A Natural History of Destruction: On the Uses and Abuses of Disturbance Ecology in Buffalo's Postindustrial Waterfront

by

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Committee in charge:

Professor Michael Watts, Chair

Professor Jake Kosek

Professor Sharad Chari

Professor Jordan Fox

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Abstract

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This dissertation develops an urban political ecology of postindustrial landscapes for the Anthropocene era. Ecological concepts have been used to explain urban dynamics since the Chicago School in the 1920's. When in the mid-1990's, David Harvey declared that there was "nothing unnatural about New York City," and that "New York City is to be construed as an ecosystem," he was making a provocative claim whose insight requires reinvestigation. With the rise of resilience thinking and new materialism, it is increasingly common to treat cities as ecosystems: that is, as integrated totalities of living and non-living relations. Today, this perspective has developed into a municipal management strategy that naturalizes urban histories and futures. This dissertation argues that the use of ecological conceptuality to discursively frame postindustrial waterfronts in the Laurentian Great Lakes obscures their settler capitalist pasts and speculative climate futures. Developing critical geographical methods, this dissertation historicizes this ecological tendency and offers an alternative approach.

Since the 1970's the concept of disturbance has become central to theories of ecological succession, as evident in the idea of resilience. Resilience theory takes disturbance to be endogenous to succession. Resilient ecosystems bounce back from disturbances and, in so doing, become better adapted to them. Interpretive and applied social scientists commit a naturalistic fallacy when they mistake settler capitalist forms of destruction for ecological disturbance. This organicism masks the fact that struggles over the right to the future city are taking place in and through the ecological discourse of urban- and coastal resilience. To spur waterfront speculation, the growth machine takes advantage of this elision.

This study reframes urban ecological discourse. It presents a "natural history of destruction" based on three years of ethnographic fieldwork, archival research, participatory observation, and landscape analysis. In resistance to the functionalist tendencies of socio-ecological systems thinking, a natural history of destruction highlights the historical contingency of postindustrial landscape formation. It ruthlessly historicizes everything that appears natural. This includes ecological discourse itself, as well as its use as a foundation for municipal governance. A natural

history of destruction in the Great Lakes demonstrates that the settler colonial process of transforming complex environments into infrastructures for commerce and speculation is an unnatural one requiring constant reproduction. It shows that the forms of destruction suffered along the Great Lakes coasts are beyond the conceptual framework of ecology. Since "coastal resilience" has become the auspice under which the future of the region is playing out, I unpack its many meanings and historical referents. Lake Erie is an ideal case study, since it is historically *the* exemplar of ecological destruction and restoration in the US.

The dissertation has four chapters that weave together environmental history, political economy, and landscape analysis. The introduction historicizes the physical integrity of Buffalo's waterfront. It argues that even the most natural-seeming parts of it are infrastructures mediated by settler capitalism. Chapter 2 offers a theoretical framing for a "natural history of destruction" based primarily in the philosophy of Theodor Adorno and, following it, the literature of WG Sebald. Chapter 3 demonstrates the relationship between Buffalo's "new hydrological regime" and waterfront real estate. It argues that regional developers are harnessing climate-related changes as an opportunity for speculative growth. Chapter 4 offers a history of the politics surrounding lake water-level fluctuation and stabilization programs. This doubles as a history of ecological governance found presently in coastal resilience management. Chapter 5 carefully traces the destruction and forgetting of wetland-dune ecology in the eastern Lake Erie basin. All five chapters demonstrate how the development of ecological thinking intersects with the postindustrial treatment of the Great Lakes.

The conclusion offers a critique of the perspective of the Anthropocene, which takes a geological and planetary approach that flattens global environmental crisis. A natural history of destruction, in contradistinction, develops a landscape-based analysis that emphasizes the incredible amount of geohistorical difference that the crisis continues to reproduce.

To my parents. To Toni.
And to the forgotten worlds on which Buffalo was built.

Contents

Acknowledgements

A sage friend recently told me that "a dissertation is for yourself." It is for yourself and yet it depends on the love, support, belief, encouragement, money, trust, and guidance of so many other people. As it turns out, a dissertation holds no material value to those who support you. Which means that this is a work of self-realization built on the labor of family, friends, and other relations. I am deeply humbled by this. And I am grateful for all of the support and solidarity. I owe much to many.

First, thank you to Berkeley's Geography Department. This thanks especially goes to my advisers, Michael Watts and Jake Kosek, who appear never to have doubted by ability to do this. I always find myself writing for them, and at least I hope that the result reflects something important of their respective influence. From the beginning, they fostered my intellectual curiosity and supported my peculiar trajectory through geography. Michael encouraged me from the very beginning to pursue a path through Sebald, which in retrospect, is remarkably lucky. He also made an offhand comment in a seminar about needing to understand ecology before developing a theory based on it, which is something I may have taken too literally. Jake has offered me consistently kind and generous space to work out an understanding of the relationship between dialectical thinking and new materialism. His comportment toward natural history has deeply influenced my own. I am eminently grateful for formative intellectual periods with Sharad Chari, Gillian Hart, and Wendy Brown, each of whom in their own way helped me to mold an understanding of Marxist geography and to situate myself within it. As well to Suzanne Guerlac who served on my orals committee and who allowed me the opportunity to work granularly through Bergson.

Both the Geography Department and Program in Critical Theory have helped me out of a number of jams, some self-created, some not. Nathan Sayre and John Chiang in Geography and Patty Dunlap in Critical Theory have wrung water from a stone for me; my success would not have been possible without their administrative support. I am also deeply humbled by the kindness and generosity shown to me after my house burned down in a wildfire in October 2017, taking my library, notes, research... everything. The fire fundamentally fractured my time as a PhD student and shaped my project. Perhaps the fire helps to explain what made a project about water so appealing.

After the fire, I went to Sweden as a visiting scholar at Uppsala University. My plan was to study resilience at the Stockholm Resilience Centre, but the project did not pan out. I am grateful for the kindness shown to me there by Don Mitchell and Brett Christophers, especially as one project fell apart and I was sent grasping for another. That said, I will forever be grateful for the time I got to spend in Uppsala with Gunnar Olsson. His intellectual engagement, his demand for thought, his humor, and his peculiar ability to work with and through thought structures—like his *mappa mundi universalis*—have been an inscrutable influence on me. Also, he is the only geographer I met during my time willing to think carefully through the problem of semiotics and language in geography. His mark is to be found throughout this dissertation. I owe much to him.

Having nothing back in California and a disintegrated project in Sweden, I returned to Buffalo, where I grew up and where I had enough social support—along with the germ of an idea for a project. In Buffalo, I had the immediate support of my family, to whom I owe so much of this. They have always treated my bizarre intellectual inclinations with unflagging support. I am not always sure why. While in Buffalo, I developed several important relationships. First among

them was to my now wife, Toni Haugen. She has been a stalwart supporter of me and of my project. Her emotional and financial labor has been immense while I worked—a veritable pauper—on this dissertation. Moreover, her expertise in Chinese medicine and elemental philosophy have had an important impact on how I saw landscapes. Her elemental disposition set about fracturing certain strictures I unknowingly retained. I am so very grateful for her and for the rest of our nucleus: my step-daughter, Marzel, and our weird pack of dogs—Saturn, Ron, and Dobbie. Forced by them into a more animal existence every day is a debt I simply cannot repay.

Also while in Buffalo, I met Margaret Wooster and Lynda Schneekloth, about whom I speak in the introduction. Without their knowledge *and* wisdom, let alone support and guidance, this project would be a paltry shell of what it is. I also owe a debt to the Partnership for Public Good, which housed me as a Fellow upon arrival in Buffalo with a half-baked idea for a project. And to one of my oldest buddies, Kev Cain, who hired me as a bartender with virtually no experience so that I could work in the heart of Buffalo's postindustrial corridor. As it turns out, working as a bartender at Duende got me access to hundreds of stories I could not possibly have heard and sites I could not possibly have visited otherwise. If the fire was the first exogenous fracture shaping the destiny of my project, Covid was the second. It ended my tenure at the bar and caused me to shelve a knotweed project, forcing my focus solely on Buffalo.

After Covid, I elbowed my way into the Critical Ecologies group at SUNY Buffalo, where I met many wonderful interlocutors, including Jordan Fox. I share with Jordan a certain uncanny intellectual connection, and our conversations resulted in him being on my dissertation committee. I am grateful for his generous and constant support.

The final push writing was greatly facilitated by my involvement in a writing group with several incredibly supportive friends and intellectuals: Nick Anderman, Anna Levett, and Camila Yadeau. Thank you to Teri Chettiar for coaching us through the emotional upheaval that attends writing. Gabriela Salvidea also gets a shout for the show of solidarity as we both ground through the writing process to meet a summer 2023 deadline.

Extra special thanks goes to a few of my closest friends. To Erik Butzek, my constant companion in humor and horror. The daily interruptions keep me afloat. To Alexander Arroyo, my most formative friend and interlocutor at Berkeley. I hope we have a long future of collaboration together. And to Mike Levien, without whom this project truly may have never come together. Of all people, Mike has been a relentless believer in my intellectual ability. He has pushed, goaded, hounded, forced, and badgered me into bringing a dissertation into existence. And has been a damn good friend along the way.

Lastly, I am humbled to the point of tears by the sites I have visited over and over and over again. Filled with the complex and violent histories of their making, they have become holy places to me. I have come to know them carefully and deeply and lovingly. They have shown me everything and more in return. They have been my most profound teachers over the past years. Along with Max Sebald, of course, who constantly asks me to come to know the places yet again another way. To these sites—Red Jacket Park, Concrete Central, Silo City, Times Beach, Michigan Pier, Tifft Nature Preserve, Marilla Street Landfill—I desperately hope that my labors have yielded something that reflects the difficult and profound beauty I have learned to understand in and through you. You have helped me remember something very important. And you have helped me learn how to grieve.

Invocation

In his excitement about the truly
boundless growth
of industry, the stateman
Disraeli called Manchester
the most wonderful city of modern times,
a celestial Jerusalem
whose significance only philosophy
could gauge. Half a life now
it is that, after leaving my remote home,
I arrived there and took lodgings
among previous century's
ruins. Often at that time
I rambled over the fallow
Elysian Fields, wondering
at the work of destruction, the black
mills and shipping canals,
the disused viaducts and
warehouses, the many millions
of bricks, the traces of smoke,
of tar and sulphuric acid,
long have I stood on the banks
of the Irk and the Irewell, those
mythical rivers now dead,
which in better times
shone azure blue,
carmine red and glaucous green,
in their glow reflecting
the cotton clouds, those white ones
into which without a word the breath
of legions of human beings has been absorbed.
And the water carried them downstream
together with the salt and ashes
through the marshland out
to the sea. Those silent mutations
clear the way to the future…

- Max Sebald, *After Nature*

I prefer natural history with its sense of real,
non-duplicated time and place to ecology…

- Carl Sauer, *Agricultural Origins and Dispersals*

Introduction – Infrastructuralization and the Physical Integrity of the Buffalo River

Dessous les pavés la plage.
Loosely translated : Beneath the pavement, the beach
-Maxim circulated in Paris during the May 1968 uprisings

The bourgeoisie, historically, has played a most revolutionary part.
-Marx, *Communist Manifesto*

Part 1 – Physical Integrity

§1 – *Views of Buffalo Creek*

Now it's all obliterated, of course.
- WG Sebald[1]

[1] In an interview: E. Wachtel (2007). "Ghost Hunter: an Interview with WG Sebald." In L. S. Schwartz (ed.) *The Emergence of Memory: Conversations with W.G. Sebald*. New York: Seven Stories Press: 40

The Bluck Etching: Buffalo was the first city on the Great Lakes to improve its harbor, beginning in 1820, and by 1825, the Erie Canal had opened. Before its dredging and canalization, Buffalo River was Buffalo Creek. There is very little in the visual record representing the waterfront. As stated by Frank Severance, former President of the Buffalo Historical Society and arguably the city's most important historian, "There are no true pictures of the early Buffalo."[2] There is a colored print from 1811, regarded as "the earliest Buffalo picture known,"[3] drawn by E. Walsh of the 49th Regiment of the British Army and engraved by one John Bluck, called *A View of the Lake and Fort Erie from Buffalo Creek*.[4] It is an apparently bucolic scene at the junction of Little Buffalo Creek with Buffalo Creek, on what appears to be a calm, early autumn day. The physical geography shows a riparian shoreline well-eroded by the seasonal action of water and ice. At the corner where the small inlet meets the creek, we see a significant scour covered by a low-lying ruderal plant. All one can tell of human disturbance is the small footpath alongside which the settler sits and perhaps a small canoe launch foreground of the teepee. The bourgeois settler, in his beaver skin top hat and tailcoat, sits in a small clearing at the northeast junction of the creeks. He is clearly Bluck's protagonist; the scene is under his command. Across the inlet, at the far right of the etching, stands his stately colonial-style house—smoke pouring out of its stone chimney: warmth, comfort. Across the creek, a Native American couple sets up their camp. Despite the Native man donning only a loin cloth, the woman appears cold, huddled beneath a blanket. They will sleep on the damp earth. Compared to the organic form of the teepee, the perfect angularity of the settler's house is significant. We learn from Vitruvius that when the Socratic philosopher, Aristippus, found himself shipwrecked on the shore of Rhodes, he saw some geometrical diagrams, which made him exclaim to his companions, "Be of good courage, I see marks of civilization," or, depending on the translation, "Let us be of good cheer, for I see traces of man."[5] The settler overcomes his earth-boundedness and brings to the Lake Erie shore Enlightenment and humanity—or so the story goes.

