literature. The works produced were deliberately created to build emotional connections as they centered around the beauty of nature. Henry David Thoreau (1854) authored a simple story about the pond he dearly loved, and John Muir (1874) wrote a series of articles about the Sierra Nevada Mountain range eventually resulting in the creation of Yosemite National Park (1890). Although Ralph Waldo Emerson was writing about nature at this time, he is not considered biosensible due to his belief that nature's purpose is to serve the needs of man. In his poetry, it is evident he appreciated it for its inherent beauty but did not see the Earth as having its own value. Today's biosensible writers fall under the umbrella of Romantics for their focus on beauty towards the goals of conservation and protection. Wendel Berry, a poet, is well known as an agricultural conservationist and activist. He began publishing in the 1960s and continues to this day. Berry's collection of over 200 writings includes those focused on the tenuous relationship between humanity and nature.

His convictions are evident in his calls to action to protect the Earth while learning to work within the natural systems, but he always reminds the reader to slow down and enjoy what nature has to offer you right now. As a professor he has influenced many of his students, Rebecca Martusewicz (2001), a well-respected environmentalist in her own right, has written extensively on the topic of ecojustice. Her work covers both tenets of biosensibility and the ethics of care through a traditional feminist lens.

The ethics of care is an umbrella term that includes ecojustice, ecoliteracy, education and critical consciousness; in some references it also includes critical geography. In 1994, Lewis Owens reminded his readers that “humankind [has a] crucial responsibility for the care of the world we inhabit" (p. 29). This care is not limited to any species or system. Ecopedagogical care is shared equally between living and nonliving. The soil and water must be cared for so that the living species dependent upon them may also thrive. This care extends into the social justice arena, as the poor are most often disposable and ignored. Their lack of power and protection exposes them to a plethora of environmental dangers. Peter McLaren is among the earliest writers to include environmentalism within the field of Critical Theory and Critical Studies. McLaren (2013) acknowledges the power inequity among the social classes as a critical issue that contributes to the demise of the health of the planet and humanity. In 1985, William Gibson, a theologian, connected ecology to justice in one of his writings on preaching. He continues his work in the ethics of care; however, more focused on religious aspects. Having not inspected each reference for all of Chet Bowers’ works, it is unclear to me if he was influenced by Gibson. However, for the last two decades and still today, Chet Bowers (2001/2022) has been a leader in the ecojustice arena, publishing nearly every year. Prior to this century Bowers was simply an

environmentalist, but the development of internet and satellite technology, and recognition of ecojustice set his contemporary trajectory into ecopedagogy.

Richard Kahn (2010, 2011), David Jardine (1999, 2000, 2012), and Jackie Seidel (2016) write on ethics, morals, and love for the environment while addressing how these issues can be included in the praxis of education. I appreciate that they are not afraid to use emotional metaphors to gain the attention of the reader. Their goal is to incite compassion towards the Earth. While they are not cited directly in chapter five, collectively they have given me permission to express myself emotionally in the findings. Helen Kopnina (2020) took ecopedagogy and the ethics of care into the business world with her article in the *European Journal of Sustainable Development Research*. Although this is a field of interest to me, I am choosing to limit my scope to the local area and its economy. Murray Bookchin (1982) observed the network of social ecology and hierarchy that has converted the Earth and its inhabitants into exploitable resources, by using the pronoun 'it' he recognizes how easily we buy and sell the commons. The use of the word 'it', is addressed in chapter four of this research; you may find that I have gone to great lengths to avoid the use of the word 'it' when referring to the River. Focusing on the exploitation of resources and people are two women with feminist foundations and the ethics of care as their respective platforms. For the last two decades Gretta Gaard (2008) has focused on children's literature and how the natural world is presented to young minds, while Vandana Shiva (1981/2022) has spent a lifetime disrupting the agricultural and energy industries internationally while fighting for the protection of Earth's natural resources and its inhabitants. Both women are highly respected in their fields and even considered threatening to the world's economies. Shiva has been placed on watchlists by multiple countries for inciting words that

bring people to action to protect their crops, water, and soil from globalization and corporate market economy systems.

While Vandana Shiva (2001) includes herself as a global citizen, she considers globalization the path to the incorporation of the planet (1999). This balance between global citizenry and globalization is precarious and addressed within the tenet of pedagogy of place. The acceptance of the entire planet as one's place is central to ecopedagogy and Gaia Theory. This precept has evolved with technological advancements, but technology also has an antagonistic relationship with humanity. The internet makes information available at an instant but creates false associations and is easily manipulated. The consumer rarely knows the motivation of the source of the information and must dig deep to discover the validity - this breeds fear and isolation. Prior to the internet, information was more difficult to access, but was also vetted and perceived as truth. Nowadays, few sources are considered trustworthy. As I finalize this dissertation, Artificial Intelligence is breaking into the K-12 classroom and educators are discouraging its use. We may even revert to paper and pencil to ensure authentic work is done by our students.

Those in attendance at the first Human Environment Conference in Stockholm, Sweden in 1972 could not have imagined a world so connected but they did dream of one. Heavily influenced by Paulo Freire, Moacir Gadotti (2011) was developing his theory of integral ecology during that conference. It took many years for him to publish these ideas, but they included the water cycle and molecular cycles as they passed through the Earth's systems. He continued to write about topics within ecopedagogy throughout his career. Now, in his 80s, he is editing for others. Gadotti's focus on place was limited to Latin America but included all members of the community. He was one of the first authors to consider a cosmic or planetary framework that

evolved away from the anthropogenic viewpoint. By 1992, the Earth Summit: United Nations Conference on Environment and Development in Rio de Janeiro, Brazil attendees were aware of the environmental haves and have-nots. Geopolitical and socioeconomic environmentalism became pivotal issues. As industrialization spreads throughout underdeveloped nations the disparity between the classes increases. Those with the means move to areas with safe land and clean water while those without are destined to live with the remnants of industrialization. This often means pollution of the water, air, and soil. Within a decade the internet would reveal these inequities to the world, but consumers were already jaded and doubted the veracity of the information. Some authors responded with texts that were limited to their own communities. Rhonda Davis (2013) and Mustafa Eryaman, Emel Okur, Zeynep Cetinkay, and Selcuk Uygun (2010) are just a few examples of writers who pulled back to focus on their own communities. While others like Geoffrey Lummis (2002) and Greg Misiaszek (2015, 2017, 2019) continued to work toward building responsible global citizens through education and activism. My research will include a very small region of the Central Savannah River Area (CSRA) that spans a 30-mile stretch of the Savannah River. I neither have the time nor the means to address the entire watershed area, much less the water regimes of the southern United States; however, there is room for further studies of these regions in the future.

The tenets of ecopedagogy serve as a framework for my research. Sustainability, biosensibility, the ethics of care, and global citizenship within the pedagogy of place connect rhizomatically throughout my investigation. These tenets were a touchstone as I applied multiple lenses to ecopedagogy, which has evolved out of critical theory as a result of the development of critical consciousness, ecoliteracy, scientific revolution and globalization. Now that more residents of planet Earth are gaining access to information as it is published, we can clearly see

the connections between how our behavior, knowledge, and lack of knowledge affect the health of the planet. Using ecopedagogy I hope to grow reciprocal relationships between humanity and nature that engage the reader and invite them to prioritize the protection of Earth's resources for the future.

Methodological Justification

Throughout the research I have applied new ways of learning and knowing. Questions that guided the research include: How do we understand milieu differently if we position the River as the teacher? What would be revealed about a community if ethnography were conducted on the River as the subject? How can the multidisciplinary exploration of ecopedagogy serve as an antidote to the positivism found throughout traditional scientific inquiry? How could the Savannah River be holistically understood if the River were considered a vital member of the community? Each of these questions addresses a section of the four commonplaces of education in an innovative way.

The writings of Joseph Schwab (1969/1978) resonate with me as a scientist, educator, curriculum developer and potential agent of change. His theoretical and applicable works have helped me develop a framework for my own research. Schwab's (1969) *The Practical: A Language for Curriculum,* describes the commonplaces of curriculum and how they should operate within the classroom. In 1971, he added the *Arts of Eclectic to The Practical,* including the use of creativity and as a constructive application of learning. By 1973, Schwab unveiled the "five bodies of the discipline of experience that must be represented when revising curriculum" (scalar.usc.edu., para. 6). In *The Practical 3: Translation into Curriculum,* the four commonplaces of educational thinking are defined as: "Affected learners, teachers, subject matters, and sociocultural milieu" (Schwab, 1973, p. 508). He added that a curriculum specialist

was also necessary and believed that each was inextricably connected to the others. It is Joseph Schwab's commonplaces that inform my chosen methodology of a/r/tographic ethnography. A/r/tography employs active participation of the investigator as the artist, researcher, and teacher. These three identities encompass Schwab's "affected learners, teachers, and subject matters" (p. 508). His sociocultural milieu is addressed using the ethnographic framework.

The basic structure of ethnography seeks to reveal a holistic picture of a community or a culture. I investigated the economic, political, geographic, social, and ecological factors that are primary to the middle Savannah River. My work included the River as the subject of ethnography and investigated the River as a potential teacher. Many ethnographies include the water resource as an object and the human members as the subject - I will treat them all as equal participants. Today, this area of the River provides theoretically free power and fresh water to over 250,000 people in the CSRA as well as supports a burgeoning tourism industry. Historically, fresh moving water was an ideal area to settle for agricultural purposes and later for shipping goods. Both timeframes were under investigation.

I addressed the fiscal value of the River as the commons, to the locals and to the states of Georgia and South Carolina as well as the current political issues affecting this area. I discussed the historical geography of the River and the physical changes it has undergone both naturally and at the hands of humans. There are multiple layers of social issues surrounding this portion of the River, including the impoverished homes without levy protection as well as a large homeless population that lives under bridges and survives by fishing. Small tributaries that originate in dense populations are leaching *e coli* bacteria into the River, while run off and pollution from flooding add to the degradation of the water quality. Invasive species have been introduced by international ships and endangered species are disappearing from the area. It may seem as though

150 miles upriver from the Atlantic Ocean would not be affected by infiltrating waters; however, this River is inseparable from the rest of the water on the planet.

Traditional scientific inquiry and science education is purposefully isolationist to uncover the variable that is responsible for change. While this may be a valuable tool for pharmaceutical testing or identifying a point source pollutant, it is not appropriate for the classroom or the curriculum. Science education as a whole, needs to be integrated into other subjects to provide a holistic understanding of the Earth's mechanisms and the role humanity plays in the destruction, protection, and remediation of Earth's bounty. Ethnography allows the researcher to integrate the social, economic, political, environmental, historical, and cultural aspects of a specific subject by immersion. There are risks and expectations attached to this type of research; reflexivity is employed to attenuate those risks. As with any inquiry of this manner, I immersed myself in the subject, the Savannah River. Although I neither had the time nor the resources of Darwin or Humboldt, I conducted my own expedition from the headwaters of the Savannah River to the New Savannah Bluff Lock and Dam, including three dams and a canal. I included visual representations of the expedition as data and created art to initiate connections and discourse.

A/r/tography is an "invitation to think through art making, researching, teaching, and learning…to create additional and/or enhanced meanings" (Irwin, 2021, p. 1). By working in the spaces between ethnographic topics, I attempted to rhizomatically build a more descriptive account of the vital role the middle Savannah River plays in the community. It was my intention to practice the artist-researcher-teacher relationship as an example for other educators and students to follow and adapt as necessary. A/r/tography has been practiced for a few decades as its own methodology; however, it is most often used in art and special needs education research. It has entered the classroom under the umbrella of STEAM (science, technology, engineering,

art, and mathematics) initiatives because curriculum designers have finally realized that creativity and imagination are critical to understanding and innovation (Greene, 2011). Unfortunately, the application of STEAM in my local education system is focused on meeting engineering and programming goals. Although artifacts are often used in ethnographic research, I have not found any specific examples where a/r/tography was used as a vehicle of ethnography. I have also found no evidence of a/r/tography being explicitly used on a body of water. I refer to the work and research of Rita Irwin (2009) and her student Pauline Sameshina (2007, 2019) throughout my a/r/tographic endeavors. Ethnography and a/r/tography as combined methodologies may seem incongruous; however, Deleuze and Guattari (1988) encouraged deep discontinuous connections, where the participants are not necessarily living beings. They look to the natural world to identify heterogeneity and possible relationships where others may not have even considered the thought. Diverse pathways and choices may sometimes be overwhelming, but more options allow for more opportunities to succeed; differentiated ways of acquiring information ensure more access to learning.

Structure of the Study

The first chapter of this study outlines the theoretical framework of ecopedagogy through the principles of the rhizome, as described by Deleuze and Guattari (1988). The multiple nodes include: Ecopedagogy, ethnography, and a/r/tography as methods of inquiry towards understanding the science behind the Curriculum of Nature as it applies to the middle Savannah River. The introduction includes my relationship with nature throughout my life leading up to my final decision to focus on ecopedagogy as an offshoot of my Bloom of the Day project. It threads the tenets of ecopedagogy into the science of ecology using non-traditional qualitative methods that address each of the four commonplaces introduced by Schwab (1973). This

research provides an antidote to the positivism found in traditional scientific inquiry and adds multidimensionality to aid in understanding the multiple perspectives of our natural world.

Using concepts from Curriculum Studies, I engaged the ‘four commonplaces’ (Schwab, 1973) and the ‘commons’ (Bowers, 2007) through a/r/tography (Irwin, 2013). I present a holistic view of the middle Savannah River as a subject rather than object within an ecopedagogical framework. Ethnographically, I followed the direction of Atkinson (2001) and Pink (2009) but focused on those researchers who have specialized in liquid ethnographic subjects (Wagner & Jacka, 2018; Rolls & Bond, 2017; Weir, 2009; Hviding, Mawyer, & Laning, 2018). Ultimately, I present a text as well as a visual, tactile, and auditory installation inspired by the Romantic tradition to reignite a sentimentality that could inspire a desire to protect the Earth.

In chapter two, I present each of the tenets of ecopedagogy as a node in the rhizome. Sustainability, biosensitivity, the ethic of care, global citizenship, and ecoliteracy are presented in an order that is not representative of any value system. Sustainability (UNESCO, 2022) is addressed first as it is used in common language and is most accessible to the reader. Sustainability is contrasted with hegemony and exploitation under the umbrella of social justice and described within the context of the ‘commons’, science, and philosophy. The second tenet, biosensitivity, is defined by Antunes and Gadotti (2005) as a method for understanding the lens of others including non-human and non-living participants on this planet. The ethic of care, tenet three, is presented through a philosophical lens of Romanticism as well as ecojustice. It is within the ethic of care that scientists must consider the ‘precautionary principle (O’Riordan and Jordan, 1995). The fourth tenet, global citizenship, is the most recent addition to ecopedagogy and is only possible due to the connectivity of the international community. It was introduced and instituted based on the writings of Chet Bowers (2001) and Richard Kahn (2010). This tenet also

addresses hegemony in power structures as well as the oppression of those without clear access to natural resources. Global citizenship introduces the River as a member of society with the same rights to protection as the living species that depend on the water that flows between its banks. The last tenet, ecoliteracy, was one of the first to exist within ecopedagogy. I present it last as a way to introduce ecopedagogy into the science curriculum and increase the breadth and depth of our understanding of literacy. After discussing the barriers to literacy, I introduce alternative literacy practices, including aesthetic literacy.

Ethnography and its components provide the structure for chapter three. In it, I outlined the history of the middle Savannah River and its inhabitants, including the non-humans. As the subject of the ethnography, the River is the central figure, and the nonconsensual treatment of the River is foundational. Like traditional ethnography it contains historical, economic, political, scientific, and cultural phenomena; however, unlike traditional ethnography, this information is discussed from the lens of the River. I have used similar non-anthropogenic ethnographies from Wagner and Jacka (2018) and Rolls and Bond (2017) to guide this section of the research. Using historical maps and other evidence, I documented the changes the River has undergone at the hands of humans and how it may have naturally evolved if left alone. Inspired by the writings of Alexander Von Humboldt (1859) and one of his biographers (Nicolson, 1987), I conducted this study as I kayaked the middle portion of the River. The findings are presented as a record of health. Economic, political, and cultural information was acquired through open records and the Library of Congress. Local historians, librarians, and lifelong residents guided me to sources I would not have found on my own and are already aware of my gratitude.

As chapter four is traditionally the presentation of findings, I will keep to that pattern; however, my findings are twofold and require two chapters. Chapter four is the presentation of

the ethnographic findings and chapter five is the result of practicing a/r/tography as it was developed by Rita Irwin in the early 1980s. I constructed a visual, tactile, and auditory immersive River experience as a/r/tographic findings. As the artist and researcher, I concede that the River is the teacher of this material, and I am simply making it accessible. The River is represented on a fabric map with photographs, documentary clips, acrylics, clay, and mixed media that allow the audience to experience the River in a new way. This alternative methodology is designed to engage multiple perspectives and senses to create innovative internodal connections. In addition, in chapter five I discuss the findings using an alternative lens and suggest areas for further research. The Central Savannah River Area (CSRA) has a rich history with great turmoil and great possibility. Natural resources have been abused and under siege since the arrival of James Oglethorpe in 1736 and many of those scars are still visible. It would be of interest to the local community and perhaps a wider audience to discuss how other natural resources have been altered anthropogenically without the application of the precautionary principle. I recommend that an ecopedagogy course be added to the senior level options in high school as a cross curricular literacy/activist class or as an interdisciplinary course for education majors at the university undergraduate level.

Significance/ Impact of the Study

This study employed multiple lenses and methodologies in an ecopedagogical investigation as an antidote to the positivism found throughout traditional isolationist scientific inquiry and created its own multiplicity with the River. Martin Buber, perhaps unknowingly, wrote of multiplicity as, " The power of decision…[which] does not appear as quantity but reveals the measure of its strength only in action itself" (2002, p.171). Again, it is neither the decision nor the strength but the action of connecting the two when the genesis of multiplicity

arises. I hope my participatory research has laid a foundation for more flexibility in the science curriculum as well as among educators. I hope I have provided enough evidence that multidimensional, cross-curricular, and differentiated learning strategies provide a rich understanding for the researcher and all those who benefit from that research. Studies of rivers only cover so much; however, I was seeking a deeper understanding. By investigating the River as the subject of my research and treating the River as the teacher within the definition laid out by Joseph Schwab (1973) in *The Practical 3: Translation into Curriculum.* The middle portion of the Savannah River has contributed ecologically and culturally to the development and economic success of this region; it should be recognized and protected as a valued and vital member of the community.

"Research programs are often long and grueling to the point where a degree of personal investment may well be required in order to bring even a modest project to completion" (Jane, 2016, p. 11). I am personally invested in this River as a resident of its banks and a citizen of this planet. While there are many historical documents on the area and on water in general, river specific ethnographies have only been conducted outside of the Southeastern United States. I have found no evidence of a focus on the Savannah River in an a/r/tographic or ethnographic format. There are historical documents on the founding of the Port of Augusta from a political and economic point of view, not from an ecological, social, or cultural viewpoint. I hope to add to the understanding of this region within the Curriculum of Nature and inspire an ecopedagogical curiosity of the world.

CHAPTER 2

LITERATURE REVIEW: CONNECTION IS NECESSARY

Figure 2.1, *Reeds in Winter Riverscape*

The tenets of ecopedagogy serve as the framework for this literature review. I have woven the principles of the rhizome metaphor by Giles Deleuze and Felix Guattari (1988) into the Curriculum of Nature, Gaia Theory, Romanticism, water regimes, and science. This structure is outside of my scientific comfort zone; however, as I see it, one of the problems with science is its single-minded positivistic belief system. Gaia Theory integrates quantifiable science into the hypothesis that the Earth is a self-regulating system that actively works to seek physical and chemical homeostasis (Lovelock, 2007). Lovelock developed this theory while creating a mass spectrometer that could identify elements in the atmosphere of other planets; his technology would suggest if life was possible or not. He turned his research towards Earth when he realized that our atmospheric balance was only possible if living organisms were managing it. His theory

proposes that the Earth system seeks the optimal environment for life, including the regulation of salinity, temperature, biodiversity, and atmospheric compositions (Lovelock, 2010). Gaia Theory has a multitude of data to support these hypotheses and is now accepted as a theory within the environmental science field and throughout ecopedagogy. One purpose of my research is to illuminate the value of interdisciplinary investigations, so, it is appropriate that I practice this approach throughout my dissertation. Ecopedagogy is the active participation in the ecological study of the Earth and its participants towards the improvement of planetary health as well as the health of all living and nonliving occupants. It is "connected to a utopian project - one to change current human, social, and environmental relationships" (Antunes & Gadotti, 2005, p. 135). Ecopedagogy requires the participant to practice sustainability, biosensibility, global citizenship, ecoliteracy and the ethics of care through the Curriculum of Nature. Each of these tenets enters the curriculum at a variety of nodes and creates multiplicities in doing so. Although I begin with sustainability, the order of presentation should not reflect a hierarchy.

Sustainability

Sustainability is a word found often in the media and used to trigger fear and empathy in the general public; however, in ecopedagogy it refers to the promise of safe and accessible natural resources for generations to come. Gregory Cajete's (1999) *Look to the Mountain,* reminds the reader to think of the Earth and her resources in thousands of years, not merely generations. Fear is created when scarcity is attached to sustainability; empathy is possible when we consider those who do not have access to clean water and the work necessary to make this possible. There is much debate about the possibility of an accurate definition of sustainability; for the purposes of this research, I will use the definition from the Earth Summit of 1992. "Sustainability is a societal goal that broadly aims for humans to safely co-exist [with nature] on

planet Earth over a long period of time." There are issues with this definition, such as anthropocentrism and the vagueness of the words *safe* and *time.* I will attempt to clarify these throughout the research. The question arises: What needs to be sustained? Ecopedagogues agree that 'the commons', resources we share, are most at risk at this point. Earth's resources are considered 'the commons'; this term prompts its own investigation (Bowers, 2005; 2007). Ecopedagogues and ethnographers point out that no matter how the term is defined, it is important to remember that when we engage with the commons, multiplicities are formed, and they are forever changed. Chet Bowers (2007) stated the commons are "shared between humans, and between humans and the non-human world…includes the quality of air, water, plant and animal life - in effect, all that is essential to a self-renewing ecosystem" (p. 59). He recognizes that his own words are centered on the human, but points to us as the greatest threat to the commons. According to Deleuze and Guattari (1988), when the relationship between the subject and the object ceases to matter, the nature of the substance has changed. In essence, a multiplicity is formed. Bowers (2001) addressed hegemony in the Curriculum of Nature by proclaiming that "any definition of social justice that does not take account of how human demands on the natural environment are affecting the lives of future generations is fundamentally flawed" (p. 3). He is one of the most influential and prolific writers within the field of ecopedagogy. He has spent a lifetime developing curriculum appropriate for delivery in the school systems that addresses power structures within environmentalism and the need for disruption.

Bowers' curricula and others were built to integrate ecopedagogy into the sciences, while practicing ecojustice. Although William Doll was not considered an ecopedagogue his insights into curriculum have influenced the slow acceptance of new ideas. Doll (1993) asserted that

"open systems actually need problems and perturbations in order to function" (p. 66-67). In agreement with the idea that disturbances lead to renewal and balance are, Edwin Hubble (1923) with his discovery of astronomical shock waves from Cepheid variable stars, John Lovelock (1974) and Gaia Theory, as well as Charles Darwin (1859) who referred to this phenomenon as 'punctuated equilibrium' (Eldredge, 1993, p. 223). Each of these respected scientists understood that stasis leads to decay, (Jardine, 2012, p. 48). As I discuss sustainability, I am not referring to a return to the stone age or the discovery of a single system that works. The search for sustainable practices is ongoing and should continue to address issues as they arise.

"Nature is to be viewed as a system of stages, in which one stage necessarily arises from the other…though not in such a way that one would naturally generate the other, but rather in the inner idea that constitutes the ground of nature" (Hegel, 2002, para. 194). It is the Earth's ability to adapt to change that allows life to continue to evolve on this planet, and it will be humanity's ability to adapt that ensures the continuation of our species and others. For the first billion years of Earth's existence, harsh conditions and constant impacts guaranteed a hostile environment; however, without that level of violence our planet would be barren. "The universe, earth, life, and consciousness are all violent processes. The terms in cosmology, geology, biology, and anthropology all carry a heavy charge of tension and violence. Neither the universe as a whole nor any part of the universe is especially peaceful" (Berry, 1990, p. 216). To understand how sustainability is possible, we must first understand how the Earth evolved into a planet with an atmosphere capable of supporting any type of life. I will examine this more in the ethnography section of this dissertation.

Keeping in mind the narrow lens of science, it is still valuable to understand how science advances our understanding of sustainability. At its foundation, science has contributed to the

evolution of memory and how we categorize information. The value in the phrase, 'from now on we understand something this way' prevents us from erasing the past (Bowker, 2005). Bateson (2000) argues that the way scientists analyze information may be equally useful beyond scientific investigation. In fact, because my adult life has been spent practicing scientific investigations, I have found it applicable in my personal, artistic, and professional life. Even as I attempt to protect this research from the scientific method, I cannot ignore the value of the data derived from scientific endeavors. "Philosophers of science have repeatedly demonstrated that more than one theoretical construction can always be placed upon a given collection of data…retooling is an extravagance to be reserved for the occasion that demands it" (Kuhn, 1970, p.76). Though industrial and technological progress is often considered forward, ecopedagogues would argue that these practices have caused such a great degree of long-term damage that the benefits are negligible. "Cultural/bio-conservatism…is the form of conservatism exhibited by indigenous cultures that have adapted their technologies and communal patterns to live in ways that do not degrade the self-renewing capacities of the environment" (Bowers, 2001, p. 61). Lovelock would agree that early hominids were in mutual symbiosis with Earth. Lovelock's interests were in scientific advancement, while Chet Bowers' attempted to integrate that into the classroom. Bowers is one of the leaders in the field who reminds environmentalists to consider traditional ways of managing water, soil, and forests. He is not alone; however, the fact remains that we now have eight billion people on this planet to feed and that cannot be done in traditional ways. The World Health Organization and United Nations are more concerned with the immediate needs of the most impoverished people, per their directives. The modern version of sustainability must consider the needs of all the living species against the resources available.

We may settle on a decision that does not protect human life over all other species; all "life is a system to be managed" (Haraway, 1997, p. 174).

It is within the context of the rhizome metaphor that heterogeneous connection and communication become pathways to sustainability. Martin Buber (1975) examined different types of communication and found that genuine dialogue has the "intention of establishing a living mutual relationship" (p. 19), this new relationship forms the multiplicity that potentially leads to sustainability practices to take care of one another. Isaac Newton's (1687) Law of Gravitation places this connection in a planetary position, stating that "every point mass attracts every other point mass by a force acting along the line intersecting the two points" (Verlind, 2011, p. 29), reminding us that our survival depends on the gravitational pulls of the sun and the outer planets. Knowing that there are forces out of our control, we need to focus on the practices we can adopt. Jackie Seidel (2016) takes an interesting approach to Newton's Law of Gravity replacing humans as the 'mass'. She states that for the education of and the structure of science to balance with that of sustainable practices "we are each center and periphery to each other" (p. 31). Her replacement of humans for mass is more explanatory than she may have intended. Using Newton's Law of Gravity, (see appendix) the farther apart the two masses are the lower the force they exert on each other. This may help explain how environmental disasters that happen in another hemisphere appear to have no effect on us, physically or emotionally, but the effect will ripple towards us eventually. Seidel consistently brings her readers back to the purpose of teaching, reminding us that our value is in increasing the social, cultural and intellectual capital of the next generation. Where Seidel's focus is on the future, Wendell Berry's (2007) is in the past. He has his own take on Newton, placing humanity as the centripetal force that holds not only the soil and water in its place but also the memory of what they could be.

Each of these writers has contributed a great deal to the field of Curriculum Studies through ecopedagogy. These connections may not be considered valid in any other forum; however, within ecopedagogy they are complementary and applicable to the practice of sustainability.

