SWAMP WALK:

Unearthing stories about The Great Swamp in New Jersey

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ABSTRACT

Swamps play an invaluable role in our ecosystem: the prevention of erosion and flooding, the filtration of water and pollutants, the creation of fish nurseries, numerous habitats for vegetation and wildlife, and a refuge for more than one-third of all endangered species. Swamps occupy around 5-8 percent of the land surface on Earth and hold almost up to 30 percent of dangerous carbon emissions in its soil, a far better scenario for our environment than to have traces in our atmosphere. Why then, throughout history, have swamps been maligned as primordial, wild and mysterious—a haven for poisonous snakes, man-eating alligators and wild-eyed crazies that cause sickness, insanity and death among their innocent victims?

This data visualization project specifically frames the visually rich story of The Great Swamp located in Morris County, New Jersey between 1959-1970 when a group of residents waged opposition to a New York Port Authority proposal to drain and pave over the swamp in order to build a Jetport there in 1959. Such institutional change would have brought significant destruction to both plant and animal habitats that would have never recovered.

This project weaves together the archival historical data from both this battle and the cultural references at that time, with biologic data accumulated through applied research of The Great Swamp. In the last fifty years, environmentalists have cautioned that our planet is at risk of irreversible destruction. The battle to preserve The Great Swamp is a microcosm of our global challenge.

INTRODUCTION

Swamps are "essentially wooded wetlands, distinguished from bogs or marshes primarily by the presence and density of trees. This terminology, though, is deceptively simple, in that the term 'wetland' itself was a creation of the 1950s, in part in response to the negative connotations borne by a centuries-old catch-all term for soggy ground – or 'swamp'." (Wilson, 2018).

Biologists now define swamps as 'wetlands' – a broad term encompassing a variety of ecosystems and environments that filter water, brim with wildlife and are pure, pristine landforms. They are essentially 'in-between' areas, mixtures of water and earth, land and liquid. They may be permanently or seasonally saturated, and include swamps, bogs, floodplains, marshes, mires, quagmires, fens, moors and bayous.

The interaction between the two terms 'swamp' (bad) and 'wetland' (scientific), and the idea of essentially being an 'in-between' environment is also mirrored throughout history as swamps have been demonized. This thesis project is a reflection of this same paradox. Focusing on the specific story of The Great Swamp, located in Central/Northern New Jersey, and its fight to remain in existence, this project will make the connection between examining the paradoxical stories of swamps, our fascination and horror with the effects of climate change, globalization and suburban/urban development and what swamps, or wetlands really provide. In order to try to understand this paradox, there is also the story of human progress, which forever looms in the background. Property values, jobs, and development, which I include peripherally, but must mention, works clandestinely and overtly as a continual motive for greed and profits in our world.

The seed of this project sprang from my deep-seated fear of all things 'swamp-like'. I was born in the 1950's in Southern California and was a big fan of Saturday afternoon horror films. I had never seen anything remotely similar to a swamp, bog, marsh, everglade or quagmire. Films such as *Creature from the Black Lagoon*, *Swamp Thing*, *Tales of Terror: The Bog Beast* were filled with alligators, snakes, mosquitoes and (horrors!) monsters and places where you could be swallowed up by quicksand, or dragged down to the bottom of the swamp by a creature. Primordial places, dark, evil and teeming with criminals and inhabited by people with no teeth who could change into a half amphibian, half man.

In those days, it was easy to associate a swamp with these types of images. However, we've now come to understand that wetlands are fragile, ecologically threatened and endangered – a place where water is filtered, biodiversity thrives, and natural flood protection exists.

This project tells the story of how the survival of The Great Swamp was an environmental success story and how natural swamps are important to the health of our planet. This fragile ecosystem, while appearing as wasted land to be commercially developed and demonized, still remains embattled as we continue our march toward 21st century progress. What this project will not convey is to take a deep dive into swamp microbiology or analyze the business or cost benefit of development of The Great Swamp.

The small success story of the preservation of The Great Swamp in the 1960's is one that is continually being fought, recognized and experienced in all communities that continue to fight to save their local natural ecosystems around the world. As our understanding of environmental issues and pressures constantly evolve, our need to understand the small triumphs and struggles to preserve our swamps is evident in this written thesis and visualization project.

TREATMENT

2.1 A Brief Introduction to The Great Swamp

The Great Swamp Wildlife Refuge is a major environmental, social, economic and recreational asset to New Jersey and is managed by the U.S. Fish & Wildlife Service. "It's visited by more than 300,000 people each year, is home to more than 220 bird and 1,000 plant species and provides many environmental functions. There are 26 state listed endangered species of wildlife, including the bog turtle, wood turtle, blue-spotted salamander, great blue heron, red-shouldered hawk, barred owl, osprey, cooper's hawk, cliff swallow, red-headed woodpecker, and bobolink." (Browne, 1997). "It encompasses 7,768 acres and is located 26 miles west of New York City. The area is heavily suburbanized, and as a result, the refuge has become an island of wildlife habitats in a sea of development and has a mosaic of forested wetlands, emergent wetlands, and various successional stages of upland vegetation that provides habitats for a diversity of wildlife species." (U.S. Fish & Wildlife Service, 2014).

Besides being a wildlife refuge, the Great Swamp is an efficient and well-functioning wetland ecosystem, providing "a variety of benefits including flood control, groundwater recharge, stormwater filtration, wildlife habitat, ecological diversity, active and passive recreation, aesthetics, ecotourism, public education and scientific research." (Browne, 1997). Since the surrounding area is heavily suburbanized, with approximately 138,000 people living in the swamp and adjacent towns, it's important to note that with growing development, increased stormwater runoff and pollution enters into the Great Swamp. "The Great Swamp is wetter, it floods more frequently, and it receives higher loadings of sediments, nutrients, and other pollutants." (Browne, 1997). Those nutrients and pollutants include fertilizers, animal and human waste and motor oils.