The settler, seated on his rock taking notes on a plat, remains deep in his study. His mental labor lies in contrast to the manual activity of the Native American couple, who appear autochthonous, practically wild and of the elements. Their labors are formed in their bodies as well: the Native man is muscular, dynamic; the settler kyphotic, hips tight, glenohumeral joints anteriorly rotated, forward head carriage from the persistent sedentarism required of studiousness.[6] Both industrious in their own way, the Native couple remains in the immediacy of

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[2] F. Severance (1912). *Picture Book of Earlier Buffalo: Publications of the Buffalo Historical Society, Vol XVI:* 1; Frank Severance was the President of the Buffalo Historical Society and edited some 30 volumes of collected works chronicling the history of Buffalo. I know nothing else about him, but this project is indebted to his labors.

[3] *Ibid.* Frontispiece

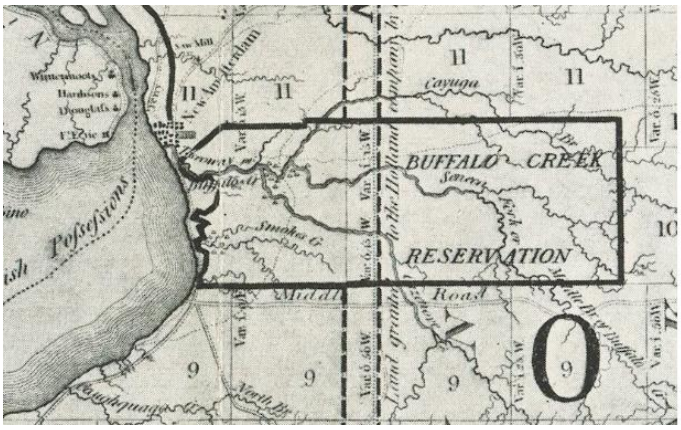
[4] *Ibid.* 5

[5] The allusion—homage, really—is to the inestimable Clarence Glacken. C. Glacken (1967). *Traces on the Rhodean Shore*. Berkeley: University of California Press. For the various translations: Vitruvius. *The Ten Books on Architecture: Parallel Editions*. Online: Lexundria, 6.0.1: https://lexundria.com/vitr/6.0/cf. In Vitruvius's Latin, "*…bene speremus, hominum enim vestigia video*…" He sees the *vestigia* of *hominum*, literally the footsteps but also, of course, the vestiges, of man.

[6] G. Hewes (1955). "World Distribution of Certain Postural Habits." *American Anthropologist* 57(2): 231-244. This remarkable essay diagrams how people across different geographies squat and stand while at rest. "Squatting with the soles of the feet flat and the buttocks either actually resting on the ground or floor, or only an inch or two above it, has a very wide distribution except for European and European-derived cultures." Indicative here of tight hips is the way this man loses his lordosis (the curve of his lower back) as his knees come up above his midline. This effectively forces him to round his back and exaggerate his kyphosis (the curve of his upper back), jutting out his

their world while the figure of bourgeois enlightenment has clearly disenchanted himself from any such captivity; he is free to speculate. His reasoning mind, liberated from the immediacy of his environment, sets forth a plan to engineer the riparian landscape according to the dictates of his logic: according to the work of commerce, competition for which establishes the entire context of the scene.

It seems to me that the etcher implies Buffalo Creek to be a dividing line. It separates two worlds, two ways of life, two ways of knowing and acting in the world. It represents the divide between an archaic past and a civilized future. As such, Bluck's etching works to settle the landscape by submitting it to the symbolic violence of Western binarism. But at the time of the etching, the Buffalo Creek served as an actual political boundary too. The 1797 Treaty of Big Tree relinquished Western New York to the newly independent settlers, save twelve reservations—the Buffalo Creek Reservation being the largest. The Buffalo Creek ran through the middle of the 50,000 acre rectangle of a reservation. But it was dogeared in the northwest corner, a concession that allowed settlers access to the mouth of creek. The slice of waterfront land between reservation and Lake Erie was typically referred to as the gore tract. The settlers would demand future concessions: the center of Buffalo's industry would eventually be built along the river, atop the reservation.



Bluck's scene is also colored by the paranoia of pending war. The French having been dispensed in 1763, competition between the Americans and British for the continent's resources is the reason for all of the forts rimming the strategic northeastern outlet of Lake Erie. If one takes the view of the etcher of the scene, rather than the bourgeois speculator, they espy a naval vessel between two stands of trees and the British Fort Erie, off in the distance. Trade and military boats anchor in the lake, just outside the harbor-to-be. Within a few months of the etching, the War of 1812 would break out, and in late 1813, the British would set Buffalo ablaze, burning all but three of its buildings. This vantage point makes the speculator re-appear as engrossed in his machinations, a pawn himself in larger geohistorical maneuverings only apparent to the invisible viewer of the scene, who sits with greater vantage—perhaps on a dune. There is, it turns out, always another aspect from which a viewer might perceiver the scene. That said, I doubt anyone in 1811 could have foretold that this scenic point would, within the span of a single lifetime, become one of the foremost infrastructures in the industrialized world.

The Feldman Poster: Could anyone have imagined the poster made almost 125 years hence by the Buffalo artist, Bernard C. Feldman, on the occasion of Buffalo's centennial? The

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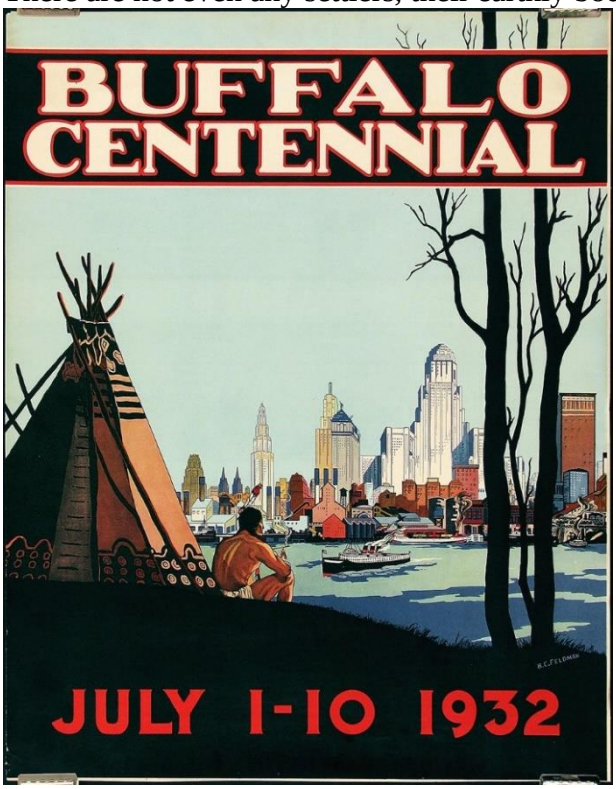
head and caving in the posterior aspect of his cervical spine, making it appear from the back that he has no neck. That the man requires a rock or stool to sit on is telling. This is not a characteristically European postural deformation but a characteristically "civilized" or modern one, indicative of excessive sitting. Natural histories of destruction extend to bodies as well. My gratitude for this knowledge goes to Francois Raoult, whose seminars on posture and movement in Rochester, NY, have influenced me greatly. To evidence the last point, Raoult shows paintings of medieval and early modern Europeans—typically peasants—with excellent posture and mobility.

poster is almost certainly referencing the Bluck etching: the indigenous man, only without his companion, sits muscularly on the same side of the creek as before—in his loin cloth beside his teepee, adorned with feather and pipe. But Feldman has turned the scene around. This time, the indigenous man is observing the scene. Feldman replaces Bluck's white settler with only the symbols of European settlement: a totally urbanized view devoid of all naturalistic elements. There are not even any settlers, their earthly bodies transcended by the outcome of their industry: skyscrapers, ships, factories. This time, the viewer of the poster sits behind the indigenous man; they look back across the Buffalo River, toward the city. While the viewer technically looks northward, the symbolic effect is that on the occasion of the Centennial, he looks back to the east, from whence the settlers came. Buffalo's City Hall—an art deco masterpiece then newly constructed (finished in 1930)—looms outsized, phallically, and in white along the skyline: in reality it faces east. The port, full of grain transshipment infrastructure, sits in the foreground on the other bank of the river. The Native American sits in the dark shade of the forest while the late morning sun shines brightly over the city—a clear commentary on the burgeoning American empire built over and against the fading landscapes of Iroquoia. The poster, however, strikes a pensive and reflective tone about this empire. Feldman puts the viewer on the side of the Native American, not so much in solidarity, but in alienation from the American side. This alienating effect dislocates the viewer and forces them to look back upon the scene with foreign eyes. From this vantage, the intensively urbanized scene may be alternately impressive, overwhelming, and irrational to the point of chaos. If one sits and reflects long enough, how could it not begin to appear cramped, bloated, violent, and totally out of scale with human endeavor? The viewer is even soothed by the relative austerity and naturalism of the fictional Native American scene, perhaps sharing with the man an overwhelming grief for what this absolute geography of modernity has rendered. But at this point the Reservation has been destroyed and the Native Americans relocated, mostly to Cattaraugus county. The viewers are not so much spectators but spectral: ghosts from the past reflecting on the swiftness of history.



Buffalo is the westernmost city of New York—the Empire State—and, by 1932, had been established as one of the world's great inland ports, thanks to being the western terminus of the country's first vaunted infrastructural work, the Erie Canal. The canal lets out into the Buffalo River, well within view of the Native observer. By the 1930's the Canal and the Buffalo River were American lore, and this poster plays on this mythologization: the geographical character of the waterways is transformed into an historical passageway between past and future. I wonder if in creating the poster Feldman didn't have in mind the River Lethe—λήθη—from which, according to ancient Greek myth, those who drank from it experienced complete forgetfulness, oblivion, concealment. I shall read it this way regardless: drunk on forgetfulness, Buffalo's

history has been concealed.[7] More than forgetting it, Buffalo has literally produced oblivion out of it by building a new nature atop it. This kind of forgetfulness is required not just for the creation of "settler common sense"[8] and "second nature" but—as we have seen countless times throughout the bloated age of civilization—for the absolute historical rupture required by imperial victors to write their own hagiographies.