According to Brent Adkins (2015), "making a rhizome does not see clear lines of descent, it seeks to scramble the codes and make new connections" (p. 28). In the case of my research, sustainability as it applies to global water supplies and my local river led me to the value of water in society beyond the physiological need for survival. Pueblo Elder Gregory Cajete (1999) wrote about water as a "place that holds our memories and the bones of our people" (p. 3). In the *Anthropology of Water*, Ballestero (2019) found water to be a place of engagement with multiple ways of knowing. In other anthropological studies of communities, Yazzie and Baldy (2018) described water as a "relative with whom we engage in social and political relations premised on interdependency and respect" (p. 3) while Gagne and Rasmussen (2016) found water to be much more than a natural resource. They stated that "it is a substance that, in its many manifestations, connects distinct realms of social life" (p. 137). The above-mentioned anthropologists did not set out to study the value of water in their respective communities or how they maintained access to safe water supplies. It became obvious as they spent time embedded with their subjects that sustainable water practices held more value to the entire community than to its individual members.

While researching the economic value of water to indigenous tribes in Oceania, Wutich and Beresford (2019) found that exchange systems were important in "mediating and mitigating the human impacts of water scarcity" (p. 175). Water insecurity has become a major issue globally (Freeman, 2000; Pawar, 2013), it is now recognized as a "scarce resource and commodity" (Wagner & Jacka, 2018, p. 2). Locally, I will investigate the sustainability of the

middle portion of the Savannah River. It is as old as the Appalachian Mountains, at one time running between walls over 400 feet high (Kane & Keeton, 1994). As the volcanic ash decreased the pitch of the walls overtime and these mountains went from dormant to extinct, so has the swiftness of the River. The multiple values of the Savannah River will be explored in Chapter four as I undertake an ethnographic investigation of the area. What is already obvious to me is the limited scope of value we have so far placed on this body of water.

Biosensibility

Sustainability will only be possible when we become aware of and care for the resources needed by every living organism on the planet. This will require an ecopedagogical curriculum that includes science, literacy, historical understanding, and biosensibility. Beyond the economic and hydroelectric power is the cultural, social, and aesthetic value of this River. To consider this in a scholarly context, I will continue with the next tenet of ecopedagogy - biosensibility. This term was developed by Stephen Boyden of the Frank Fenner Foundation to "describe a way of living that is best both for people and nature" (2017, para.1). It supports respect for nature and the abiotic world and embraces biodiversity. The framework of biosensibility connects my research to social justice and global citizenship. Biosensibility goes beyond this investigation and into poverty studies and multiculturalism linking the protection of nature to each. In a rhizomatic network, the only requirements are the six basic principles (Deleuze & Guattari, 1988), so I would like to thread the biosensibility of water as a social participant in the "destabilization of boundaries" (Ballestero, 2019, p. 408). It is unusual to consider such a topic in a way that is antithetical to science; however, there is opportunity in taking risks.

In a journey of risk taking, I am including Romanticism in my research. The Romantics were highly influenced by science, yet they took an approach that was attractive to the public

whereas scientists and their jargon were off-putting. Alexander von Humboldt was one of the first scientists to sail parts of the world collecting specimens. His expeditions inspired Charles Darwin and they corresponded later in life. Because von Humboldt was also a gifted artist, he was able to deliver highly detailed accounts of his travels to allow his readers to experience the voyages for themselves. He was one of the few scientists of the time who could hold the attention of the commoner and the academy, as well as his sponsors. Humboldtian Science connects the "ethics of precision and observation with scientific field work, sensitivity, and the aesthetic ideals of the age of Romanticism" (Nicholson, 1987, p. 167). It is not my intention to explore every aspect of Romanticism but to integrate the lens that aesthetic investigation adds to the rhizome.

When nature itself becomes the curriculum then science does not need to be the central focus. John Amos Comenius wrote about our curiosity to investigate nature as early as the 1600s (Britannica, 2022), his ideas were revived in the early 19th century and evolved into what is known today as pedagogy. He leaned heavily on religious and aesthetic pathways to understanding. It is not necessary to write scientifically to grow an interest in nature, early naturalist authors were, "observers, popularizers, even adventurers, but by catching the excitement and enthusiasm for their experience, they were able to inspire" (Paine, 2011, p. 8). In his *Birds of America* (1843), John James Audubon did not set out to scientifically educate his readers. He painted to reach their hearts, activate their minds, and build a love for his birds while earning a living. Even Joseph Pulitzer recognized that many people are educated visually (Ungar-Sargon, 2021). The ideas of Comenius are supported today by leaders in the field of Curriculum Studies such as: Ted Aoki, Maxine Greene, and Elliot Eisner. I will delve into the

aesthetic aspects of Romanticism in my methodology section; however, ecopedagogy allows for biosensibility to be expressed through the curriculum multidimensionally.

There are three basic types of traditional curriculum: subject-centered, student centered, and problem centered. William Pinar, among others, focused on the lived experience of the student. While this is an interesting lens, using a single lens often limits the view. He would later integrate his ideas of curriculum which is also my intent. William Pinar (2012) suggested that "currere…[is] an ongoing project of self-understanding in which one becomes mobilized for engagement in the world" (p. 47), although he was not necessarily writing about the natural world, it is worth considering that he could have been. If we investigate nature through the individual's experience with it, we can share the benefits with each other. Pinar's use of currere requires the reader to imagine a variety of possibilities. This thought experiment allows the reader to consider what may or may not happen should the security of the world's fresh water supply cease to exist or if we should design a way to clean and resupply to accommodate the world population. While Pinar was not considered an ecopedagogue, his ideas and viewpoints translate well into ecopedagogy.

Ecopedagogy is based "upon a planetary understanding of gender, species, kingdoms, formal, informal and nonformal education" (Antunes and Gadotti, 2005, p. 136). A physics professor turned naturalist, Fritjof Capra (1996) described the principles necessary to understanding nature as interdependent flexible partnerships that create sensitive relationships towards the protection of each other. Although he did not use the term, biosensible, I am convinced that is what he is outlining. Ecopedagogy recognizes biosensibility as a tool for "understanding how different creatures value, understand, react and relate to their environment" (Mandoki, 2017, p. 24). There is one clear difference between ecology and ecopedagogy,

Ecology is a pure science that is anthropogenically focused. Ecopedagogy opens space for other living and non-living entities to experience connection. If the thought has just crossed your mind that non-living entities have no place in biosensibility, consider that the COVID-19 virus is considered non-living by experts in virology, microbiology, biology, and medicine.

Ecopedagogy is about "returning our attention to home…to the delicate and difficult reliance and debts that intertwine our fleshy lives with the fleshy life on earth" (Jardine, 2000, p. 20). This return home that Jardine speaks of is also a return to historical methods and indigenous wisdom. Biosensibility requires that we recognize the value of that knowledge and integrate it into the curriculum. Gregory Cajete (1999) wrote about and from the perspective of Native Americans in *A People's Ecology: Explorations in Sustainable Living*. In this text, he described how "they understood that the natural universe was imbued with life and sacredness. They understood their effects on their place had to be carried out with humility, understanding, and respect for the sacredness of the place and all living things of those places" (p. 5). He may not use the term, biosensibility, but this is a clear description of the word. There will be those who oppose the religious aspect of the term - fine - let that go and accept the remainder of the description. Even the U.S. Fish and Wildlife Service has officially recognized that the "knowledge acquired by indigenous and local peoples over hundreds or thousands of years with direct contact with the environment" (2011) is of the utmost value to the sustainability of our natural resources.

Biosensibility requires that we feel a deep connection to our world. For some readers that will include a historical connection, for others it will be scientific or spiritual or aesthetic. The rhizome does not dictate which connections, only that they exist in a heterogeneous fashion. The principle of cartography within the rhizome metaphor describes the process of map making.

Deleuze and Guattari (1988) specifically advise against tracing other routes and insist on the creation of new pathways. Reif Larson (2009) in his *Selected Works of T.S. Spivet* describes map making as constructing bridges, "between disparate ideas that we did not know were connected" (p. 138). These unexpected connections remind us that we are in a constant state of change (Sartre, 1956/2015). Without this progress/sensitivity to the life around us, we will wither. It must also be noted that the world is waking to the damage and beginning to acknowledge healthier pathways toward continued existence. Martin Buber (1975/2002) wrote about sensitivity as a state of co-suffering. Although he was not referring to abiotic participants, he did recognize that we "suffer together…and meet one another in it" (p. 6), this sentiment is also shared by Buddhist Monks. Biosensibility is not limited to the plant and animal kingdoms but includes all the resources needed to sustain those lives. This integration of the interdependence of the living and nonliving world is addressed in Gaia Theory, indigenous history, and most recently in ecopedagogy. The scientific world prefers to work with each system independently; however, many scientists are aware that isolating variables is only reasonable in theoretical settings.

Fritjof Capra (1996) spent most of his life and career investigating the world as a physicist. At some point early in his research, he integrated his understanding of the atomic world into the universe as we know it and began to explore the necessity of each connection. He may have never crossed paths with Thomas Berry or Edward Kohn but each of them has come to the same conclusion. Thomas Berry (1987) writes of the "interdependent Earth community" (p. 204) while Kohn (2013) explores the management of ecological assemblages in food acquisition in hunter-gatherer tribes. Kohn writes about the intimate relationship people have with "one of the most complex ecosystems in the world" (p. 5) when he investigates the scarcity of forest land

along the equator. Kohn, an anthropologist by trade, did not set out to become an ecowarrior, merely to describe what he was witnessing. His writings have opened the world's eyes to how we affect each other and welcomed his readers to embrace biosensitivity. Now that we can clearly see what is happening in real time around the world and we are "capable of responding, [we] have to acknowledge that [we] have respons-ability" (Haraway, 2016, p. 16). Not necessarily considered an ecopedagogue, Donna Haraway's feminist environmentalism is aligned with ecopedagogy within the tenet of biosensibility and the ethic of care.

Environmentalism and our response to ecological degradation is a fine line in the classroom. We teach our students that the answers are found in scientific investigations but fail to teach them about our limitations. Garrett Hardin (2019) has been writing about the 'commons' since the mid-1960s. He continues to cover the destructiveness of commercialism; noting that when individual desires supersede the needs of the commons, the result is the destruction of nature. He has connected the banking crisis, big oil, and industrial farming to the mistreatment of the Earth. He provides evidence of our failure to acknowledge that human beings are a part of nature not her master, and how nature will not be dominated by any one species. Without specific intention he supports Gaia Theory and ecopedagogy. Hardin's work in ecojustice is foundational to understanding how biosensitive behaviors and practices could retard the current stream of damage. He is joined by Delgado & Stefancic (2017) who include ecojustice in their work on Critical Race Theory (CRT). Although CRT is beyond the scope of my research it is worthwhile to note that certain groups of ethnicities have been deleteriously affected by environmental problems more than others. The collective hope of these authors is that "if we pay attention to the multiplicity of social life perhaps our institutions and arrangements will better address the problems that plague us" (Delgado & Stefancic, 2017, p. 63). I believe we can all

agree that the classroom is the place to address society's problems. Unfortunately, in the current political environment, educators are risking their careers if they go beyond the curriculum in any way. Ecopedagogy provides a scientific lens with which to address inequities through the view of environmentalism in the science classroom and across curricula. "Based on its comprehensive focus on sustainability, ecological literacy, sociopolitical factors that affect communities, and a multitude of other factors that underpin social injustice, ecopedagogy may be uniquely positioned to offer a more holistic view" (Davis, 2013, p. 77) that is not antagonistic to the local education authorities. This view of ecopedagogy has been publicly recognized since the early 2000s yet remains outside of the academy.

Because the academy is controlled by financial institutions, the curriculum is designed for profit and metrics and is no longer focused on creating an educated public. This creates a myopic lens for the student that does not encourage life-long learning. In 2013, while referring to environmental issues, Bruno Latour sarcastically referred to those who believe they can still make a difference as "most likely artists, hermits, gardeners, explorers, activists or naturalists" (p. 13); he forgot to mention educators. We spend our days believing in the potential of the future, remaining hopeful. In his *Handbook of Ethnography* (2001), Paul Atkinson directs the investigator to "elucidate the social structure - the pattern of real relation of connectedness" (p. 64). This assignment is exactly what an effective teacher does daily. The science classroom could become a conduit of connection where students experience "nature, in itself as a living whole" (Hegel, 1819/2002, para. 195); however, the mere introduction of philosophy into a science classroom would become a point of contention. "Advances in scientific thought come from a combination of loose and strict thinking" (Bateson, 2021, p. 75), it is the introduction of

biosensibility and philosophy with aesthetics into the science curriculum that will instigate innovation. Loose thinking is what is commonly referred to as creativity.

Integrating art into the curriculum "allows for 'sense perception'[which] mediates experience, prior to the rationalization of the experience" (Lopes, 2015, p. 18). This is not new information. "In the 17th and 18th centuries when philosophical endeavor was reappraising the value of the senses in the acquisition of knowledge" (Lopes, 2015, p. 17), aesthetics was highly regarded as a means of delivering and receiving information. The Romantics of the early 19th century sought to emotionally engage their public as a means to promote change and innovation. Biosensibility was a requirement for the Romantic writer and painter, as was asignifying rupture and heterogeneous connections. In the United States, Romanticism was rhizomatic, requiring complete creativity that did not build off others' works as well as unique bridges to new ideas. The poets, artists and writers of the Romantic era are embedded throughout the methodology section of this research. The Romantics brought experiences to those who did not have access to the natural world they described. These experiences, whether real or imagined, build new synapses of possibility.

Maxine Greene (2001) also promoted experiential learning through art which "intensified consciousness" (p. 30). Her focus was not on biosensibility, but rather, on the variety of ways one could achieve understanding. She promoted literacy through experiences and creativity stating, "at the very least, participatory involvement with the many forms of art, can enable us to see more" (Greene, 2001, p. 123). Could we not consider 'seeing more' as biosensibility? Jason Hoelscher (2021) in his text, *Art as Informational Ecology*, explores how organisms coevolve over time with their surroundings and compares this to the artist and their work. James Lovelock (2001) uses a similar phrase when describing the evolution of Earth's atmosphere. Coevolution is

the development of a multiplicity where biosensibility is introduced to science through aesthetic endeavors. Chet Bowers (2016) and Richard Kahn (2010) write technically about the patience it requires to understand this planet, but David Jardine (2012) is eloquent in his explanation. “As anyone rapt of the Earth’s ways will understand, it takes quite a while to experience the wiles of the Earth and its ways…it takes time and practice to learn how to treat [the Earth] well” (p. 190). Biosensibility is nurtured in experience; it cannot be rushed or taught in theory. The mistakes we have made in our care of the planet are opportunities for learning within the frameworks of ecopedagogy. When reflecting on Gaia Theory, Lovelock would propose that we are evolving with this planet, as the whole Earth system is constantly regulating our existence (2001).

We are only now beginning to understand how an abiotic system could regulate a living one. Historically, philosophers and scientists adhered to the positivism that allowed them to believe the world was flat and non-responsive. Even as Newton and Kepler were decoding planetary orbits, others were attempting to remain in a world of concrete knowledge that was attainable to every man. According to Hegel’s *Philosophy of Nature* (1819/2002), there is no room for multidisciplinary sciences. Today, the line between science and philosophy is subjective whereas in his time the two were clearly separate. In fact, he used philosophy to explain why nature belonged to the sciences and not to philosophy. He stated that nature is universal and “outside of space and time…real and mutual being apart from itself, particular or material existence…inorganic and organic” (para. 196). He goes on to describe the only true sciences, describing how they are independent of philosophy and each other, “mathematics, physics, and physiology” (paragraph 196). I only introduce Hegel to show that progress has been made. In fact, there is no scientific understanding without mathematics and no physiology without physics, and each is applicable in multiple branches of philosophy and nature. When we

introduce philosophy into the scientific world, we create multiplicities that require "technical dialogue…solely for objective understanding" (Buber, 1975, p. 20).

To continue with the intersection of philosophy, nature and science, David Orr (2002), a political scientist turned ecopedagogue stated, "the environment outside us is also inside us. We are connected to more things in more ways than we can ever count or comprehend" (p. 29). Although he did not mean this literally, the microbiome of soil is replicated inside the intestines of healthy mammals and the carbon in our cells has been recycled innumerable times through living and nonliving entities. It is interesting to note that when humans have gut issues it is often tied to the health of their internal bacteria. Deleuze and Guattari (2009) made no distinctions between science, man, or nature, "the human essence of nature and the natural essence of man become one" (p. 4) through the implementation of science. The allowance for intersectionality is why the rhizome metaphor belongs with my research, in fact, it is the framework for this literature review. One final bite of philosophy from Cultural Studies theorists, Chris Barker and Emma Jane (2016), "every philosophical current leaves behind it a sediment of common sense…[this] creates the folklore of the future, that is as a relatively rigid phase of popular knowledge at a given place and time" (p. 77). When we consider philosophy as a connection to biosensibility, we can view nature as a participant in our system of life and not merely the supporting role to our success as a dominating species.

Barker and Jane (2016) refer to currents and sediments as if water were essential to the understanding of culture. In the methodology section of this research, I propose that it is. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) updated their website in April of 2021 to include the cultural value of water stating, "life satisfaction and happiness depend to a great extent on water: Water can appeal to people for spiritual reasons, or

through scenic beauty, because of its importance for wildlife or recreation, among others" (retrieved August 2022). This international evidence of biosensibility has taken years of evidence and open mindedness by those in power. UNESCO also recognized that the "connection between water and place, often categorized by incalculable 'relational values', can be strong in many indigenous cultures" (retrieved August 2022). The additional recognition of indigenous cultures has been fought for by Native Americans and ecopedagogues.

In *Water Wars,* by Vandana Shiva (2016), she defends the protection of the freshwater sources of India by describing how the rivers have created civilizations. "The earth has shaped our destiny and through this connection, we have been connected as a civilization" (p. 58). Shiva goes on to explain how the bio-insensitivity of the economic powers of the world have nearly destroyed the soil and water. She is one of the strongest female voices in ecopedagogy, yet few in the Western world have heard of her or her causes. Her promotion of water as central to culture is supported by the historical *Biography of Water* by Giulio Boccaletti (2021) and many other historians. Boccaletti outlines the history of life on Earth as it evolved around water; he includes the civilizations that were built and destroyed over water.

The challenges surrounding biosensibility and water are addressed in the methodology section of this research but there are some well-known issues around the global water supply. For example, "freshwater ecosystems support a disproportionately high concentration of global biodiversity and ecosystem services given the small proportion of Earth covered in freshwater" (Rolls & Bond, 2017, p. 65) while remaining under multiple threats. I address the history of flow alterations of the middle portion of the Savannah River by the Army Corps of Engineers (ACOE) to "control nature and pit the technology of human beings against the river" (Lydon, 1992, p. 49) in the methodology. There is no doubt that dams and weirs have "impacted the ecological

functioning and biodiversity of rivers, wetlands, floodplains and estuaries worldwide" (Poff & Zimmerman, 2010, p. 194). Where I diverge from the inflammatory politics is in keeping biosensibility central to the research. The ACOE is not the enemy, there is no enemy except the limitation of time. Our past mistakes have caught up to us and our children are already in grave danger.

In *Journey to the Sea* (1941), Rachel Carson describes the life of an eel as she struggles through the shoals of her river to reach the sea. As you read this essay, you are invested in her success and want the elver to reach her full potential and live her life out in the ocean. This work of romantic fiction is no less important than the facts and figures regarding the pace of climate change, but Carson leads you to care for the eel. Because you feel connected to another living species you become more biosensitive. Carson is clear in her disdain for capitalism, but it is her portrayal of the life that depends on the water that leads the reader to root for the survival of the eel and her precious world. It is this characteristic of ecopedagogy that leads to the tenet, Ethic of Care.

Ethic of Care

Each tenet of ecopedagogy is heterogeneously connected; it is this webbing that directed me towards the rhizome metaphor as a framework for my research. The rhizome is antithetical to the tree (Deleuze and Guattari, 1988), without a central trunk the rhizome has non arboristic entry and exit points. There is no node in the rhizome where one does not affect the others, this is most obvious in the ethic of care which envelopes the whole of ecopedagogy and each tenet individually. When considering a clear definition of the ethic of care it is necessary to look beyond ecopedagogy towards education in general, directly at Nel Noddings. In her highly recognized text, *Caring* (1984), Noddings outlines the specifics when making ethical decisions.

She writes that caring is characterized by consciousness and attention and while reciprocity is ideal it cannot be expected. Her focus on care in educational settings is applicable to the field of ecopedagogy, noting that education is central to the "cultivation of caring in society" (2002, p. 283). Noddings further defines education as a "constellation of encounters, both planned and unplanned, that promote growth through the acquisition of knowledge, skills, understanding and appreciation" (2002, p. 289). For the ethic of care to underline education, it must become second nature through daily practice.

Noddings' theory of caring in education follows a "line of flight" (Deleuze and Guattari, 1988, p. 89) that leads to how ecopedagogy is designed. Ecopedagogy is built around an ethic of care that ensures that all participants on Earth are considered worthy of care, none above another. This is done without regard to the size of contribution or the space it occupies. The smallest microbe is necessary for the health of the soil as much as the entire water cycle is necessary for life to exist. "Nature favors diversity for sustainability and the health of the entire system" (Bowers, 2002, p. 21). This diversity is also interwoven into the curriculum of ecopedagogy acknowledging that indigenous knowledge is as valuable as modern scientific information and should be preserved and cared for as such. Gregory Cajete has written multiple texts describing the connection and responsibility Native Americans hold with the Earth. "They [Native Americans] understood ecology not as something apart from themselves or outside their intellectual reality, but rather as the very center and generator or self-understanding" (Cajete, 1999, p. 6). This connection embodies the ethic of care that is expected throughout ecopedagogy as educators and researchers consider their place and obligations to the past, present, and the future.

"Reconciling indigenous perspectives in science with a Western academic setting" (Pember, 2010, retrieved September 20, 2021) is one of Cajete's gifts. He has been able to teach Indigenous wisdom in the science classroom at the university level and has passed this skill onto his students. Cajete sets the example for the practice of an ethic of care with the next generation of students and nature. One of the most difficult decisions we must make is in the use of science and technology in the management of natural resources. Because there are eight billion people on this planet, we can no longer afford the luxury of time and nature's cycles to repair the Earth. "What the industrial economy calls 'growth' is really a form of theft from nature …this growth is based on robbing the forest of its biodiversity and its capacity to conserve soil and water" (Shiva, 2001, p. 1). Cajete and other ecopedagogues are purposefully integrating indigenous technology into the science to provide evidence that we can feed ourselves and protect the Earth. Within the ethnography section of this study, I provide examples of rivers that have been damaged by technology and are being returned to their natural state. The burden of water reclamation is on those who need it most, not necessarily the entity that created the problems, as most dams in the United States are over 55 years old. Rivers around the world have been diverted from forestland; they have overused groundwater and polluted resources (Graham, 2015). It is the misuse of our scientific knowledge that has created these issues, but it will be the scientific implementation of indigenous wisdom that heals the damage. In the instruction of science, we must impress our students with the weight of every decision and teach them to implement change only after considering the effect on all parties, including the abiotic environment. The ethic of care grounds ecopedagogy and is missing in the economic and industrialization of our natural resources.

Tom Barone wrote about the collisions of science, art, academia, and even fear in his educational research. He found that an ethic of care is missing within the academy and

determined that one of our greatest problems is the undermining that takes place between disciplines. His aim is to find a middle ground where "working together, with our ignorance about and fear of each other diminished, researchers of all stripes tackle the myths in our academic and popular cultures which have predisposed others to disparage the work of educational researchers and practitioners alike" (2001, p. 28). If educators cannot find a common ground for the benefit of the system and its participants, how can we expect politicians, economists, and investors to aim for the greater good of the environment? If we cannot practice an ethic of care among each other, how can we expect others to do the same. The most common places to learn compassion and ethics are in the home and in the schoolhouse. If we are not the example, there may not be one to follow.

The ethic of care is most obvious in the connections between humans and other species as well as between humans and how we treat the natural world. For many years humans were inextricably connected to the Earth. We depended on the soil and water, the seasons and sunshine. They were at the mercy of the weather and found ways to survive. These skills have been passed on through generations of oral history. Our connection to the planet is still necessary but we have distanced ourselves with technology. Even the word 'ecology' can be "traced back to the Greek word 'oikos' which refers to the maintenance of relationships" (Bowers, 2002, p.30). Donna Haraway recognizes the need for connection in her writings but also reminds her reader to "incite an inquiry into which connections matter, why and for whom" (1997, p. 128). Although she is not writing about ecopedagogy or even the environment, this is sound advice within the ethic of care. Borman and Overman (2004) conducted longitudinal studies in schools and found the factor that most influenced success in school was a "supportive community" (2004, p. 178). The community connections allowed students to overcome poverty,

developmental delays, and even race - the three top factors attached to dropout rates. Teachers and administrators who practice with an ethic of care are building communities.

As a species, we are not meant to survive alone. Perhaps this is why isolation is such an effective tool of torture, and why the mental health crisis is at a peak post COVID isolation. Should we all not be in some isolation rehabilitation program where we meet one new person, face to face, a week and find some commonality? Lynn Margulis (1981) describes the connection between humans and microbes in detail in *Symbiosis in Cell Evolution: Life and its Environment on the Early Earth*. In the text she explains the process of speciation, the coevolution of humans and companion animals, and the purpose of extinction. Following the same research from a different lens, Eduardo Kohn is an anthropologist who investigates how other species communicate and care for each other. After spending nearly a decade researching forests, he published *How Forests Think* (2013). He was highly criticized for the use of the word 'think'; however, his theories on communication have since been supported by Suzanne Simard and her colleagues. Simard (2015), a biochemist, found that trees send nutrients to their offspring, through mycorrhizal networks, when they are struggling. This exchange of gases and sugars is often at the risk of the 'mother tree'. There are detractors who think that Kohn and Simard have gone too far. They do not dispute the science, only the interpretation of the data derived from the studies. An ethic of care is evident in the animal kingdom and now in the plant kingdom. Edwardo Kohn stated, "encounters with other kinds of beings force us to recognize the fact that seeing, representing and perhaps knowing, even thinking, are not exclusively human affairs" (2013, p. 1). These scientific revelations would not have been possible without someone considering the value of other species to the success of the planet. The ideas would not have been possible without an openness to biosensibility. None of the authors mentioned in this paragraph

would consider themselves ecopedagogues; however, their contribution to the curriculum cannot go unmentioned.

"The ethics of care intersects with many other frameworks within curriculum studies; however, as it applies to ecopedagogy it is a 'care ethic' in philosophy [that] emerged from feminist perspectives" (Whyte, Cuomo, Gardiner, & Thompson, 2016, p. 234). This is not to say that the entire burden of caring falls on the women of the world, but historically this has been true in many cultures. It is only in the last 100 years that men have taken on the role of caregiver in the Western world. Chet Bowers (2005) warns the world that the ethic of care must become a global consideration or Western hegemonic ideals will "choke out non-Western ways of thinking, viewing, and interacting with the …environment" (p. 188). In *Volume I Curriculum Studies Guidebooks* (2016), Marla Morris coined the term 'ecospirituality' to describe the relationship that works, "toward attaining a more ecologically sustainable and spiritual world" (p. 214). I contend that this 'ecospirituality' is highly compatible with the ethic of care in ecopedagogy. Because Morris leans heavily on philosophy, she uses a different approach and different vocabulary; however, the intent is the same. Brené Brown (2015) a social scientist recognized spirituality as a "celebration that we are all inextricably connected to each other by a power greater than all of us" (p. 10). It is this connection that demands an ethic of care. Brown uses the term 'compassion' because she has spent her career in social work. Semantics should not divide our focus, if anything, the fact that there are terms in every field that describe a necessary connection should provide evidence for the need for an ethic of care.

Ecopedagogy welcomes these various perspectives in the hope of creating global rhizomatic connections. These connections can cross cultures and economies, belief systems and history. In *Other Destinies* (1994), Lewis Owens, a Choctaw and Cherokee, states, "Native

American writers are offering a way of looking at the world that is new to Western culture. It is a holistic, ecological perspective, one that places essential value upon the totality of existence, making humanity equal to all elements but superior to none" (p. 29). It may sound idealistic, but this is the goal of ecopedagogy. Owens walks the reader through the level of responsibility that we each have on this planet through the eyes of a Native American. His perspective is not unique, it is found throughout cultures that are deeply rooted in the health of the soil and water. "Indigenous peoples [are working] to advance the rights and opportunities [to] steward biocultural diversity and sustainable land management practices" (Romero-Briones, Salmon, Renic, and Costa, 2020, p. 16). Gregory Cajete (1999) connects human relationships with the place - or the lack thereof - with our "self-serving will of materialistic economic systems" (p. 18). He goes so far as to state as fact that the marketplace has developed a lack of consciousness in the school curricula. His opinion is shared by many educators, especially those who are attempting to raise awareness of global conditions. Practicing ecopedagogy in the classroom is one antidote to this loss of connection our students are unknowingly experiencing.