2.2 What do swamps do? Some key benefits:

- The Great Swamp is a series of wooded ridges interspersed with wide areas of wooded swamp, and open marsh.
- Dry woodlands are approximately 20% of the swamp, the wooded swamp and marshland are composed approximately of 80%.

- There are 10 towns and townships that surround or reside in The Great Swamp: Morristown, Madison, Bernardsville, Mendham, Chatham, Mendham Township, Harding Township, Morris Township, Longhill Township and Bernards Township.
- If not for the Great Swamp, increased development in the next 60 years in the area, along with climate change will make flooding more extensive.

There are 3 areas that I've chosen to visualize data and make connections. I am identifying **hydrology, vegetation and wildlife** as separate, but interdependent natural intrinsic entities. They are parts of a whole that are independent but interact with each other for the swamp to stay healthy – one doesn't exist without the other.

"The progression of landscape research has demonstrated the importance of multiple driving forces and the interaction of those forces in generating vegetation patterns. (Turner 2005a, b). In many instances, land-use is the dominant driving force of landscape patterns (e.g. Foster 1992, Dupouey et al. 2002); however, this is not always true. Studies of land-use legacies must, therefore, also address other driving forces acting separately and in conjunction with land-use." (Momsen, 2017).

It's important to note the research of geography and landscape is interdependent but must include human interaction as well. In my thesis report about The Great Swamp, not only are there natural key intrinsic forces that consist of the hydrology, vegetation and wildlife, but key social extrinsic forces as well – histories, cultural legacies and biases that include how human actions can decide land-use.

"The concept of driving forces has gained attention in ecology. The concept of driving forces has been traditionally rooted in geography and landscape research (Wood and Handley 2001, Burgi et al. 2004), where driving forces have been grouped into five categories: natural, cultural, socioeconomic, political and technological. In the space-time hierarchy, environmental disturbance regimes would be considered natural driving forces of landscape change. By expanding that portion of the paradigm to more generally include driving forces, we explicitly address the complex relationship between people and their environment. Driving forces do not act in isolation. They interact, depend on other driving forces and affect multiple spatial and temporal scales (Burgi and Schuler 2003)." (Momsen, 2007).

2.2.a. The Hydrology - Swamps are sponges.

This is a straightforward way to describe the swamp ecosystem with regard to water: “Swamps are among the most valuable ecosystems on Earth. They act like giant sponges or reservoirs. When heavy rains cause flooding, swamps and other wetlands absorb excess water, moderating the effects of flooding. The swamp ecosystem also acts as a water treatment plant, filtering wastes and purifying water naturally. When excess nitrogen and other chemicals wash into swamps, plants there absorb and use the chemicals. Many of these chemicals come from human activities such as agriculture, where fertilizers use nitrogen and phosphorus. Factories, water treatment plants, and homes also contribute to runoff. Chemicals not absorbed by plants slowly sink to the bottom and are buried in sand and sediment.” (National Geographic Society - http://www.nationalgeographic.org/encyclopedia/swamp/)

The floor of the Great Swamp is approximately 250 feet above sea level and sits in a 7 by 3-mile basin. The composition of the swamp floor is essentially several feet of peat and organic mulch, which overlays a thin layer of sand. Beneath that sand is impermeable clay and silt, that averages around 60 feet in depth and below that is another deposit of sand and gravel aquifers (water carriers) which then overlays bedrock. The Great Swamp connects with 5 brooks and rivers (Black, Great, Loantaka, Primrose brooks, and the Passaic River), which carries silt and water in and out of the swamp, which then brings in larger plants that compete with the natural vegetation of cattails and grasses of the swamp. Its surrounding vegetation absorbs water and by transpiration, sends that water into the atmosphere. As a result of transpiration, and the ‘storage’ quality of the swamp, the water that leaves the swamp averages around 25% less than how it entered. This transpiration assists in flood protection in the surrounding areas due to heavy rains, especially since the water moves into the Passaic River which flows for another 79 miles amidst highly populated residential neighborhoods and commercial areas and finally empties into the Hudson River in New York state. Some of these 130 towns include Newark, Montclair, Clifton, Patterson, Summit and Rutherford. This river also provides drinking water for over 2 million people from some of its pristine watersheds.

Most people in New York City and the tri-state area recall Hurricane Sandy in 2012, one of the deadliest and most destructive hurricanes of our time, and the flooding and devastation it caused. Without our natural marshlands and swamps absorbing water, and along with more extreme weather patterns, can lead to even more devastating weather events in our immediate future.

There is also the indication that with advancing development in the area, the amount of stormwater runoff and impervious surfaces (parking lots, roadways, roofs), the more water will filter into the swamp. That

stormwater runoff picks up "pollutants on its path such as animal waste, trash, motor oil and more. Stormwater runoff flows across impervious surfaces directly into the nearest stream, or into a storm drain, which eventually empties to a stream. Mown grassy areas like lawns and golf courses are also relatively impervious and contribute to runoff often adding excess fertilizers (nutrients) to our waters." (Great Watershed Association, 2018). This fact makes the wetlands and swamps natural filtering systems all the more important.

CLIMATE AND WATER QUALITY RETENTION

The threat of climate change has a significant impact on the need for more research, monitoring and water management strategies for the Great Swamp and all global wetland environments. With the warming of global average temperatures, greenhouse gas increases and carbon emissions, the "increase in average temperature and a rise in sea level that is consistent with observed and predicted global trends." (U.S. Fish & Wildlife Service, 2014), which means that our "sea levels could rise an additional 4 to 35 inches over the same time period of projections of global temperatures over the period of 1990 to 2100. Rising ambient temperatures are expected to have direct and indirect impacts to human health, natural ecosystems, agriculture, and the water supply in New Jersey." (NJDEP 2010). "These rising temperatures also impact the amount of oxygen that is available to the aquatic life that lives in the Great Swamp." (Great Watershed Association, 2018). The increasing amounts of water discharge are one of the markers that show the trends of climate change.