Much has been made in philosophical discourse about the fact that *Lethe* is the root of the Greek word for "truth," *aletheia*—ἀλήθεια—or, as Martin Heidegger translates it, "unconcealment."[9] The project of natural history advanced in this dissertation, however, works precisely against the kind of remembering posed by Heidegger. As Theodor Adorno states in his 1932 talk, "The Idea of Natural History," Heideggerian historicity is ultimately ahistorical: "an illusory solution to the problem of the reconciliation of nature and history." Adorno criticizes historicity's false mastery of contingency, which renders the dialectic of history and nature moot by absorbing all facticity into the static naturalness of being. For Adorno, the contingency of history is the dialectical core of nature, rendering all nature historical. At the same time, history has the natural character of impermanence. If we are able to look from the bank of nature back toward the bank of history—back toward the city—we must also look back in the other direction to realize the bank of nature is constituted in and through its relation the bank of history. Thus if the Buffalo River is a figuration of Lethe, we discover that the forgetting has gone both ways.

The Encyclopedia Photo: The forgetting is captured in a contemporary photograph that accompanies the Wikipedia entry for the Buffalo River. That this is the Wikipedia photograph of the Buffalo River is itself significant. If facticity is that part of the thing-in-experience that resists explanation and interpretation,[10] this encyclopedia entry turns the facticity of the river into a mere factoid—something trivial and easily knowable. The photograph is by a person named Darmon, and it also seems to pay homage to the Bluck engraving by showing the same final stretch of the river as it empties into Lake Erie. Only here, the river is perfectly straight, ushered to the lake by steel and concrete embankments. Its banks have been sterilized of anything at all that would connote the dynamic hydrology that makes a river a river. Herodotus's paradox loses its tension when the river becomes a canal. With the lighthouse in the distance, the southern bank is lined

[7] H.G. Liddel & R. Scott. *A Greek-English Lexicon*. Online: https://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.04.0057

[8] M. Rifkin (2014). *Settler Common Sense: Queerness and Everyday Colonialism in the American Renaissance*. Minneapolis: University of Minnesota Press.

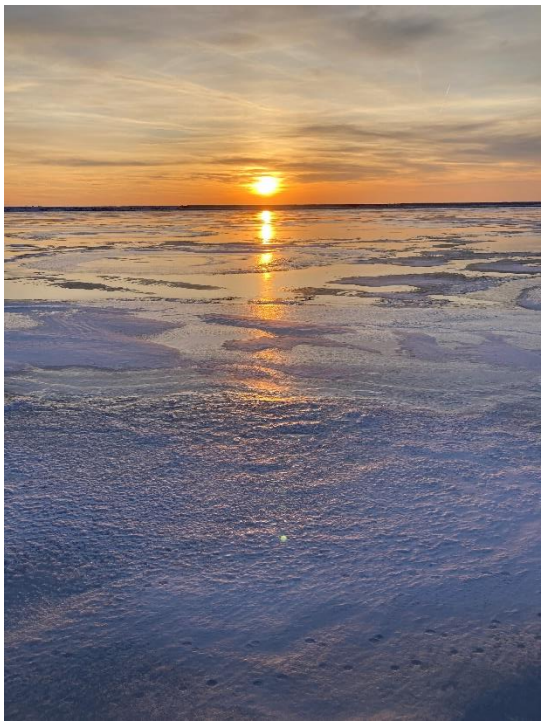
[9] See M. Heidegger (2000). *Introduction to Metaphysics*. New Haven & London: Yale University Press: 203-6. For Adorno's critique, see especially T. Adorno (1984 [1932]). "The Idea of Natural History." *Praxis* 4(2): 111-125; T. Adorno (2002 [1960-1]). *Ontology and Dialectics*. Medford, MA: Polity Press: 179-180

[10] J. Habermas (1998). *Between Facts and Norms*. Cambridge: MIT Press

with a handful of willows and on the northern bank, a single line of uniform trees—clearly ornamental and manicured to appear as geometric as the river. Darmon—I do not know who this person is—has titled his photograph "Long Shot of a River,"[11] and it is a cheeky pun. It is, photographically, a long shot. But the river is also a long shot in that its development was a gamble with only a slight chance of succeeding. This is a River that should never have been, at least not in this form. It is a contingent historical episode. It may have very easily gone another way. It was a speculation.

* * *

From these images, we learn that places can become symbols and mythologies. They can become enchanted and disenchanted. They can be used to tell stories of glory and of devastation. Places are rationalized, instrumentalized, fetishized, dispossessed, violenced, exploited. This is true of all places (is that not what the Anthropocene hypothesis tells us?). All places can be measured, violenced, but only *particular* places can be loved. *This* place at *this* point in history can remain full of wonder, defiance, beauty. Grief is born of love, of the way the winter turns the lake to slush and the setting sun turns the icy mixture lavender as it undulates, offering rhythm to chaos. But loving *this* place, this so-called Buffalo creek, without grief, without offering it the labor of remembering, reproduces its destruction. How, this dissertation asks, do we produce that remembering?



What we have in these three images are so many ways of looking at the relationships between geography, history, and representation. In this triptych, we have born witness to one particular but otherwise unnoteworthy conjunction of river and lake over a span of two hundred years. Wait: already, calling it a conjunction points to the possibility that a lake can be thought separately from the river that feeds it. Are these really separate things joining each other? Or are they different snapshots of a dynamic process in motion? Distinction is a classificatory nicety that hydrological cycles may not abide. But distinctions produce a powerful—if despotic—way of seeing. So what are we seeing at in these various representations? Environments, landscapes, ecologies, natures, assemblages, socio-ecological systems? In fact, it does not matter what we call them; all of the names are wrong, and for this, we rejoice. Each time the name attempts to fully enclose the material, the particularity of the material resists it. And yet, without any name at all, the material slides beyond the reach of communication. This negative dialectic, always at play behind the scenes, cautions us against believing that we can finally know *this* river at the place where *its* waters flow into *this* lake.

[11] "Long Shot of a River" By Darmon - Own work, CC BY-SA 2.5, https://commons.wikimedia.org/w/index.php?curid=2149430

What we realize is that whatever we call it, the name represents a historically mediated form of ~~nature.~~ And we must negate this negation: we must name it!

This is neither bad nor good: it is simply that the nature of things that history mediates human nature. This little insight affords us license to try on names that yield different understandings of the scene. From another name, one can begin to see the limits of the other. Fall in love with the place, but don't fall in love with the name. Good names have a tendency to calcify; they begin to appear as truth. My name for this triptych is "a natural history of destruction." Hopefully it is a bad name.

§2 – *Transformation: Summary and Chapter Outline*

The Buffalo River empties into the southeast tip of Lake Erie, the last waterway to do so before the lake narrows into the Niagara River—really a strait connecting Lakes Erie and Ontario *via* Niagara Falls. The transformation of the river's mouth into what was among the world's largest freshwater ports, granaries, and steel and chemical manufacturing centers was a profound feat of Enlightened infrastructuralization. It only took the total destruction of the Lake Erie coastline, the muddy-bottomed river, and the extensive wetland complex they contained. The story is not unique, even for the Lake Erie basin. Other than the one created by a reformed sand spit at the end of the last glaciation at Presque Isle in Erie, PA, all of the major harbors in Lake Erie are manmade, and each are constructed at the mouth of a river: if you include Detroit, at the Rogue; Toledo, at the Maumee; Cleveland, at the Cuyahoga; and in Buffalo.[12] As environmental writer William Ashworth points out, along the Great Lakes coastline, "The prized sites for cities—protected harbors and river mouths—were precisely the areas of richest environmental diversity and value."[13] Ashworth concedes that "Cities need harbors, after all; they need land adjacent to rivers to build buildings upon. [But] there is generally only one way to get these things, and that is to dredge and fill the rivers and the wetlands. And that is precisely what happened."[14] Ashworth is no fool. He understands that this "need" cities have is a handmaiden to the justification for the destruction of those historical ecologies misaligned with the logic of settler capitalist conurbations. Speaking about the changes wrought on the rivers of the Great Lakes before the beginning of the 20th century, he calls the transformations "staggering." Nearly every watercourse throughout the basin has been dredged and straightened, sand bars at their mouths removed. In their stead, breakwaters and groins were built for navigation, which had the impact of altering shore-drift action. Besides making harbors usable, for Ashworth, it also made them "ugly, dirty, and largely sterile."[15] I would argue that the implications are even far more significant than these aesthetic and even ecological concerns.

This dissertation offers a natural history of destruction of Buffalo's postindustrial watercourse. The study primarily addresses the emergence of ecological conceptuality, and analyzes how ecology lapses into ideology as it fails to account for the contingencies of history and politics. Ecologists model contingencies as "uncertainties" and use the "ecosystem" as a totalizing framework that transforms the relations between all social and natural phenomena to the same measurable units. The socio-ecological systems analytic extends the conceptual framework of ecology to account for *everything*. If it cannot be counted, it does not count.

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[12] Nuala McGann Drescher (1982). *Engineers for the Public Good: A History of the Buffalo Districts US Army Corps of Engineers*. Ann Arbor: University of Michigan Library: 8

[13] William Ashworth (1987). *The Late, Great Lakes*. Detroit: Wayne State University Press: 59.

[14] *Ibid* 60

[15] *Ibid*

Ecology has always doubled as a form of environmental management that, in my reading, cannot readily be separated from its science. One must understand the discipline's own contingent history to see that "eco-governmentality" was always already part of an ecological way of knowing. A key part of ecology's history is, in fact, tied up with the death of Lake Erie in the late 1960's, of which the burning of the Buffalo and Cuyahoga Rivers served as exclamation points. The management of ecosystems as a governing paradigm fist emerged in the 1976 version of the Great Lakes Water Quality Agreement. By focusing on the historical and futural implications of the *physical* transformation of Buffalo's waterways, I trace the way ecology simultaneous produces and erases natures in the Great Lakes Rust Belt. That said, the problem is often not with ecologists *per se* but with government officials, funding agencies, urban planners, academics, journalists, non-profits and NGO's, and the broader intellectual middle management for mistaking ecological concepts and metaphors as universal modes of explanation. In particular, my dissertation offers a careful analysis of how disturbance ecology—of which resilience is the most prominent exemplar—has been ontologized by the professional class. The ramifications of ontologizing disturbance are not only apparent in intellectual discourse—in new materialism and all of its offshoots. Disturbance has come to frame the very ways in which cities in the era of climate change are understood, planned, and governed. Approaching postindustrial landscapes as fields of disturbance enfolds all of their aberrant histories into the totalizing conceptual apparatus of ecology. The ontologization of disturbance, in particular, actively misapprehends the production of historical and futural postindustrial ecologies, since it generates a redemptive social ecological character—an "adaptive capacity"—based on the structure of the resilience, rather than on the actual history and politics of the place. It is an idealist structural functionalism for which the rules of the concept have become more true than matter they seek to describe—and manage.

A "natural history of destruction" represents an alternate way of engaging the environmental past and future—not as an ecological problem but as an historical one with ecological characteristics. The theory and method is based on an explicit critique of approaching destroyed landscapes as though they are—as in Anna Tsing—"human-disturbed." A natural history of destruction develops a method of Marxist historiography read through Theodor Adorno and Max Sebald. It is an approach to modern landscape that actively accounts for the continued importance of geohistorical rupture that, in the Great Lakes, is executed through an indissociable alliance between settler capitalism, the production of scientific knowledge, and urban governance. There is no "natural" or "ontological" definition of destruction, and that is precisely the point. Destruction is that contingent anthropogenic activity that fundamentally ruptures environments in a manner inassimilable to ecological discourse. Destruction is, after Marx, a "separation process [*Scheidungsprozess*]."[16] It is inassimilable to ecological discourse because social forces mediate destruction. The attempt to explain destruction in a purely ecological mode can be politically savvy, however, since it obscures those social forces and makes it appear that ecology—rather than politics—is the path toward a more "whole" society. From an ecological vantage point, destruction is a chaotic attempt to reorganize life according to a social logic that has little or no grounding in ecosystem structure and function. Technologically-mediated modern capitalists transform "nature" into something "unnatural," and while ecology can offer information about this transformation, it is not explanatory. To simply

[16] See the end of Chapter 1 for a fuller discussion. He calls primitive accumulation a "separation process": K. Marx (2013 [1867]). *Capital, Vol. 1*. New York: Penguin: Ch. 26

say, "the city is an ecosystem" only ontologizes an ur-historical nature truth that erases historical distinction.