Curriculum studies has returned full circle to the value of experiential education. Even Dewey (1933/2005) was attempting to "restore continuity between…doing and suffering that are universally recognized to constitute experience" (p. 2). Many others have referred to experiential learning as a valuable factor in a holistic education. This is true of ecopedagogy. Ethics of care and experience intersect in the protection of the Earth to ensure that experiences in nature are available for future generations. Bruno Latour (2011) illuminated the connections of experience as a node within the rhizome, noting that each experience added to the constant state of flux increasing the complexity of ourselves; with each intersection a new multiplicity is formed. The next year, William Pinar (2012) published *What is Curriculum Theory?* In his discussion of

currere, he addresses the students' point of view. "The student of educational experience accepts that at any given moment she or he is located in history and culture…a situation to be expressed autobiographically (if indirectly) through the curriculum" (p. 45). These independent points of view add to the depth of ecopedagogical experience. When each student finds their place in the natural world, they are more likely to care for that space. Although I live in a community that depends on the health of the Savannah River, few students or residents come to the riverbanks or spend time on the water. Many do not even realize the water in their homes originates from this River. My own students did not understand that they reside in the Savannah River watershed.

Ben Orlove and Steven Caton (2010) conducted an intense anthropological international study of water and found its value to be underestimated in communities that are no longer dependent on subsistence farming or fishing. They found "water…circulates through practically all domains of social life and… is handled differently by men and women" (p. 403). They found an ethic of care missing from populations that are removed from the collection of water. Richard Kahn (2010) refers to this lack of concern as 'othering' and states that "humanity has served to functionally oppress all that has been deemed 'other' than human by interested parties" (p. 9). He is not only referring to the world's water, but also the soil, forests, and animals. In his text, *Critical Pedagogy, Ecoliteracy and Planetary Crisis* (2010), he goes on to describe the oppression and abuse that are conducted in the name of preserving humanity.

It is this preservation of humanity that allowed the rivers of the world to be altered by government agencies to provide water and energy to communities whose economies were growing. In the United States, the Army Corps of Engineers is charged with controlling nature by damming up rivers. Bruno Latour (2013) wrote about his experience on the Mississippi River and referred to Mark Twain's *Life on the Mississippi River* (1883/1994). In their texts, both

Latour and Twain describe the Corps attempts at river management to "make them behave, as to try to bully the Mississippi into right and reasonable conduct" (Latour, 2013, p. 52; Twain, 1994, p. 168). While flood control and hydroelectric power are considered best practices in many communities, they are not without consequences. The damage to areas with altered river flows has been documented as "destruction of agricultural land, loss of wildlife habitat and biodiversity, and destruction of cultural capital" (Graham, 2015, p. 6). This damage is not limited to indigenous populations. My research is aimed at uncovering damage along the middle Savannah River.

Little thought was put into the long-term effects of damming rivers by government and independent agencies. At the time of their construction the immediate needs overrode the potential damage that may have come about. Dams were constructed to store and regulate water to ensure a "reliable supply of water for human use" (Rolls & Bond, 2017, p. 65). This was a sincere and significant need; however, now these fragile landscapes are being abandoned (Hearn, 2021) as budget cuts and new regimes control the Army Corps of Engineers. At stake is the degradation of the dams and everything that flows downstream. When considering our next steps, whether they be the demolition of or reinforcement of the dams, the long-term effects must be held within the ethic of care. Thomas Berry (2010) wrote about our relationship with the planet and its natural resources, calling for us to "embrace a new role…consisting of a communion of subjects not a collection of objects" (p. 17). When we stop to consider the natural resources of the Earth as equal participants in the success of the entirety of life, we are practicing an ethic of care that will provide for a future on this planet.

An interesting yet non-productive advance in science is the possibility of inhabiting another planet. Unfortunately, this has spurred the ignorant to abandon the rescue of the Earth

and ignore the reality that humanity has coevolved with the available natural resources. Our survival is founded in the gravitational pull, the atmospheric pressure, and the natural resources of this planet. The recent identical twin study on the International Space Station provided unquestionable proof that the human body cannot sustain or recover from life off this planet (Witze, 2017) for any significant amount of time. Despite this new turn in scientific trends, there are many humans invested in environmental recovery. Ted Toadvine (2009) adds to hope in philosophical terms, noting that the counter to science could be a "viable and productive response to the ecology crisis of our times" (p. 255). Ecopedagogy is invested in science, along with other opportunities that address local issues on a global level. Global citizenship is the most recent addition to the tenets of the curriculum; it has advanced as the internet has connected the disconnected to the world.

Global Citizenship

Before global citizenship is possible, we must address Western hegemonic expectations and their origins. Because many techno-industrialized countries have the financial means to conduct research from their lens, they are knowingly or unknowingly promoting their own views and sharing those as a singular truth. Henry Giroux (2017) argued for a cultural studies lens while practicing critical pedagogy. He and Peter McLaren called for a "revolutionary multiculturalism" (Bowers, 2002, p. 23) as an antidote to the hegemonic status quo. Bowers (2002) refers to these authors when uncovering what he believed was a problem with Paulo Freire's vision of emancipation that is shared by corporations and politicians that promote globalization. Bowers warns the ecopedagogue to be aware of the origins of their own beliefs and the effect they may have on suppressing others' wisdom traditions. In *Science, Democracy and Curriculum Studies* (2018), John Weaver explores how management often turns into

oppression. “Through statistics, scientific management, social engineering and operational research, modern science also quickly became a way to govern…to better manage both nature and society” (Pestre, 2012, p. 427). Now we have many cultures that have assimilated in order to survive, who are attempting to regain their historical land and water.

Resistance to hegemonic norms is a battle between David and Goliath; the tests of persistence, time, and financial means are often the deciding factor, rather than what is best for the planet or a species. Anti-environmentalism is aimed at groups who challenge longstanding hegemonies that determine political and economic wealth, while promoting Western and Eurocentric visions of progress (Kopnina, 2020; Kahn, 2010; Taylor, 1995). Resistance “actions can be deemed as illegal…or these same actions can be viewed as signs of active citizenship” (O’Riordan, 1999, p. 1) depending on the place, time, and goals of the leadership. Those in power also control perceptions and change takes societal support. Even water management is hegemonic. As we control the water and expect it to behave, we also control who has access to it. Those in power continue to have more access than the oppressed (Orlove & Caton, 2010). Recently, the Waorani people of Pastaza, Ecuador won their lawsuit against the Ecuadorian government to protect millions of acres of the Amazon Rainforest, but illegal logging continues (asu.edu/sustainability-innovation, May 2019). Their success has led other tribal communities into the courtroom. Even as the Waorani have legally protected their region of the forest, the Ka’apor people of Brazil have taken up arms to defend the same forest under a different government (Mongabay News, 2022). The Ka’apor are considered resistance fighters while the Waorani are considered environmentalists.

Hegemony is the enemy of ecojustice - a grounding tenet of ecopedagogy. To be honest, until year three of this program I never considered how the environment and our natural

resources could be used as weapons to hold groups of society back. I was so deeply entrenched in agriculture; I could not imagine groups without access. I did not consider how other people, except Native Americans, were affected by access to nature. Because I had a progressive Geopolitics teacher in high school, I was keenly aware of the Native American issues with water rights in the American Southwest (Mrs. Wren, Venice High School, Florida, 1986). She connected the lack of a vote to the loss of water rights and nuclear testing to the contamination of water on the reservations. Without her clarity and tenacity, I would have remained ignorant. It is important to note that she also had the freedom to deliver her curriculum in the way she believed was most effective. "Ecopedagogy…upholds similar values that see the exploration of social injustice, educational inequalities, and marginalized populations as central areas of focus" (Davis, 2013, p. 84). Therefore, looking at pure science for the answers to environmental issues is not enough. Science is biased by the researcher and the funding source. We need a holistic approach to problem solving; ecopedagogy offers this. Ecojustice embraces the need for justice to create responsible, equitable, and compassionate relationships as well as the recognition that "human societies cannot flourish unless natural systems flourish too" (Gibson, 2004, p. 7). This includes the understanding that the nonhuman world is instrumental in the health and welfare of all planetary participants.

Ecopedagogy requires a basic comprehension of power relations and politics, this must include an understanding of the "dialectics of justice" (Houston & McLaren, 2005, p.9). Professor McLaren (2013) was among the earliest writers to include environmentalism within the field of Critical Pedagogy and Critical Studies. He acknowledged the power inequity among the social classes as a critical issue that contributes to the demise of the health of the planet and humanity (McLaren, 2013). The principles of connectivity and heterogeneity within the rhizome

metaphor (Deleuze and Guattari, 1988, p. 7) help us to understand the necessity of creating a variety of relationships that strengthen the whole of humanity. It is the biodiversity of the individual that strengthens the whole. The rhizome favors no node or pathway over another, only that they exist and are available for connections. By introducing ecojustice as a thread withing ecopedagogy we can reform and democratize science, technology, and education. With ecojustice in the curricula, we can expose cultural forces that worsen inequities and illuminate knowledge that develops a sense of responsibility (Bowers, 2001).

In 2002, Chet Bowers continued his literary fight for global equality. He asks the reader to consider how ecojustice could address environmental racism while creating alternatives to our "consumer dependent lifestyle" (p. 21). He wondered why critical pedagogues have ignored the environmental crisis and explored reforms for educators to introduce ecojustice into the classroom. Two decades have passed and very little has changed. In fact, the public expresses hostility toward any classroom material that borders on moral decision making. Freire wrote of these complications in a different context; however, his words are applicable. "Learning to perceive social, political, and economic contradictions and to take action against the oppressive elements of reality" (1968/2020, p. 4) is our obligation to society. This is the task of the teacher, to quietly point out the contradictions so that the student is aware. Mrs. Wren did not tell her students how to fix the lack of water for the Native Americans. She planted a seed in 1982 that has grown. I taught my children this lesson and now one works on water security issues in the American West as a liaison to the Crow Nation, the Arapaho, and Shoshone elders; seeds take time to grow. Environmental injustice is not obvious until you look for it, then it is everywhere. It is easily found in the value of property with access to natural resources and cosmopolitan

cities. When they are compared to rural and inner-city communities, the economic opportunities are disparate (Hearn, 2021, p. 51).

We need to teach our children and students to look through other lenses and find small ways to act towards equality. Martin Buber (2003) wrote of the power of decisions being measured "not as quantity but reveals the measure of its strength only in action" (p. 71). Ecojustice requires action, as does the curriculum of ecopedagogy. Freire (1970) wrote to the oppressed to free themselves and their oppressors. The curriculum of ecopedagogy teaches cooperation for mutual success. This cooperation is integral towards reaching the goals of resistance. Ecojustice seeks to help people see that individuals in a community are capable of powerful action. "Rural community members may view themselves as independent and isolated…they are capable of taking powerful stances [together]" (Davis, 2013, p. 88). Resistance is risk taking in the best way (Darder, 2014; Freire, 1996). Even though our farming community was not able to hold off the industrial farms, we were able to support neighboring farms to stand their ground. We put our hope in this risk-taking, and in the "politics we hope to cultivate" (Kohn, 2013, p. 19). We place heterarchy over hierarchy and celebrate rhizomatic processes that connect us to the living and nonliving world.

Each connection reinforces the strength we have as global citizens. We are connected through time and place. The 18th and 19th centuries bore witness to the rise of Romanticism as a reaction to the Industrial Revolution. The Romantics delivered to their viewers and readers the minutiae of the environment even as machines and smog gradually took over. Generally credited with developing an environmental consciousness, the Romantics offered us a window to the world (Hubbell, 2018). The connection between environmentalism and romanticism is not always evident until we consider why we desire to preserve nature. The "Romantics realized that

nature only becomes a matter for ethical concern, inspiration, and love when the mind…[is] properly attuned and receptive to its meaning" (Hinchman & Hinchman, 2007, p. 334). They purposefully and consistently kept nature on the minds of the people. Although they did not know the term 'ecojustice', they were fighting for it. In 1789, William Wordsworth and Samuel Taylor Coleridge published *Lyrical Ballads,* where each man, in his own way, replaces the anthropocentric view with a lens from nature (Williams, 2022).

We are cartographically woven into romanticism through the rhizome. The rhizome is not a permanent structure, it is a living generative model; a "map and not a tracing" (Deleuze & Guattari, 1988, p. 12) that is new with each node. As our map grows and changes, so do we by our exposure to science, curricula, politics, economics, romanticism, and the multitude of intersections we experience daily. Each of those scholarly fields is broken down and separated into their "splintered pieces" (Paine, 2011, p. 535) when they could come together under ecopedagogy to face climate change and the factors influencing it. When we remain disconnected the answers elude us. "Each of us …is a vital link within the context of creating and remembering the reciprocal relationships that sustain …the global ecology" (Cajete, 1999, p. 20). Deborah Rose (2005) is a modern Romantic Indigenous philosopher who seeks to redraw the connections between humans and nature. She is writing to deanthropencentrize ecological maps and place the natural world in an equal position as humans.

Consider water, the cartographer that connects every living thing on this planet, the thread between each node of the rhizome. Orlove and Caton (2010) describe water "not only as a resource, but also as a substance that connects many realms of social life" (p. 401). It is central to each domain of life and as it is affected by one, it affects all others. Chet Bowers (2007) refers to this connectivity as the 'commons' because it is essential that we share all the water on Earth, but

others dig deeper into the meanings of water. Amber Wutich and Melissa Beresford (2019) consider water as “co-constitutive” (p. 171) in understanding the relationship between humans and nature. Water is inextricably linked to power in many areas by hegemonic forces or by nature. Either way, “living systems are networks of chemical and energetic flow and transformation” (Shiva, 2008, p. 135) and water is the chemical that has produced life on this planet. In her text, *Water Wars* (2016), Vandana Shiva attacks the government agencies that are poisoning the waterways of India. She is considered an environmentalist by the people, but on the government watch list as a domestic provocateur.

Unfortunately, water is neither distributed nor accessible equally on this planet and this has led to oppression and violence. When designing a sustainability plan for their education system in South Africa, two points were foundational for the participants. They wanted the local, state, and national education agencies to recognize their concept of ‘needs’ and especially the needs of the poorest students. They also wanted the agencies to place limitations on technology for the “environment to meet present and future needs” (Grigorov, 2011, p. 3). The designers understood that if the basic needs of their students were not met first, education was of no consequence. They also found that the technology industry was using many of the natural resources and leaving behind toxic by-products for the locals to consume. This should have helped the school system; unfortunately, the school system does not contribute to the economy directly where the technology industry does. This is an excellent example of how influential economics are in education and ecojustice. We have put ourselves in positions where we cannot afford to turn down income. Something more drastic will need to happen for change to take place.

The *Earth Charter of 2022* calls for all countries to implement "patterns of production, consumption, and reproduction that safeguard the Earth's regenerative capacities, human rights, and community well-being" (retrieved June 23, 2022). These terms are not defined in the Earth Charter, they are left to the individual members to define for themselves. This will not happen on a national level, but it is possible for independent companies and individuals to make a difference. In September of 2022, Yvon Chouinard, founder of Patagonia Clothing Company, turned over his ownership to a newly established nonprofit organization. The profits, averaging $100 million a year, have been set aside to "combat climate change and protect undeveloped land around the globe" (Gelles, 2022, para. 2). The new nonprofit, Holdfast Collective, is guided by saving the Earth physically and through education programs. Important threads of scholarship include exchange and increasing diverse economies, understanding the ecology of water, building resilience, growing education programs, and water and health (Gelles, 2022). Chouinard's ideals are aligned with the global economy of water. Wutich and Beresford (2019) found that there is a moral economy of water that "facilitates survival…and builds trust" (p. 170). They also found that "water sharing occurred under conditions of scarcity with expectations of reciprocity" (p. 169). The term 'sharing' may be misleading since those with water are able to name the price of reciprocity. Economics continues to be the controlling factor under all forms of currency.

Water is a social phenomenon that is basic to every society and culture (Orlove & Caton, 2010) and power system. Water is the foundation of relationships for many cultures, especially those who are not dependent on technology and industry. According to UNESCO (2022), "water is also a contributing factor to the conflict, … but a spirit of dialogue helps to transform water-related conflicts into cooperation" (retrieved June 2022). The discourse UNESCO refers to is

found within the conflict resolution and ecojustice curriculum of ecopedagogy. Because water is a global commons, it can serve as a connector to support peacebuilding (UNESCO, 2022). Fair water sharing builds prestige and social capital as it is "central to negotiating … relations" (Wutich & Beresford, 2019, p. 169). Clean and safe water is one focus of ecojustice as water is not equally accessible on the planet. Industries that need water for their processes often locate in areas where the population is poor and uneducated to take advantage of them. H&M clothiers are but one company located on the Citarum River in Indonesia that dumps its waste directly into the river; the mercury levels are more than 100 times the accepted standard (German Broadcast Service, 2020). The residents of the area and downstream are too poor to move or purchase clean water; as such, they are forced to use this water and have paid the price with their health. This abuse is only possible because the fashion industry and others do not value the people or the river as entities with rights; they value profits. The Citarum River is considered the most polluted river in the world. Although the government of Indonesia knows this, they need the income so desperately they cannot afford to shut down the industries. In a world with global citizens, the more financially stable economies must support others so that they are able to make more sustainable choices.

To address this disequilibrium, Angela Antunes and Moacir Gadotti (2005) proposed ecopedagogy as the appropriate pedagogy for UNESCO and the Earth Charter because of the holistic point of view. They outlined the move from an anthropocentric lens that placed humans above other species to the planetary citizenship model where all living species are considered equal with the same rights and protections. This new dynamic is considered a reliable course to ensure ecojustice for the living world but leaves the natural world which supports life out of the equation. In the last decade, this has begun to change. Karine Gagne and Mattias Borg

Rasmussen (2016) researched the place of water in a variety of societies and found that "as water changes and moves under broader political, economic and environmental processes, new ways of knowing and understanding the world emerge" (p. 141). India, Oceania, China, and the United States have recently granted the status of 'personhood' to dedicated waterways in order to ameliorate prior damage and protect the water from future damage (NPR.org, retrieved November 21, 2021). Knowing that anthropocentrism is hegemonic, it is still the way we value life. 'Personhood' is not the appropriate label, but it is a step in the right direction. New Zealand took a more indigenous point of view when the state recognized the Whanganui River as a living being with "right to be protected and defended as one" (Wagner & Jacka, 2018, p. 5). Oftentimes, we think of ecojustice as only affecting the living beings and forget that if we were to protect the non-living - the water, soil, and air - we would be protecting the living. This global view of citizenship is reaching mainstream through the consumer. As they choose more items that are from recycled materials or decomposable, they are choosing to become global citizens.

In 1992 at the Earth Summit, the 14th Dalai Lama stated, "universal responsibility is the real key to human survival. It is the best foundation for world peace, the equitable use of natural resources and through concern for the future generations, the proper care of the environment" (June 1, para. 2). Personal and global responsibility is foundational to ecopedagogy and ecojustice. It is not enough to protect the local environment; one must consider the future of that environment and its future residents. In *Ecojustice: The Unfinished Journey* (2004), William Gibson discusses the changes in social responses to problems. He uncovers how private sector policies and practices affect the poorest in society as well as how international cooperation can move us all toward ecological sustainability. Gibson outlines how consumer demands for 'greener' products and services are changing social and environmental ethics. The idea of a

global citizen brings about the question, where is my place in the world? Ecopedagogy asks the student to reconsider the term place as the entire Earth. When we can do this, we begin to live more carefully and delicately in our place. We begin to think in terms of belonging to the Earth (Jardine, 2012) as opposed to the Earth belonging to us. This ethic of citizenship takes time to grow and foster, yet it is needed immediately.

So, the question is how do we introduce global citizenship and implement these tenets? Through education programs that focus on our relationship with the Earth as an equal in a mutually beneficial partnership. A specific goal of ecopedagogy is to "stimulate active citizenship through the lessons of environmentalism, exposing students to the critique of the underlying power structures of society" (Kopnina, 2020, para. 1). It is the role of the teacher to promote active engagement in a democratic society, this comes in many forms. Richard V. Khan, along with his co-author, Richard Kahn (2010) sees the role of the educator through two lenses, "to design alternative modes of ecopedagogy…as well as to provide appropriate tools for more democratic, social, and cultural relations in support of a planetary community" (p. 77). In *Critical Pedagogy, Ecoliteracy, and Planetary Crisis: The Ecopedagogy Movement*, each discuss the specifics in detail. They explain the value of teaching our students to critically examine inflated claims, exclusions, and oppressions as well as to look for the hidden curriculum in texts and advertisements. Cross curricular projects are an integral part of global citizenship education, yet they are often avoided due to the difficulty in the planning stages. Eryaman, Okur, Cetinkaya, and Uygun (2010) followed local communities that had engaged their public schools in ecopedagogical projects and found that community participation was essential to a successful partnership. These projects required each team to consist of students, parents, community members and at least one educator. Together the team developed and implemented a plan to

address a local issue. Beyond remediating the issue, they gained social capital, increased local sustainability, practiced activism, and honored local knowledge.

There are many instances of successful community-school partnerships and each of them has allowed the team to choose the issue they wanted to address and design their own plan. Agency is required for success. We are still using science, politics, and social philosophies from the 16th and 17th centuries. These attitudes govern destructive behaviors towards the Earth (Lydon, 1992). As we look for the curriculum that will address the globe holistically, it is time to seriously consider ecopedagogy - "earth pedagogy is for the planetary citizen" (Norat, Herreria, and Rodriguez, 2016, p. 179). Earth pedagogy is offered as ecopedagogy. It is the opportunity for our education system to introduce a "culture of sustainability and peace" (Gadotti, 2011, p. 22) that can lead our communities towards cooperation and away from competition.

In *Teaching to Transgress* (1994), bell Hooks stated that "education is the practice of freedom" (p. 126). This truth cannot be overstated. It is proven in its antithesis. If the goal is oppression, then ignorance is the key. Freedom is what is necessary to accomplish global citizenship. Education is the path to that freedom and "ecopedagogy is a solution to our environmental problems" (Zocher, 2020, p. 234). These are the nodes in rhizome that clearly map out multiple routes to peace and sustainability. "Our task, then as critical educators…is to embrace our relationship with the world…to encourage reflection, dialogue and action" (Darder, 2014, p. 43). It is our role to encourage the global citizen by teaching them to think and act for themselves with others' interest in mind. It is not our job to tell them what to think, only to encourage critical thought.

As we shift the focus of environmentalism towards global citizenship, we guide our students to use new skills to become active citizens capable of working towards solutions on

issues they care about (Zocher & Hougham, 2020). One final note for our students who find themselves “in between” (He, 2010, p. 471), whether they be immigrants, Native Americans, or displaced; we are all neighbors on this planet and as such - belong. Ecopedagogy includes working with “equity, equality, social justice, and human freedom” (He, 2010, p. 471) as citizenship goals. Ecopedagogy includes “indigenous knowledge…in a cosmological context” (Grim, 2009, p. 1) and recognizes that wisdom traditions often parallel scientific breakthroughs (Bowers, 2016). The global citizen acknowledges that their decisions and actions will affect others, they are aware that the effect must be positive for the future. There is no longer a belief that any action is neutral. In the Gaia model every action either protects or damages the system. Every action requires follow-up to ensure that no net negative effects will be passed on to the next generation.

Ecoliteracy

Ecopedagogy is a holistic ecological approach to understanding the interconnectedness of living and nonliving systems on a planetary level. This can only be achieved if the depth and breadth of literacy regarding the environment is increased. Ecopedagogy requires a global ethic towards sustainability through biosensibility in education. The specific delivery system of that curriculum is known as ecoliteracy. This term was coined by David Orr (1992) and Fritjof Capra (1983) when referring to ecological literacy. Ecoliteracy is centered around the understanding of systems thinking, sustainability, and the interdependence of ecological systems with social systems (Orr, 2011). Ecoliteracy is a participatory approach to literacy which aims to “produce an environmentally literate citizenry that is not only aware of environmental problems but is motivated to work towards their solution” (Zocher, 2020, p. 232). Ecoliteracy is not only about

biology, ecology, nature, and economy; it begins with teaching ourselves and our students how to read the world (Antunes & Gadotti, 2005).

Beyond learning to read and comprehend the written word, the first step in literacy is recognizing what keeps us from becoming literate. It is important to notice the barriers as such and be willing to face them. The student must be able to identify reliable information; "data are not knowledge" (Weaver & Ranniery, 2020, p. 286), they are merely information that can be used as the author sees fit. Quoting Daniel Rosenberg's *Data Before the Fact* (2013), "facts are ontological, evidence is epistemological, [and] data is rhetorical" (p.18), Weaver and Ranniery describe how each is interwoven until they are indecipherable. This leaves the reader wondering what is true and how to recognize the untrue. This is more pervasive in video clips as the brain wants to believe what the eyes perceive. It is important to understand that facts are ontological based on the belief of the system or the culture; this leaves the data susceptible to change which negates the word 'fact'. Epistemologically, evidence is also based in the current understanding of the structure, leaving it subjectively challenged. It appears as if there is no truth in data, or in facts. This is not to say there are no facts, gravity is a fact, but it is important to recognize and to teach the impermanence of science and other subjects when teaching ecoliteracy.

Literacy itself is "an ecological act" (Davis, 2013, p. 81); the simple, yet grand, practice of literacy is emancipating. Again, I refer to those without literacy as oppressed. Critical literacy is essential for increasing our depth of understanding and our ability to problem solve. It is worth noting that with each scientific advance that disproves prior knowledge, the older information becomes mythologized (Kuhn, 1970). Keeping this in mind, it serves us to hold scientific 'facts' in soft hands and only use them as support for what is observed. It is also important to notice what is missing when becoming ecologically literate; what is the hidden curriculum in

ecopedagogy? Ecopedagogues, in general, agree that while the abiotic world is of value, it is of value because of the lives that depend on it. “The fixation on human interaction through all the post-qualitative work simply vivifies… thinking beyond the human condition to expand the horizons by which we think to dissolve it. The posthuman dimension of nonorganic life is glaringly missing” (Jagodzinski, 2017, p. 287). It is my contention, supported by Gaia Theory, that the abiotic world is the only reason life evolved on this planet and it should be held as at least equal to the biota. Perhaps it is just an issue of the written curriculum of ecopedagogy and ecoliteracy that lead us to interpret the indifference to the abiotic world. If this is true, then this needs to be addressed within the curriculum. “Words matter…they are designed to reproduce the same rather than to encourage difference, they trap us in the given, the myth of science” (St. Pierre, 2013, p. 226). Ecoliteracy moves us toward complex thinking using the “principles of sustainability, biosensibility, ethics of care and global citizenship” (Norat, Herreria, & Rodriguez, 2016, p. 178). For it to be effective, ecoliteracy must also be globally inclusive.

The process of growing an ecoliterate society begins with the students and teachers. As they enter discourse, each is traditionally considered the subject. Consider the possibility that the Earth is actually the subject, and we are merely objects in a 4.5-billion-year cycle. When the lens is altered and a new construct is created, both teacher and student practice co-creating new knowledge. It is within this dialogue that we learn to read the world (Darder, 2014, p. 21). It is important that the teacher be willing to visibly fail with the student in this endeavor, it develops multiple intelligences beyond the academy. The act of learning should not come easily as failures teach their own lessons (Brookfield, 2017). In ecoliteracy, this would appear as problem solving and discovering that the perfect solution does not exist. It is important to learn this through practice and not theory, to consider or create better alternatives. This “intellectual activity tends

to create cultural associations of its own" (Marx, 1973, p. 27). Ecopedagogy does not dictate the outcome of any problem or project only that it must be equitable, ethical, and sustainable. Like every scientific revolution, "discovery commences with the acknowledgement of anomaly" (Kuhn, 1970, p. 52). It is these anomalies that can be researched with ecoliteracy and addressed with ecopedagogy. In 1996, Fritjof Capra stated that ecological intelligence "would lead to patterns of thinking that understand relationships" (p. 132) in innovative ways that cannot be predicted. This is what progress should look like globally, not increased greenhouse gases and pollution.