The Great Swamp Watershed Association also grades the water on the New Jersey Department of Environmental Protections (NJDEP), and the U.S. Environmental Protection Agency (EPA) standards.

Three ways that the Great Swamp measures and monitors its water quality is looking at amounts of:

1. Dissolved oxygen – aquatic life needs oxygen to survive. Low dissolved oxygen levels can be caused by algae blooms, high water temperature and slow flowing water. To keep the amounts of dissolved oxygen high, you can look at the vegetation that is near the stream banks and can shade the temperature of the water.

2. E. Coli – bacteria found in the intestines of mammals (including humans) and birds. Most strains are harmless, but some presence of fecal matter can contain harmful viruses. Stormwater runoff can score depending on amounts that might include contamination from broken sewerage or septic systems, wildlife and pets.

3. Macroinvertebrates – small animals without backbones that live in water, such as crayfish, insect larvae, and worms. These types of macroinvertebrates need a variety of water quality, so the presence (or absence) of different types tells the recent history of the water quality.

(The Great Swamp Watershed Association,2018)

WETLAND MANAGEMENT

Without the help of human and/or beavers' intervention, silt and dead vegetation would filter into the Great Swamp, which would allow larger plants and trees to find a foothold to grow and compete with the natural cattails and grasses. Through time, the swamp would become dryer and dryer, eventually turning into a dry woodland or forest habitat. Careful management of the swamps must be maintained in order to preserve them as wetlands. "Excess pollutants could actually become sources of water quality issues such as poor water color/clarity/odor, low dissolved oxygen leading to plant die off, and prevalence of algal blooms." (EPA, 2009).

As less money from the Federal Government is allotted to our National Parks and Wildlife, it becomes increasingly difficult for Park rangers and Wildlife refuge directors to maintain swamps. "Managers are frustrated by the lack of funds and recurring low priority given the needs of northeastern refuges. The top priorities and prestige assignments are still in the west. On a practical level, the Great Swamp refuge is one of three refuges with the highest rents (set by the federal government) for managers' houses." (Cavanaugh, 1978).

2.2.b. Vegetation - A Mosaic of Diverse Habitats for Wildlife

There are several land types that cover The Great Swamp and support a variety of land cover and habitats that contributes to both the health of the hydrology and wildlife. Although the Great Swamp was "established primarily for migratory birds, the refuge's mosaic of forested wetlands, emergent wetlands, and various

successional stages of upland vegetation provides habitats for a diversity of wildlife species." (Patel, 2011). **The Great Swamp is a place where unique habitats support a variety of vegetation and wildlife, which are important for its healthy hydrology.**

THE GREAT SWAMP HABITATS INCLUDE:

Bottomland Forest – (5,028 acres or 65% of The Great Swamp). Forested bottomlands include floodplains and riparian (riverbanks) habitats. This is the most dominant vegetation on the refuge. The dominant tree types include green ash, pine oak, swamp white oak, and American beech trees. These habitats support federally listed and endangered species such as the Indiana bat, and state-listed barred owl, blue-spotted salamander and the red-shouldered hawk. This habitat also includes invasive types of vegetation such as purple loosestrife and shows the increased flow and sediment from upstream development, altered hydrology, and impaired water quality for biologists to measure.

Upland Forest – (288 acres or 4% of The Great Swamp). Upland forest areas are defined as small inclusions of the bottomland forests, which include vegetation such as Coastal Plain beech-chestnut oak forests and invasive vegetation such as the Japanese barberry, garlic mustard, Russian olive, Japanese wisteria and Japanese honeysuckle. The bird species in this habitat include the wood thrush, wood warbler, fall migrating raptor as well as the state endangered barred owl.

Non-forested Wetlands – (692 acres or 9% of The Great Swamp). Non-forested wetlands are emergent wetland habitats that contain the eastern cattail, pickerel weed, broadleaf arrowhead and the invasive purple loosestrife. Living in this habitat are the federal listed endangered bog-turtle, the state listed endangered wood turtle, the American bittern, and the Northern harrier. Most of these habitats are managed as restoration areas for the bog turtle and are areas for fall migrating waterfowl, and also indicates increased water flow, upstream sediment and impaired water quality.

Impoundments – (479 acres or 6% of The Great Swamp). Impoundments include 5 artificial impoundments of open water, emergent non-forested wetlands and other wetland areas that have scrub-shrub vegetation (woody vegetation smaller than 20 ft tall – usually stunted trees and/or shrubs, stunted because of environmental conditions usually caused by humans that include damage from fire or grazing animals). These impoundments also include drains, ditches and dikes that help contain flood and mosquito control areas.

Some of the 'pool' water areas contain cattails, wool grass and willows along with nesting, roosting, feeding and brooding spaces for migrating waterfowl. This area also includes accessible areas for observation for visitors.

Grassland Management – (793 acres or 10% of The Great Swamp). These grasslands are defined as being 'successional wet meadows' that are periodically mowed to suppress woody vegetation in order to create an ecologically sound balance for hydrology. These areas are home to prioritized bird species such as the bobolink, the northern harrier, the eastern meadowlark and the ranger managed bluebird box programs that assist in the safe nesting and breeding of the common bluebird. This area also includes areas of historic contamination from dumping, landfills or remediation.

Brushland Management – (314.5 acres or 4% of The Great Swamp). This habitat contains a mix of woody and herbaceous species, sometimes known as 'Successional Wet Meadow'. There are state-listed species such as the wood turtle, and the blue-winged warbler that live there.

Scrub Shrub Wetlands – (58 acres or <1% of The Great Swamp). Scrub Shrub wetlands (see definition above in Impoundments) are dominated by vegetation such as buttonbush, swamp rose and dogwoods. These habitats also contain standing water and support wildlife such as the American woodcock, the blue-winged warbler and the willow flycatcher.