The first chapter of this dissertation, "A Natural History of Destruction: theory/ method" offers a brief intellectual history of disturbance in ecology and contrasts it with the theory and method I have engaged throughout my analysis. The empirical portion of this dissertation starts with the way speculative climate futures articulate with the present developmental regime in Buffalo. It begins in Chapter 2, "A New Hydrological Regime," by examining the ill-understood impact of climate change on Lake Erie's coastline, understanding it as only one of several iterations of anthropogenic destruction since the beginning of the 19th century. I then demonstrate how Buffalo's growth machine flouts these realities by initiating speculative development on the city's waterfront under the cloak of resilience. In Times Beach, I find the potential for an actually resilient moment on the waterfront. Building on the problem of lake level fluctuation, Chapter 3, "Steady States," offers a history of ecology's implicit techno-managerialism as it emerges around debates over Great Lakes water-level variability and—its biotic complement—wetlands. These debates have had a great influence on the International Joint Commission—the international body that oversees Great lakes issues—and frame how the discourse of coastal resilience gets employed along Rust Belt waterfronts. Building on the problem of wetlands, Chapter 3, "Ruptured Environments," examines the destruction—not disturbance—of Buffalo's coastal environments. Offering an historical geography of the Lake Erie's dunes and coastal wetlands, this chapter demonstrates how an ecological analytic fails to account for the transformation of this region into an infrastructure. In fact, an ecological analytic obscures the possibility of understanding such a transformation. The remainder of this introduction develops the importance of focusing on the *physical* transformation of the environment through the history of Buffalo's postindustrial landscape. In so doing, it offers a theory a theory of infrastructuralization—an historical approach to the built environment that helps to clarify the object of study for a natural history of destruction.

§3 – *Infrastructure, or Terra Nullius*

Margaret Wooster has become something of a mentor and a friend here in Buffalo. It would not be too much to call her an inspiration. She has been at work trying to improve regional waterways for near fifty years; now in her 70's, she remains as engaged as ever. Margaret was a co-founder of the Friends of the Buffalo River,[17] and a former Executive Director of Great Lakes United, a now-defunct watchdog group of the International Joint Commission. She is kind, brilliant, deft, radical, and a font of wisdom and integrity. Despite her mantra of "we're fucked," she has exacted important changes in Buffalo and throughout the Great Lakes. Over four years, she has become a moral compass on matters concerning Great Lakes environmental issues. Margaret welcomed me into the fold, inviting me to join the Steering Committee of a group called Our Outer Harbor, which advocates for the environmentally-sound and public development of Buffalo's postindustrial waterways. I reached out to her after reading her book, *Living Waters: Reading the Rivers of the Lower Great Lakes*,[18] a gorgeous and terrifying meditation on the industrialized waterways of upstate NY. As it turns out, when I arrived to

[17] Friends of the Buffalo River has morphed into what is now called Buffalo-Niagara Waterkeeper, the largest and by far most powerful environmental group in the area. They have become a classic example of the "non-profit industrial complex" and are key players in greenwashing—or, "bluewashing," as they would have it—Buffalo's waterfront development.

[18] M. Wooster (2009). *Living Waters: Reading the Rivers of the Lower Great Lakes*. Albany: SUNY Press.

town, she was in the middle of writing a kind of follow up book, which I had the honor of reading in draft form. That book, *Meander: Making Room For Rivers*[19] rests on a basic premise: ecologists and officials have failed to recognize the significance of the physical integrity of ecosystems. Her contention is based her long engagement with the 1972 Great Lakes Water Quality Agreement between the US and Canada.[20] The Agreement—which I discuss in Chapter 3—established a path "to restore and maintain the chemical, physical, and biological integrity of the Waters of the Great Lakes."

Wooster argues that much effort has been expended redressing chemical and biological integrity—cleaning toxic waters and building habitat—but almost nothing has been done to restore the physical integrity of the waterways, which, she argues, is a much thornier—and ultimately more significant—proposition. She maintains that (a) the extent of the physical transformation of waterways is vastly underestimated, (b) the physical integrity of waterways is a vastly undervalued feature of ecosystem integrity and (c) the politics of physical integrity are more volatile, since they infringe on the economic interests of Great Lakes cities and their developers. In an unpublished piece,[21] where she calls physical integrity the "missing link"[22] in Great Lakes restoration and protection, she offers a photograph of Buffalo's harbor from 1923 that shows a totally industrialized landscape. She simply asks: "What species lived here? What ecosystem remnants are left?" Nary a plant in the scene, there is only on possible answer: "There are none." The 1987 revision of the Great Lakes Water Quality Agreement, she notes, provides an "oddly specific" way to think about physical integrity, considering it only in terms of three particular water impairments: high water temperature and high levels of asbestos and suspended solids. She juxtaposes this with a series of scientific definitions of physical integrity in aquatic systems that focus on the holistic and dynamic interactions between the hydrological, morphological, and biological processes at work in the creation of the physical landscape. Even these definitions confine physical integrity to a strictly ecological way of thinking, suggesting that if you are able to capture the right variables, they will disclose the story of physical impairment. Margaret points to economic development and political shortsightedness as primary culprits in overlooking the physical integrity restoration as a

[19] M. Wooster (2021). *Meander: Making Room for Rivers*. Albany: SUNY Press.

[20] The GLWQA was signed in 1972 by President Richard Nixon and Prime Minister Pierre Trudeau and updated in 1978, 1987, and 2012.

[21] M. Wooster (2023). "The Missing Link in the Great Lakes Water Quality Agreement." Unpublished

[22] She calls it thus in homage to another scientific paper on the issue: B. Asmus, J. Magner, B. Vondracek, and J. Perry (2009). "Physical Integrity: The Missing Link in Biological Monitoring and TMDLs." *Environmental Monitoring and Assessment*, 159: 443-63.

remediation strategy. But it is not only developers: Margaret calls out some of the strongest proponents of the Great Lakes Water Quality Agreement, like the influential John Hartig, who calls for a 3 to 1 return on investment for remediated sites under the agreement. Could this mean, she asks, that "all the time and public money spent on restoring the largest fresh surface water ecosystem on the planet…have been invested to provide shovel-ready sites for redevelopment? In some cities around the Great Lakes, it would seem so."

Margaret's vision is to allow rivers to—as her book title states—meander. Restoring fluvial geomorphological or littoral dynamics goes against how Great Lake settler states understand their role in controlling and managing waterways as hydraulic systems. It also goes against how they believe postindustrial redevelopment will occur on their waterfronts. The physical integrity of waterways has been compromised by having been hardened and dredged, but the push for coastal resilience—with its calls for nature-based solutions—has challenged this protocol. Non-anthropogenic waterways in the Great Lakes tend to have soft, labile, and constantly shifting hydrologies. In urban and agricultural systems, virtually every aspect of water flow is controlled through hydrological and hydraulic engineering. There are two primary reasons for the complicated politics. The first pertains to the continued influence the Army Corps of Engineers, whose express mission is to manage waterways for the purposes of navigation and flood prevention. When the Army Corps speaks of resilience, it tends to refer to the capacity of infrastructure to withstand environmental hazards. While the analytic used may be "ecological," the goal is not restoration, unless that restoration supports the Corps' priorities. For instance, the Corps is always looking for ways to use their dredge spoils, which can be put to use to increase habitat in certain situations. In prioritizing the extant urban fabric, the Corps continues to dredge, canalize, and harden waterways. As one ecologists told me, the Corps "never saw a shoreline or bank they didn't want to rip-rap."[23] In speaking with a representative from the Army Corps, he pointed out to me that if they stopped dredging, all of South Buffalo would flood.[24] Which indicates the predicament: a third of Buffalo—and virtually all of its industry—was built not just in a flood plain but on lacustrine and riverine coasts privy to perennial change. Thus, there is a certain path dependency: if you build in a flood zone, you must also build to stave off the flood. The object of "coastal resilience" changes from, say, wetland habitat to protecting urban infrastructure.

The second reason for the complicated politics is that restoring the physical integrity of the harbor undermines the overripe postindustrial economic hopes of Buffalo. The dream of postindustrial waterfront speculation has been a key part of Buffalo's identity for the past fifty years. The hardening of the shorelines for industry from about 1825 to 1970 produced what is now prime coastal real estate, and the municipality is not about to give up the speculative opportunity for something as unprofitable as ecological restoration—not, that is, unless restoration can be incorporated into the game of real estate speculation. This is precisely what has happened: brownfield tax credits, for instance, channel public money to private developers who remediate toxic land. The phantasmagoria of renderings, proposals, and promises for waterfront megaprojects, tourist destinations, and housing have been constant since the early 1980's. The cycle of proposal and failure has been a key feature of the Rust Belt political economy, but since about 2015, waterfront redevelopment has found some momentum in Buffalo—largely spurred by New York State economic initiatives. Boosters now eagerly speak

[23] Paul Furhmann (Retired Environmental Engineer) in discussion with the author, May 2020
[24] Brian Hinterberger (Army Corps of Engineer Rep) in discussion with the author, May 2019

of Buffalo's "resurgence"[25]—also the name of one of the city's new waterfront breweries. This dissertation follows Wooster's lead, investigating the physical integrity of Great Lakes waterways. It also follows her lead in attempting some kind of historical accounting of a settler capitalist landscape. Margaret, who also works closely with the Tonawanda Seneca and the Haudenosaunee Environmental Task Force, and who has been deeply influenced by the Onondaga faithkeeper, Oren Lyons, locates one origin of environmental destruction in the Doctrine of Discovery and its founding principle, *terra nullius.*[26] The Doctrine was a legal mechanism enshrined in a 1493 Papal bull in order to extend Spanish sovereignty to the so-called New World. It has been upheld time and again through the American legal system, most recently by Ruth Bader Ginsburg in her notorious 2005 decision. My theory of infrastructuralization is intended to complement Margaret's and others' accounts of the physical transformation of Western NY into a settler colony formed at the nexus of infrastructure, speculation, and destruction.

§4 – *Urbem Condidit*

> Previously, the area was a poorly drained swampland that was regularly inundated by periodic storms.
> -Traynor *et al*. [27]

The founding moment of the Buffalo harbor's physical transformation is well-accounted for in the historical record. Lake Erie is notoriously tempestuous and unpredictable. Since Buffalo faces the weather coming off the open lake, and since it possesses no natural harbor, the only safe place where vessels could lie or change cargo was in the mouth of Buffalo Creek, which was "exceedingly difficult to enter," owing to the outer sand bar confining its channel inshore. The sand bar also caused the creek entrance into the lake to be nearly parallel to the shore, effectively closing the mouth of the creek to navigation most of the year—only canoes could reliably gain access, and even they would regularly run aground on the bar. Typically in the spring, freshets—small floods caused by heavy rain and snow melt—would open channels across the bar, but the wave action of the lake soon closed them off again. These forces meant that the mouth of the river was continually shifting—sometimes dramatically.[28] The first order of business in the creation of a harbor was to create easy traffic between the river and lake.