The purpose of ecoliteracy is to ensure a democratic society. When history is erased and reason is compromised by emotion, "diverse forms of ignorance [undercut] the possibility for producing critical citizens willing to struggle over and fight for sustained democracy" (Giroux, 2017, p. 14). Ecoliteracy has been described as knowledge that serves the people of Earth (Kahn & Kahn, 2010). It guides the students toward an understanding of the deep cultural assumptions that underlie consumerism and industrialization as well as Western hegemony (Bowers, 2002). An ecoliterate populace considers environmental conflicts when voting with their voice and their investments as well as everyday purchases. They do not consider environmental damage as acceptable for personal convenience. It will take an overhaul of the system, a "transform [ation] of the academy" (Gilpin and Liston, 2009, p. 2) to institute ecoliteracy into the public school system. This will not happen while we wait for Boards of Education to tell us what to do, it must be student and teacher led. When students express an interest in ecology or equality or environmentalism, a window opens. The teacher only needs to ensure that the student thinks critically and evaluates each source for its veracity.

When Joseph Schwab wrote *The Practical: A Language for Curriculum* (1969) he unveiled the 'four commonplaces' of curriculum. In his text, he reminds those who would create curriculum to represent each participant throughout the discipline. If we were to introduce ecopedagogy, specifically ecoliteracy, into today's science curriculum, we would need to: Gain the confidence of the learners and teachers, allow the subject matter to reveal itself naturally, and be aware of the sociocultural milieu of the classroom, the schoolhouse, and the community. In the political culture of today, teachers must tread lightly when introducing new material to the curriculum if they hope to maintain their careers. One answer to this dilemma is student-led research, in which they choose their interests and issues and find their own solutions. In this time of open hostility towards educators, this is the only path I see towards the "cultural and social transformational…growth of individuals" (Ainsworth, 2013, p. 165) in education. Ecopedagogy outlines a strategy for educational reform that confronts the rapid degradation of our ecosystems (Bowers, 2001). This is a sensitive issue for many community members, educational authorities, and parents; it also feels like a minefield for the teacher. When referring to specialized disciplines, William Pinar (2019) stated, "the social and political milieus which influence…must be accompanied by ongoing attention to the field's intellectual history" (p. xiv). There must be reverence for our environmental history without placing blame. We cannot forget the past or try to rewrite it in a more flattering way for the industries or individuals who have committed atrocious environmental crimes; however, it serves no one to dwell on those mistakes without working towards remediation. Ecopedagogy encompasses history, culture, politics, economics, and science while using critical literacy skills. It transcends the limits of Sustainability Education (Grigorov, 2011) and "breaks the traditional educational scheme" (UNESCO, 2006, para. 17). It is a value driven curriculum that focuses on interdisciplinary, participatory decision making that

is locally relevant and globally responsible. Paraphrasing Archimedes, Thomas Paine (1792) said, “had we a place to stand upon, we might raise the world” (Proclamation 6637). We have a place to stand and a way to communicate with many members of the world’s population. “It is our duty to retrieve and revise the essence of education as a humanizing public force and participatory democratic project” (Grigorov, 2009, p. 109). Literacy is the soil in which the freedom of the Earth and the lives that depend on it can grow. The process of raising an ecoliterate society can end the cycles of oppression and environmental toxicity with which we have become habituated.

Ecoliteracy originally focused solely on sustainable development (Grigorov, 2011); it has evolved throughout the years to include many more facets. The additions of a reverence for traditional methods and global citizenship eventually were enveloped under the umbrella of ecopedagogy. Ecopedagogy is now considered the model for sustainable civilization (Antunes & Gadotti, 2005) while ecoliteracy is still considered a form of critical theory grounded in the governing concept of planetary citizenship. David Jardine (2000) writes that ecopedagogy is an “attempt to find ways in which ecologically rich images of ancestry…and topography can help revitalize our understanding of all the living disciplines in our care” (p. 3). The Romantics wrote, painted, played, and otherwise explored our interdependence and kinship with nature to garner support for and attract their patrons to the world out-of-doors. They understood that experiencing ecological relationships was the most effective way to protect the natural environment. This is the earliest evidence of purposeful ecoliteracy in the Western world.

Scientists, like the Romantics, also focus on observation and experience, but exclude the unquantifiable variables. Naturalists were, “long belittled by scientists…however, nature study should occupy the core of any twenty-first century school curriculum” (Fleischner, 2011, p.110).

Ecoliteracy includes all ways of reading the world to include science, personal history, beliefs, traditions, experience, art, and ephemeral understandings that may only last a moment. It is these fleeting moments that Romantics and aesthetic researchers attempt to capture. Ted Aoki (1993), a curriculum scholar, thought that science, especially the natural sciences, should be taught as a humanity. He believed that the scientific study of nature was too limiting and did not allow for a holistic understanding of the world. He called the 'lived curriculum' an antidote to the scientific method (Aoki, Pinar, Irwin, 2004). He is not alone in this belief, Deborah Rose (2004) considers ecopedagogy, in particular ecoliteracy, a philosophical endeavor. The value of literacy is accepted; the introduction of ecoliteracy to the curriculum is not yet proven. What is known is that "complicated conversations become meaningful only when threaded through academic knowledge" (Pinar, 2012, p. 209). For this reason, it is essential that science-based information remain the foundation of ecoliteracy, but we must also remember that there are multiple lenses with which to read our world and we should not limit ourselves or our students.

Like Rose and Aoki, Ted Toadvine (2009) combines environmental philosophy with phenomenology as a "richer, multifaceted philosophical investigation of nature" (p. 6). His explorations in nature research fall squarely within the definition of ecoliteracy. When addressing literacy rates and water security in underdeveloped nations UNESCO (2022) describes the value of water as a "cultural perception…that directly influences use" (April, para. 2). The document goes on to describe the phenomenology of water as it intersects with communities, literacy, ecosystems, politics, and economies. Science educators and environmentalists know that the curriculum around nature, specifically water, must change if we have any hope at all of protecting our natural resources. One way of allowing students to design their research while also working multidimensionally is including art as a form of literacy.

Joseph Pulitzer recognized that “many people in the world are educated through the eyes” (Ungar-Sargon, 2021, p. 35). He was referring to those readers with a lower level or nonexistent academic background. Pulitzer understood that every person had their own way of reading the world. He was trying to sell papers, but also trying to reach the masses with his message. The current delivery of information in the field of Curriculum Studies and in the classroom has not changed much since the time of John Dewey. Even though we know that many of our students want and need additional methods to access material and actually learn, we are oftentimes ruled by the standardized test that lurks around the quarter. Elliott Eisner (2002) promoted the arts as a means of “exploring our own interior landscape…mov[ing] us to discover what it is that we are capable of experiencing” (p. 11). His and many others’ interests in aesthetics stem from the meaning of the word. Aesthetics is a “breathing in or taking in of the world” (Hillman, 2006a, p. 36); is this not what we want for our students - to be able to take in the world? We want them to experience the world from multiple perspectives and find their own way of understanding and of contributing. Charlotte Aull Davies (2012), an ethnographer, promotes the integration of visual arts in the research process. She found that “obtaining visual material was central to the methodology” (p. 132).

When the definition of literacy is expanded to include concepts beyond the textbook, the possibility for reaching a global audience is feasible. There are many ways we sort our humanity, but art can breach and connect different cultures unlike science. Because we have restricted our definition of nature scientifically for so long, it will take time to reach the Western educated person; however, the Romantics preferred “colloquial nature writing…to more formal pursuits” (Graham, Parker, & Dayton, 2011, p. 1) and the masses were intrigued. It is possible to reintroduce romance into environmental science without denigrating either methodology. The

introduction of a/r/tography (artist/researcher/teacher) as an “invitation to think…to create additional and/or enhanced meanings” (Irwin, 2021, p. 1) into research and the classroom, is one option. It is the practice of creating a living rhizome of art and text. Ted Aoki (2004) recognized the limiting factors within curriculum research and called for “new orientations that allow us to free ourselves of the tunnel vision effect of monodimensionality” (Aoki, Pinar, Irwin, 2004, p. 1). Rita Irwin answered that call with a/r/tography. Curriculum Studies scholars and educators agree that in order to read our world we must become ecoliterate. To reach the world, literacy must include a variety of paths, languages, lenses, and methodologies.

Each tenet within ecopedagogy is its own junction in the rhizome of my work. None holds dominance over the other. While ecoliteracy is the foundation on which they are built, it is of no use if not applied to global citizenship. What is the purpose of global citizenship if not practiced with an ethic of care and biosensibility? Sustainability is a fantasy if not oriented around the other tenets. The field of ecopedagogy should be exploding at the same rate as climate science, but it lingers in the background. I wonder if a return to Romanticism will cultivate the concern necessary to make a change. Take a moment to listen to the sounds of the reeds in winter before moving on.

Figure 2.2, *Sounds of the Reeds in Winter*

CHAPTER THREE

A GREEN WATER JOURNEY: A/R/TOGRAPHICALLY INFORMED ETHNOGRAPHY

Figure 3.1, *My Point of View*

This project is an a/r/tographically (artist/researcher/teacher) informed ethnography. It expands my original proposal that ethnography would cultivate empathy and compassion in my reader towards the River. Because my subject is inanimate, I have attempted to give a voice to the River. Water specific ethnography is a small niche and is based on traditional methods. Integrating the outlines of Sarah Pink (2009), Sally Denshire & Alison Lee (2013), Kyle Hearn (2021), and Paul Atkinson, Amanda Coffee, Sara Delamont, John Lofland and Lyn Lofland (2001), I have distilled five basic requirements for an unconventional ethnography. A historical background section is necessary for an informed starting point. This includes the geological formation of the River as well as the cultural and political histories. The cultural and social assumptions regarding the subject must be addressed; this portion of the River has been the focus of the Central Savannah River Area (CSRA) for a multitude of reasons that are discussed in the research. Any political and economic factors or controversy are uncovered for the reader without bias, or with personal bias divulged. Because my research is River specific, I also address the relationships between the River and the entities that intersect with the River, including myself.

I started this research as a pure ethnography; however, this River deserves to be seen and heard. I am confident that a variety of art forms can support an ecopedagogical ethnography but much of the data is found in the research. Ecology, biology, botany, limnology, and other sciences in addition to the cultural aspects serve as nodes in this ethnographic rhizome. Because Weaver and Snaza (2017) recognize the entitlement attached to the visual, I will include works of art that supplement the visual. As I begin this journey, I am cognizant of those who will not be able to view the artistic installation. In order to offer the ability to engage, the works will include tactile, audio, and visual pieces to enhance the River experience. "As we compare the different domains of artistic and scientific knowing, it is essential to avoid the tendency to reduce one to the other…it is more intriguing and ultimately more productive to look at…how they can inform on the other" (Correia, 2013, p. 42). Weaver and Snaza (2017) also warn the writer to be aware of becoming 'methodocentric'; it is this advice that encouraged me to add an artistic component. Their admonition has me on alert to not get stuck in a position where I must complete one method before I embark on others. Ethnography is a well-established domain within the fields of anthropology, education, and curriculum studies, where works of art are often considered pieces of cultural capital within ethnographic research. Separately, the arts have been employed as their own form of research, but rarely does arts research weave itself into science as data. Arts-based research is not new; however, its validity has been questioned by scientific researchers. Because it is not quantifiable, the reader must be informed to understand its value. Visual art "enables us to capture the ineffable and helps us to understand phenomena that are difficult to understand through words alone…meanings are more accessible through the use of shared visual conventions" (Gouzouasis, Irwin, Miles, & Gordon, 2013, p. 5). As a student researcher and

technical writer, I will rely on the visual to convey meanings that I have not yet learned to put into prose.

It is our eyes that sit in front of our brains - there as our first line of defense as well as information gatherers; interpretation is made deep in the brain based on experience. Visual cues are universally understood and rarely need translation within a culture; however, between cultures there can be an assortment of understandings. Creating art mobilizes knowledge in multiple ways and is employable in a variety of settings (Cole, 2001). Art is a communication device prior to the acquisition of language and enhances understanding as the language grows. It allows both the creator and the observer to 'speak' without words. I hope the creation of art will connect my reader in a personal way that does not rely on their understanding of the research or a scientific background. According to Karen Barad (2007), a/r/tography is considered a post qualitative entanglement used to "critique and/or deconstruct in order to make data unintelligible…[to] produce different knowledge and produce knowledge differently" (St. Pierre, 1997, p. 175). If I only rely on scientific information, no new knowledge will be created. The idea of deconstruction, or asignifying rupture, to create a new multiplicity is not only intriguing but also inspiring. My own experience of the River is unlike anyone else's because it is based on my own history. In that way my data will produce new knowledge and could open pathways for others to produce their own understandings. In keeping with the rhizome, a/r/tography is an "assemblage of heterogeneous components" (Denshire & Lee, 2013, p. 222) with infinite possibilities. Knowing that I cannot possibly address all issues that intersect with this River, my directive is to address a few of those possibilities and save the others for post-doctoral research endeavors and other interested parties. I am investigating the relationship of this portion of the River with the biotic and abiotic communities that depend on the welfare of the River. I have not

attempted to reach out to every entity that intersects with the River, but rather investigated any serendipitous meeting that organically occurred.

An expectation of a/r/tography is a multiaxial growth in praxis through creativity. “Becoming pedagogical is a phrase we use to connote a state of embodied living inquiry whereby the learner is committed to learning in and through time and space, with an emphasis placed upon creative flow” (Gouzouasis, Irwin, Miles, & Gordon, 2013.p. 8). This commitment may be met with encouragement or criticism depending on the curricula. There is a high value placed on curiosity in the sciences; however, this does not include the creative process until the student reaches the highest levels of innovation. While in elementary through college, the student is expected to absorb and regurgitate the scientific method. The integration of non-quantifiable variables is still considered a distraction from progress even though science fiction is credited with the conception of many scientific advancements. Becoming pedagogical requires “the courage to change” (Gouzouasis, et. al., 2013, p. 2). This courage often requires the individual to take risks alone and hope that those in charge do not notice, interfere, or stop the process.

Any kindergarten teacher can attest to the value of creativity when teaching/learning new material. Minds, especially young minds, are excited to build their own rhizomes and explain them to others. This is most interesting when there are unexpected outcomes. When students receive the same information and interpret it differently, polysemic readings increase the engagement of the whole class (Barther, 2009). In addition, the concentration required to create has developed mindfulness in those students who are given multiple opportunities per week. This “mindfulness in curricula has demonstrated benefits of increasing academic performance and decreasing anti-social behaviors” (Orr, 2014, p. 48). Prior to my research, I wondered why I rarely had behavior issues with my students. Beyond respecting them and their emotions, I

developed creative projects for each unit. My students knew they could prove their understanding in a way that best suited their brains. I had no idea I was building mindfulness or allowing them to address their own anti-social behaviors. My goal was to grow their confidence and hopefully increase their affinity for science. By allowing them to be creative, they were able to integrate multiple perspectives, increase learning, engagement, and acquire content comprehension (Hall, 1973/2003; Burnaford, Aprill, & Weiss, 2013). This would not have been possible if I was teaching from a script or towards a standardized test.

The integration of ethnography with a/r/tography is guided by the ethnographies of other rivers and water regimes. Similar ecopedagogical research has been done on rivers within and beyond the United States; however, they have focused on the political, historical, or scientific aspects of the water. At this point in time, three types of river ethnographies are recognized in academia: Those "organized around the river… [ones that investigate] relationships of people to the river…and the political and technological studies of the river" (Wagner, Jacka, Hviding, Mawyer, and Muru-Laning, 2018, p. 8). Wagner and his research team, work in Oceania investigating the relationship of the local people to their water systems. I have included this type of research in my own study. In the Southern Hemisphere, Jessica Weir (2009) is also investigating human-environmental relationships in Australia; however, her research examines how indigenous knowledge can transform societal understandings regarding the environment and climate change. While I do address indigenous populations around this River, they no longer influence our contemporary understanding of the River. Wagner et. al. (2018) discuss the validity of water as social due to its ability to "animate all aspects of life" (p. 4). This research team focuses on the societal pressures placed on the water with overuse and pollution. I also address how the local industry in the CSRA influences the health of the River currently and in the past.

The study of island rivers in Oceania continues as climate change places an urgency on the welfare of freshwater globally. In India, Lyla Mehta's (2005) research on water scarcity supports the efforts of Vandana Shiva (2009, 2016) to protect water politically in the college classroom as well as in the Indian Parliament. Each of the examples adds a foundation to my study; however, my research differs in one important aspect, the recognized river ethnographies keep the river as the object of the study. I intend on adding a fourth type of river ethnography - the River as an ecopedagogical teacher - the subject.

Ethnography on abiotic subjects

Technological studies of rivers are generally focused on power and pollution; it is not surprising that many of these studies take place in colonized areas. Taylor Graham's (2015) research on the Teesta River of India investigates the contested banks that provide the livelihoods for indigenous Lepcha and Bhutia communities and hydroelectric power for the Indian government. Other river ethnographies in Nigeria (Nwankwoala & Omofuophu, 2020), China (Zhao, Wan, Yu, & Huang, 2015), and the United Kingdom (Hathway & Sharples, 2012) focus on capitalism and other dominant ideologies that have led to the control of the waterways at the degradation of the natural environment. These studies refer to the concept of Manifest Destiny without specifically using the term, and the need to control nature as "common sense" (Brookfield, 2017, p. 21). An interesting differing point of view is the ethnography of the Duero River by Kyle Hearn (2021). He investigates the general disdain of the watershed due to the agropastoral past of the region between Spain and Portugal. Because the borderland represents backwardness and ignorance to the residents, there has been an intense community engagement effort to acknowledge the cultural value of the landscape; this is a rare ethnography where the governments are leading the people to protect the natural resources. Crisca Bierwert (1999)

created a post structural ethnography where she did not attempt to create a complete picture of Coastal Salish culture in Washington state and British Columbia, but rather thread together multiple approaches that offered a new lens. Her work allows the reader to engage with the culture without expecting a technical explanation. These and many other ethnographies are organized around the production of everyday life by ‘othered’ peoples and scrutinize their social structures, power relations, and history. While compelling investigations, the human remains the central figure. I am interested in sliding the human factor to a position that is equal to the natural world without placing one over the other and reconsidering the River as the ‘other’.

South American, Central American, and most recently North American rivers are being considered and legally given the rights of personhood. While I disagree with this nomenclature, I understand that it is the most effective way to communicate the rights of protection to the public. Latin America is home to the largest freshwater system on the planet; it faces an increase in hydroelectric dam construction and transportation projects (International Rivers, 2022). Among others, the Amazonian tribe of Yanomami are fighting to protect the portion of the Amazon River upon which they rely by nominating the river for personhood. Currently, the Amazon is being poisoned by gold miners who are also bringing in disease, drugs, and abusing the young women of the tribes (United Nations Human Rights, August 2022). This is an interesting case study because the tribal members themselves do not have the protections of personhood, yet they are fighting to get those protections for their way of life. These ethnographies are organized around the relationship of people to the rivers. In Central America, concerted efforts are aimed at saving endangered species by protecting the water. It appears as if the governments are more concerned with how the world will perceive their efforts to protect endangered fauna over the

protection of the people or the water (Conservation Planning Specialist Group, 2022). No matter the subject, it works towards the protection of the water.

In the United States, river restoration by dam removal is an ongoing battle between Indigenous peoples, government agencies, environmentalists, and economic powers. Each believing they know what is best for the residents or the environment, but with little compromise or resolution. My own portion of the Savannah River has been embroiled in the court system for the last two years over the costs associated with dam restoration, deconstruction, and endangered sturgeon. This struggle is covered in the last two chapters of my research. In November of 2022, Native tribes that rely on the Klamath River, which runs from Oregon through central California, were able to celebrate. Removal will begin this summer on the four dams that span the length of the river. The dams have provided less than two percent of PacifiCorp's power yet have significantly interrupted and damaged the health and welfare of the Pacific Salmon, and therefore the health and welfare of the people. The dismantling of the dams was an economic decision by PacifiCorp, the organization could not afford the hundreds of millions of dollars it would have cost to comply with new voter approved environmental regulations (Al Jazeera, 17 November 2022). Your vote matters. Across the U.S. over 1900 dams have been removed in the past two decades. Some were for environmental reasons, but most were economic decisions. In each case, the cleanup took many years and millions of dollars. In the areas where the rivers have been returned to nature, indigenous voices report an increase in the number of species and health of the fish and bivalves, as well as the plants and animals that extend throughout the watershed. In 2012, two dams on the Elwha River, on Washington's Olympic Peninsula, were removed. The Lower Elwha Klallam tribal elders were instrumental in the removal of the dams and having the river granted personhood for its protection (nps.gov/olym/learn). Although it took nearly a

decade, the Elders report strong salmon and clam seasons with a lower infant mortality rate. These regions are highly contested and deserve a voice that represents all living and non-living entities within the water regime.

Ethnography is a connective component that allows me to bring a voice to the River while sharing space and time with the subject matter. The participant-observer relationship becomes a partnership; it is not possible to observe without participating (Liston, 2001). It was my intention to become a partner with the River, allowing an alternative lens to open a previously unrecognized pathway to knowledge. Before I could discuss the relationship of the River to other entities, I needed to identify those participants. Attempting to not become the director of this study, I allowed the participants to reveal themselves as I paddled the River. Many ethnographic studies focus on the multiplicity of relationships between humans and their biophysical environments (Little, 1999); with this perspective in mind each actor and resource that I had access to entered the rhizome as if it was a flexible location on a map. I hope this builds a holistic understanding of the position and perspective of this River. Ethnographies have been conducted on other rivers in the world; however, they did not focus on the River as the teacher or as an equal participant. According to Paul Atkinson (2001), "the power of an ethnography rooted in alternative perspectives is the ability to perceive science and technology differently" (p. 242). Science and technology played their parts in this research; however, a/r/tography was the alternative perspective on which I relied. As an artist/researcher/teacher, I am reminded of Joseph Schwab's (1969) four commonplaces. Traditionally I would lead as the teacher; however, for this experiment to work the River was the teacher and I received. The subject matter informed how science, ecology, and specifically this River enter the curriculum, while the milieu is addressed throughout in ethnographic forms.

My role as an observer-participant aligns with the Eriksson and Kovalainen (2015) description of a confessional ethnographer. One who "opts for a personal style, presenting emotional reactions, unexpected occurrences, and one's own expectations and experiences of the fieldwork" (p. 161). I collected data and presented it along one section of the River as a flowing story that enters and exits time and space as I float. Relying on authors who have engaged with the non-human world for inspiration, I gave a voice to the River. Eduardo Kohn (2013) wrote ethnographically about forests, calling his writings meditations as he described communication between trees. Robin Wall Kimmerer's (2013) writing is reminiscent of prayers that braid her Potawatomi history into botany as she carries the reader through pecan groves and fields of wild strawberries. Wagner, Jacka, Hviding, Mawyer and Muru-Lanning (2018) explore the four main rivers in Oceania as fluid tissue mimicking the flowing nature of culture. Each express, in their own way, a desire to connect with thoughts and beings that are beyond human - this too, is my desire. Kohn (2013) states that those connections "make us" (p. 228). Kimmerer, Wagner, Jacka, Hviding, Mawyer, and Muru-Lanning agree with Kohn's recommendation that the primary analyst, "collect a variety of information, use observational - on site documentation, and take field notes rich in description" (2015, p. 156). My field notes included cartography, documentary, and photography to add to the depth of the readers' experience. Roger Payne (1995), a renowned marine biologist, recognized the value of local knowledge and immersion in research. He pointed to knowledge of the observant local as the expert over any scientific theoretical research, recognizing that a formal education is not necessarily better than a life lived attentively.

Recognizing that this research placed me in a vulnerable position and knowing that my tolerance for exposure is critical to the research, I continued along this path. Paul Atkinson

(2001) writes that it is necessary to “take us somewhere we couldn’t otherwise go” (p. 413). He further clarifies that this is not exposure for its own sake but rather essential for the research to flourish. Because I am working in my own community, Eriksson and Kovalainnen (2015) issue one final warning to the familiar observer-participant; there is a distinct “danger of misunderstanding” (p. 153). They warn the researcher to be reflective often and wary of making perspective assumptions, stating “specific groups and individuals develop distinctive world views” (p. 153) that should not be presumed but rather investigated. As a reflective investigator, I have curated a small team that consists of a science educator, art educator, a historian, and a brutally honest friend to question my assumptions as I write. They are not being compensated in any way and have volunteered their time and expertise to ensure that my work stays focused on the River and not myself.

Because the participant-observer helps to construct what will become the data (Davies, 2012), this is also considered action research. Ethnography and a/r/tography are each considered actionable, together they are capable of dealing with a greater variety of issues (Jagodzinski, 2017). Together they form their own multimodal multiplicity, able to focus both a critical lens and a romantic lens on structural relationships. Integrating art into scientific research requires justification and an explanation for the rationale. Although this adds to the work of the researcher it also clarifies the challenges and opportunities within the research. Paul Atkinson (2001), writes in his *Handbook of Ethnography*, “the study of society is rooted as much in the [researcher’s] personality, and the purely fortuitous circumstances into which she is thrust” (p. 408). I am privileged to share space with this River. Even though my move was long considered and purposeful, it was not until the imposed COVID isolation that I realized how important this body of water is to my physical, mental, and spiritual health and the health of the planet.

It is widely understood that isolation is detrimental to *Homo sapien* health; however, isolation in nature has proved to be very beneficial as well (Cacioppo & Hawkley, 2009). Many early scientists and romantics spent long periods of time alone in nature; while they recognized loneliness, it did not overshadow their contentment or their productivity. Their engagement with nature proved to be their inspiration for creativity and innovations. John Dewey (1923) called for more creativity and imagination in education whether the child was alone or in the classroom. He stated, "the joy which children themselves experience is the joy of intellectual constructiveness - creativeness" (p. 166). Many education researchers have followed Dewey's recommendations and agree with the necessity of creativity, connections, and joy in education. Maxine Greene (2000) saw art as the means of connection between the teacher, the subject, and the learners. She referred to art as "relevant in overcoming our inability to see each other" (p. 136). Barone and Eisner (1997, 2012) described how humans make sense of their world through their connections and creativity. This is most obvious when young children play 'make believe' together. There are no rules or limitations, just pure creativity. In *Education for Eco Justice and Community* (2001), Chet Bowers focused on the need for new metaphors and new methodologies that could connect us to nature. In 2004, William Pinar wrote the introduction to *Curriculum in a New Key: The Collected Works of Ted T. Aoki*, where he recognized that creativity and connections were being made with art. These connections may not have been possible with mere words. Pinar stated, "I was then, quietly pleased to witness a curriculum scholar bridging curriculum concerns with art" (p. xiv). Nature, creativity, and curriculum intersect in the science classroom when permitted. When this is allowed discourse is generative; however, assumptions need to be addressed so that authority figures do not intercede in the process or attempt to influence the outcomes.

Appreciating multiple intelligences and allowing them into the classroom has long been recognized for its potential, in theory. It is just now slowly being accepted into practice; kinesthetic and visual intelligences are most applicable now, but educators are still limited to manipulatives and videos. Visual intelligence seems to "function unconsciously" (Siegesmund & Freedman, 2013, p. 21) and can be overused. Because visual understanding is automatic, it also goes under investigated and becomes a part of the "positivist and post positivist research" (Siegesmund & Freedman, 2013, p. 18) problem in science education. Specifically, in ecopedagogy, visual arts are necessary to convey issues of pollution, abuse, and sustainability; however, a photograph or video recording does not tell the whole story. It is "naive realism associated with mechanical processes of recording, whether audio or visual, that must be acknowledged…the camera sees and records only a very limited selection of what is to be seen by a human in the same position" (Davies, 2012, p. 133). Beyond the obvious lies of filters and cropping film, the recorder chooses what enters and what is excluded from the frame.

Ethnographic research can, and in my case should, include visual records, but as the researcher it is my responsibility to ensure that I convey an honest representation. I was careful to limit editing to only what clarified the image and included the surrounding environment. "Another consideration closely related to the presumed realism of the image is the assumption of its supposed objectivity" (Davies, 2012, p. 134). There is no single photograph that tells the story of the subject; therefore, the research will include multiple perspectives and multiple modalities. Moving water has very specific qualities that cannot be captured in a photograph. "Only the form is permanent, and what gives any shape at all to the water is the motion" (Langer, 1957, p. 124). This study includes documentary clips that allow for the weight of the sound of moving water as

well as the grace of a peaceful meander. While it cannot be fully captured without being there, the video does invite an understanding of the power generated by moving water.