Other –Administrative facilities such as headquarters and the visitor center and management roads, rights-of-way for power and gas and utility purposes. There are also single-family residences here that include lawns and manicured areas.

(U.S. Fish & Wildlife Service, 2014).

The maintenance of these important habitats in the swamp cannot be understated. Besides being crucial for the regulation of water hydrology, these diverse habitats support a wide variety of plant life, wildlife and are home to a number of federal and state endangered species. "The surrounding area is heavily suburbanized, and as a result, the refuge has become an island of wildlife habitat in a sea of development." (Patel, 2011).

2.2.c. The Wildlife – Skinks, Skunks and Snakes!

The mission statement of the Great Swamp National Wildlife Refuge is to "administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." (National Wildlife Refuge Improvement Act 1997, Public Law 105-57.) In other words, wildlife comes first.

Even as the Great Swamp was primarily established to preserve habitats for migratory birds, there is an abundance of other wildlife as well.

THE WILDLIFE INCLUDES:

- Approximate 39 mammalian species such as the: white-tailed deer, raccoon, Virginia opossum, striped skunk, masked shrew, smoky shrew and the starnose mole.

- Rodents such as the: Eastern cottontail rabbit, eastern chipmunk, woodchuck, eastern gray squirrel, southern flying squirrel, beaver, woodland vole, muskrat, woodland jumping mouse.

- Small and medium-sized predatory carnivorous mustelids (the weasel family): such as the river otter, mink, long tailed weasel, coyote, gray fox, red fox, include the black bear and the state-endangered bobcat.

- 8 bat species such as the: Eastern red bat, eastern small-footed bat, hoary bat, the federally endangered Indiana bat, tri-colored bat and the little brown bat.

- Frogs such as the: Northern cricket frog, green frog, bullfrog, leopard frog, Fowler's toad and the New Jersey chorus frog.

- Salamanders such as the: Redback salamander, northern slimy salamander, red-spotted newt, Northern dusky salamander, and the state-endangered blue-spotted salamander.

- Turtles such as the: Federally endangered bog turtle and wood turtle. The state listed box turtle and spotted turtle and snapping turtle, eastern painted turtle, musk turtle, red-eared slider and red-belly turtle.

- Snakes such as the: Northern water snake, brown snake, common garter snake, northern black racer, eastern worm snake, black rat snake, smooth green snake and the state listed eastern hognose snake.

- Waterfowl such as the: Mallard, wood duck, Canadian goose, American Black Duck, snow goose and the tundra swan.

- Approximately 87 species of Landbirds such as: Owls, hawks, woodpeckers, doves, cuckoos, swallows, swifts, warblers, wild turkey and wood thrush.

- Waterbirds such as the: Great blue heron, night heron, bitterns, cattle egrets, and the common moorhen.

- Shorebirds such as the: American woodcock, spotted sandpiper, plovers, terns and gulls.

(U.S. Fish & Wildlife Service, 2014)

2.3. The Swamps as 'Evil'; Cursed, haunted and filled with monsters.

"I'm swamped", "I'm in such a quagmire", "Drain the swamp". Swamps are used as verbs as well as nouns, and we tend to use the term interchangeably, however the context always stays the same – swamps are a "menace or nuisance, horror or hassle, are proving grounds or financial sinkholes", a "long, rich and varied history as quasi-active antagonists to human endeavor, whether collective or individual, programmatic or personal. To 'swamp', as the Oxford English Dictionary defines it, is 'to overwhelm with difficulties', 'to ruin financially'; the World English Dictionary adds 'to render helpless'. In its adjective form, 'swamp' is similarly negative; to become 'swamped' has similar connotations – when one is swamped, one is buried under unmanageable tasks, weighted down by work, overcome by seemingly insurmountable labors." (Wilson, 2018).

Swamps, throughout history were always considered foul and 'wild' places, with menacing dangers, mythologized with moral depravity and misunderstood as wilderness that should be tamed and controlled. "Wild nature has long inspired contradictory impulses of fascination and disgust, and a sense of both refuge and threat in Western Culture." (Nash, 1967): (Jones and Cloke, 2002); (Koole and Van den Berg, 2005).

2.3.a. A Breeding Grounds for Disease.

Even as far back as the first century AD, the Roman agricultural writer Columella reports "Marshland throws off a baneful stench in hot weather and breeds insects armed with annoying stings, which attack us in dense swarms; then too it sends for the plagues of swimming and drawling things deprived of their winter moisture and infected with poison by the mud and decaying filth, from which are often contracted mysterious diseases who causes are even beyond the understanding of physicians." (Wilson, 2018).

Malaria, which comes from Italian for 'bad air', was considered a catch all disease from inhaling swamp air. Early American colonies believed that all stagnant water bred diseases by mosquitoes. And disease was not the only danger that was present in the swamp. Besides stinging mosquitoes, alligators and poisonous snakes have become evil representations of the swamp that lay just below the waterline ready to pull you down under into the bottomless bog.

A prime example of the 'evilness' of the 'forbidden' swamp can be seen in the story of the "Battle of Ramree Island, a six-week conflict in early 1945 between the British Indian Army and the Japanese Imperial Army on an island off the coast of Burma (Myanmar). As the British forces drove Japanese troops across miles of coastal mangrove and inland swamps, the soldiers began to fall prey to swamp-related afflictions, including mosquitoes and swamp-related disease. Most dramatic, though, are legendary, but apocryphal accounts of Japanese soldiers being devoured by crocodiles in what the Guinness World Records has dubbed the worst animal disaster in world history. As the story goes, a thousand Japanese soldiers entered those swamps in the dark of night and only twenty emerged the next day. The rest had been devoured by crocodiles or otherwise claimed by the swamp." (Wright, B.S., 1962).