The historical accounts dramatize the personages, politics, finances, trials, and tribulations of the job to ensure that the reader understands: the setting of the southern pier was a world-historical moment. The man—the Man—assigned to this victory was named Samuel Wilkeson. He became the mayor of Buffalo on the back of his work on the harbor. His headstone at Forest Lawn cemetery reads *Urbem condidit*: he built the city. The books specify: "he built the

[25] See for Example: M. Connelly. "From the Editor: Reporting the Second Decade of Buffalo's Resurgence." *Buffalo News*, 6 Feb 2022; Epstein, Jonathan. "Corporate Magazine Touts City's Resurgence." *Buffalo News*, 13 Nov 2022.
[26] M. Wooster (2021): 115-123
[27] K. Traynor, A. Shentag & C. Miller (2018). "The Buffalo, New York Outer Harbor as a Cultural Landscape." Buffalo: kta preservation specialists: https://ppgbuffalo.org/files/documents/environment/the_buffalo_new_york_outer_harbor_as_a_cultural_landscape_report.pdf
[28] E. Low (1903). "The Breakwater at Buffalo, New York." *American Society of Civil Engineers* XXIX (9): 949

city by building its harbor"[29]—a sentiment all the more spectacular since, as several accounts tell us, "Mr. Wilkeson had never seen a harbor" before building Buffalo's. Wilkeson's legend grew since he not only funded the project but also worked vigorously on it, laboring with his crew on the water. A race for regional economic supremacy—or rather, "the spirit of enterprise and rivalry"[30]—began between Buffalo and Black Rock to establish an adequate harbor for the western terminus of the Erie Canal. Black Rock, just north of Buffalo (now part of the city), was built on the mouth of Scajaquada Creek, which outlets into the Niagara River. While Unity Island—then Squaw Island—created a more natural harbor there, it was small and the rapids and increased current at the entrance of the Niagara River made the area difficult to navigate. It was clear that "Buffalo could more easily be made into a harbor of ample dimensions to accommodate the lake commerce of the future."[31] However, much hydraulic engineering was necessary: "At Buffalo, it was not only necessary to excavate the channel across the bar, but to build protective structures which would prevent the sand borne by littoral currents from filling it up again. This," the Symons's account goes on to say, "was originally accomplished by the pioneers of Buffalo."[32] Wilkeson and his team of *ad hoc* engineers constructed large timber cribs—basically wooden boxes—and filled them with stone. The south pier, first built in 1821, faced the brunt force of the lake and thus "proved to be a very troublesome structure to maintain. It was exposed to the full force and fury of the storms of Lake Erie, and the frail structures first put up were washed away again and again." The accounts are full of folly in this regard. One tells of Wilkeson and some two hundred men marching with shovels to the newly set pier in hopes of protecting it from a storm. They waited all day for the lake to rise, but it never did. As soon as they retired for the night, a storm swept in, but the pier miraculously held—a sign of their pending accomplishment.[33] Nevertheless, "It took some years and much experience to demonstrate that only a structure of tremendous strength could withstand the fierce onslaught of the lake when lashed into fury by a southwester."[34] Upon completion, the southern pier effectively blocked the lake's waters from re-nourishing the sand bar and closing the mouth of the river. Consequently, the engineers could cut a channel through the bar and stabilize the mouth of the creek. Additionally, this created a reliable enough harbor for the Erie Canal to join the Buffalo River at its mouth. The map below shows a somewhat later stage of development—in 1906.[35] Instructively, the Buffalo Creek is in this map labelled "Buffalo Harbor (Creek)," which is a perfectly symbolic designation: the function of this waterway as creek has been made

[29] J. Lord (1896). "Samuel Wilkeson" in Ed. F. Severance. *Publications of the Buffalo Historical Society, Volume IV*. Buffalo: The Peter Paul Book Company: 75-8; A. Bigelow (1896). "The Harbor Maker of Buffalo." in Ed. F. Severance. *Publications of the Buffalo Historical Society, Volume IV*. Buffalo: The Peter Paul Book Company; S. Wilkeson (1902). "Historical Writings of Judge Samuel Wilkeson: Reflections of the West and the Building of the Buffalo Harbor" in Ed. F. Severance. *Publications of the Buffalo Historical Society, Volume V*. Buffalo: Buffalo Historical Society.

[30] T. Symons & J. Quintus (1902). "Buffalo Harbor: its Construction and Improvement During the XIXth Century. In Ed. F. Severance. *Publications of the Buffalo Historical Society, Volume V*. Buffalo: Buffalo Historical Society: 240-285.

[31] Symons (1902): 241

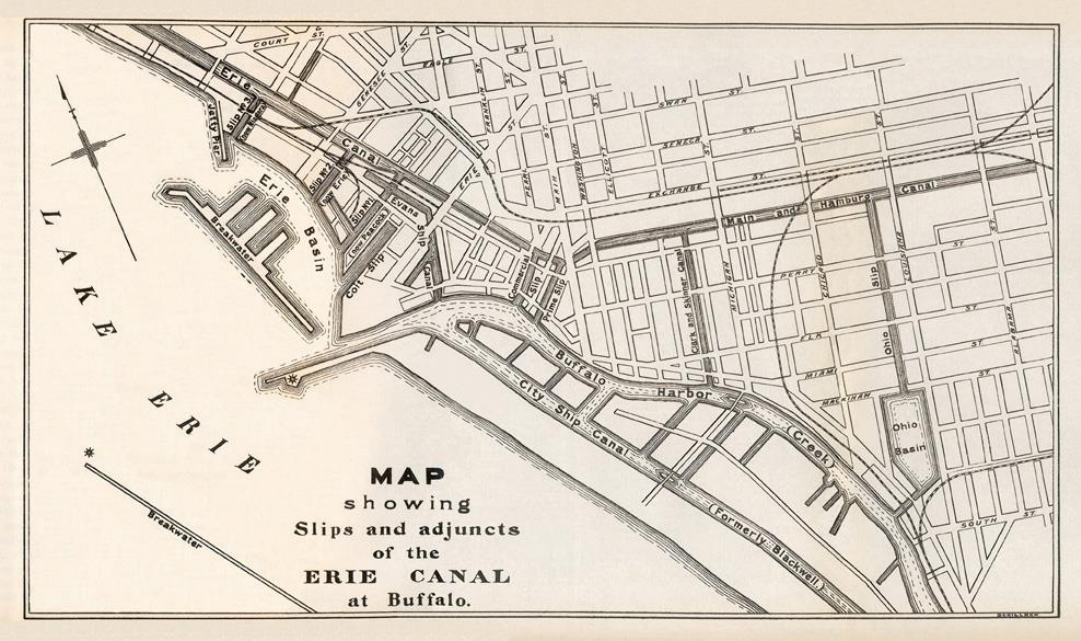
[32] *Ibid*: 242

[33] J. Sloan (1902 [~1865]). "Adventures and Recollections of a Pioneer Trader: with an account of his share in the building of Buffalo Harbor." In F. Severance (Ed.) *Publications of the Buffalo Historical Society, Vol. V*

[34] *Ibid*: 245

[35] "Map showing Slips and adjuncts of the Erie Canal at Buffalo" -- from: History of the Canal System of the State of New York ... by Noble E. Whitford (Albany : Brandow Publishing Co., 1906) -- vol. 1, opposite p. 588.

parenthetical to its "higher" service as harbor. The south pier is jutting out furthest into the lake with the lighthouse—symbolized as an asterisk—at its tip. The mouth of the river is brought to total stasis. The Erie Canal came in from the north, and it was connected directly to the mouth of the river and eventually to the Erie Basin by a number of feeder slips and smaller canals. The proliferation of slips and canals was in order to create more efficient ship traffic and to maximize waterfront real estate for commercial business. The harbor could become notoriously congested. Where the Erie Canal ends, forking into the Commercial Slip and Prime Slip is the location of present-day Canalside, a local tourist destination. The silt that would have become the sand bar accumulated along the southern pier, creating land that would eventually become the northern tip of the Outer Harbor, which is the outermost strip of land represented here. Its construction was made possible by the completion of the breakwater just a few years prior to the publication of this map. The northern tip of the breakwater can be seen in the lower left hand corner of the map. As a more contemporary account notes, "It is likely that much of the stone and rubble south wall of the Buffalo river, opposite the Erie basin Marina, is Wilson's original pier. Here surely lies the foundation of Buffalo."[36]



Wrenching the river into navigability was but a first step in transforming the eastern tip of Lake Erie into a commercial harbor. The Whitford map clearly shows that "As the needs of commerce developed, projects for the harbor's improvement also developed."[37] In 1835, the US Government took over the building and administration of the harbor. It looked to protect the entrance channel to the river and—more expansively—to build the breakwater and outer harbor. Throughout the latter half of the 19th century—and especially after the Civil War—they built an incomparably long breakwater. It spans from the north, at the entrance of the City Ship Canal—evident in the map—to the south, at Stony Point, at the southern edge of the city. "The practical completion of the stone (or rubble-mound) section of the breakwater, in December, 1902, forged the last link in the chain of a system of harbor protection which is undoubtedly without parallel

[36] T. Tielman (1990). *Buffalo's Waterfront: a Guidebook*. Buffalo: The Preservation of Coalition of Erie County: 6
[37] Symons (1911): 244

in the United states."[38] At more than 24,000 feet long—4.8 miles—it boasts being the "largest artificial harbor in the world."[39] Fortunately, the building of the breakwater was relatively well documented.[40] The drone shot looks south and about half of the length of the breakwater is visible.

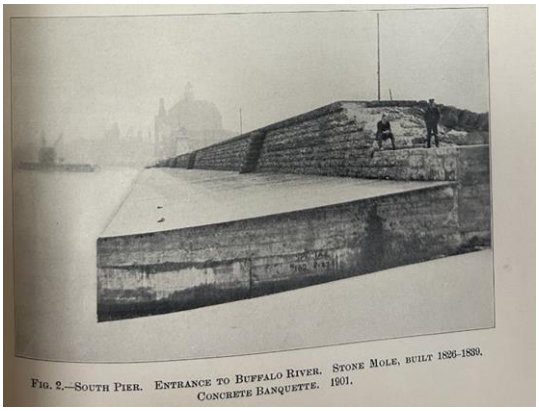


Fig. 2.—South Pier. Entrance to Buffalo River. Stone Mole, built 1826-1889. Concrete Banquette. 1901.

Fig. 1.—Old Breakwater. Building Monolithic Concrete Superstructure, 1891.

Fig. 1.–South Harbor Section. Various Stages of Concrete Superstructure. 1901.

[38] E. Low (1903): 948-9

[39] S. Magavern (2019) "Buffalo's Outer Harbor: the Right Place for a World Class Park." Buffalo: Partnership for the Public Good: 5. https://ppgbuffalo.org/files/documents/environment/buffalos_outer_harbor_the_right_place_for_a_world-class_park.pdf

[40] All of these photos are from E. Low (1903).

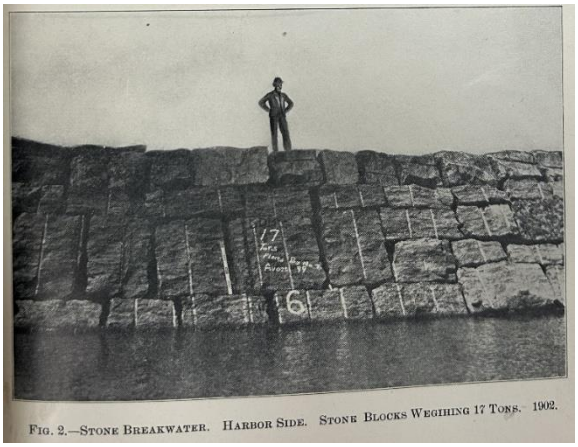


FIG. 2.—STONE BREAKWATER. HARBOR SIDE. STONE BLOCKS WEGHING 17 TONS. 1902.

FIG. 2.—SOUTH HARBOR SECTION. CONCRETE SUPERSTRUCTURE. PARAPET WALLS IN PLACE. 1901

In protecting the shore from the vagaries of the lake, this "system of harbor protection" created the possibility for manufacturing an outer harbor.[41] Out of the water and swamps, more than 450 acres of land readily emerged. By 1925, several major piers and industrial facilities were constructed "to capitalize on [the] advantageous location." Additionally, "City-owned land located between some of these piers was used primarily as a dumping ground for dredged sediments."[42]

As I address in chapter 3, Buffalo's growth machine has maintained a plan to create opportunities for real estate speculation on the Outer Harbor. Our Outer Harbor, the citizen's environmental group with which I have done my participant observation, was formed by a trio of brilliant elder environmentalists in opposition to this development. They hoped to turn the outer harbor into climate-resilient barrier island park. The fight continues, but the Governor and Congressional representatives have pinned their hopes on waterfront redevelopment. This brief history of the building of Buffalo's harbor is not meant to extol the virtues of industrious man. Quite the opposite. This origin story aims to mark out the very contingent histories at work in building physical infrastructures that come to serve as conditions of possibility for anthropogenic natures that follow. Rather than adapting to an environment, settlers, entrepreneurs, industrialists, and engineers have forced environments to adapt to their exigencies: commerce and speculative capital. Landscape is reduced to infrastructure.

<u>Part 2 - Infrastructuralization</u>

For how hard it is
to understand the landscape
as you pass in a train
from here to there
and mutely it
watches you vanish.