A/r/tography as methodology

Water itself is generative, as are arts integrated studies. The act of making art mobilizes knowledge in formal and informal settings (Cole & Knowles, 2001). Art making "facilitates access to deeper and untapped ways of knowing…the self in relation to the other" (Sameshima, Maarhuis, & Wiebe, 2019, p. 155). In order to become generative, the researcher must be willing to open oneself to possibilities that have not been previously considered. There is a certain level of faith involved in allowing the outcome to show itself. Maggie MacLure (2013) refers to this vulnerability as 'wonder' and requires it for her own research. A/r/tography is "open to wonder while trusting uncertainty… [the a/r/tographer] exposes their living practices in both evocative and provocative ways" (Irwin, 2013, p. 198). This type of inquiry is ontological; it invites both the researcher and the reader to engage wholeheartedly. When each participant is active the discourse becomes transformative. William Pinar (1994) wrote about the same type of transformation through autobiography. His use of the term 'deconstruction' (p. 223) to deform and unlearn what we think we know about ourselves is akin to the uncertainty required to become a generative rhizome. While I did not conduct an autobiography, there were times where I adopted an autobiographical lens. I cannot assume to know what the River knows or wants, but I did take a protective stance for our natural world. In this role as the voice for the River, I attempted a variety of art making projects.

Arts integrated studies "refers to the research project in which the arts are used specifically as a generative mechanism…[they] can be used to advance scholarship by a researcher working independently" (Sameshima, Maarhuis, & Wiebe, 2019, p. 2). As an

independent researcher, I endeavored to discover and practice an innovative lens for uncovering scientific curiosity. It is with this purpose that I am focused on the arts instead of the scientific method, in the hopes of encouraging other educators to reach beyond their level of comfort. Addressing Ted Aoki's (2004) concerns, "what seems to be needed in curriculum inquiry…is general recognition of the epistemological limit-situation in which curriculum research is encased…we need to seek out new orientations that allow us to free ourselves of the tunnel vision effect of mono-dimensionality" (p. 1). This task will require mindfulness, contemplation, and an exploratory spirit. Gadamer characterized the aesthetic experience as "disorienting…an ontological matter that breaks open the being of the object…not only what we understand something to be, but also how we understand it, and our understanding of it, to exist" (Jardine, 2012, p. 103). In order for a generative discourse to occur, we must be willing to 'break open' and disassemble our understandings. When we allow ourselves and our students to do this, the outcomes are unpredictably unique - this is where innovation occurs – where learning occurs.

The willingness to experiment with learning is desperately needed in our increasingly formulaic education system, especially in the sciences. "The arts and sciences are twin peaks in human cognition, and neither should be privileged in research practices" (Rolling, 2010, p. 105). Unfortunately, in the sciences this statement would be disregarded as rubbish, even though it is through medical illustration and technological creativity we have reached the current level of comprehension. Photography has allowed us to understand other galaxies and star systems. Even the botanists agree that the watercolors of Nirupa Rao (Sanjappa & Venu, 2020) capture the fullness of the Indian Western Ghats better than any single photograph is able. Science and art-based research share similar goals and experimentation, both are based in research and involve the use of systems…with the goal of gaining knowledge (McNiff, 2007). As long as all

participants/stakeholders have the same goal of gaining knowledge, there should be no issues with how a teacher goes about that effort. “By claiming to have rigorous methods and to produce ‘truthful’ statements, most scientists… underestimated all the other ways of producing knowledge, considering them and their outcomes as subjective, vague, untrusting, or suspicious” (Correia, 2013, p. 39). Interestingly, Einstein’s Theory of Relativity and his postulations on quantum physics were also considered subjective, vague, and suspicious. His creativity was consistently questioned, as was his sanity.

Curiosity and a willingness to experiment allowed Einstein and other notable scientists to achieve more than those who strictly followed the scientific method, yet we still ask our teachers and students to be followers. There is no doubt that DaVinci’s integration of the arts and sciences proved successful for both fields. “Science must be taught as a humanity: A curriculum anecdote” (Aoki, 1993, p. 255). There is growth, acknowledgement, and acceptance of the power of integrating the arts in research. Arts educational researchers have also crossed into collaborative interdisciplinary research with the understanding that knowledge is mobilized when accessed from multiple disciplines (Andrews, 2020). The positive outcomes of this integration have been recognized throughout curricula, disciplines, and across demographics. Christopher Emdin (2010) witnessed his students display “thoughtfulness and creativity…while [attempting] to make sense of science” (p. 11) but also saw how disenfranchised they became when cramming facts for standardized tests. At the university level, Giles Deleuze straddled the rules of science by “sympathizing with the arts while at the same time…liberating it from the power of opinions, proposals, and functions” (de Landazuri, 2009, p. 90).

Arts-infused research is not traditionally organized; there may be five chapters but more likely there are pieces or collections that represent chapters. Researchers often use metaphor to

describe poignant ideas while they "interweave their literature review with their own conceptual framework" (Adkins, 2012, p. 60). There are instances that require more guidance for the reader, oftentimes the prologue or introduction will direct the reader to specific information before they move from one section to the next. This is true of published and student work. As a doctoral candidate, Dana Compton McCullough (2016) expressly guided the integration of her play with the written dissertation. She wanted to ensure her committee gained a strong foundation prior to reading the play and did not want them to read the findings or discussion prior to understanding the dialogue in the play. (McCullough, 2016). The directions were necessary to ensure a complete understanding of her thesis. I have provided advice with regards to the installation for chapter five. It is imperative that the observer bring listening equipment in order to block out any background sounds and focus on the River. The pieces of art stand alone in representing the movements of the River, but together, they are a multiplicity of ecopedagogy in practice. The a/r/tography model encourages the researcher and the audience to "engage with the content in a personal, artful, conceptual, or metaphorical way" (Sameshima, Maarhuis, & Wiebe, 2019, p. 38), while the ethnographic model addresses convergences within society. The two methods are in conflict when introducing artworks. Ethnography employs works of art as support for conclusions, whereas a/r/tography introduces art as a way to generate thoughts and conclusions. When presented as nodes in the same rhizome, the conflict is nullified.

A/r/tography intersects with ethnographic research when employed to immerse the student/reader into the environment. We are part of a "vibrant and crawling interrelatedness and resonances of the Earth" (Jardine, 1999, p. 264). When the researcher, the participants, and the artifacts come together, they form a "system or network of social relationships, that are not unlike any other kind of system or network we might imagine or experience, such as a

community, or a social movement" (Sameshima, Maarhuis, & Wiebe, 2019, p. 37). The relationships created by the River are of special interest to me. I allowed wonder to direct me to what the River could teach. By integrating a/r/tography into ethnographic research, I was able to demonstrate a clear connection between my research questions and the means by which I reached conclusions. Ecopedagogy invites nature to become our teacher, requires us to investigate the positivism in the science curriculum, and facilitates the flexibility of the researcher to conduct the investigation in any manner she sees fit.

CHAPTER 4: RIVER AS ETHNOGRAPHIC SUBJECT

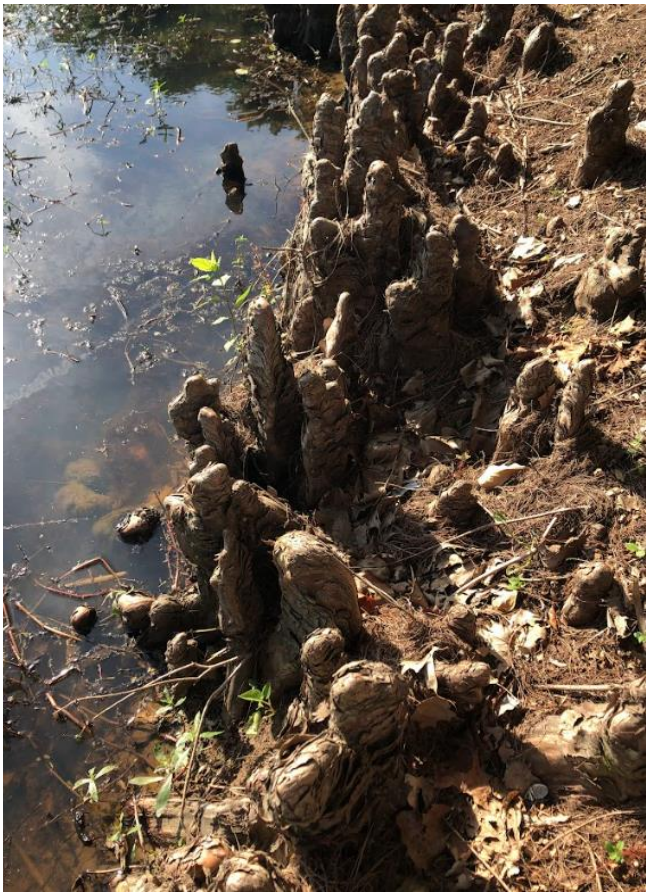

Figure 4.1, *Cypress Knees*

Before I dive into the findings that have emerged from my green water journey, I need to introduce the term, 'ki'; I will use it for the remainder of my research and for the rest of my life. In *Braiding Sweetgrass*, Robin Kimmerer (2013) invites her reader to consider nature as a living being, with value and equality. She outlines the etymology of the pronouns 'ki' and 'kin'. As a member of the Citizen Potawatomi Nation, she refers to all of nature as beings and as her family members. Her tradition and language respect all life and recognize that when we use the word 'it' we place ourselves above other life forms. "When Sugar Maple is an 'it', we give ourselves permission to pick up a saw. 'It' means it doesn't matter" (Kimmerer, 2013, p. 57). This pronoun is also found in Buddhism, Daoism, and other East Asian cultures as *chi*, *ki*, or *qi* and holds much the same meaning, something with a life force or an energy (Hook & Twitchett, 1991). You may have already noticed that I capitalize the word 'River' throughout this document when referring to the Savannah River, it is with the logic of Lovelock and from the traditions of Kimmerer that I do so. Kimmerer, along with many other indigenous peoples, value the land, air, and water as life-giving and therefore recognize them as living entities. Where Kimmerer writes of tradition and botany, Lovelock (1972) and

Margulis (2008) concur with atmospheric and hydrochemistry and microorganisms, respectively. There are a multitude of subject matter experts who agree that the Earth and all kin members behave as living beings. In *The Sacred Universe* by Thomas Berry and Mary Berry Thomas (2009), the authors state that the universe is made of subjects and not a collection of objects placed there for our observation. For most of my life I have held the belief that the mountains, soil, wind, and water were keeping me alive through their presence. These thoughts made me feel so different from those around me that I never expressed them to anyone except my own children. It was not until this research that I found the vocabulary for my way of understanding the world. For these reasons, I will refer to the River as ki so that my reader will experience this immersion - if only for the duration of the story because this ethnography is placed within an ecopedagogical framework. My interpretation of the River's voice is printed in italics. For the most part the River reminds the reader to pay attention to the world around them.

This research began as an antidote to the positivism found in science education with the intention of conducting a post humanist ecopedagogical investigation to uncover a new lens on the natural environment; however, it has branched into much more. Ecopedagogy requires that we look at the subject matter through multiple lenses in order to gain a more holistic understanding of the situation or the needs of the study. Michel Serres (1997) *Troubadour of Knowledge* suggests that there is a desperate need for the weaving of the humanities into the sciences for the purposes of education; I have long held this belief clandestinely. We practice the scientific method in the school house by teaching subjects in isolation. Segregating variables is necessary in pure science but antagonistic to learning in a holistic curriculum. I cannot be the only educator who believes that all of our subjects and topics should be connected to the student and to each other as they are in life. I wondered what could be discovered ecopedagogically if I

positioned the River as the teacher (Schwab, 1969) and as a vital and equal member of the community. As the student, I will listen to what the River has to teach. Through a multidisciplinary investigation including ethnography, science, history, ecology, and economics, I set out to explore a section of this River and allow ki to lead the way. Humbly, I will take on the voice of the River inspired by Wendell Berry's (1970) essay, *The Unforeseen Wilderness* and Bruno Latour's (2013) *Facing Gaia: Six Lectures on the Political Theology of Nature*. Do not misunderstand; I do not believe that I could hold or voice the knowledge of millions of years of experience; this is merely an experiment in practicing the use of an alternative lens towards discovery. It should also be noted that I am a skilled scientific researcher who has never conducted qualitative research or taken an art class beyond my middle school days. I am practicing what I believe needs to be incorporated into the environmental curricula.

According to Giddens (1990) any ethnography must first identify the 'phantasmogoric' social actors who were not necessarily present throughout the history of the study but who exert an influence from a distance spatially or temporally. The Port of Savannah is a major controlling phantasmagoric actor for this region politically, environmentally, and economically. In addition, the Savannah River Nuclear Site, multiple power companies, government agencies, the Army Corps of Engineers, the U.S. Coast Guard, and historic mills have each played roles and continue to influence the health and welfare of the River. These, and other factors, are investigated throughout this study; however, in order to support the teacher role, the River and the water remain the central focus.

As the teacher, the River asks, *if have I considered the origin of the water I float upon? Have I considered what is floating in the mud after a hard rain? Have I considered what lies beneath the water?* Hydrologists study how water moves through and on Earth's surface,

meteorologists study how water interacts with the atmosphere, biologists study how water interacts with life, and astronomers study the origin of water in our solar system. Many of these specialists agree that the water on our planet came from microscopic drops embedded in every gram of every comet, meteor, and asteroid that ever hit the planet (Piani, Marrocchi, Rigaudier, Vacher, Thomassin, & Marty, 2020; Meech, Raymond, Meadows, Army, Schmidt, & Des Marais, 2020; Leshin & Vicenzi, 2006). Most of the water evaporated into the atmosphere until the Earth cooled enough for the water to condense and fall to the surface. This phenomenon alone is enough to ponder on as I paddle the short section of my study; I have just placed a paddle in the water and already I am contemplative. Because our planet has enough gravity and centripetal force to hold onto our atmosphere, we also have water in all three phases. Along with a magnetosphere, the combination of water and protection from solar radiation allowed life to evolve. My teacher asks me again, *how is it possible that you do not take the time to recognize how rare, random, and amazing this combination of events really is?*

Evolution is touched on in life science classes but only to the extent of understanding what Darwin learned on the Galapagos Islands and how Linnaeus developed binomial nomenclature. Cladograms show how adaptations are advantageous, but the term evolution is a trigger word in the school system is kept very basic. It is rare when a teacher is able to discuss how or why water or air, or soil is adapting or being anthropogenically altered. This information crosses into climate change which has become a political term meant to agitate rather than investigate and mitigate. A teacher must promote open questioning to allow the students to introduce evolution and climate inquiries. When teaching the Drake Equation (Drake, 1961), my students are able to calculate the probability of life existing on any other planet. They find that the possibility exists within our own galaxy, but when we add their combination of genetic

material to the formula, there is basically no chance of them existing on this planet or any other one - they are always astounded. This is one of those times when I let the silence grow while they realize how precious they are on an equally precious planet. This is also where I suggest they write about their epiphany while they can hold onto the fleeting feeling. Why is this not a part of the writing curriculum in our school system? When I make this suggestion, the teachers are already drowning in the standardized material they are mandated to cover. Perhaps that is the purpose of a forcefully filled curriculum? If the teachers are so busy trying to keep up with a curriculum map, they will not allow time for open ended questions and thought experiments. When I consider how micromanage my day is, it prompts me to consider how micromanaged our water is on this planet.

Why do you believe that I need 'managed'? When delving into background information on the Savannah River and the watershed, I found more than 100 articles pertaining to the management of the water and the watershed; however, most referred to the marshes, the deltas, and the port area. Because anthropogenic effects and damage are so visible, there is a plethora of ecological research on the mouth of the Savannah River as it meets the Atlantic Ocean. Many universities, government agencies, and individuals are drawn to the area knowing that they will find quantifiable data that can be used to further 'manage' the water. My section of the River, although historically significant, has very little current information; the water is managed by the bordering cities pulling from the River for drinking water. Unfortunately, when the Savannah River Nuclear Site, near mile marker 170 up River from the Atlantic Ocean, stopped returning heated water directly into the flow of the River, most research ceased as well. Recognizing that this was an economic necessity, my teacher asks me to consider the other's point of view. *The water was pulled from me at nearly a billion gallons of water a day and returned at near boiling*

*temperatures (*srs.gov*). My trees, moss, reeds, and yarrow were burned. My fish and oysters were cooked if they couldn't move away. The mammals learned to stay clear of the steaming water, the reptiles learned to use it as a heat source, and the scavengers cleared the area of carrion.* The damage from the super-heated water is well documented; remediation ponds were built on the campus to cool and ground the water before it is returned to the River. The SRNS ecology center continues to conduct research relevant to nuclear science on the land, ponds, flora, and fauna within their boundaries. The Savannah Riverkeeper volunteers continue to monitor the *e coli* and other non-point source pollutants from streams that feed into the River (savannahriverkeeper.org).

It is the lack of qualitative data and local sources that secures the place of this research. I was struck by the lack of integration in the classroom. The counties that border the River in Georgia and South Carolina refer to the Savannah River and the Augusta Canal in elementary school where the standards require Civil War background, but that is the last mention of this River in the state or local standards. The River is not included in Environmental Science coursework, nor is it referred to in other subjects. This section of the River could be the foundation of a multi-perspective ecopedagogical course that integrates all subjects at any level of education. The River could be the centerpiece of a cross curricular study for upper class students or as a thesis for advanced placement independent studies classes.

The Savannah River is over 300 miles long; however, I am focusing on a 30-mile section from the Strom Thurmond Dam forming Clark's Hill Lake to the New Savannah Bluff Lock and Dam just south of Augusta, Georgia and Beech Island, South Carolina. Beyond its natural beauty, my reasoning for choosing this area is simple - I have access. Henry David Thoreau (1854/2001) wrote *Walden Pond* for the same basic reason; it was easily accessible, and he

wanted to share his world with others. “Walden is a mosaic of philosophy, natural history, geology, folklore, archeology, economics, politics, education and more” (Orr, 1992, p. 125). This region is also rich in history, contributes to the economy, is embroiled in political turmoil, and is not included in the current curriculum of the area. These factors fit well into the themes that emerged from this ethnographic investigation. When researching water regimes, it was recommended that I use navigational, regulatory, market, and intimate themes. I have adapted each of those to fit my study. Orlove and Canton (2010) remind the researcher that water is not only a resource but also a “substance that connects many realms of social life” (p. 40). The aforementioned themes were not specifically used when organizing this study due to their scale, but they did contribute to my understanding; my geographic region is much smaller and is more specific. The findings are located historically, geographically, politically, economically, and environmentally as each of those criteria support an ecopedagogical framework within Curriculum Studies. On the advice of Allen (2004); Harding, Benfield, Bolstad, Helfman, and Jones (1998) with support from Ormerod, Dobson, Hildrew, and Townsend (2010) this study is organized by the factors that place pressure and stress on the river. Keeping in mind that ecopedagogy grounds this ethnography, the tenets of ecopedagogy are threaded throughout the sections to build an original rhizome. I hope that each reader will create their own rhizome as they follow the flow of the River.

Extensive historical research has been conducted on the Port of Savannah as well as the former Port of August, and while I will refer to some of this research, my study will focus on the role of the water and ki’s influence on the surrounding community. As an ethnographic teacher, the River requires that I conduct research to discover the beginning of this water source. *My origin story is as old as the stars. It was the Population III stars that are no longer with us who*

gave me life. It is hubris that you believe you can control me for any length of time. Upon their death the hydrogen which has always been abundant in this universe was offered a coupling. When the most massive stars ran out of fuel and the pressure from fusion overwhelmed their core and successive shells, supernovas and hypernovas expelled oxygen and heavier elements into the cosmos. This random and nearly impossible meeting created the H_2O molecule in our universe. Although this is an abundant compound on our planet, it makes up less than 0.05% of the entire universe, it is a rare gift for life, and a necessity for the evolution of it. Billions of years went by before the formation of the Earth, and millions more before liquid water covered the surface. Ki asks me to consider my effect on the water. *For millennia, I flowed freely finding my way from the clouds to the sea and back. It has only been in the last 3000 years that my paths have been altered to suit the needs of humans. For most of that time, they cared for me, and we shared cooperatively; however, recently my water has become toxic, and my banks are damaged. The groundwater no longer seeps in through the Earth but floods over the land dragging soil and debris that thickens the water and steal oxygen from the fish. My resident animals are struggling to remain healthy and invasive plants are clogging my flow; they collect silt and hold onto it as you hold onto the cholesterol in your arteries.*

I am reborn from the rain and snow who find their way to mountain streams. The Appalachian Mountains, formerly called the Central Pangaean Mountains, were formed when the North American granitic plate collided with the basaltic crust of the Eurasian plate and the African continental plate approximately 300 million years ago. To relieve the incredible stress the mountains rose, and valleys formed, and the rain followed those paths. The heat was so intense that the crust of the Earth folded and broke in places. The evidence is found on the mountain paths just south of the Eastern Continental Divide. This is the northernmost portion of

the Savannah River Valley watershed. Broken and folded rocks are visible as you pass through the Blue Ridge Parkway. It was during this period that many rivers rushed down the slopes of the mountains delivering snowmelt through the South to the Atlantic Ocean. At this point there was not a single river that carried the majority of water to the watersheds; every crevasse was a river bed. For the last 250 million years, the continents have been slowly moving apart, at nearly an inch a year (Eaton & Frederiksen, 2007). As this continued the Appalachian Mountains, once the tallest mountains on the planet, diminished to a point where their pitch was able to capture some of the slower moving water. The Appalachian Mountains roll to sea level in the northern sections of Georgia and South Carolina; it is here that the Tugaloo and Seneca rivers run. Though relatively fast moving by today's standards, they crawled to their convergence at the southern end of the mountains and the Westobou River was born.

I stopped writing to sit on the water's edge and consider why this research is so important to me. As the wind blows over the reeds, I hear the answer. *My first recorded name was given to me by the Westo Indians. For millions of years, I flowed from the lower Appalachians to meet the Atlantic Ocean. I dried up in the summers and flooded the land in the winters delivering nutrients from the bottom of my bed to the land on my banks. The fish and birds, alligators and otters, reeds, and yarrow, have enjoyed my water freely. For millennia we have existed symbiotically. This is not to say that earthquakes and storms did not disrupt this peaceful existence, only that the beings of the River were not responsible for the hiatus in equilibrium. This is no longer true. My existence is no longer respected, and my story needs to be told before I am too septic to recover.*

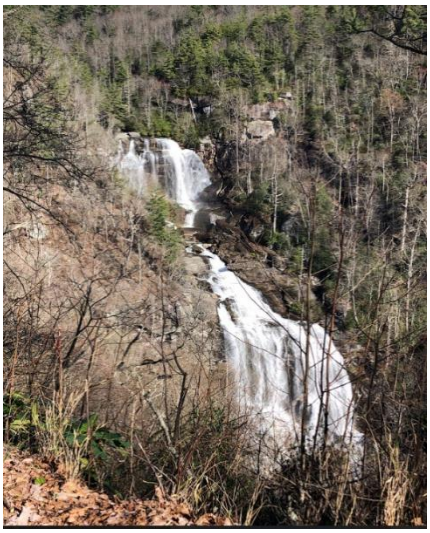

Figure 4.2, *Waterfall on the eastern continental divide*

The Savannah River includes not only the free-flowing water, but also the entire watershed that drains into ki and the groundwater that enters from the banks. Figures 4.2 and 4.3 on this page portray the northern edge of this watershed. The entire system with all its social actors is known as the water regime (Feld, Birk, Bradley, Hering, Kail, Marzin & Friberg, 2011; Lee, 2008; Duncan & EuDaly, 2003). The geographic area is over 300 miles long, sharing a 200-mile-long boundary between Georgia and South Carolina. The Upper Savannah River Basin encompasses seven watersheds, spans 1164 square miles, and includes over 744 acres. There are more than 1000 stream miles and over 43,000 acres of lake water in the area (carolana.com). Found around the 27' north of the equator, most of the Savannah River basin is in a humid subtropical climate (NOAA.gov) that rarely experiences true drought conditions. I was surprised to find myself standing in the Savannah River watershed in Gorges State Park. In March of 2023, I spent my 30th anniversary hiking waterfall trails in North Carolina. My husband and I had outlined 30 miles that included eight waterfalls in the Pisgah, Dupont, and Nantahala National Forests. Halfway through the trip we crossed the Eastern Continental Divide and found ourselves at the highest elevation of the Savannah River watershed. This weekend was intended to be a break from research, but I have found that everywhere I look, I am embedded in nature as a thread in the rhizome, and it brings me a quietude I did not realize I was missing. With the opportunity to

Figure 4.3, *Gorges State Park*

reflect, I am reminded that this water is also my teacher. *The falls breathe life into my waters, send minerals to my shores and excite my spirit. I am not merely here for you to gather, but to live my own journey. A single drop will travel the water cycle for hundreds of thousands of years before it revisits a place; I might as well take joy in the journey and so should you. Ride on top but stay vigilant of my power; jagged granite is smoothed by me; entire trees are wedged into crevices waiting for more water to set them free. I am a lovely powerful force only truly controlled by Earth's gravity. Never forget that this is my workplace, and your species is merely a temporary visitor.*

Historical Background

The earliest records of life in this area are fossils of ferns, mussels, and the skeletal remains of marine predators. Prior to the rising of the Appalachian Mountains, the southeastern portion of North America was under the ocean. Thousands of years after the mountains rose, the ocean receded, and the rivers formed, mammals migrated south, and their predators followed. The first substantiated evidence of humans is from 13,000 to 13,500 years ago; travelers who sought fresh water. These people are collectively known as Clovis people (Moyer, 2014). There are some archeologists who estimate humans were in the southeast up to 30,000 years ago but that theory is not widely accepted yet (Kane & Keeton, 1994). The Topper site, in Allendale County, South Carolina is along the Savannah River just south of Stallings Island. Items found at the Topper site are considered 'pre-Clovis' and could be up to 50,000 years old (Kane & Keeton, 1994). While it is logical that humans made their way up the River from the ocean, the oldest evidence of human occupation in the South is found on Stallings Island, an island centrally located in my research area. The island was declared a National Historic Landmark in 1961 after many years of looting. In 1929, researchers from Peabody Museum of Harvard University found

the oldest evidence of fibered pottery in North America (Sassaman, 2002). The tools and bowls were radiometrically dated to 2600 B.C.E. (Kane & Keeton, 1994). There was further evidence of stable architecture and storage areas, both suggesting a hunter-gatherer economy (Sassaman, Blessing & Randall, 2006). The Stallings People are not directly connected to any Native American tribe; however, after they abandoned the island other tribes moved in and through the area. I wondered how it felt to be occupied by an uninvited guest for the first time. *The first people to call me home followed the shad to shoals in spring, there they waited for the rocks to fill with fish. They gathered food into their boats and continued on their way North until they reached the Piedmont basin; my water is smoother there where sand covers my bed. They harvested mussels enough to build another island and left when there was no more to take.* Researchers found what equated to three football fields long and 15 feet deep piles of oyster shells (Kane & Keeton, 1994). It took decades to acquire the shells on the island but eventually the harvest would decimate the oyster population and create an unsustainable balance. Soil core samples suggest that a drought caused the oyster population to decline but the population was still in need of food. Based on pottery collected throughout the South, the Stallings Island people went further South, then West, then disappeared. For generations the River was considered a being; I wondered how it must have felt to become an object?

For many seasons migrations came and went; fish fought to get to the shoals before I settled down for the summer and their hunters followed them. Reptiles, amphibians, birds, and mammals found sustenance in my water and on my banks. It wasn't long before humans found their way back to me, most of them only stayed for a season. At first only small canoes followed the fish to the shoals but soon large vessels spewing black smoke brought people and their supplies. They came as if they owned me and treated me with disregard.