2.3.b. The 'Otherness' of Swamps

Another example of the way we have used swamps as metaphor is to attach 'otherness' along with its inherent evil. We have created swamp myths and stories around the "African other, again defined by a Western white perspective". (Wilson, 2018). Swamp dwellers were 'primitive', 'savages' or 'headhunters', as opposed to the pure and pristine cultured life as we know it. "In the North American colonies, a class of cultures shaped the destiny of swamp-dwelling Native American tribes. Terrified of wilderness as antithetical to God's order, European colonists in North America often identified 'savage' Native Americans with swamps. Native American attitudes towards nature, of course, differed starkly from this Puritan anxiety and distrust. Indeed, Native

Americans of the pre-and early colonial eras most likely regarded themselves as fundamentally part of nature, rather than destined or commanded to conquer it." (Adams, 2001). Sloth and laziness was also attributed to those who lived in and near a swamp, perhaps because of the bounty of food that swamps provided. Jack Kirby, one of comic books' most innovative artists and influential in the creation of Captain America for Marvel Comics, "attributes the famous laziness of swamp folk to malaria, which 'weakened and dispirited, imposing limits on human effort and explanation. It seems reasonable to posit malaria, then, as a principal cause of hinterlanders' vaunted ambitionlessness." (Kirby, 1995).

As we shall see in other segments of this written thesis, our societies' ability to extrinsically ascribe alienation and 'otherness' to the swamps allows us to tame and control the 'worthlessness' of a swamp to this day.

2.3.c. The Mythology - The Hero's Swamp Journey

Storytelling has been another way to fabricate and attribute the swamps with peril. The archetypal hero's journey making their way through the swamp is depicted in the "J.R.R. Tolkien's classic *Lord of the Rings* trilogy, Frodo and Sam, guided by the sinister Gollum, must detour through the ominously named Dead Marshes en route to Mordor, their ultimate objective. Tolkien's Dead marshes play to classic tropes of the menacing swamps, from their foul exhalations to their mixture of natural and supernatural menace: still, they are safer than the main roads, because even the dark lord's all-seeing eye cannot penetrate this mist-shrouded quagmire. The heroes' journey through the foul marshes includes menacing ghost lights that threaten to lead them astray; the faces of long-dead warriors appear beneath the grimy surface of the water; once noble, now 'all foul, all rotting, all dead. A fell light is in them'." (Tolkien, J.R.R., 1993).

Other hero's journey stories include the 1987 film *The Princess Bride*, with the hero saving the damsel through the 'Fire Swamp', or the 1984 film *The NeverEnding Story* 'Swamps of Sadness' and the 1980 *Star Wars* trilogy, with Luke Skywalker journeying to the swamp planet of Dagobah to seek out his mentor Yodas' magical powers.

"Passage through and escape from the mire is a trope that resonates in contemporary pop culture across multiple genres: any number of video games, for example, feature swamp levels or worlds, populated with various beasts and snares that must be navigated and overcome before the hero can progress."
(Wilson, 2018).

2.3.d. Nightmares and Horror Stories

As discussed, fear of the wilderness, or the unknown has always conveyed swamps as 'outside' civilizations; wild, demonic and mysterious. Swamps have made their way into our subconscious, with B-movies and children's stories that spark the imagination.

Our preoccupation with swamp monsters continues past childhood. Stories such as *Beowulf*, and Dante's *Inferno* have been used as "longstanding literary tradition of turning to the swamps for moral metaphors. Dante's inferno, for example, presents the stygian swamp as a two-layered pit of damnation; those who were brought down by the sin of anger battle constantly in its mud and slime, tearing at each other with nails and teeth, while those beneath the waters suffer for a different sin:

> *Beneath the slimy top are sighing souls*
> *Who make these waters bubble at the surface;*
> *…Bogged in this slime they say, 'Sullen we were*
> *in the sweet air made happy by the sun,*
> *as smoke of sloth was smoldering in our hearts;*
> *now we lie sluggish here in their black muck!'*
> *this is the hymn they gurgle in their throats*
> *but cannot sing in words that truly sound."*
> *Dante, A (1996).*

The association of swamps and sin have become metaphors for man's moral shortcomings, its landscape being a manifestation of our analogy of being lost, cursed and punished." (Wilson, 2017).

Comic books have been one of popular cultures' biggest sellers of swamp mythology. Marvel Comics' 1971 *Man-Thing*, a story about a biochemist that crashes his car into a Florida swamp, emerges from the swamp as a giant mindless monster, but feels the emotions of others, turns the comic book into a modern day 'Beauty and the Beast' tale. DC Comics 1971 *Swamp Thing* is a similar story about a scientist, who falls into a toxic swamp and becomes plant material but is still human. He becomes a heroic figure, embodying nature and battling against the evils of pollution. These are the types of stories that began to define the 1960's and 1970's, in which a better understanding of the evils of pollution and greed vs. the need to protect our environment was at its nexus. Swamps had by then been rebranded as endangered 'wetlands', and emblematic of nature. The initial Federal Clean Air Act passed in 1963, and the Federal Clean Water Act passed in 1972 exhibited how government and politics had taken a turn toward understanding how

governmental power, science and activists' perseverance began to take positive action to begin to save our environment.

In the late 60's, low-budget, low-brow B-movies and horror films were shown on TVs Saturday matinees, where villains were still synonymous with the evilness of the swamp. *Creature from the Black Lagoon* (1954), takes place in the exotic Amazon with scientists grappling with a creature known as 'Gill-man', who wreaks havoc, mauls some of the scientists to death, falls in love with a female scientist, and ultimately escapes back into the lagoon. This resulted in 2 more sequels - *Revenge of the Creature* (1955) and *The Creature Walks Among Us* (1956). A mad-scientist themed film was *Curse of the Swamp Creature* (1966), in which another scientist doing research on alligators and snakes creates a gigantic humanoid monster. Playing on our fears of swamps, jungles, and 'otherness', the African-American 'natives' warns him of impending doom by performing wild dances using drums, masks and totems. Another film that uses the idea of 'otherness' is *Deliverance* (1972), which also utilizes the fear of 'country folk', away from the mainstream of society and mainstream culture as murderous hillbillies.