[41] K. Traynor, A. Shentag & C. Miller (2018). "The Buffalo, New York Outer Harbor as a Cultural Landscape." Buffalo: kta preservation specialists: https://ppgbuffalo.org/files/documents/environment/the_buffalo_new_york_outer_harbor_as_a_cultural_landscape_report.pdf

[42] *Ibid*: 38

-Max Sebald, *Over Land and Water*

§5 – *A Scene of Inland Navigation*

There is a New York Department of Environmental Conservation (DEC) watershed map that represents the various creeks, rivers, and waterways that constitute New York's portion of the Lake Erie and Niagara River drainage basins. Maps of the region tend to emphasize a strong juxtaposition between land and lake. While aesthetically cartoonish, the DEC map sufficiently demonstrates that all land in this region could be understood as area between waterways. It confirms what Domlesky and Manaugh say in their "Living in the Glacial Afterlife": "The physical terrain of the Great Lakes region is defined on every level, by hydrology."[43] The map represents creeks and their major tributaries, but one understands that these tributaries have smaller tributaries too, so one must imagine the surface of this place as something more like a lung, with branches splitting off into smaller branches. In everyday life, these creeks and rivers fall entirely from conscious view. Except when driving over the Skyway or on the I-190 along the Niagara River, Buffalo seems to have explicitly rejected its geography as a coastal city. In part, this can be explained by the fact that the waterfront was, for the entirety of the settler period up to deindustrialization, given over to military and industry. Frederick Law Olmsted tried to build a public waterfront park at the end of the 19th century, and even the world's foremost landscape architect working on what to date was his most ambitious city-wide "system of parks"[44] was driven away from the valuable waterfront real estate, forced inland where he would build South Park—in whose shadow I currently write. Waterways were for commerce, not for people.

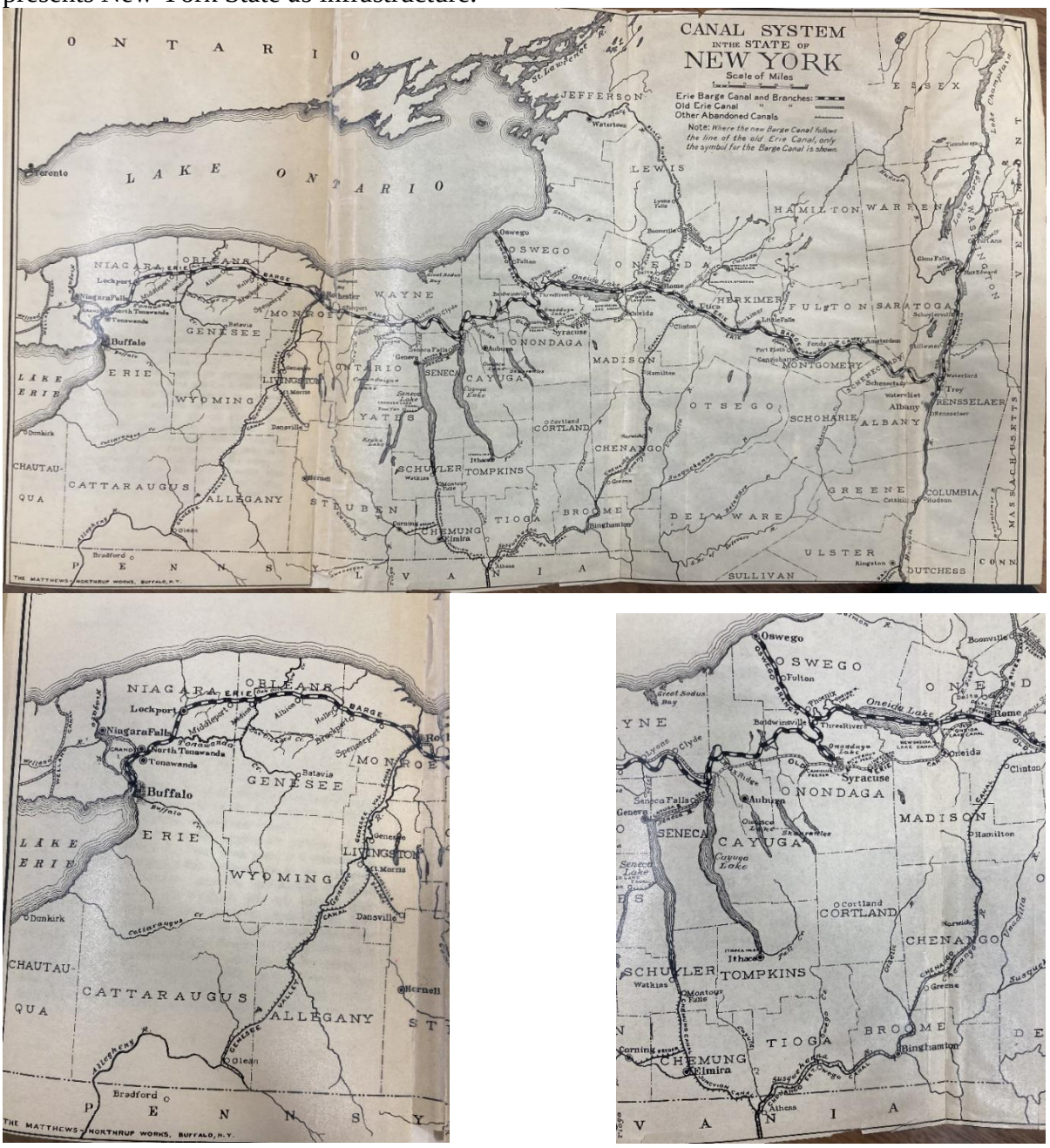
Detailed map of the Niagara River/Lake Erie Watershed

There is a map accompanying a 1908 text called *Waterways and Canal Construction in New York State* by a one-time New York State senator, Henry Wayland Hill. Hill later served as the President of the Buffalo Historical Society, which published this work as volume XII of their collected publications. The map was not reproduced in digital versions of the text, so I was surprised to see it when I encountered a physical copy of the text in the library archives. The frail parchment, scotch-taped together at the seams, nearly fell apart as I unfolded it. At first blush, I believed it was a standard map of the Erie Canal cutting across the length of New York State, intersected with several feeder canals. I saw that the map was, however, more detailed than others I had seen: it includes a number of abandoned canals, feeders, junctions, and river

[43] A. Domelesky & G. Manaugh (2017) "Living in the Glacial Afterlife." In *Third Coast Atlas: Prelude to a Plan*, Eds. D. Ibañez, C. Lyster & C. Waldheim. New York & Barcelona: Actar

[44] See, for example, F. Kowsky (2018). *The Best-Planned City in the World: Olmsted, Vaux, and the Buffalo Park System*. Amherst, MA: Library of American Landscape History

"improvements."[45] The full significance of the map only occurred to me later that week, after considering the greater geography of the eastern continental United States with relation to the watersheds of New York's waterways. More than a celebration of New York's infrastructure, I soon came to see the map as a statement of profound techno-imperial ambition. This map presents New York State *as* infrastructure.



The Erie Canal has been treated as a world-historical infrastructure and for good reason. In light of this, I refrain from saying a lot about it while also wanting to emphasize that

[45] J.L. Larson (2001). *Internal Improvements: National Popular Works and the Promise of Popular Government in the Early United States*. Chapel Hill & London: University of North Carolina Press

everything I do say is cast in its light.[46] The Canal and Niagara Falls are the *sine qua non* of this region's entire history—and of my study. The Falls were the geological feature the Canal had to divert, turning Buffalo into a chokepoint for the entire Great Lakes region. The Erie Canal ran about 340 miles through upstate New York famously connecting the extensive Great Lakes basin to the Hudson River, New York City, and the entire Atlantic arena. The Canal transformed many cities along it and none more than Buffalo, its western terminus and—originally—frontier depot. Over the century following the Canal's completion in 1825, Buffalo developed into one of the continent's largest and most important inland ports. The Erie Canal forged a transit by which timber, grain, iron ore and other resources could flow east and manufactured materials west, into the frontier. It generated speculative land booms, financial futures markets, and new loan and bond instruments that would spur development across the Midwest. The Canal was the symbol of that celebrated word, "commerce," and an icon of Americana. Its significance has been celebrated on countless occasions and in many texts, museums, commemorations, and so forth. In Buffalo, hagiography of the Canal knows no end; it is inextricable from the "industrial heritage" that so many in the region continue to identify with. Its story is understood and its geographies are engrained, so when I saw the bold checkered line across the length of New York State on Hill's map, I thought I intuited its significance. But this intuition deceived me.

The Hill map indicates other networks of lesser-known canals and improvements throughout New York State. The waterways are familiar, but unless you understand the greater system of continental watersheds, their purpose remains opaque. The map shows the Erie Canal connected, *via* the Genesee River Valley to the Allegheny River (see the zoom-in on the lower left). The Genesee and Allegheny River headwaters mingle in the Allegheny Plateau, just over the New York State border in Pennsylvania. The Genesee runs north through Rochester, intersects with the Erie Canal, and empties into Lake Ontario. The Allegheny runs southwest, joining the Ohio River at Pittsburgh, which joins the Mississippi River in Southern Illinois. By connecting the Genesee and Allegheny Rivers, the Genesee Valley Canal functionally connected upstate New York and the Great Lakes Basin to the continent's interior and to New Orleans, the Gulf of Mexico, the Caribbean, and beyond. The Chemung and Chenango Canals connected the Erie Canal to the Susquehanna River, which starts its course in Cooperstown, NY (see the zoom-in on the lower right). The Susquehanna is the longest river on the eastern continent; it runs south almost 450 miles to the major port of Baltimore. On its way, it passes through the heart of Pennsylvania's Coal Region. The Black River Canal extended north, from Rome to Watertown, NY, and the mouth of the Saint Lawrence River, which runs past the Montreal and Quebec before emptying into the North Atlantic. In other words, Hill's map is a vision that sets the Erie Canal as the centerpiece of a vast commercial network connecting the Great Lakes, the Midwest, the lower Mississippi Basin, the Gulf of Mexico, the eastern seaboard, the North Atlantic, and the mid-Atlantic. More dramatically, for Hill, Buffalo was *the* nodal point at the center of this network. This totalizing vision is what differentiates a state *with* infrastructure from a state *as* infrastructure. New York was the Empire State because it was an infrastructural state.

Hill's vision, it turns out, has been the basis for this region's settler colonial geography dating back to the early 18th century. Hill acknowledges a special appreciation for Cadwallader Colden,[47] in whom an early vision of this environment-*cum*-infrastructure was first imagined.

[46] There are many fine resources about it. Most of them ultimately fall to being hagiographic in nature.

[47] There are several somewhat recent biographies on Colden: see P. Ranlet (2019). *Cadwallader Colden, 1688-1776: A Life Between Revolutions*. New York: Hamilton Books; S. Schwartz (2013). *Cadwallader Colden: A Biography*. New York: Humanity Books.

Colden was a man of the American Enlightenment, having carried on correspondences with the likes of Linnaeus and Ben Franklin. He was the Surveyor General of what was then the province of New York. Additionally, he was the first colonial representative of the Haudenosaunee Confederacy, about which he wrote *The History of the Five Indian Nations* in 1727 and an expanded second edition in 1747. I had never heard of the man before beginning this research, despite the fact that my paternal grandparents owned a small hunting shack 25 miles south of Buffalo in a town named after Colden, and I spent much time playing with my cousins in the woods there as a child. Colden was adopted by the Mohawk Nation, which gave him liberty to explore Western New York with his Enlightened surveyor's eye. He became familiar with the existing topography, roadways, rivers, and streams, along with the various camps, villages, and settlements of both Natives and settlers.[48] Colden's explorations into the interior led him to actively reimagine the Great Lakes as a vast waterborne infrastructure for commerce. On November 6, 1724—a century before some such thing would be completed—Colden presented to Colonial Governor William Burnet a plan for a canal to connect the Hudson River to the Great Lakes in order to increase commerce—especially for fur—with the Native Americans.