Although the Cherokee, Creek, Cusabo, Catawba, and the southern Sioux tribes used the watershed in agreed upon territories (www.native-languages.org), it was the Westo Indians who violently took control over the area. The Westo Tribe obtained firearms from the English before being driven out of the Northeast by the Iroquois. They used this advantage to enslave other Native Americans throughout Georgia, the Carolinas, and Florida then traded them for more weapons and goods (Sassaman, 2002). Local colonies cooperated with the Westo to hold off a Spanish invasion from the south. Soon the colonists had enough strength and weaponry to eliminate the Westo Tribe. The Westo War of 1680 left few Native Americans alive and altered the participants in the animal skin and slave trade (Bragg, 2002). The survivors of the Westo War moved west and disappeared, leaving an opening for new trade partners. The British ruled the area at the time and the remains of ships dating back to the early 1700s have been found as a result of the recent dredging of the Savannah Harbor. In 1736, James Oglethorpe sent a detachment up the Savannah River to determine the navigability of the River and settle if there was a suitable area for another encampment. Noble Jones reached the fall line and settled the slopes of the River at what is now called Augusta (Bragg, 2002; Augusta Museum of History). History suggests that the local tribes and the new arrivals generally got along, and August thrived as a trading post. The Chickasaw, Creek, Yuchi, and Shawnee tribes used the area to cross the River using the shoals (Cashin, 2004). *The name you call me comes from the Shawnee tribe who lived on my shores; others referred to them as the Savano Indians and used their camp to give directions.* Eventually the only tribe that remained in the area was the Creek who spread throughout the watershed. See the language distribution maps (firstnations.org).

Across the River from Augusta was a quietly growing community of free Blacks, English, French, and Native Americans. In the late 1600s the Savano, Creek, Yuchi, Cherokee, and Chickasaw tribes traded with the new arrivals in the area that is now known as Beech Island, South Carolina (beechislandhistory.org). Named after a grove of beech trees that were isolated by an oxbow of the Savannah River. The eastern shore of the River was occupied by the Savano tribe and known as Savannah Town through 1715 when Fort Moore was constructed to 'control' the Indians and monopolize the trade market. Fort Moore served as a trading site from the coast to the interior and was an important sight of Indian and colonizer diplomacy. The area became so important that in 1746, Governor James Glenn came to Fort Moore to meet with a Creek delegation to resolve trade disputes (Robinson, 1996/2016). The area continued to push the Native Americans west as farmers and traders from the Charleston area slowly settled the watershed (Sinclair, 2002). The city of Augusta, Georgia was founded around 1735; Augusta distracted traders away from South Carolina because there were more Indian tribes on the west side of the River. Both sides of the River successfully grew cotton, tobacco, and indigo in this area; the region closer to the ocean was more suitable for rice cultivation and trading took place along the Savannah River. By the Revolutionary war, the Fort had been abandoned due to the significant decline in the trade of animal hides. The Siege of Augusta took place in 1781; the British surrendered after a total of 68 deaths in under two weeks. The Americans outnumbered the British by more than two to one due to traveling soldiers who

Figure 4.4, *Native American language maps*

arrived just days before the British to reinforce the local troops. There is no mention of the Creek Indians who were present the month before the siege (revolutionarywar.us). Again, my teacher stops and asks me to consider how it felt to become the disposal area for aggression. *My banks were abandoned except for the trash and carcasses left behind. The scavengers came through and ate what was not infested then the rest rotted into my soil. I stayed quiet for the next season and my bacteria, fungi, and decomposers dissolved all organic evidence of life.*

Augusta, previously a colonial capital, became the capital of Georgia at the end of the Revolutionary War and held that position until 1795. Many government leaders moved to Augusta and began growing the village into a proper city. Guided by a group of trustees, with only politics and economy lenses, the city added infrastructure, academies, churches, and worked to reach the railroad. The Charleston and Hamburg Railroad in South Carolina stopped directly across the River from Augusta. As Augusta struggled to spur its stagnating economy, the towns across the River were making history. In 1770 Campbell Town was founded in what is now North Augusta, South Carolina; it was the first truly multicultural functioning town. Just a few miles up River the town of Hamburg, South Carolina was founded in 1821. Hamburg was the terminus site of the once longest railroad system in the world. The Charleston-Hamburg Railroad was 136 miles long. Henry Shults, a German immigrant and founder of Hamburg, spent his life building the town on the bluffs of the River. For three decades Hamburg was one of the most economically successful cities in the South and the first black community with senatorial representation (Marabel, 1984). Once the Augusta Canal was completed, shipping was deterred from South Carolina to the easily accessible Port of Augusta and Georgia farmers sold their goods at the Cotton Exchange still located on the corner of Reynolds and 8th Street. Additional rail stations meant farmers no longer needed to travel to Hamburg to sell or ship their goods and

Hamburg slowly became a freed Black farming and fishing community. Some of the descendants of Hamburg still live in the small community of Beech Island, just two miles down River from the rail terminus site.

History is quiet on the east side of the banks of the Savannah River for the next few decades as tensions rise towards the Civil War, or War Between the States, or War of Northern Aggression, depending on your point of view. Augusta, Georgia was gaining economic strength and had become a major center of manufacturing by 1861. With the River providing power to the mills, Augusta was the site of the Confederate States Powder Works, built in 1862 along the canal. Like Robert Oppenheimer, the River knows the power ki possesses and the potential for good within that power. As I was tossed about in the shoals, the River reminded me to pay attention, unlike those before me. *The power I possess can be controlled to benefit the world, but you used me to build weaponry and serve violence. No good came from this use of my water. You poisoned the water and killed your own people.* Once consisting of 28 buildings covering two miles of the shore, the only structure still in existence is the obelisk smokestack. It stands towering over the River, as the only remaining building constructed by the Confederate States of America (augustacanal.org). There are no definitive answers as to why General Sherman did not burn down all of Augusta as he marched troops to Savannah. Rumors of a girlfriend from Augusta are unsubstantiated and the idea that Augusta was not a worthy target seems misinformed. Sherman knew of the Powder Works and the Port of Augusta. No matter the reason, the sparing of Augusta allowed the city to grow stronger quickly during Reconstruction. Across the River, Hamburg was so small it was completely ignored. The “location of Hamburg and the fact that no whites lived there made it an ideal place for former slaves and refugee blacks to live” (Carolana.com, 2023, para 3). When the 13th, 14th, and 15th Amendments to the U.S.

Constitution were passed, slaves were given their freedom and theoretically full rights as U.S. citizens. Hamburg grew with freed Blacks from plantations. Hamburg survived the floods of 1908 and 1912 that nearly destroyed Augusta; the town thrived until the flood of 1929. Every person who survived that flood moved to higher ground (www.northaugustasc.gov). Surviving areas are recognizable by the maturity of the trees still standing on the top of bluffs.

I am not claiming that Gaia is a sentient being, but the cycles that keep the atmosphere, geosphere, and hydrosphere balanced may use flooding as a reset button. *Your arrogance needs checked; your willingness to use more than necessary calls for correction. The problem arises when you take control of nature without accepting responsibility, so I relax my restraints. It is rare that I can feel full and flow as I was intended.* As a result of annual flooding, the city of Augusta built the levee system that underlies the one that is currently in place. Completed in 1916, it was effective until the flood of 1929 when the water crested at 45 feet above flood stage, broke through and significantly damaged over a mile of the structure. In 1936 Congress authorized the U.S. Army Corps of Engineers to improve the levee system including new walls, closure structures, and earthen embankments (sas.usace.army.mil) marking the beginning of the federal government's role along this River. As of 2010, the last inspection of the levee, there were 'unacceptable deficiencies' that have not been addressed to maintain the safety of the Augusta City Levee (Executive Summary Augusta Levee, 2010). There were plans to work on this during the summer of 2020; however, COVID protocols required USACE employees to work from home (Schwartz, ACOE, 2021).

The New Savannah Bluff Lock and Dam, named after Savannah Town, was completed in 1937. Authorized by the Rivers and Harbors Act of 1930 and 1935, it was constructed to allow commercial shipping to reach the Augusta Canal. Prior to the construction of the three dams

upstream, the River experienced dry seasons when the shoals were entirely exposed and rainy seasons, usually January through February, that filled the watershed and brought nutrients back into the flow (sas.usace.army.mil). The animals, including the humans, relied on this cycle for reproduction and hunting. This natural rise and fall of the water level was put to an end when the dams were constructed. The larger three dams were approved for construction to develop the upper Savannah River Basin and authorized by the Flood Control Act of 1944; the land was acquired by the Truman policy (sas.usace.army.mil). The J. Strom Thurmond Dam and Lake was the first to be completed in 1954. The dam has been renamed Clarks Hill Dam, in an effort to erase the long racist history of Senator Thurmond. The dam greatly reduces regular flooding, aids in downstream navigation, and consistently produces over 700,000,000 kilowatt hours annually (Southeastern Power Administration, 2023). In order to build this dam, the town of Petersburg, Georgia was flooded. Petersburg sat at the fork of the Savannah and Broad Rivers, making it the ideal area for a lake and dam. It was once a thriving commercial area that was the third-largest city in Georgia after Atlanta and Savannah. At its peak the tobacco industry was overrun by cotton and Petersburg could not adapt fast enough to keep up with the economic demands. Although the town was abandoned by the time it was flooded, preparation was needed. The interred and most wooden structures were removed (Roman, 2022). A drought in 2002 exposed old roads and broken items that were embedded in the soil. The town's church is a local dive site and nursery area for fish. At the peak of the 2002 drought, the remains of livestock spurred investigations by the Georgia Bureau of Investigation (Fowler, GBI, 2019). Moving north up the River, Hartwell Dam and Lake was completed in 1962 then Russell Dam and Lake was opened in 1985. Each of the dams provides drinking water and hydroelectric power to hundreds of thousands of residents on both sides of the River. Without begging, my teacher asks

again for me to pay attention and to inspire others to pay attention. *Your children and grandchildren of those who benefit today from my water will pay nature's price. When silt builds up behind the dams and the lowlands are destroyed or the soil from the fields has washed away and the watershed is ruined it will be too late to save me.*

Political, Economics, and Environmental Impacts

The dams were not built without controversy and conflict that continues to this day. Political, economic, and environmental issues surrounding the dams are interwoven throughout the past and present river communities, local, state, and federal government agencies. Currently the New Savannah Bluff Lock and Dam (NSBLD) is on the docket at the federal level. At the time of this writing, attorneys for the U.S. Army Corps of Engineers and the states of Georgia and South Carolina were debating the semantics of the term 'maintain a full pool', which is a requirement stated in all documents with regard to altering or demolition of the NSBLD. Because the economically driven Savannah Harbor Expansion Project causes saltwater intrusion deeper into the estuary and endangers a multitude of flora and fauna, remediation is required by law (sas.uasce.army.mil, 2014). In early 2023 the dredging of the harbor to deepen the channel from 42 to 46 feet was completed allowing neopanamax-sized ships to enter the Port of Savannah. These are the second largest ships in existence. As a result, saltwater is now moving further up the Savannah River with little resistance. In order for plants and animals to survive they too must move beyond the salty water. This is impossible anywhere near areas where the tide can influence the salinity, so the middle River is being used to provide a safe freshwater area. This region is logically the only choice to remediate the environmental damage to the estuary at the mouth of the Savannah. The flora and fauna that depend on brackish and fresh

water for breeding or nursery seasons must move upriver to find that water. The teacher quietly watches as we slowly discover that there is a price for every choice. *Humility is necessary now. You have forgotten that you live in a wild universe where natural forces are not fully understood, and consequences exist for every decision.*

There are no obstacles for over 180 miles upriver until the first small dam on the southern edge of Augusta, Georgia and Beech Island, South Carolina respectively. The removal of the NSBLD, located near mm 187 upriver, has been identified by the Army Corps of Engineers as the most cost-effective way of allowing lithophilic riverine fish access to historic spawning areas. Neither the dam, nor its locks have been used since 1979 for transportation and it is now in "caretaker status" (sas.usace.army.mil, 2014). Conflicts by four stakeholders, all with valid reasoning, have moved this decision to the court system. The ACOE has found that the dam is in need of expensive and extensive repair to keep it from collapsing. They want to tear it down completely and lower the River by three to nine feet, depending on the bottom substrate. The governments of Georgia and South Carolina want to maintain the pool, as stated by law and ACOE regulations; the water level must be maintained for "navigation, water supply, and recreational activities" (sas.usace.army.mil, 2017, p. 3). Environmentalists want a fish ladder or weir to replace the dam so that endangered short nose sturgeon and Atlantic sturgeon, along with other species that require shoals and gravel to spawn, have access to a suitable area. The shoals just north of Augusta, Georgia and North Augusta, South Carolina match that description (Reddick, 2023). Local government agencies have recommended turning the area into a white-water destination which would bring in more tourism and create a slow incline that spawning fish could navigate on their way to the shoals. On the 27th of January 2023, the Fourth Circuit Court of Appeals heard oral arguments between the Army Corps of Engineers and the state of

South Carolina regarding the Corp's proposed solution to the fish passage at the NSBLD. At the time of this printing, the Court had not published any opinion or decisions since October of 2022; however, the discussion was made available online on YouTube for thirty days.

The demolition of the NSBLD is a complicated environmental issue. If the river bed or water level is altered in any significant way, latent toxins in the silt will be introduced to the water and make their way into the endangered estuary environment. During its lifetime, the Confederate Powder Works produced approximately 7,000 pounds of gunpowder per day for a final total of more than three million pounds. The Powder Works produced enough gunpowder to fully meet the needs of the Confederate armies and still retained a surplus of 70,000 pounds at the end of the war. (augustacanal.com). According to the Environmental Protection Agency's Toxics Release Inventory (2020), toxic by-products from the Powder Works, armory, and textile mills remain on the River's bed (epa.gov, 2022). There are multiple manufacturing structures along the River that use the water for cooling and disposal, but only one has been identified as a point source polluter. A Chlor-Alkali plant has contributed to the mercury contamination of the water, the flora, and the fauna in this section of the River and at least 20 miles downstream for decades. Mercury is at toxic levels in the silt and the fish between the dams, specifically the bowfin and largemouth bass, due to biomagnification (www.srs.gov). Chlor-alkali is used in textiles and paper manufacturing, both types of plants are still in business along the River. Graphic Packaging International, a paper mill, is located 13 miles down river from Augusta and less than one mile from the River's edge. DSM Chemicals North America went out of business in 2014 in this area after it was found to have dumped more than four million pounds of toxins directly into the River (epa.gov, 2022). Every day at 4:15 in the afternoon an alarm goes off across the River. I know it is coming from some factory, but I have not pinpointed the source. It

serves as a daily reminder to me that this water is hazardous. *There are many other pollutants and polluters in my waters, but the oldest ones need to remain undisturbed until you find a way to safely remove them from my silt and bedrock. The toxins that have been permitted by your EPA are just as deadly to my fish and flowers yet there is an "acceptable range" you have decided is allowable. You believe you are taking care of your water supply but there is no acceptable range that is actually safe for your family or mine.*

Two other structures have played economic and environmental roles on the River. The Stevens Creek Hydroelectric lock and dam has operated continually since 1914, providing power and regulating the flow downstream. Up until the 1950s it allowed the passage of barges and boats; the locks are no longer in use, but electricity is predictably being produced. This dam is much smaller than the ones upstream and as such, has caused less environmental damage. Because of its proximity to Stallings Island, it has been researched extensively for environmental and historical damage (Jones, 2014). The creation of this dam and the levee system changed the hydrology of the area significantly, rerouting creeks and drying others. The Augusta Levee was effective at protecting the city of Augusta after being fortified in the 1930s; however, it was at the sacrifice of the environment. More than a dozen creeks were cut off from the River (Reddick, 2023) with the construction of the levee effectively suffocating the wetland and killing all the flora and fauna that required moving water and dissolved oxygen to survive. Two decades later a nuclear facility would nearly destroy the River downstream from the levee.

The Savannah River Site, a Department of Energy Superfund site, was once one of the River's worst offenders, but has since become a major contributor to clean up and environmental research.

> As a diverse industrial complex, SRS produced and disposed of multiple waste streams. Risks at the site include radioactive isotopes in the environment (sediment, fish, deer, soil, and groundwater) such as Cesium-137, uranium and tritium. Chlorinated solvents used at the facility resulted in groundwater and soil contamination with trichloroethylene in some areas. Coal burning plants produced power and steam at the site. As a result, some areas around the site have coal ash basins and landfills (epa.gov/SRNS, 2023).

The list of contaminants is overwhelming and will take a lifetime to clean up. In February of 2022, the Savannah River Site celebrated the completion of their 4000th environmental cleanup milestone since the funding began in 1993 (Townsend, 2022), I was unable to obtain the number of projects planned or the original total number. Plant Vogtle, 34 miles down the River, just added two more reactors to its nuclear facility. Because of the lessons learned from damage done by the Savannah River Nuclear Site, Plant Vogtle's environmental impact should be significantly less toxic, but no less damaging to the River's ecology. About 35 miles downstream from Augusta, the huge twin cooling towers of the Vogtle nuclear plant loom along the river in Burke County. In 1983 fossilized whale bones dating back 40 million years were discovered during plant construction. Plant Vogtle uses over 74 million gallons of water per day with more than half permanently removed from the River (gawater.org). If a River were to curse this is where it would: *What in the name of Gaia are you people doing to me? Are you so arrogant that you believe you can control nature? How many times must you repeat the same mistakes?* The dangers of nuclear energy are contained when everything functions well but will outlive our species if a meltdown occurs. Chernobyl, Three Mile Island, and Fukushima Daiichi are just three examples that will require between 1000 and 20,000 years to be considered habitable again (Blakemore, 2019).

Since the Clovis people, 1500 B.C., this region has been an area for economic and social meetings. Speculated as a gathering place for trade and commerce, based on beads, jewelry, and pottery (Kane & Keeton, 1994), the Central Savannah River Area has long been an important economic location in the southeast. Historians estimate that this trend continued until the indigenous people were pushed out. Three millennia later, the area was occupied by the British (1778-1781), who used the region to make and ship arms (Robertson, 1974; Jackson, 1976) to support their occupation of the land for England. During the Civil War the Powder Works were put back into service and the textile factories were ginning cotton (Augusta Museum of History, 2022); Augusta was among the leading textile manufacturers in the South. When the Port of Augusta was built a wall was placed in the River. Known as *The Training Wall* (figure 4. 5), it is a nearly two-mile long, stacked granite wall in the river channel closer to Augusta. It was designed to hydrodynamically force the flow of the River, keeping the water deeper on the Georgia side. Installed in 1902, it runs from near Eighth Street downtown to 1,800 feet past the Boathouse, where steamships used to dock. It is called a 'training wall' to train the River how to flow and where to loosen and deposit sediment (Roman, 2022). Although this area never saw Civil War action, it was a

Figure 4.5, *The Training Wall*

medical center and home to the first Medical College of Georgia (Augusta Museum of History, 2022). Since that time the buildings along the River have come in and out of use towards political capital and the economic growth of the area. To date, the military and medicine still have the greatest economic impact in the area. The Department of Defense employs over 38,000 people on three campuses and the medical centers employ over 21,000 people in the public sector over four campuses (Augusta Economic Development Authority, 2020).

From the 1940s through the early 1990s the area around the mills was occupied by those living below the poverty level. As is often the case, environmental justice often serves the wealthy and displaces low-income people disproportionately. Brownfield sites, identified by the federal government as in need of environmental cleanup, are vulnerable to flooding and contamination and often house low-income people of color (Eckerd & Keeler, 2012). Many of the fabric mill workers lived in the houses provided by the mills. Mill houses that were not destroyed are now located in the historically black community of Harrisburg, just one mile from the River's edge. For decades this area has been the site of drug wars, gang activity, and homelessness. The community is now slowly reaping the benefits of historical preservation, but for decades it was ignored. Less than a mile away, along the River's edge, Sibley Mill was built on a site that produced the Confederate Powder Works in the 1700s. The mill was completed in 1882 and produced textiles until the 1990s. Developed to run on hydropower, the success of Sibley Mill was the impetus for the building of Enterprise and King textile mills. It is unknown how much toxic effluent was dumped into the canal and subsequently the River; however, the soil itself contained high concentrations of toxic waste. Environmental poverty is not isolated to the United States, it is a global issue. I imagine that in the 1800s the Savannah River resembled the modern Citarum River in West Java, Indonesia. Known as the most polluted river in the

world, ki's main polluters are also fabric mills that pour their waste directly into the water (Riyadi, Alhamda, Airlambang, Anggreiny, & Anggara, 2020). The poorest Indonesians live downstream of the mills and must fish for survival and use the toxic water. They know it is making them sick, but they have no other choice.

Figure 4.6, *Sibley Mill Tower*

In 2010, the Augusta Canal Authority purchased the mills and began the cleanup. Seven years and $1.3 million later, the environmental project was completed. The soil was excavated and moved 'elsewhere' (Indiana University Environmental Resilience Institute, ND; Downing, Rosenthall, & Hudson 2003). As a result, black and brown people were displaced; the mills now house expensive lofts in one of the most gentrified sections of Augusta, Georgia. This photograph (figure 4.6, *Sibley Mill Stack*) is taken from the River's point of view. The U.S. Army Cyber Command moved from the Washington D.C. area to Augusta for the lower cost of living and access to a trainable workforce willing to work for lower wages. In 2020, the construction of two large buildings on the shore of the River were completed and students were moved into the area. The rooftops of both buildings feature covered patios with picnic areas so the students and teachers can at least enjoy a view of the River. Although many trees were destroyed to construct the buildings along the shore, there was no alteration of the Riverbanks thankfully.

Economically, downtown Augusta is finally starting to recover from three-quarters of a century of neglect as military, academics, medical, and manufacturing returns to the River's edge. Unfortunately, this political and economic clout is also highly influential in the school system. There is now a cyber security certificate offered in every high school in the CSRA and National Security Agency internships for a select number of highly qualified high school seniors. While these are great opportunities for our students, the money being diverted to these programs was taken from the Arts and higher-level sciences. Our students are now expected to dual enroll if they want creative and challenging courses in the last two years of high school.

There are large influxes of tourism quarterly that contribute to the economy including Master's Week at the Augusta National Golf Course in the spring and a half Iron-Man with a River swim in the fall. The Master's Tournament is estimated to bring in over 250,000 people over the course of eight days and Iron Man brings in between 5000-7500 participants and tourists over a long weekend. We do not know how many golf enthusiasts visit the River, but we do know that every Iron Man competitor swims in the River and their support teams stand on Ki's banks to watch. The Iron Man organizers keep an eye on the health of the River throughout the year and are effectively keeping the factories in check. There are three companies that rent kayaks, two that rent jet skis, and two captains who offer boat trips on the River. Petersburg Boats (electric) run daily in the summer with historic trips along the canal and in the evenings for musical events. The Greenway is a 13-mile trail that connects Augusta to North Augusta along the River and is frequented by locals, ecotourists, and birdwatchers. There are no statistics on tourist visits to the

Figure 4.7, *Lone Ibis*

Greenway, but anecdotal evidence and personal experience suggest it is busy every day of the week. It is well known that we care about the things and beings we see, and the more we see them the more we care. Figure 4.7, *Lone Ibis*, is taken from the Greenway. The rules of proximity apply to the natural world as well; the more we are in nature, the more we care (Manzini, 2022; Shibata, 2016; Nordhaug & Nortvedt, 2011; Martin, 2007). It is reasonable to suggest that the more visitors that come to the River's banks and play in the water, the more we will protect and care for ki. Shibata's (2016) mixed methods research found that connectedness to nature is weaker as availability decreases and aversion of nature is stronger in younger people than in older. His research does not suggest a reason for this phenomenon, but I believe that access to electronic devices that overstimulate the brain and create an addictive chemical response could be one reason the younger generation is less attracted to nature than their parents and grandparents. Rachel Carson (1962/1994) stated, "the more clearly we can focus our attention on the wonders of and realities of the universe about us, the less taste we shall have for destruction" (p.94).

Destruction and politics are unfortunately often connected when the focus is nature. Political ecology is embedded in ecopedagogical ethnography. It combines the multiplicity of human relationships with the biophysical environment and economy (Sheridan, 2001; Stonich, 2000, Little, 2007). Unfortunately, at times one individual can wield enormous power. Development along the River in both states was politically and economically unscrupulous at best and completely illegal by today's standards. Carl Sanders was the governor of Georgia from 1963 to 1967. During his tenure, Sanders purchased hundreds of acres of river front property just before he reorganized the state highway department and approved the construction of Interstate 20. The acreage straddles the interstate and the exits on either side of the River. His son and

grandson are still reaping the financial benefits and the political capital that comes with owning the banks of the Savannah River. Sanders was a staunch segregationist; although he did not fight federal integration orders, he did ensure that the property rights of his white constituency were protected. When referring to the Civil Rights Movement he described his position as a "segregationist but not a damn fool" (Cook, 1988, p. 179). Since Governor Sanders purchased most of the available Riverfront land, there has been no single person since with such power over the Riverfront in either Georgia or South Carolina. There are rumors of real estate investors who 'knew' when Riverfront land would be available, buyer before others could have a chance but those are unsubstantiated.

Governor Sanders was not concerned with the environment and used two miles of the River's banks in South Carolina just south of where the Hamburg Railway ended as a dump site. This area is now a neighborhood; bioremediation is necessary prior to every structure being built. The State of South Carolina covers the cost, but the environmental damage has been done. A huge scar was carved into the watershed just a few yards away from the River when fill dirt was needed to support the highway bridges in 2009. For 15 years this area was ignored, and nature healed ki's wounds. Now it is a seasonal marsh that is home to reptiles, amphibians, and birds in spring and fall - the wetter seasons, and home to larger mammals in the summer and winter. I wholeheartedly believe this is because the land was considered of little value. I have named this photograph, and the area, *Cicatrix Swamp* (figure 4.8); a cicatrix is a scar that heals

Figure 4.8, *Cicatrix Swamp*

naturally. *If you allow the time, I can clean the air and the soil as well as myself. When the factories stopped polluting the sky, the trees and I worked together and cleaned the air. When you were locked indoors and stopped burning fossil fuels, the Himalayas were finally visible to those living at their feet. I have proved my power to every generation, yet you refuse to believe. Do you need another pandemic to believe?*

The only way we can estimate the damage we have done to the Savannah River is by examining ki's sisters. The Altamaha and Ocmulgee Rivers are considered siblings of the Savannah with the same approximate age and. Having the same origin and pattern of evolution, geomorphologists believe they behave as the Savannah would, had ki not been accessed by the English in the early 1700s and subsequently walled and dammed extensively. These Rivers have been thoroughly researched and serve as a template for the possible natural flow of the Savannah. While working in the Altamaha, archeologists found extinct animals and tools in the deep holes in the river bottom (Cerulean, Ray, & Newton, 2004), it is possible that Native American tools were also along the banks of the Savannah; however, the process of building dams is extremely destructive and there have been no artifacts found since the clay pots on Stallings Island. As far back as 1765 this area was recognized for its natural beauty. John Bartram was appointed by King George III as the Botanist Royal to the Americas. He brought his son William along as he mapped the region's plants and animals in the back country of Georgia. William continued his father's work until he was conscripted for the Revolutionary War; the Bartram Trail runs along the Savannah River for miles as it weaves in and out of forest lands through the watershed.

There are agencies, organizations, and individuals who have begun to recognize the value of this River, yet we continue to refer to ki as it. By altering my lens, I have been able to consider

the value of the natural world for more than the economic value ki holds. Yet, this concept remains outside of the classroom. How long will it take before ecopedagogy enters the curriculum? Perhaps it is too much to ask for an Earth Science or Environmental Science class to put the environment before the science. Perhaps we will have to introduce the value of nature through the arts and humanities and later connect it to the science classroom. By conducting an ethnographic study on a non-human being, I hope to have shown a pathway towards that end. The integration of multidimensional lenses and cross curricular study enables the student to open up to new understandings. One might question the validity of allowing an inorganic entity to become a teacher; I would argue that a true student of life can and should learn from their surroundings opportunistically. The River has power and value simply by being a river. Ki makes life possible in the wetland, on the banks, and in the water. Clean, fresh, safe water is at significant risk on this planet. *The Indigenous Peoples believed rightly that I could not be possessed, I am available for all to enjoy as long as they don't harm any other being in my name, including me.*

The obstacles I face are opportunities for change, for it is in my nature to flow. I move through time and space without the worry of barriers or endings for I know I will eventually flow over or under or through everything, including you. When damned I may look like a lake, but I will always be a river, waiting to move again. In time, the rock - made by nature or man - will wash away. Throughout this research I have momentarily grasped the River's point of view. I recognize the feeling from comprehending Einstein's Theory of energy, $E=mc^2$, then losing it. I am wise enough to appreciate that fleeting knowledge. Having conducted this short ethnography on the River, I find it insufficient to convey my understanding of the water to the reader. I have followed the water focused ethnographic examples of Paine (1985), Little (1999), Edgeworth

(2011), Wagler & Mathews (2012), Hussain & Floss (2016), Wagner, Jacka, Hviding, Mawyer, & Muru-Lanning (2018), and Baxter (2019); I am unsatisfied with my portrayal of the River. I wonder if the aforementioned authors felt the same upon the publications of their works. With evidence from research and personal experience, I have changed the organization of this study to an ethnographically informed ecopedagogical a/r/tography. As such, I am reorienting the focus on the visual representation of the River and its constituents; science and ethnography will remain nodes in this a/r/tographic rhizome. The next chapter will discuss the findings as they relate to the River from the artist/researcher/teacher point of view.