A more current similar theme was in *True Detective* (2014), a television series that tells the story of two detectives trying to solve a murder against the backdrop of the Louisiana swampland, with its natural wetlands disappearing at a fast pace facilitated by the oil industry's factories and pipelines. "Much has been made of the literary influences on *True Detective*, particularly that of existential horror. The specter of the Yellow King; the idea of dark, occult societies; secret, perhaps satanic churches; defilement of innocence; walking monsters; the hell-on-earth that is Carcosa (a doomed ancient mysterious city) – these all echo, if not outright embrace, the darkly supernatural." (Wilson, 2018). *Swamp People*, a TV miniseries on the History Channel is the documenting of descendants of French-Canadian refugees who settled in the swamp region of Louisiana in the 18th century and struggles to preserve their way of life in the Atchafalaya Basin in New Orleans during alligator-hunting season.

Whether embodied in ancient myths, or current pop culture, swamps have come to represent the unknown, a repository that holds all of our fears, bad dreams, the things that we can't explain or expect to happen in our lives. Especially in this time of the Coronavirus, this metaphor seems especially appropriate. Unknown diseases, unseen germs, fears of sickness and death, brave scientists – trying to explain and investigate the phenomenon, and politicians thinking only of economic repercussions at the cost of human lives. This current crisis speaks to our own personal origin stories of fear and wonder, and the question of how we ever got to this new uncharted evil place.

2.3.e. The Commercialization of Swamps

In colonial U.S., the attempt to commercialize swamps in 1760 by George Washington, while consistently demonizing them is apparent in this following story. “In a fascinating historical episode, George Washington, who would of course, go on to become the first president of the United States, co-founded a company with the goal of draining the Great Dismal Swamp in Virginia. The appropriately named Great Dismal Swamp Company conceived of its goals as a combination of public service, transforming useless swampland into arable productive soil and private profit.” (Wilson, 2018). “Most soil along the road into North Carolina was sandy and poor. Yet Washington was sure that within the swamp all was black and fertile… Though local people thought it ‘a low sunken Morass, not fit for any of the purposes of agriculture,’ Washington felt certain that it was ‘excessive’ rich.” (Royster, 1999). The company then spent 40 more years sending slaves into the Great Dismal Swamp to clear, drain and rehabilitate the swamp into ‘arable’ land. Of course, the untold story was how countless laborers died from suffering and disease in the swamp to cut down the native juniper trees that would go on to profit its owners.

“Rice and corn farming in the Dismal Swamp was only marginally successful, and, as the Dismal Swamp Company, Washington's adventurers moved into what would be an enormously profitable enterprise: timbering, felling cypress and juniper trees, riving shingles in the swamp, and shipping them out by flat boats called lighters. By 1795 the Dismal Swamp Company had cut over 1.5 million shingles in the Great Dismal Swamp. Though wooden shingles would eventually give way to tin and slate as popular roofing materials, vigorous swamp timbering operations employing railroads and, later, trucks would go on from after the Civil War until well into the twentieth century.” (Powell, 2006; Simpson, 2006).

The commercialization story of The Dismal Swamp in Virginia is an example of how swamps are meant to be used for profit, at the risk and expense of laborers and for owners’ corporate gain. Destroying our natural resources is a lifelong tale and a constant struggle that will be shown in the next section specifically about a local story of the Great Swamp Wildlife Refuges’ fight to survive.

2.4 Saving the Great Swamp: The battle to defeat the Jetport

In 1959, the Port Authority of New York and New Jersey announced plans to replace Newark Airport with a massive "jetport" in a suburban area 26 miles west of New York City for modern-age travel in jumbo jets. 1959 had heralded the dawn of the Jet Age and jet passenger service began with the introduction of the Boeing 707 and Douglas DC-8 airliners. "Pan American introduced overseas flights on 707s in October 1958. National Airlines soon began domestic jet service using a 707 borrowed from Pan Am. American Airlines opened domestic jet service with its own 707s in January 1959. Delta and United began flying DC-8s later that year." (The First Generation of Jet Airliners- https://airandspace.si.edu/exhibitions/america-by-air/online/jetage/jetage02.cfm).

2.4.a Is Progress good?

> *In a region such as ours, nothing gets built without putting it someplace where some don't want it. But millions of our people need that airport and need the jobs and business it will support...It is not easy to recommend changes that even a few people view as disruptive of their way of life. But in a very real sense, the lives of millions of others are at stake…*
>
> *August J. Tobin, Executive Director, The Port Authority of New York*

What the advent of the Jet Age meant to the airline business was huge. "Whereas air travel had once been confined to the affluent, it now became a mass-market conveyance as airline ticket prices fell and airlines became more sophisticated in their pricing practices." (Roger Bilstein-Tom Crouch - https://www.britannica.com/technology/history-of-flight/Progress-in-engines-and-airframes).

It increasingly became evident that the heavily populated New York region wasn't equipped to handle the increase in the quantity of air travel that was about to take place. A preliminary report by The Port of New York Authority titled "A New Major Airport for the New Jersey-New York Metropolitan Area" dated December 14, 1959 outlined that preliminary jetport studies would take place "with the cooperation of many other governmental agencies, civic groups, airlines, and others which share responsibility for the problem of adequate air service for the Metropolitan region and with the assistance of aviation and engineering consultants in the various fields of inquiry. The results of such definitive studies will furnish the bases on which the Commissioners may make and submit definitive recommendations with respect to the regional airport

system to the Governors and Legislatures of the two States for their consideration." (Port of New York Authority Hearing before Subcommittee No, 5 of the Committee on the Judiciary House of Representatives, 1960).