Hill quoted Colden extensively from his 1724 pamphlet, *Papers Relating to the Indian Trade*, contained a short report, "A Memorial Concerning the Furr-Trade of the Province of New York." In the report, Colden wrote:

> *Canada* is situated upon the River of St. Lawrence, which the five great Lakes (which may properly be called *The five Inland Seas* of *North-America*) empty themselves into the Ocean… The five great lakes which communicate with each other, and with this River extend about one thousand miles Westward, further into the Continent. So far the French have already discovered…
>
> The Method of carrying Goods upon the Rivers of *North- America* into all the small Branches, and over Land, from the Branches of one River to the Branches of another, was learned from the *Indians* and is the only Method practicable through such large Forests and Deserts as the Traders pass through… Thus, the French have an easy Communication with all the Countries bordering upon the River of *St. Lawrence* and its Branches, with all the Countries bordering upon these Inland Seas, and the Rivers which empty themselves into these Seas, and can there-by carry their Burdens of Merchandize through all these large Countries, which could not by any other means than Water-carriage, be carried through so vast a Tract of Land.
>
> This, however, but half finishes the View the *French* have, as to their Commerce in *North-America*. Many of the Branches of the River *Mississippi* come so near to the Branches of several of the Rivers which empty themselves into the great Lakes, that in several places there is but a short Land carriage from the one to the other. As soon as they have got into the River of Mississippi they open to themselves as large a Field for Traffick in the Southern parts of *North-America*, as was before mentioned with respect to The Northern parts. If one considers the Length of this River, and its numerous Branches, he must say *That by means of this River and the Lakes, there is opened to his View such a Scene of Inland Navigation as cannot be Paralleled in any other part of the World*.[49]

[48] J. Devine (2008). "Cadwallader Colden : Father of the American Canal System." http://livingstonmanor.net/coldenweb/ColdensCanal112508.pdf

[49] C. Colden (2017). *The History of the Five Nations*. Ithaca: Cornell University Press: 15-16 (emphasis in original)

Quoting the last part of this passage, Hill, "in justice to Cadwallader Colden," states "that no man before him and few, if any after him have a keener grasp of the advantages, possessed by [New York] State by reason of its geographical position and natural facilities for great commercial development."[50] Hill believed that Colden's education, "practical experience," and imagination led him "to take a comprehensive view of the commercial possibilities of [New York], intersected as it was by a system of natural waterways, which could easily be made to intercommunicate, and lying as it does between an extensive system of waterways on the west and the Atlantic on the east…"[51] Colden saw that New York could become the center of a British settler empire.

Hill's map and essay are not only a history. They constitute a form of early-20th century regional boosterism aiming to resituate Buffalo and upstate New York as centerpieces to a waterborne commercial-industrial empire, even with the advantages of rail. This vision would not end until the mid-1970's[52] when deindustrialization gutted the region, and even recently some planners and designers [53] have looked to revivify this geographical coherence. Looking ahead to next chapter, what is important in this vision is that it demonstrates the contingency of geography and history. It forces us to understand that when speaking of "ecosystems," ecologists, planners, administrators, and environmentalists alike are often talking about settler capitalist infrastructures. Treating these waterways straightforwardly as quantifiable ecosystems obscures the history and politics of power that actually destroyed their physical integrity in order to transform them into infrastructures.

§6 – *Ellicott and the Apolline Imperative*

By "infrastructuralization" I do not only mean the total *physical* transformation of a complex milieu into a medium.[54] Such a physical act is unthinkable without a set of cultural and economic dispositions that make this transformation legible as a reality. There are many potential paths to investigate here, but the Holland Land Purchase maps clearly express those dispositions relevant to my study: they indicate a clear articulation of technical, economic, and—not incidentally—racial forms of thought that have come to characterize settler colonial Nature in North America. If Hill's map builds on Colden to reimagine the state's waterways as commercial infrastructure, the Land Company maps proves that the land too is part of the infrastructure. The form of land presented by the Holland Land Company is not the passive medium of waterborne networks but is itself a foundation for a second nature whose essence is legibility, speculation, whiteness, and property. The Holland Land Company—a group of a half dozen businessmen in Amsterdam—purchased what is now Western NY in 1792 and 1793 to speculate on. There is an idea about land that it is some *thing* in this world—that it is physical entity. And this may have been true for a feudalist or even a physiocrat, but land is a social formation, and in a settler capitalist state, it must be transformed—like all things—into a commodity, both usable as an

[50] H.W. Hill (1908). *Historical Review of Waterways and Canal Construction in New York State*. In Ed. F. Severance. *Buffalo Historical Society Publications, Volume XII*: 12

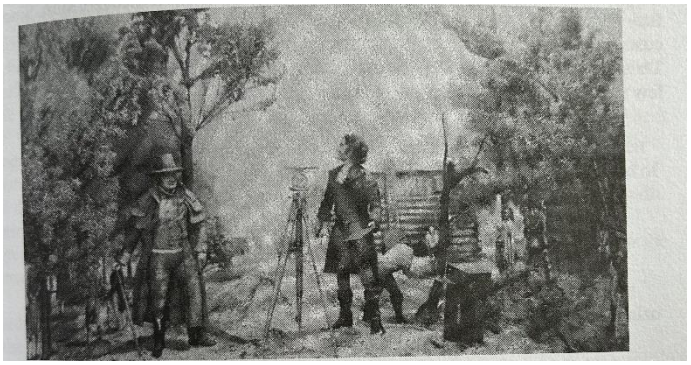
[51] *Ibid*. 12-13.

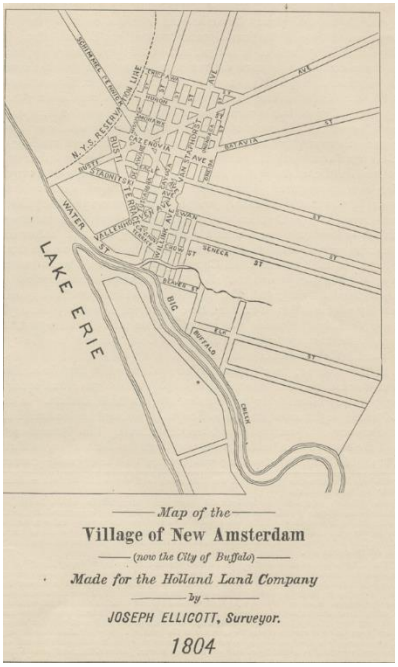
[52] See C.A. Doxiadis (2005 [1968]). "The Emerging Great Lakes Megalopolis." *Ekistics* 72 (430/435): 167-188

[53] See D. Ibañez, C. Lyster, C. Waldheim & M. White. (2017). *Third Coast Atlas: Prelude to a Plan*. New York & Barcelona: Actar: *en passim*

[54] This framing I owe to conversations with Alexander Arroyo.

object and exchangeable according to its monetary value. In order to transform land thus, it must first be appropriated.





There is an vast archive of Holland Land Company maps.[55] They are almost entirely the outcome of the Holland Land Company surveyor, Joseph Ellicott, who would also become the Holland Land Company manager.[56] Ellicott and his brothers were well-known surveyors. Joseph served his brother, Andrew, in surveying the nation's capital and was then sent to Georgia to survey the boundary line established in the Treaty with the Creek Tribe. The Holland Land Company hired him 1797 to survey its 3.25 million acre purchase, which it took him two arduous years to do. It is referred to as the Great Survey. There was almost comical diorama of Ellicott at the Buffalo History Museum,[57] looking proudly up from his sextant after laying out his famous radial plan for Buffalo in 1804, which he called New Amsterdam, in homage to his benefactors. In the diorama, Ellicott stands with Sir William Johnson—the ardent land speculator who was fully embedded into the Mohawk tribe. Behind him is Crow's Tavern, at the corner of Main and Exchange Streets in Buffalo. The juxtaposition between this scene and the plat of Buffalo—with its radial grid—are evidence of the Apolline fervor with which Ellicott could operate. Much has been written about the high modernism of Jefferson's grid and its total imposition of abstract space on to complex environments.[58] Ellicott was a contemporary of such an attitude, and, like Jefferson's, his lot system exemplified a desire to create system of erasure of geographical difference in preference for rectilinearity achievable only through geometry. The vernacular landscapes of Western New York owe much to the ideological tendencies of the grid that mediated their establishment.

[55] Most have been digitized and can be found here: https://nyheritage.org/collections/holland-land-company-maps

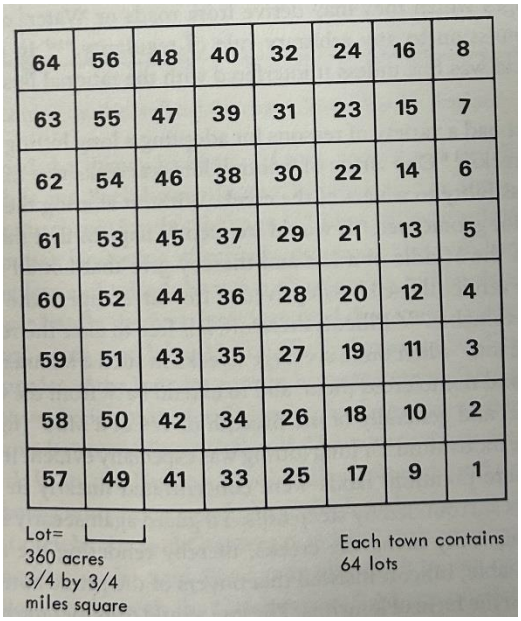
[56] There are many informative histories of the Holland Land Purchase, which itself demands several more volumes to critically understand and interpret. I refer the reader to W. Chazanof (1970). *Joseph Ellicott and the Holland Land Company: the Opening of Western New York*. Syracuse: Syracuse University Press; W. Wyckoff (1988). *Developer's Frontier: the Making of the Western New York Landscape*. New Haven: Yale University Press; C. Brooks (1996). *Frontier Settlement and Market Revolution: the Holland Land Purchase*. Ithaca: Cornell University Press; O. Turner (1991). *Pioneer History of the Holland Land Purchase of Western New York Embracing Some Account of the Ancient Remains*. Maryland: Heritage Books. For more critical interpretation, see L. Hauptman (1999). *Conspiracy of Interest: Iroquois Dispossession and the Rise of New York State*. Syracuse: Syracuse University.

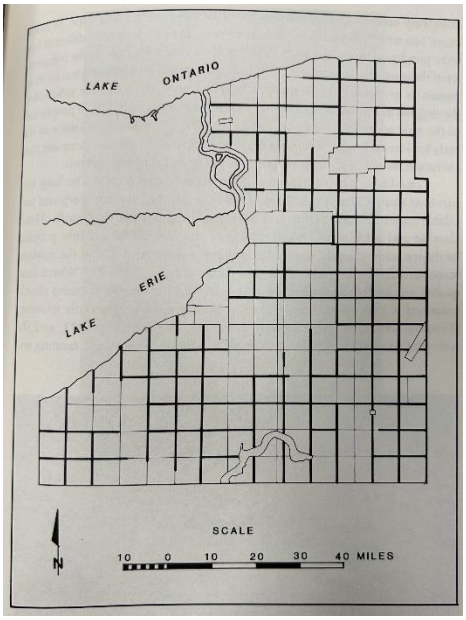
[57] R. Silsby (2016). *The Holland Land Company in Western New York*. Buffalo: Buffalo & Erie County Historical Society: 5

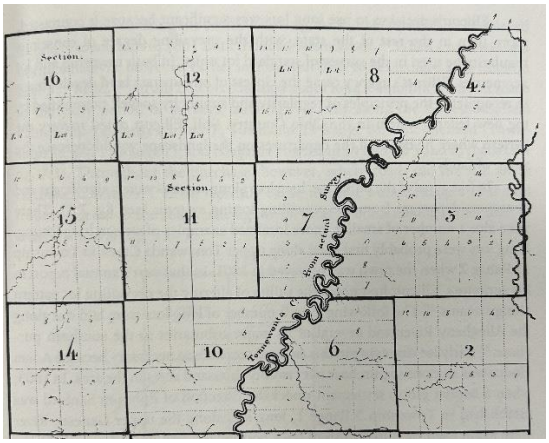
[58] See, E. Price (1995). *Dividing the Land: Early American Beginnings of Our Private Property Mosaic*. Chicago: University of Chicago Press; J. Stilgoe (1983). *Common Landscape of America, 1580-1845*.