CHAPTER 5: AN A/R/TOGRAPHIC RESPONSE TO A GREEN WATER JOURNEY

Figure 5.1, *Summer Riverscape*

I set out to conduct an ethnographic study of the River with the ki as the teacher and a/r/tography to support my research. I was so off balance. In fact, whenever I was stuck in the details of ethnography, I changed my lens to that of an artist looking for beauty or points of contention or interest. I began this research with a water testing kit but soon found it distracting from the River's point of view. You will not find exact amounts of dissolved oxygen and contaminants in this research because when I thought about the River in that way I reverted to the role of teacher/scientist and could not let the River lead. Science turned the River into an object as opposed to a subject; science took away my ability to empathize with a being in need. Science turned the River back into an 'it', which is exactly what is wrong with how we interact with nature. I did not want to repeat the process I had already mastered; I needed to find a way to maintain the River as a being. I love the practice of science and investigation; I was completely unaware of the distance it created between the subject and the investigator. This is a necessity in certain circumstances but unproductive in nature studies. When I considered how the River moved and what was going on in the water, I could only understand it as an artist and a

participant. Even with little exposure to scholarly art and none to the making of art, I was able to let go of control and let the water lead me. In fact, I am convinced that my lack of training allowed me to break rules I did not know existed. I later learned that there is evidence that formal training stimies flow (Funke, 2009).

Initially, I was unsure how an a/r/tographic lens would fit into an ecopedagogical investigation. After two years spent in research, the creative process, and silently paddling on the water, I have a new view of artistic endeavors. My innate desire to employ art as a method to inform science was inconsistent with decades of training as a scientist and science educator, even though I witnessed its value daily in my own classroom. For example, after an introduction to the electromagnetic spectrum, my students researched the wavelengths of light that were produced by specific elements and molecules in nebulae. Their culminating project required them to research a nebula and choose the colors they would use to create their own based on the elements present; they were engaged and curious throughout the process. They went beyond the assignment to discover how long it would take to see the light on Earth and how old the nebulae must be. They posited if it was even still in existence today. They researched how the Hubble and now James Webb telescopes could produce such intricate photography and discovered charged coupled devices (CCD). My math and science lovers continued to dig into the CCDs and discovered they are controlled by artificial intelligence programing that consolidates thousands of photographs into a mosaic. My art lovers realized how applicable chemistry and physics are to their mediums of choice; one student produced a graphic novel based off this assignment. They took risks and were proud to show their work. Imagine eighteen-year-olds, who have struggled most of their time in academic settings, sharing their science project with their peers and their

parents. It was heartwarming and edifying. This is but one of the ways that art initiated Scientific curiosity in the classroom.

Figure 5.2, *Nebula*

If I had assigned research on nebula chemistry and charged coupled devices my students would have grumbled and put forth the minimum effort. How could I have ever questioned the value of art to science? This is the example I created in 2022 with my Astronomy class, *Nebula* figure 5.2, is based off a Hubble photograph of the Crab Nebula. Each color represents a specific element; the white spaces are the hottest areas where stars are actively forming. The engagement of my students is not unexpected; integrating art has increased learning engagement and content comprehension across the curriculum (Burnaford, April, & Weiss, 2013) in every age group. STEAM (science, technology, engineering, art, math) programs are widely successful, even though they are limited in my school system where cyber skills are highly valued. So, my research morphed from an ethnography supported by a/r/tography to an a/r/tography founded in ethnography. It may seem like semantics to an outsider but to me this is a significant mindset alteration. The principles of the rhizome ground this a/r/tography and allowed me to attempt to consider the River's point of view as it applies to an ecopedagogical study.

Summary of the Study

Conducting an ethnography of the River was straightforward; however, adding the voice of the River proved quite difficult. I found many essays that attempted to voice the local Rivers, but each still had a strong human element. I discovered just how challenging it is to put myself in

a position that is physically impossible. I found inspiration in *Braiding Sweetgrass* by Robin Kimmerer (2013) and *Mississippi Solo* by Eddy Harris (1998), as well as multiple texts by Wendell Berry and Bruno Latour. Despite feeling inept, I did attempt to consider how a billion-year-old voice would interpret human intervention. I forced myself to think from the water's point of view but remain in the temporal zone of humanity. When I considered the voice of the River, I thought humans may not be worth the time. We have only been on this planet for a few hundred thousand years and have only affected fresh water systems in the last 5000 years. In truth, the River may already know that ki will outlast any *homo sapien* species, and there is no need to react to any damage they may do. On the other hand, it may be so upsetting that this arrogant species has done so much damage in such a short amount of time the River may need to revolt. The last two sentences prove how difficult it is to contemplate Gaia without attaching a human thought process.

Scientists associate climate change as a response to the burning of fossil fuels and an increase in carbon in the atmosphere. Gaia responds to this change by increasing the intensity of weather on this planet. Gaia is not a sentient being wreaking havoc; violent weather systems are increasing because the increase in temperature melts a greater portion of the polar ice caps. Therefore, there is more liquid and gaseous water available for weather systems. As the water on this planet becomes more and more toxic, so does the weather. Scientists would look at Milankovitch cycles (Buis, 2020) and show the recurrence of intense weather every twenty thousand years or so; these cycles are directly related to the amount of carbon in the atmosphere. The difference now is that we are pumping carbon into the air and previously volcanos and space debris were causing the increase in greenhouse gases. Climate change is not a coincidence, it is the result of behaviors. The ethnography of the River was solid research and using a unique lens,

produced interesting details for the body of knowledge on the Savannah River. The study provided evidence of the multiple rhizomatic connections that intersect with the River and allow life and society to thrive in this region of the Southeast. If one were to remove the River from this area, there would be no reason for the first residents to encamp here, for the early invaders to stop here, for the British to invade here, or for the Native Americans, hunters, trappers, or traders to cross here. Without the River no power could have been produced here and no transportation could have reached the area. The economy would not have gained a foothold and eventually gathered enough people to call a stable community. The only reason the Port of Augusta, the town of Hamburg, New Savannah, or Silver Bluff even exist is because of the water. Cotton and indigo grew powerful due to access to fresh water. Hunting, trapping, and trading were lucrative because the animals sought out fresh water. All one needs to do is look to areas removed from freshwater sources to see how desperately the land and people must fight to merely survive.

The Altamaha River is considered a sister of the Savannah. Both Rivers originated in the same time frame from the same sources at the southern end of the Appalachian Mountains, yet the Altamaha has had very little intervention. When trying to voice the River, I looked to the Altamaha for guidance. Attempting to 'think' like water was more artistically productive than I could have predicted. While it was very hard for me to find the words, it was stimulating to photograph, film, and paint moments of enlightenment from the water and the watershed. The Green Water Journey and the representative artworks present my unique point of view of the middle Savannah River as a teacher and living force that deserves our attention and empathy. We owe ki the utmost gratitude; this is what makes the abuse and neglect of Gaia so egregious. The ethnographic portion of this research presented a natural resource that has enabled and

contributed to the success of the surrounding species; the a/r/tographic portion presents a member of our community worthy of protection and respect.

As a critical pedagogue, Paulo Freire (1996) promoted the ideas of learning from a variety of sources. He knew the farmers were experts in environmental practices and other knowledge from outside the university system; he encouraged the impoverished to value their own intelligence and use that to their advantage. He recognized the difficulty in change and compared it to a rebirth, stating that "those who undergo it must take on a new form of existence, they can no longer remain as they were" (p. 61). Although he was addressing the people of Brazil, his ideas are now necessary for the whole of humanity. The destruction that was once limited to the landscape is now global, and the idea of wilderness is quickly being absorbed by industry (Latour, 2013) and Fortune 500 companies. In order for true transformation to take place, the whole of humanity must be 'reborn' into sustainable practices where decisions are based on public interest in the commons. "The democratizing process needs to be guided by an intergenerational perspective that takes into account future generations-which teachers need to help students understand" (Bowers, 2002, p. 33). To do this, we must continually practice being students; hence, the green water journey.

Section 1: Figure 5.3, *The Shoals*

Although I intended to kayak from dam to dam from the North end of my study area to the South, I was forced to break my green water journey into sections. Weather, dam releases, and a full-time teaching position limited the amount of time I could spend on the River at one time. I focused on the shoals first because they are central to the ecology of the fish and bivalve species, as well as the reason the area was settled by those traveling by boat. Six miles of this journey are edged with the Augusta Canal trail: a trail I have run so many times I have it memorized. From the trail level this water looks peaceful and rolling; from the water level it is anything but peaceful. My husband helped me carry the kayak down two flights of stairs to drop into the Savannah River just in front of the Augusta Canal and spillway for the ten-mile trip to my home. I was moving quickly from the start and thought I had researched the journey well; I was wrong.

As soon as I put the kayak in the water, I was hurled down the River. I had to decide quickly which side to stay on because crossing the River later was out of the question. I decided to take the eastern side since I had not seen much of it. The western banks of the River have a few outlets (like the one pictured) that will force a kayak into the channel, and I wanted to stay close to the water's edge. There are ninety-nine islands that fill the

Figure 5.4, *Rae's Outlet*

River from the coast to Clarks Hill Dam, more than twenty are squeezed into the path I took on this day. At some places the islands are so dense that I thought the River was narrowing and had to look on the map to figure out where I was. On this day, water was being released from the Clarks Hill dam. I read up to make sure it was still safe to kayak, and all the literature said that once you reach two to three miles down River the dam flow should not affect water craft. The literature must have been referring to boats with motors. When I first slammed into the rocks from the push from *Rae's Outlet*, figure 5.4, I could feel my 'break away pedal' actually break away. I managed to wedge it back in place but lost it on the next set of rapids. I'm sure the impact of my kayak broke loose some sediment and shook the smaller bivalves, so the River gave it right back to me. I did not feel as if I was being punished but it was obvious that there is a price for using the water for my own purposes. The River reminds me that homeostasis is a requirement on this planet. Balance is necessary in nature and for all of life to exist. Even this photo of *Tree Takes a Dive*, figure 5.5 is a part of the cycle. The pedal replacement was only the immediate cost. The natural fall line is approximately two miles wide, transecting the River. There is no escaping it. I traveled on the east side of the River for most of the trip. Once I chose a side, I was stuck there. Because I had no control over the trajectory of my kayak, I ended up pulling up my rudder, pulling out my pedals, and using only my oar. The shoals are miles long and fill the width of the River with large obstacles; there is no getting around them. I decided to take the paths that were wide enough to shoot through and

Figure 5.5, *Tree Takes a Dive*

heard myself commanding my brain and arms to stay straight and to pull hard through the water. Wishing I was not alone, but grateful to have no one to consider except myself, I paddled onward, see QR code figure 5.6., *Beginning of Shoals*. Even in this short journey, the self is disassembled so that the soul or id can connect with nature. Oftentimes I find that my ego is in control, when I am not mindful, I miss the gifts in front of me. The rushing water and narrow passages kept me alert to my situation. Still there were areas where I was pushed parallel onto the shoals and nearly flipped the kayak. I never felt as if my life was in danger, but two weeks later a young man was lost and drowned in this same spot from the video clip.

I cannot envision doing this against the current or in a less seaworthy vessel. I can only imagine how treacherous this trip was for the original travelers using canoes made of bark and animal skins (Ruhl & Purdy, 2005). Is the River rougher because my kayak is not made from natural materials? I wonder if the flexibility of the skins allows for smoother travel. At one point I was able to record myself and unknowingly said, “you are not in control”. Was this the River talking to me? I have felt this before while ice hiking in Colorado, camping across the country alone, working with the large animals on the farm, and swimming in the open ocean. Not once did it scare me, but rather, brought my life into perspective and allowed me to rest my mind, much like a tragic loss. Maybe it is not just the River sending me messages, but all of nature.

Figure 5.6, *Beginning of Shoals*

I may not speak well for the River, but I am an excellent student of K's power. This section of the River did not give me much time to ponder the beauty of nature; however, I did notice how different the terrain is from the East to West. The Georgia side of the River is rolling and much flatter and lower, while the South Carolina side has more rocky outcroppings, granite boulders, and tall cliff-like drop offs, see figure 5.7 *Granite Shores*. It is easy to see from the water level why Georgia was settled first, and the east coast of the River was left for the Native Americans and other people of color who made their way up the River. This section is a little over ten miles long and took less than three hours to travers. Had I waited until the summer, the current would have been significantly slower, closer to 5000 cubic feet per second, and without dams this area would have dried up in July and August. Once I made it home, I cleaned up, hydrated, and went to bed.

Figure 5.7, *Granite Shores*

Section 2: Figure 5.8, *Port of Augusta to the New Savannah Lock and Dam*

This is relatively calm water, moving much slower than the rest of the trip, I have time to photograph the journey and take it all in. In fact, this area is so isolated my only concern is finding help if I need it. I purposefully chose a clear Saturday, knowing that there would be fishermen on the water, and I would not be alone. When the water is working hard so am I, when ki rests I can rest as well. I did not learn this lesson when my twins were infants, but I have no choice when the River is in control. This section of the River allows me to focus on what the water has to tell me. There is an annoying industrial sound that lasts for what feels like miles, it is from the AirGas factory. AirGas compresses carbon dioxide into a liquid that is used in chilling and freezing products to prevent spoiling during transportation. There are also large iron vents in the banks on the Georgia side. They are bolted and rusted closed but look like wounds. The docent from the History Museum of Augusta said they were used as city drains before the wastewater system was built, *Iron Outlets*, figure 5.10.

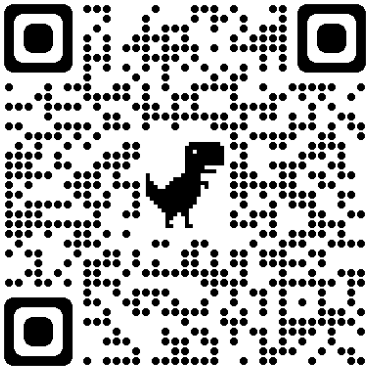

Figure 5.10, *Iron Outlets*

About two miles from the Port of Augusta a wretched stench finds its way to me. I recognize it and realize the slaughterhouse is only a few hundred yards away from the River's banks. There is no record or evidence of their waste leaching into the River, but it must be soaking into the watershed. Not coincidentally, there is more evidence of large reptiles. See the QR code, figure 5.11 *Behind the Canal* to experience the area. The banks on the East Coast are shallow and sandy, scattered with alligator slides. Another Osprey nest must be nearby; both parents are

Figure 5.11, *Behind the Canal*

hunting around me to feed the chicks I hear. I know they must have their first feathers by now or both parents would not leave the nest at the same time. For miles the trip is quiet and peaceful, but this section of the River is deceptive, appearing calm on the surface but swirling eddies rise from deeper channels and large boulders on the River's bottom. I borrowed a fish finder for this section because I knew it would be safer. The bottom terrain is an alien environment with ridges and valleys only explained by hydrodynamics. I am a part of this River here. We are not fighting each other but working together on a journey to the ocean. I feel as if I am a partner with the water - not on it or in it - but with ki. I respond to the way the water moves in a gentle way, so differently than the battle I fought to stay upright in the shoals just one week ago. The River is slowly carving out the outside of the turns and depositing sand, silt, and gravel on the insides of the curves. Left alone, ki will create a new path and new fertile lands, but it is unlikely that humans will allow that to take place unless it benefits them. River time is creative, it is only when humans try to change the Earth on their own timeline that these changes become destructive. We are here for such a short period; wouldn't it be better to watch and learn than to change and leave the damage for the next generation? I am not often so contemplative as I have been throughout this text; time on the water with the River in the sounds of nature has given me this opportunity. I need to find a way to give my students this same opportunity.

One of my co-workers conducted what she called ‘sit-spot’ lessons on the edge of a pond near the school. Because this concept was not approved by the Georgia Department of Education, she was prohibited from using class time. She offered these lessons on the first Saturday of the month for an hour and a remarkable number of students showed up just to sit in silence and write or sketch what they saw, some parents even stayed. After a while she would have everyone close their eyes for a few minutes to focus on their other senses. I watched this cypress tree throughout the year while I used her methods myself, figure 5.12 *Cypress in October*. This teacher’s methods are considered best practices in ‘green schooling’ where entire institutions are designed around these ideas (Gordon, 2010). The students and their parents loved this time with nature and with her. Of course, the local education system bragged about her influence in the Environmental Sciences and eventually got the attention of the College Board. Because of the bureaucracy, she left the classroom and is now a Naturalist at a local state park. Although we lost an amazing classroom teacher, her influence continues. At least once a month a class goes outside for a lesson and just sits and listens and draws. No one is bragging or posting photos, just listening, watching, and smelling the world around them. I think of her often when there is silence on the River or in my garden.

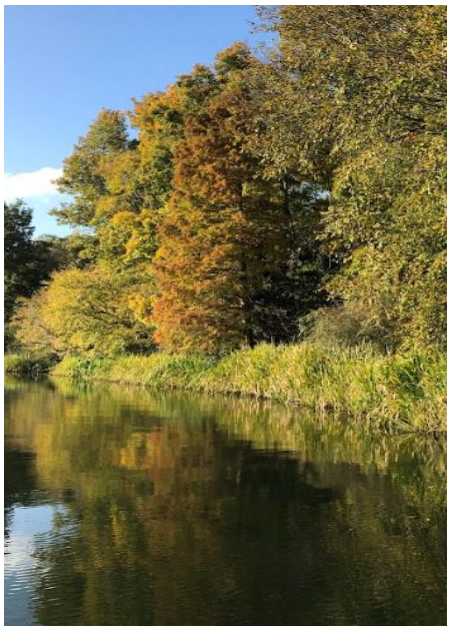

Figure 5.12, *Cypress in October*

Further down River I see the sparkle that inspired the name of Silver Bluff. Lustrous mica flakes embedded in the clay banks on the East Coast glisten in the sunlight. The walls are much higher here. The eastern banks are at least 20 feet higher than the western banks. A bald eagle

flies high overhead to investigate me as a threat. No high pitch call and no excrement means I am not, but I watch to find the nest. It is three trees deep on the eastern shore and too high to capture a photo with my camera. My binoculars bring two eaglets into focus pulling apart flesh. I am unable to tell what their meal is, but they are impatiently taking turns. One parent sits above the nest on a sturdy branch while the other is working. The chicks are mottled black, brown, and gray; it will be years before their white feathers arrive. The area to my left is protected land, owned by the Silver Bluff Audubon Society. It is over 3400 acres of woodland, 3000 of which were donated by the former resident. In this section of the River, I recall the words of Wendell Berry (1970), "drifting, there comes an intimate sense of how the water has sought its way through the country, and one feels how simple and steadfast is it obedience to the law of gravity, filling and flowing on" (p. 638). This photograph of *Covin's Cemetery Coastline*, figure 5.13, is the western edge of the Silver Bluff Audubon property.

Figure 5.13, *Covin's Cemetery Coastline*

Soon I hear the rushing sounds of water and know I must be getting close to the New Savannah Lock and Dam, there is no geological reason for the water to drop here. My level of alertness rises, and I look for the boat ramp to save me from the fall. The dam here is in disrepair and the locks have not worked in decades. The fishermen tell me this area is full of large fish and the high dissolved oxygen levels explain why

the fish are thriving. This very small dam is the reason why two states, federal and local agencies, and private individuals are fighting in the legal system for control. At this point, we need to consider the significant damage that will be done if the dam is removed. It is not just a matter of removing the concrete but also keeping the Riverbed intact upstream to prevent the heavy metal toxicity from being released. Personally, I would like to see a system of weirs that allow the fish to safely move upstream and bring more people to the water. This does the least damage to the River, keeps the dam from failing, and creates a relationship between the community and the water. Unfortunately, it is also the proposal that requires the greatest amount of funding, planning, and time.

Section 3: Augusta Canal and Spillway to the Stevens Creek Dam

The next section was short and partially protected from another large dam release. I put in as the sun was rising. Racing a storm on the radar, I worked hard to avoid the approaching lightning. The only way to complete this two-mile section of the River is to paddle against the current. There is a small gravel ramp about one hundred yards north of the head gates of the Augusta Canal on the west side of the River that warmed up all my muscles - luckily. Although the Stevens Creek dam is constantly releasing water, it was only on the east side of the dam that morning, so I took the chance that I could fight the current. I was surprised at how strong the flow was so far downstream and for a few minutes I worked to right the kayak, figure 5.14, Stevens *Creek dam,* shows the struggle. Again, it felt as if I had no control and was at the will of the water. Once I realized I had lost the connection to my rudder it made sense. I was in a bit of trouble and was forced to jump out into about 3 feet of water and sank a few

Figure 5.14, *Stevens Creek Dam*

more inches into the mud to reconnect and tighten up the rudder line. This dam consistently releases water in short sections to balance the water depth above the fall line. The current was moving at 22,000 cubic feet per second - fast for this River - and my equipment was failing. At one point I said out loud to myself, "I feel like the first explorer". I kayak alone to focus. I am sure the reader will find this foolish, but I am prepared for safety issues, wear a life jacket, carry a whistle, and pay attention. Being alone allows me to take photos like figure 5.15 *Heron Hunting*. I know that I can swim out of any trouble in this section of the River, but I prefer to stay dry. While standing in shin deep mud and chest deep water, I was keenly aware of the alligators and water moccasins that reside in this area, but also knew that the sun had just risen, and it was only 45 degrees outside. Most reptiles will still be sleeping, waiting for the heat of the day to wake them up. I was wrong. Not five minutes after I rolled back into my kayak a six-foot water moccasin swam past me, reminding me once again that I have no control. In this section of the River, I was able to circle Stallings Island taking in its size and surroundings, figure 5.16 is my *Homage to Stallings Island*. The island is a little over a half a mile long and 100 yards wide; it separates the east and

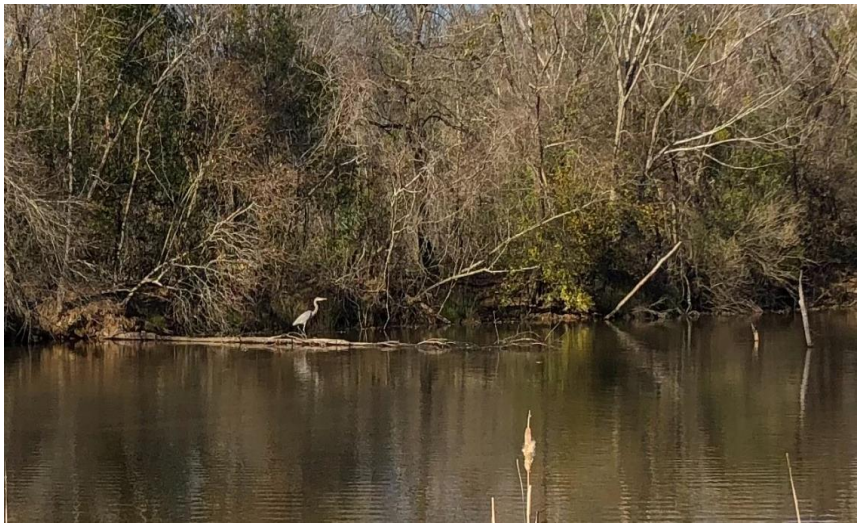

Figure 5.15, *Heron Hunting*

Figure 5.16, *Homage to Stallings Island*

west sides of the River. I was on the calm side today. This piece was done early in the dissertation research when I first discovered the *People of the Shoals* (Sassaman, 2006). I kept thinking how difficult this was and I knew what to expect; I checked the weather and the dam release schedule; I knew the speed and depth of the water and virtually toured this section on Google Earth. How intimidating this must have been for the first people to canoe its waters. Before the dam was constructed the water would have been much shallower but not necessarily slower or safer. The River bed would have been more treacherous and could have damaged or overturned a canoe. I took very few photos as my hands were on the oar and I was paddling hard. I did not have time to reach forward or even tap the photo button on my phone. A couple of hundred yards from the dam, the water calmed down significantly. I could see the water rushing to the opposite side of Stallings Island and I was able to put down my oar and pick up the camera. At that moment, a muskrat popped up next to me, figure 5.17 *Muskrat*, and startled us both. I was able to get a short clip of her a few minutes later. Having gone as far upstream as is safe, I turned around and ran multiple ditch scenarios through my mind. The only thing I really needed to save was myself, but I should be able to grab a tree and tie off the kayak if it was necessary. I hugged the shoreline until I saw my first water moccasin hanging from a branch. Then every branch resembled a snake, and I kept my distance from the shore without venturing into the channel. I heard crunching and turned on the camera and stopped peddling. Three well fed

Figure 5.17, *Muskrat*

Figure 5.18, *Three Otters*

otters were eating on a large branch just off the shoreline. The largest gave me an upward nod-a threat, another gave me a hiss, then all three submerged. For *Three Otters,* figure 5.18, you will need to turn up your volume to hear their warning. I thanked them and paddled on. A red tail hawk popped from his nest to a morning observation branch and not long after another water moccasin slid into the water from the mud. It was my reward for persevering into an area few boats ever enter.

As I reached the center of the River, I felt very exposed. The Stalling's People must have felt very safe in the area to inhabit this island; it is clearly visible from the surrounding hills and would have made them easy targets for any other tribe wishing to take control of their space. No evidence of weapons was found during the three long archeological digs that took place on the island, only remnants of food preparation and homemaking. It took a little over an hour to get up to the dam and I only noticed one snake. The return was less than a third of the time but by then the sun was up and the residents were taking in their morning meal. As I approached the back of the Augusta Canal and spillway, I could hear the water long before I could see it. These clips from *Above the Spillway,* figure 5.19 and *Below the Spillway,* figure 5.20 are immersive in sound. The roar alerted me to find the safety of my ramp or choose a strong tree. My adrenal glands have learned to secrete just enough adrenaline to focus my brain and muscles without overwhelming me and shutting my system down. In my youth,

Figure 5.19, *Above the Spillway*

Figure 5.20, *Below the Spillway*

adrenaline was too often dumped into my bloodstream in fight or flight situations, but exposure and age have tempered the flow. Venomous snakes, like the cottonmouth, are similar in that they inject all their venom when young, then learn to be conservative as they age. I raced the squall line and managed to secure the kayak just before the storm hit the area.

Section 4: Figure 5.21, *Clarks Hill Dam and power station to the Stevens Creek Dam*

Finally, the opportunity to drop into the water in front of Clarks Hill Dam was safe and I was able to close the distance to the Stevens Creek Dam, see video in QR code figure 5.22. I waited for months to catch a weekend day without lightning and without a dam release. Even without a dam release, the water is moving briskly here due to gravity, and I remained vigilant. Knowing there were a pair of nesting bald eagles, I kept an eye on the sky. Although I did not see the mating pair of eagles that are just beneath the dam, I was in awe of the flora and fauna. Except for the sound of tree frogs, the dam drowns out nature for over a half a mile. Then, suddenly, the air is filled with the

Figure 5.22, *On Top of the Clarks Hill Dam*

songs of birds. A naturalist from the Silver Bluff Audubon Center, Paul Koehler, sent me a link to the phone app Merlin and I put it to good use. When birds are singing the app identifies the song and sends a photo to identify the bird. In the first three miles down River from the dam, I was able to identify: green-winged teals, hermit thrushes, yellow-rumped warblers, and common gallinules from their songs. Some are only winter residents; although it is in the mid-60s here, it is still winter up North.