However, the Port of New York Authority had already decided that an area located in Morris County, NJ called 'The Great Swamp' was a perfect site for this new airport for the New York/New Jersey area. Within the Port of New York Authorities jurisdiction, the proposed jetport "would cover 10,000 acres — twice the size of Idlewild (now John F. Kennedy) International Airport and would cost $220 million. According to the Port Authority's predictions, almost twice as many passengers and more than twice the cargo tonnage was to be expected in 1965 as had been handled in 1958. By 1975, the predictions were that 45.3 million passengers (3½ times the 1958 figure) and 680 tons of cargo (4 times the 1958 figure would travel through the New York—New Jersey airports.)." (Cavanaugh, 1978).

Besides fulfilling the logistics for this enormous growth, The Port Authority also argued that "the jetport would bring a tremendous boom in employment and business opportunities. The Jetport would be a super-city in itself (like Terminal City at Idlewild Airport), offering thousands of new jobs and business opportunities, first for construction works, then for the operators of services and other facilities that keep an airport humming. Although the Port Authority's enemies were ganging up it would be a mistake to think that everyone was against the jetport plan. Some people just didn't care or thought it couldn't really happen. Others felt that a jetport would bring desirable new business and employment opportunities. "Stop crying the blues and move along with Progress," a reader chided the Daily Record (in Morris County, NJ) after an editorial against the jetport. Another letter writer thought the protesters could "take their horses and tally-ho on up to Chester if they are so crazy about the rural life." Some state labor leaders came out strongly in favor of the jetport." (Cavanaugh, 1978).

2.4.b The Opposition to the Jetport

Within hours of the announcement, a sizable opposition to the massive jetport in the sleepy suburban towns and villages around the Great Swamp had formed. On December 17, 1959, 1,000 angry and concerned residents responded to the Port Authority's proposal, storming into a local high school carrying posters and signs condemning the jetport. A petition with 600 signatures was sent to Washington D.C. Unknowingly, the Port Authority had overlooked the fact that some of the residents of the towns and villages surrounding the

Great Swamp included wealthy directors and presidents of major banks and important local companies that lived in nearby estates, that the proposed plan would build the airline runways over. One of those that owned an estate in the area was Congressman Peter Frelinghuysen, Jr. who had been in Congress since 1952 and was a member of the Foreign Affairs Task Force appointed by President Dwight D. Eisenhower. He was one of many in his family who had deep business, social and political connections in New Jersey, New York and Washington D.C. Another was a landowner by the name of Marcellus Hartley Dodge, the retired chairman of the board of the Remington Arms Company, who had served as a director of the Equitable Life Assurance Society and the Delaware, Lackawanna & Western Railroad just to name a few of the boards he had served on. He was also married to Geraldine Stillman Rockefeller, whose father was the founder of Standard Oil Company. Now retired, Dodge was "one of the largest landowners in the Great Swamp area. More importantly, he was an ardent conservationist, and was extremely concerned for the loss of a beautiful and unique environment he happened to call home." (Cavanaugh, 1978).

With the help of these well-connected businessmen and philanthropists, various other local grassroot committees were formed. Women's committees circulated petitions, made phone calls, recorded donations, sent out mailings and coordinated with the Steering Committee, Regional Advisory Morris (called SCRAM), which would later be called the Jersey Jetport Site Association (JJSA) in Congressman Frelinghuysen's Morristown office. "With $150,000 in start-up money, the JJSA created "Fact books" (stapled mimeographed sheets) featuring comparisons of statements made by the Port Authority, and the position taken by the JJSA; excerpts from newspapers, radio and television commentaries; and information supplied by the numerous committees on the number of private homes and institutions that would be affected, legal opinions, and technical information." (Cavanaugh, 1978). "The JJSA boasted legal and public relations committees and utilized their extensive connections with the Associated Press, The Newark News, and The New York Times. They created handouts featuring graphically how the jetport would affect over 500,000 people, not just big estates or one or two small villages but all residents and businesses, big and small. The JJSA understood the power of the press and kept up their interests in the great eye of the New York City public by writing constant articles (one was called "How to Rescue New York From Its Port Authority) that was published in Harper's Magazine and The Saturday Evening Post. They were able to subtly turn the tables on the power structure that existed in New York Port Authority and the perceptions of the 'bistate agency for straying from its original purpose in pursuit of political power and financial security and called its policies 'marketplace concepts' that emphasized the lucrative airport, tunnel, bridge, and marine operations while ignoring the less remunerative aspects of mass transportation such as bus lines, subways, and commuter railroads." (Cavanaugh, 1978). The JJSA was also able to direct people's attention to the fact that the proposal would not only affect people, their homes and businesses, but with the prospect of extreme noise,

pollution, congestion and more importantly, how irreparable damage to the watershed would happen if the jetport was to be built.

2.4.c A Winning Strategy: Conservationism, not politics.

Besides the enormous impact on the infrastructure and the environment, "The Regional Plan Association predicted an 86% increase in the area population growth within the next 10 years, and an assessment of the social and economic impact of the area was also needed. By 1960, poor air and water quality was becoming increasingly evident in U.S. cities and the rising environmentalism and conservationism movement was beginning to take place." (Cavanaugh, 1978).

An important event would eventually take place to change the course of the opposition. "By September 26, 1960, in the county clerk's office, a local lawyer filed papers that would transfer almost 1,000 acres of land in the middle of the Great Swamp to the U.S. Department of the Interior, for use as a wildlife sanctuary. Fifteen families had deeded twenty-five parcels of land worth about $200,000 to Horace C. Jeffers, who signed them over to the North American Wildlife Foundation, a prestigious national conservation organization in Washington D.C., which in turn, arranged to deed them to the United States of America. With the financial assistance by the wealthy families that lived around the swamp, 'the newspapers hinted that Marcellus Hartley Dodge was behind it all.... but Dodge himself was unavailable for comment. It was known that Dodge had been a trustee of the North American Wildlife Foundation for many years. It was also known that since 1957 he had been a generous donor of land to the newly-formed Morris County Park Commission, but the actual extent of his concern for saving the Great Swamp was not to be revealed until much later." (Cavanaugh, 1978).