This section of the River is far more secluded than the other sections. Section one is residential, section two is dotted with neighborhoods, section three is mainly agricultural and industrial, but this section is surrounded by protected forestlands. Although I know the damage that was done to create these lakes and reroute this River was significant, there is very little remaining evidence beyond the sights and sounds from the dam. Nature is resilient, the forests are dense and healthy, the watershed looks and smells fresh, the flora and fauna are thriving here, *Egret and Cormorant* figure 5.23. I fully expected to see a bobcat peer out of the woods to inspect the visitor. I started early today as usual, and I can hear the deer waking up on the shoreline. I am always pleasantly surprised and grateful when I am the only person on the water. Oftentimes fishermen race their engines to find their secret spot but today it is quiet. My pedals are the only unnatural sound. As I continue downstream, I am acknowledged by snowy egret, black and white ibis, and the occasional blue heron. They are all year-round residents, and they have no fear of

Figure 5.23, *Egret and Cormorant*

Figure 5.24, *Yellow Bellied Slider*

me or my vessel. On the other hand, the turtles are evolutionarily skittish and jump off their sunning spots as soon as they notice me. It is hard to get close enough to identify them, but I believe they are Y*ellow-Bellied Sliders, figure 5.24,* and spiny softshell turtles.

I continue in silence just listening to the River. I have been invited to rest in this section. I know this River is filled with a healthy variety of freshwater fish, but I am not a fan of watching an animal struggle for its life. As I gently paddle, I am greeted on the banks by a nervous gray fox. The biodiversity in this region gives me hope for the health of the planet; the only necessity is that we stay away. Unfortunately, my presence is a detriment to the wellbeing of the animals and therefore the entire ecosystem. I make a point of moving to the center of the River to do as little damage as possible, *Below Clarks Hill dam* figure 5. 25. As soon as I turn the rudder, I am warned by the call of a bald eagle. She or he, I have no way to tell from the water, flies directly overhead to ensure my attention. Typically, the female is larger than the male, but from my point of view this is simply a very large bird. The sound produced is much smaller and has a higher pitch than expected. The osprey have stronger voices and the hawks near my home are far more aggressive. This eagle is merely warning the family that an intruder is approaching. I never spotted the nest, and the predator was careful to pull my attention away from the family. I must have gone at least nine miles by now because these birds of prey require miles of territory and I have already seen two other top avian predators this morning. I am moving faster than I expected but the spring has been consistently rainy, and the water is moving quickly. This is not the muddy river after storms that carries entire trees downstream, but it is much darker than the clear green water of summer.

Figure 5.25, *Below the Clarks Hill Dam*

It is not long after my eagle spotting that I hear the water again. Although time on the water is relative. I am not wearing a watch and my phone is being used as a camera for most of the trip. It seemed like I was on the water for less than two hours, when I was gone for more than four. I finished my coffee and drank most of my water so I should have noticed the time passing. At some point, I covered my ears from the sunshine, so my body noticed the time passing. The wind rolling up the River kicked in a while ago, so the signs were there that the day was heating up, but I was mesmerized by the sights and sounds of uninterrupted nature. Even as I write this, I can feel my spirit slowing down to the speed of green. It is a quiet, calm, and grounded space - I need to visit more.

Major findings

As intelligent beings, we should be able to understand the immediate needs of survival and take into consideration the future viability of the soil, water, and atmosphere. At this point, the Earth "depends so much on us that it is shaking" (Serres, 1995, p. 86). This is not to say that we are fighting a losing battle; the history of the planet and the history of life on the planet is a story of resilience. It is a "positive response to failures" (Perkins-Gough, 2013, p. 14). Gaia Theory would suggest that the Earth and its living inhabitants have placed the planet in peril multiple times before (Latour & Lenton, 2019), as have space debris and magma activity. Melting phases followed by glaciations have allowed the Earth to reset and recover, often with new forms of life finding success, while the unadaptable die out. The human issue now is that we do not want to be replaced by another form of life that can adapt to environmental changes faster than our genetics allow (Latour, 2013). To build and apply more sustainable practices, we must find a way to integrate science without allowing it to subsume alternative ideas that may lead to innovative solutions. While there are "strong arguments for employing it [science] in attempts to

solve the host of problems that still remain" (Kuhn, 1970, p. 173), we must approach sustainability multidimensionally.

Figure 5.26, *Just off the Dock*

This study is evidence of the resilience of nature as well as ki's ability to be a teacher and member of our community. By becoming a student of the River, I was able to consider what is needed in a curriculum to foster planetary citizenship and empathy. *Just Off the Dock*, figure 5.26, is my daily reminder not to take a moment for granted. After every traumatic injury, anthropomorphic change, the River has rebounded. The early photographs of the River before the dams were built were peaceful. During the building phases, it is evident that no care was taken to protect the health and welfare of the River or the watershed. Machines and materials infiltrated and demolished what was deemed unnecessary or undesirable. Now, decades later seen in figure 5.27 *Between the Dams*, the River has reclaimed the banks with tertiary trees, dense undergrowth, and a multitude of plants to catch the runoff before it reaches the stream. There is plenty of room for improvement but let us first do no more harm. After heavy rains trash is blown into the water and there are factories and nuclear plants that use more than their share of the River's water. Ki has quietly, for the most part, found a place in our community as a softly meandering source of life and power. We can work together to improve

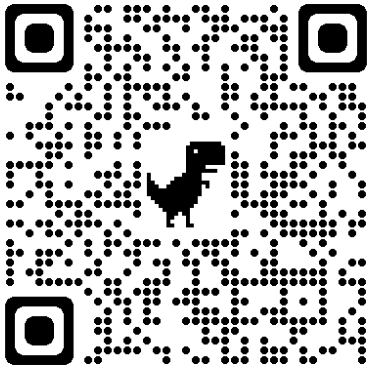

Figure 5.27, *Between the Dams*

the health of the water and the watershed and ensure a continued relationship with ki. As a romantic, I hope you will fall in love with the world in which you reside; as a global citizen, I want you to notice what can be improved and find a way to join in that effort.

Findings related to the Literature

A/r/tography as it relates to the principles of the rhizome and ecopedagogy. A/t/ographer Sameshima (2019) recommends the following questions in the analysis of the art. How did interacting with the art influence thinking, feeling, and sensing the project? How did interacting with the data influence the medium? Just knowing that I would be producing some type of artwork to represent the research changed the lens. I was able to shut out the constant questions of my scientific brain and let the River lead me to an understanding of flow and the lives dependent on the health of this body of water. This was not easy and took time but after the first year of kayaking my brain was trained to relax on the water. This ability to let go carried over into art making. At first, I was compelled to create representational work but soon realized I neither possessed the skill set nor the time required to gain those skills. Once I was able to relax, I found a creative outlet in watered down acrylics. Their liquidity reminded me of the movements of the water and without the pressure of 'trying' to make something happen, I was able to let the painting move until I was satisfied. I attempted to work with watercolors, but they too needed direction, and I did not want to force my way into the art.

Throughout this project, I am practicing a/r/tography and ethnography as ecoliteracy. Ecoliteracy requires active participation to become environmentally aware. In an effort to increase the depth and breadth of my understanding of the River and the watershed, I immersed myself in the environment as a student of nature. I have woven the tenets of ecopedagogy into the six principles of the rhizome (Deleuze & Guattari, 1988) while practicing a/r/tography. In the

process, I was able to practice ecoliteracy and increase my understanding and appreciation for the River, the watershed, and the water regime. Antunes and Gadotti (2005) describe ecoliteracy as a methodology for learning to read the world. Although a/r/tography is not a traditional ecological text - that is the point of this research - it allowed me to view the River through a different lens. Just as thought experiments release the thinker from strictly adhering to the laws of nature in order to allow for creativity and innovation, a/r/tography is a way to open the doors of science to new ways of thinking. Innovation requires a bit of risk and ecoliteracy requires an open mind. These are both possible within the scope of ecopedagogy.

I have always felt like I belong in nature, but this endeavor strengthened my connection to the water and the water to me. The time spent on the water renewed my connection to the land, specifically the watershed, and the lives that depend on symbiosis. Within the tenets of ecopedagogy, biosensibility requires attention to those connections no matter how tenuous they may be. Principles one and two of the rhizome metaphor (Deleuze & Guattari, 1988), connectivity and heterogeneity, follow lines of flight together. They cross at biosensibility. It is difficult to consider water in biosensibility when viewed through a narrow scientific lens, after all, water is abiotic. However, when we connect the value of water to all living species on the planet, we cannot underestimate its importance. Without water on this planet in all its phases, life would not exist and there would be no need for ecopedagogy. The water vapor in our atmosphere deflects enough sunlight to keep us warm without burning us up. The ice at the poles reflects sunlight back into the atmosphere further moderating our temperature. While water cycles through the living and nonliving, it hydrates and protects the species that depend on it. Biosensibility is one goal within my research. I aim to disrupt the scientific curriculum but not antagonize those who control it. Like water, I want my study to be generative and powerful,

there is nothing to gain by aggravating those in control of the school systems or the financial power houses that control them. I will work quietly, peacefully, locally, and my students will carry this into the world.

The biodiversity along the River's banks and within kin's water are a testament to the increasing health of the water due to great efforts by individual, community, and government agencies. There are areas where monocultural pines are farmed along the River in section three but for the most part the River's banks are densely packed with deciduous and conifer trees as well as perennial and annual plants, including these *Reeds in Fall*, figure 5.28. According to the local Audubon Society, a multitude of animals live here year-round, and the variety of migrating birds and mammals has been increasing over the last few decades (sc.audubon.org). This biodiversity is both evidence of connectivity of nature and the protectiveness of heterogeneity or diversity. *Aquatic Photosynthesis*, figure 5.29, is representative of the healthy bacteria that live within the silt and soil, the unseen warriors for the water. Arenes, Latour, and Gaillardet (2018) might consider my work a microcosmic Gaia-graphy of a critical zone. While their work is focused on the land, it includes watersheds and fresh water. Their

Figure 5.28, *Reeds in Fall*

Figure 5.29, *Aquatic Photosynthesis*

main concern in *Giving Depth to the Surface,* is to recognize and promote a change in perspective towards events as they are tied to place. I have done this with my canvas to stimulate empathy in the public.

There are groups and individuals fighting for bodies of water to have the same rights as humans and in some cases those battles have been won. This idea disheartens me; we are so arrogant as a species that we believe we are equal to the molecule that makes life on this planet possible. I understand why those entities chose the term 'personhood' to describe the protection a body of water deserves; I just wish it wasn't necessary. Just as I was bringing this research to a conclusion the Environmental Protection Agency, for the first time in its history, put limits on the amount of per- and polyfluoroalkyl substances (PFAS) better known as forever chemicals allowed in drinking water supplies (epa.gov, March 2023). Positive change is happening. The EPA is concerned about the human consumption of water, but our connection to the watershed is symbiotic.

The most immediate issues for the River right now are the chemicals in the silt and the possibility of being dislodged if the New Savannah Bluff Lock and Dam is dismantled. The ecopedagogical ethic of care should be the primary guiding principle. Nell Noddings (1995) tells us not to expect reciprocity from caring, we know that it takes generations for trees to mature, decades for children, and years for mammals. It will take time to see the progress from the work we put in today. "The engineering illusion has produced damage…that will require a geologic era to correct" (Berry, W., 1970, p. 634). According to Moore and Langer (2012) a River can naturally heal itself from toxic chemicals in 90 to 100 years at the source and 10-25 years downstream of the pollution point if no further pollution occurs. *Safe Drinking Water* estimates a decade to clear drinking water of contaminants with the most advanced, and expensive,

technological processes (safewater.org, 2017). We have finally begun to see the health of the River in this area rebound after decades of cleaning up by the Savannah River Nuclear Site and the remediation of DSM chemical dumping. The mouth of the River at the Port of Savannah is considered one of the most toxic ports in the nation. If the removal of the NSBLD is to remediate damage due to dredging at the port, it is foolish to remove a dam that will destabilize toxic silt. As it stands now, the chemicals in the silt are degrading on their own, being absorbed by bacteria and fungus, and not damaging the water. It is time to apply the same ethic of care to the River that we would expect from any health care provider.

Figure 5.30, *Fractured Sunset*

There are three pieces on the canvas inspired by care and connection, beyond the canvas itself. The ceramic tile titled *Fractured Sunset* figure 5.30, depicts the refraction of sunlight on the water at sunset, photograph figure 5.31, *Stormy Sunset*, is of a sunset facing up River just after a storm. *Fractured Sunset* was inspired by the photograph. I chose five colors I saw that evening, pouring one on top of the other and rocking the tile back and forth. I did this on four tiles and although I liked three of them, they did not exude the energy of sunlight. I added white to each tile to see if the contrast would help, and this

Figure 5.31, *Stormy Sunset*

was my favorite. It shows my connection to the sunset as well as the light's connection to the water. Another acrylic canvas experiment surprised me. Figure 5.32 *Glacial Ice* is my reminder that the water on the planet is in a fragile state. *Glacial Ice* was a complete accident and almost went in the trash. There are at least three other paintings underneath it. To create boundaries with black and white to portray asignifying rupture, I was reminded of a trip to Haines, Alaska. I let the painting wait for weeks before I chose the blue that reminded me of the remaining ice in Glacier Bay in the summer.

Figure 5.32, *Glacial Ice*

The canvas itself, a cartographic experience, is inspired by Harold Fisk's (1952) *Mississippi Meandering* Map. A topographer for the Army Corps of Engineers, Fisk spent his career carefully noting every change in the course of the Mississippi River. He documented the changes, both natural and manmade, on top of one another in 20 colors covering 200 years. My map is far less detailed but is the product of temporal decalcomania. Using maps from the Library of Congress, the local historical society, and the Savannah Riverkeeper, I was able to locate 10 maps that overlapped my area of the River. From these maps, I decided to work with half century changes that were influenced by anthropogenic forces, specifically dam building. Prior to 1800 the River, painted in green, had not been influenced by any significant human forces. As stated in the ethnography, Stallings Island and other areas were occupied by humans but they did not change the flow of the River.

The purpose of the map is to provide a foundation for the art it carries, not to be absolute and accurate. I want the viewer to notice that after a dam, canal, or levee was built the River

changed course. Some of the changes were forced to send more water to the dams but others were hydrodynamic responses. The watershed is represented in a variety of densities of green. These gradations are clearly visible on Google Earth and were achieved using fabric dye. The most difficult decision was choosing the direction the canvas should hang. I wanted the viewer to be a little disoriented and have to consider the direction of the flow of the water but settled North to the left, for a week. I let this hang in my school's library until I realized it needed to hang vertically so the viewer is forced to look up and down the River, like I did as I paddled. The map, figure 5.33 *Canvas Map Progression*, is made to hang in three directions so there are no true entrance or exit points.

Figure 5.33, *Canvas Map Progression*

Deleuze and Guattari (1988) intended for the principles of cartography and decalcomania to form a multiplicity. In their honor, I have remained true to the concept. The canvas is the base with the maps layered one on top of the other. Beneath the paint and fabric dye is a sketched map of the River from 1785. This is no longer visible, but it guided the entire project. The lighter materials are placed onto the canvas in the sections where they were observed.

While focused on the principle of decalcomania, I was pointed towards another example.

Figure 5.34, *Decalcomania in Practice*

The idea that we leave impressions on each other and on nature could be expressed by pressing materials together and pulling them apart. Much like children make butterflies, the sides reflect each other. The four-piece tile, figure 5.34 *Decalcomania in Practice,* is a pressing of one tile onto the other then the top two pressed simultaneously onto the lower two. The colors were chosen from a combination of sunrise, river silt, and the various colors of the reeds. This piece is only possible because I was at the water level as the sun was rising. These colors would not show up in a photograph because my camera automatically adjusts to low light in the morning. The canvas also represents the layers of the River we cannot see. Only the surface is on the map, not the silt, not the bedrock, not the fall line. What is not visible is also found in the empty space on the map. When combined the map and the pieces of art are no longer separate entities, they are a visual representation of my green water journey.

Principle three of the rhizome is multiplicity. In a Deleuzian tradition, my entire dissertation is a multiplicity of nature. It is my attempt to understand, other-organize, and other-assemble a personal experience with the River. It was difficult for me to depict multiplicity visually, but I have a video of a juvenile osprey frolicking in the water. He allowed me, maybe even invited me, to sit beside him for minutes while he hopped

Figure 5.35, *Juvenile Offspring*

around. Enjoy this osprey in solitude. Listen to the bugs and frogs as he practices his hunting skills. This juvenile fledged in the spring of 2022 and the footage is from the early fall of the same year, figure 5.35 *Juvenile Osprey*. He called to me from the top of a dead sycamore then dropped straight down to the water. He did not fly - he dropped. This particular osprey and I are hunting partners. He knows that the pedals of my kayak stir up the bottom and scatter unsuspecting fish and an occasional freshwater eel. He waits for me to get close to the shoreline and then flies overhead. He has successfully skirted the water to fly off shaking his fish like a dog with his favorite toy just moments after I pass by. Also like that dog, the osprey gets off balance and must recover midair, I am awestruck each time he chooses to spend time with me.

Wendel Berry (1970) applied the term multiplicity to new understandings. "As soon as it is recognized that a river -or for that matter, a home - is not a place but a process, not a fact but an event, there ought to come an immense relief: one can step into the same river twice, one can go home again" (p. 635). When looked at through a new lens any subject can hold more than one meaning. It is the act of taking the time to notice that creates multiplicity. The relationship between humans and the abuse of our natural resources has created a world of scarcity and hegemony; this is an unacceptable and unsustainable multiplicity. The River is simply being a River; however, it is our connection that changes our understanding. The *People of the Shoals* (Sassaman, 2006), previously known as the inhabitants of Stallings Island, understood that relationship well. Their clay tools and bowls were made from the local soil and embedded with fibers to make them stronger. In their honor I attempted to work with clay to make a bowl. This endeavor ended in crumbs until I went to a local potter who literally laid her hands over mine to make the bowl presented. I wondered if that is how the women taught their daughters how to mold clay. I was given some remaining clay and rolled leaves found on the banks of the River

onto it. Although the act of softening the clay and carefully pressing it was satisfying, it is an odd sensation to feel the ribs and veins of a soft green leaf in the roughness of the solid clay. The following figures 5.36 *Southern Fern*, 5.37 *What is a Weed?*, and 5.38 *Pieces of the Cypress Soul* are some examples of flora I was able to collect from my kayak.

Figure 5.36, *Southern Fern*

Figure 5.37, *What's a Weed?*

Figure 5.36, *Pieces of the Cypress Soul*

The unexpected intersection of tactile experiences leaves me with a temporary glimpse of understanding as to how multiplicity is formed when the zone of intensity (Deleuze & Guattari, 1988) is confronted with the transition of smooth space into striated. This is how my students feel when, for a brief moment, they understand the concept of spacetime and gravitational waves.

The most literal principle, asignifying rupture, is clearly depicted on the canvas in black lines. The channel, strength, and amount of water in this River were significantly impacted by each alteration at the hands of humans: The Augusta Canal built in 1845, the Augusta Levee built in 1916, Stevens Creek Dam constructed in 1935, New Savannah Bluff Lock and Dam completed in 1937, and Clarks Hill Dam and Reservoir opened I 1954. There are visible changes in the course of the River after each interruption in flow. Asignifying rupture requires disconnection and new relationships in a variety of ways. The River has done this. The flow was altered by human intervention and reconnected by us as well, but the River found other ways to

adapt. In a completely natural River, silt is deposited downstream and opposite curves. In this River, that silt continues to be deposited for miles along both sides narrowing the channel every decade. “It is the business of natural processes to produce consequences, and the first law of ecology is that justice is always done-though not necessarily to those who deserve it. Ecological justice, in fact, falls most often on later generations, or on the people who live downwind or downstream” (Berry. W., 1970, p. 634). This is true for the species and the water downstream of anthropomorphic changes. The sturgeon that once spawned in the shoals are no longer able to reach that area. Even if a path is created for them, there is no guarantee they will ever find their way back to the region. In a free-flowing River, the faster areas carve out new streams, but in this River, those areas have grown closed. It is clear to the careful observer that ki is trying to recuperate from the damage done. On the canvas, there are streams that no longer reach the River. In another few decades they will fill in with runoff and trees and other smaller streams will break off into the River. Asignifying rupture is an evolutionary necessity. In order for this River to survive, ki must adapt.

Response-ability (Haraway, 2016) belongs solely to those who accept it. Although it is unenforceable, the United Nations Earth Summit (2020) stated that the people and entities who are in the financial position to use clean energy and repair industrial damage are obligated to do so. Global responsibility, biosensibility, and sustainability are tied to each other in their multigenerational outlooks. Ecopedagogy is directed towards the education of our youth in the hope that they will carry new practices into future generations. In the classroom this looks like an ecology curriculum with practical projects that can be conducted at the local level. Agricultural classes that include soil and water studies, cafeterias with compost bins, art installations with environmental protection themes are all possible in the public school system; we do a

satisfactory job with our youngest students. Where we fail is inspiring our secondary students to become adults who continue these behaviors outside of the school house, adults who vote with their conscience and with their investments. The pedagogy of place can be practiced locally with an eye on the entire planet as one place. Bruno Latour's (2013) *Facing Gaia* asks the human population to consistently ask themselves to recognize and reflect on how each of us affects Gaia. Knowing that conflicts are expected, we must find ways to make diplomacy work for the future health of humanity and the planet.

This study has evolved into an a/r/tographic practice in ecopedagogy with support from ethnographic research. When I began, I honestly believed that art would supplement the ethnography, but as I progressed, I discovered I had it backwards. Ethnographic data was essential to my understanding of the value of the River to the community; a/r/tography actually placed me as the student of the River. I allowed the River to lead the discourse, guide my eye and my thoughts. Because I set aside the time to quietly listen, I have grown closer to nature. The challenge ahead is for our students; it will be difficult to separate them from their addiction to electronics, but we must find a way. Simply participating in this endeavor gave my brain and mind the opportunity to consider the world from a different perspective. In Bruno Latour's (2013) *Facing Gaia* there is a lecture focused on finding collective rituals, including art and science, that allow us to explore the world more kinesthetically. I have learned that creativity frees the mind to process deeply and unconsciously. I was surprised to discover how much pleasure was possible when I allowed the paint to flow like a River. I sought to discover how a River could be considered an equal member of a community, but this is impossible. While we generally consider water a natural resource for our use, ki is in fact the only reason we are here.

If anything, we should consider the water, soil, plants, and animals above ourselves and care for them as if our life depends on it - because it does

EPILOGUE

At the onset of this study, I had two basic questions I was seeking to answer, with primary goals in mind. I wondered what information would be revealed by conducting an ethnography on an abiotic resource, and I wanted to know what could be learned by allowing the River to become a teacher. I hoped to provide an antidote to the positivism found in the scientific method and science education through a humanistic approach to ecology using the tenets of ecopedagogy. Conducting ethnography on the middle Savannah River as the subject as opposed to the traditional place of an object fit those parameters. Finally, I hoped to give the River a voice. I have successfully integrated a qualitative humanistic approach to an ecological investigation through ethnography and a/r/tography. I satisfactorily conducted a basic ethnography of the middle Savannah River as the subject; finding that insufficient to properly acknowledge the River, I practiced a/r/tography throughout the green water journey. While I am dissatisfied with my portrayal of the voice of the River, I am not sure this was a realistic goal. I chose my inspiration wisely, but I am not convinced that any human could honestly voice the River. In hindsight, it was a foolish endeavor but not a waste of time. I forced myself to apply a lens I would never have used otherwise. I was able to step away from a human time scale and consider a geological one. I did learn a great deal about patience and power - I have relatively little of both. Gaia is an evolving entity that is neither science, nor religion and needs to be recognized as such. I found that I agree with Bruno Latour's (2013) assertion that both need to be taken out of our understanding of the planet.

By conducting the ethnographic research, I was able to create a background and timeline of the River's role in the region, including the settlement of humans, the changes in flow, and the contribution to the economic success and social development of the area. I was also able to connect human intervention with the detrimental issues that plague this area of the River, toxicity, erosion, flooding, and silt build up. The data within the ethnography is not new; however, the lens applied is innovative. Until this study, the River has merely been a natural resource to be used as we saw fit. Placing ki in the position of subject creates an equality of membership that has not been published for the Savannah River. It came as no surprise that anthropomorphic forces are not neutral, and although the River is resilient, ki is a vulnerable member of our community. Any other member of a vulnerable group would have significant protections against use, abuse, or even investigations. This research provides evidence that the River deserves at least that level of consideration.

As an antidote to the positivism in science, I hope that both the ethnographic and a/r/tographic sections create more questions than answers. We do not understand the complexity of Gaia. We have a basic knowledge of physics, biology, and chemistry, but these do not provide all the answers to how this planet functions with or without us. Maintaining a willingness to learn from all sources is the antidote. As a critical pedagogue, Paulo Freire, (1996) promoted the ideas of learning from a variety of sources. He knew the farmers were experts in environmental practices and other knowledge from outside the university system, he encouraged the impoverished to value their own intelligence and use that to their advantage. He recognized the difficulty in change and compared it to a rebirth, "those who undergo it must take on a new form of existence, they can no longer remain as they were" (p. 61). Although he was addressing the people of Brazil, his ideas are now necessary for every participant of Gaia. The destruction that

was once limited to the landscape is now global, the idea of wilderness is quickly being absorbed by industry (Latour, 2013) and Fortune 500 companies. For true transformation to take place, the whole of humanity must be 'reborn' into sustainable practices where decisions are based on public interest in the commons. "The democratizing process needs to be guided by an intergenerational perspective that takes into account future generations-which teachers need to help students understand" (Bowers, 2002, p. 33).

It is this connection between educators and the curriculum that is essential for the successful implementation of ecopedagogy. Participants in the Earth Summits (1992, 2002, 2012, 2022) have created a great deal of environmental curricular material, unfortunately it has not made it into the science classroom. This disconnection between information and delivery is one of the challenges to building sustainable practices. Transformative education helps individuals see themselves as a participant in the social structure (Freire, 1968/1996). When humans see themselves as powerless, oppressed or othered, they feel no obligation to the future generations. We feel no obligation to the *other*. The integration of nature as a community member can attenuate that separation. In 1982, Murray Bookchin observed the network of social ecology and hierarchy that has converted the Earth and its inhabitants into exploitable resources. The power differential that exists between the owners and the employees of the world is maintained by the lack of information that is disseminated in curriculum. It is my intention to be disruptive to this dynamic without becoming so antagonistic that those in control over my classroom take notice.

The field of curriculum studies is the beneficiary of this research as a model of a multidisciplinary approach to the curriculum of nature through ecopedagogy. In general, the curriculum of nature falls into a scientific category; however, with this research it is now

connected heterogeneously to the humanities, social sciences, art studies, and education. This model could be used within curriculum studies as a jumping off point for those interested in other forms of wisdom from inorganic members of our community. Additional subjects could include the soil's relationship with fungus and bacteria as it applies to the health of a community beyond the food sources. Ecopedagogy is a wide field that could and should be applied to the education of our students at multiple levels across the curricula. Ecological issues can and should collide in education "with social justice, peace, and democracy" (Shiva, 2016, p. 126).

The green water journey was limited by weather conditions and safety issues but was eventually completed. It was not cartographically linear as I had hoped, but each section was investigated. In the end, the lack of continuity proved to serve as another example of asignifying rupture with heterogeneous connections and provided further evidence for the value of rhizome epistemology. Because I chose to use a romantic lens, the element of environmental fearmongering is absent from this research. This was done purposefully and should be considered as a delimiter and not an absence of information.

"Without the wilderness to teach us, without the willingness to go and learn what it alone has the power to teach, we can only become more dangerous to the world and to ourselves" (Berry, 1970, p. 644). The application of multiple lenses to explore the Savannah River has exposed the possibility of a non-human teacher in an ecopedagogical curriculum. This experiment in rhizomatic perspectives has opened a creativity I did not realize I possessed. I contend that if I can experience this epistemic change so can others. The significance of this post humanistic ecological research is parallel to the scientific understandings we have of fluid dynamics, hydropower, geomorphology, and biology. The findings should not be underestimated

as inferior to the science, for they enhance not only our understanding and appreciation of this River, but also our compassion for ki's protection.

As I complete this dissertation I am filled with excitement and gratitude. When I inhale, I take a moment to ponder the complexity of this planet, and as I exhale, I smile for the gift of reciprocity shared with Gaia. I have no desire to master nature; I simply want to dwell in a peaceful state of awe.

Figure 5.39, *Inhale - Exhale*

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