Dodge and his well-connected friends understood that if enough land around the swamp was purchased and donated as 'parkland', The Great Swamp would become inaccessible to the Port Authority. A land acquisition committee was soon formed in 1961 alongside the JJSA whose "goals were to create a refuge of about 4,000 acres, conduct a strong educational campaign with support from the New Jersey Audubon Society, and open negotiations with Fish and Wildlife service officials. The new committee announced two objectives: to inform residents of New Jersey of the treasure house 'at our elbow' and to raise funds for an educational center to be

established with the New Jersey Audubon." (Cavanaugh, 1978). The committee would soon become The Great Swamp Committee, which combined the JJSA, and the land acquisition committee's forces in December 1961.

The newly combined Great Swamp Committee decided that the main reason why the Great Swamp should be saved was to stress that "as the largest unspoiled remnant of Lake Passaic, it is a major resting and feeding area for waterfowl and other migratory birds along the Atlantic Flyway. As one of the major headwaters of the Passaic River, water quality in the Great Swamp affected the water in the populated areas downstream. The diverse habitat made fine homes for many animals and supported a large, beautiful variety of vegetation. Not the least of the benefits of such open space is the opportunity for human enjoyment and recreation. Should an area like the Great Swamp be destroyed, it could never be replaced." (Cavanaugh, 1978). For 3 more years (1961-1963) donations came flowing in from both small and large donors: $300,000, along with 3,000 acres was needed to be deeded in order to be designated by the Department of the Interior to become the Great Swamp National Wildlife Refuge. Continuing their push for funds, and with their well-connected media contacts, a big endorsement from a national figure was obtained. Stewart L. Udall, named Secretary of the Interior by President-elect John F. Kennedy, was that endorsement. "Udall was not just a conservationist." As Smith points out, "he was a 'new conservationist,' meaning that Udall embraced the concept of ecology—the idea that while humans were closely interrelated with the planet, modernity had torn the two asunder. It was the new conservationist's challenge to heal the divide." (Smith, 2017).

Finally, in the Spring of 1964, the Great Swamp Committee's efforts had finally paid off, the last 2,100 acres was handed over to the federal government and with the Secretary of the Interior, Stewart Udall in attendance— The Great Swamp was designated and dedicated as The Great Swamp National Wildlife Refuge to be run by the Fish and Wildlife Service branch of the U.S. Federal government, the first such area in the United States' refuge system.

With this accomplishment, however, The Port Authority didn't give up its plan to build the jetport and continued to try to push through its original plan. They tried to make the argument that The Great Swamp and the jetport could exist in tandem. It was finally stopped about four years later, when in 1968, the swamp became a National Wilderness Area, the most protected status any land in the U.S. can have. "The Great Swamp National Wildlife Refuge Wilderness becomes the first FWS wilderness to be added to the National Wildlife Preservation System." (https://wilderness.net/learn-about-wilderness/history/1950-2000.php)

2.4.d Environmentalism

The fight to save The Great Swamp was a small success story at the forefront of the beginning of the environmentalism movement in the United States that began in the 1960's/70's and culminated with the Federal Clean Water Act (CWA) becoming the law of the land in 1972 and the Federal Clean Air Act (CAA) in 1973. See below for the 2015 update of the portion that defines wetlands and its protection of this Act:

The Code of Federal Regulations (CFR) provides definitions of "waters of the United States" and "wetlands" at 40 CFR 122.2 (a) through (g). Because wetlands are included under this definition of waters of the United States, their water quality must be protected to meet the mandate of the CWA articulated in sectionl0l(a) "to restore and maintain the chemical, physical, and biological integrity of the nation's waters." The protection of water quality must address not only the water chemistry, but also the multiple elements, including aquatic life, wildlife, habitat, vegetation, and hydrology, that together make up aquatic systems. Therefore, relevant issues to address with respect to wetlands protection include the toxicity and bioaccumulation of pollutants, diversity and composition of aquatic species, entrapment of pollutants in sediment, habitat loss, and hydrologic changes. (Environmental Protection Agency, 2009).

"The environmental movement has significantly evolved in the last six decades. Today, many of the rallying points of the environmental movement have become ingrained into our American society with air and water quality standards regulated for the public good, endangered and threatened species protected, and chemicals and products adhering to rigorous testing processes to determine potential health and environmental threats." (https://www.globalsecurity.org/military/world/usa/history/13-09.htm). The active environmental movement in the United States will never forget that it has been built on the activism and successes of the previous decades.

CONCLUSION

As I set out to do a deep dive into the Great Swamp's ecosystem, I found scientific facts, figures, social constructs and academic papers on just how important this ecosystem is but I soon realized that sometimes it is simply not enough to mount protests—clear action and utilizing the resources you have at hand is super important. One very important conclusion that is difficult to deny in order to continue to preserve and protect our environment is this: Knowing the right people with access to the right political connections, possessing intelligence and know-how, along with deep pockets go a long way in winning environmental battles, especially when dealing with the prospect of progress and revenue.

I also discovered that swamps reflect a myriad of our fears to ourselves and our own attitudes towards nature and her mysteries. From foul and mysterious places to be paved over, to symbols of our endangered wetland environments, swamps keep transforming, and shape shifting to prove over and over that they will endure and are resilient ecosystems, but also need our continued protection. Swamps will continue to be misunderstood and demonized in our culture, however salient, beautiful and self-contained they are.

This project opened up other conceptual facets for me. I found many similarities in how we deal with our fears about swamps and the COVID 19 pandemic that we are now facing. Like a swamp, the virus seems to lie 'just under the surface', an unseen source of pestilence and death. The swamp quickly became a metaphor for the coronavirus for me, in that the natural world can decide if and when it wants to destroy and show its power. That combination of the unknown and the science paved the way for me to understand the swamps' beauty and strength. To conclude, even as we learn that swamps teem with life, they remain a hybrid combination of reality and myth, and reflect a myriad of our own fears and attitudes toward the strength and force of nature in all her forms.

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