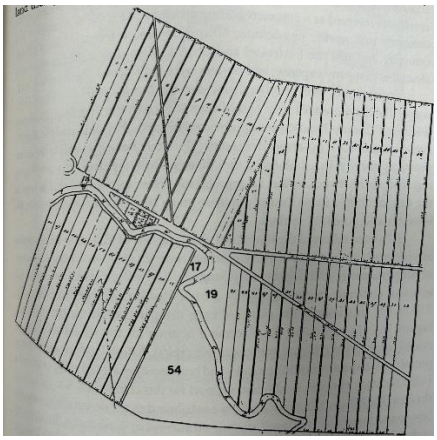
Ellicott's copy of Abel Flint's *A System of Geometry and Trigonometry with a Treatise on Surveying* sits on display at the Holland Land Company museum in Batavia, NY, alongside his sextants, Gunther chain, and other surveying instruments.

The four diagrams from Wyckoff's book, *The Developer's Frontier* elucidate the compulsions of the Enlightened mind to overwrite the vagaries of natural form with the efficiency of rectilinearity. The upper left diagram was Ellicott's plan for each township and on the upper right, each town is laid out on the New York State map. The lower right is Ellicott's plan for Batavia, which housed the Land Company headquarters, and the lower left diagram, is from "township 11, range 2" in what is present-day Amherst, just north of Buffalo. The crenellated waterway is Tonawanda Creek, which bifurcates the Onondaga and Niagara escarpments, emptying into the Niagara River fifteen miles north of downtown Buffalo. The diagram shows how the Tonawanda Creek forced Ellicott to compromise his exacting order by extending or shortening lots in order to accommodate the fact of the waterway.

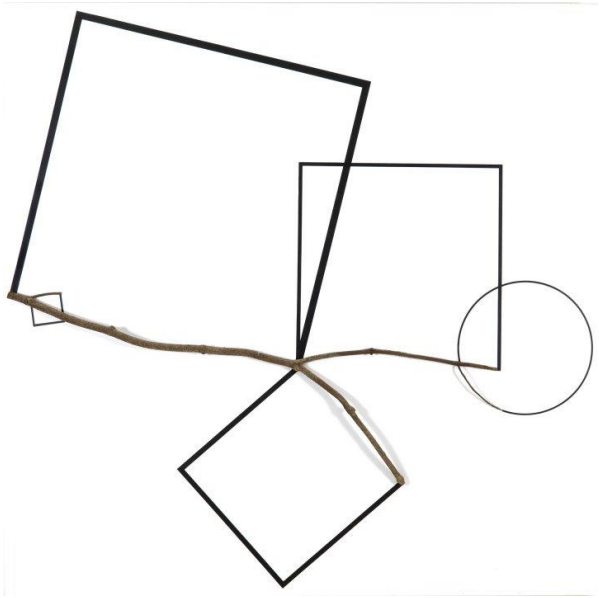








The timing of the purchase was bad: the land speculation bubble burst in 1797, leading to the Panic of 1797-8, and the Holland Land Company figured that if it was going make money on its investment, it would have to divide its land thoroughly and sell plots at retail. Due to the comprehensiveness and accuracy of his surveying, the Holland Land Company hired on Ellicott to serve as the land manager, which he did dutifully. He built a network of gristmills, sawmills, roads, and other speculative infrastructures designed to attract pioneers. He recruited frontiersmen, especially from Vermont, to cut the woods, which raised the value of the land. Once done, he set to selling the cleared land to yeoman farmers. Since Ellicott ultimately mortgaged many plots himself, he attempted to recruit specific kinds of settlers who he thought most likely to pay him back. It was gentrificaiton *avant le lettre*. White propertied citizens would fulfill the conglomerate ideal of a Roman-capitalist grid of the sort that inspired Jeffersonian agrarianism. Ellicott's lines are not only the lines of property but of order, legibility, management, and legality. They are the lines of disenchantement. These are the qualities necessary for land to become a commodity, for it to become—literally and figuratively—alientated. This yolking of the natural world to the tenets of land speculation subsumed ecologies to the calculable reference point of monetary value. While "natural capital" is a contemporary term, it is a concept as old as the surveyor, as one can see when looking at old hand drawn plats: the natural elements—water, timber, slope, etc.—are always listed as assets.



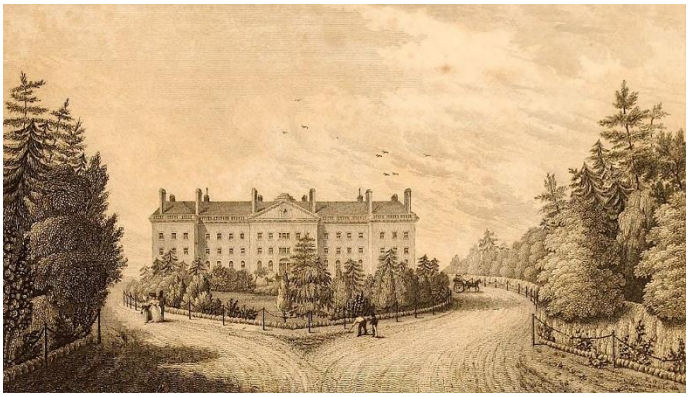
There is something else embedded into the structure of trying to affix rectangles to the crenellations of a creek that requires examination here. This "something else," is commented on in a 1984 artwork by the modern French artist, François Morellet, who played an important role in the development of geometrical abstract art. The piece is occasionally on display at the Albright-Knox Art Gallery in Buffalo (now called the AKG). The first time I saw it, it was hanging in the southern wing of the museum. The piece entranced me, and I returned to it many times in quick succession to study it. In contrast to the color saturation of the nearby Rothko and Pollack, the Morellet is minimal but large—about 6½ x 6½ feet. An actual stick is fastened to a canvas. The

ephemeral shadows cast from stick under gallery lighting stand in stark contrast to the mathematization of the stick's naturalness. In black acrylic paint, Morellet has translated the natural curves and three-dimensionality of the stick into planar squares and a circle—precisely as a surveyor would when he imposes property on to the earth. The name of the piece is a pun that only works in English: *Geometree, No. 51.* The interpretation notes that "Morellet playfully explores the relationship between science and nature,"[59] but, beneath the humor, I find the piece to be deadly serious: a commentary on the violent artifice of reason. What is this relationship between science and nature? Geometry—truth, the ideal, natural law—is extracted from nature but, in so doing, it alienates nature from the relationships that make it natural: it plucks the stick from the tree and pins it to a canvas for investigation. The angularity of Morellet's squares and circle dominate the stick, reducing it to a residue of itself—to a calculation, to a semblance of nature. The ideal becomes the primary object and the material is threatened to be transformed into a mere reflection of it. If art, to use Aristotle's formulation, is an imitation of Nature,[60] here Morellet comments that modern art stems—no pun intended—from schemes to subdue it. Nevertheless, the qualitative aspect of the stick cannot be fully captured by the geometrical. Even if dominated, the presence of the stick declares arbitrariness to the scheme and limitation to the ideal. The play of presence and absence of the shadow is particularly troubling for rectilinearity, since light produces it as a remainder that the geometrical can never quite grasp. If "geometry" is literally the "measure of the earth," the form of reason necessary to surveillance, then *Geometree No. 51* points to the fact that transforming the earth into a manageable form of reason will remain troubled by the particularity of the earth itself.

As Nietzsche famously reminds us, there is madness too in Ellicott's parcellation of Tonawanda Creek. Nietzsche describes Apollo "as the magnificent divine image of the *principium individuationis*, whose gestures and gaze speak to us of all the intense pleasure, wisdom and beauty of 'semblance.'"[61] Apollo fragments the whole, creating an *appearance* of truth in order. As Nietzsche notes, "The innermost purpose of a culture directed toward semblance and measure can only be the veiling of truth."[62] The adherence to an apparent truth that veils the truth—to, say, property in place of the earth—Nietzsche says, works against the Will. "The more degenerate the Will is, the more everything fragments into individual elements."[63] In contrast, "Nature expresses itself with its highest energy in Dionysiac intoxication… [I]t binds individual creatures together again, and it makes them feel that they are one with each other." Both an "enormous *horror*" and "blissful ecstasy" might arise whenever a breakdown of the *principium individuationis* occurs, but if the Will is not prepared, intoxication becomes madness. The image-worship of Apolline cultures—such as ours—have as their "sublime goal" the "ethical demand for *measure*." But, Nietzsche notes, "It is only possible to demand measure where measure and limits are held to be *knowable*." "γνῶθι σεαυτόν" the motto atop Apollo's oracle at Delphi Reads, but "μηδὲν ἄγαν." Know Thyself. Not Too Much.[64]

[59] AKG (1984). *Geometree. No. 51. https://buffaloakg.org/artworks/19849-geometree-no-51*
[60] Aristotle (2018). *Poetics*. New York: Norton
[61] Nietzsche (1999 [1872]). *The Birth of Tragedy*. Cambridge: Cambridge University Press: 17
[62] *Ibid.* 128
[63] *Ibid*. 123
[64] *Ibid*. 128

Ellicott's survey that subdued the frontier of Western New York into mortgageable units helped to establish an infrastructure every part as fundamental to the future of Buffalo as Wilkeson's pier. It is also my contention that Ellicott's was an excessive reason. And the more he forced himself into believing in the apparent Apolline truth he had created, the more his degenerate Will began to fail him. The veiled, repressed truth—the particularity of the crenellations of the creek, like the *qualitas* of Morellet's stick—forced its way back into view. I may be wrong, but I can think of no other way to explain the fact that shortly after his retirement, Ellicott's health deteriorated rapidly. His physicians advised him in 1824 to seek treatment in New York, where doctors deemed he was suffering from "severe mental depression as well as physical breakdown."[65] He was encouraged to enter the Bloomingdale Insane Asylum, a pleasant-seeming manor in Upper Manhattan where Columbia University now stands. There, according to Chazanof, "His life had become a twisted world of tormented thoughts, whirling confusion, and deep moroseness. Occasionally, his mind would flash back to the rich and warm moments of the past, but the blackness of the present would soon overwhelm him once again." My supposition is that the timeline was not nearly so clear cut as this. Indeed, I sincerely wonder—as Ellicott snuck away from his handlers into a closet in the heat of late August 1826, tying one end of a handkerchief around a dowl and the other around his neck[66]—whether, while he hung, he thought of being knee deep in a swamp in township 11, range 2, looking down at trigonometry tables to figure out how to draw a straight line through the wind.



Ellicott's work may have drove him to chaos, but it became the truth—the Nature—of New York State. The annihilation by Ellicott's grid, for the sake of speculation, of the particular history, quality, and dynamism of the land mediates all scientific study of the region. There is no penetrating deeper than this into some primordial history about which pure ecological statements can be made. Studies of ecosystems or social-ecological systems cannot measure this political history as a calculable force to be included in is models. Instead, the study of such ecologies are *mediated* by this history. This forces us to reject their truth as nature and inquire into how their apparent truth—their semblance—operates historically and politically to consolidate power.

§7 – *Concrete Central*

[65] Chazanof (1970): 207
[66] *Ibid*. 208

Crossing over the old CSX railroad bridge from Red Jacket Park, you find yourself on a small peninsula carved out by the Buffalo River doubling back on itself. At the river's edge sits the sprawling mammoth concrete massif known as Concrete Central. The grain elevator was built during World War I, completed in 1917. It was, at that time, the largest grain elevator ever built, capable of handling an unfathomable 4.5 million bushels of grain at any one time—a bushel being about the amount of grain a peasant could carry in his arms. It would take a line of bushel-carrying peasants a thousand miles long to fill these furrowed towers. For fifty years, it was filled and emptied countless times, pumping Midwest grain across the globe according the rhythms of the growing season—and the market. Operation ceased in 1966, and by 1975 the building was totally abandoned. Over the past half century, the world has filled back in around it. One approaches the east facing side of the building, and there is a large meadow sweeping toward it, full of mugwort, goldenrod, and mullein. One's footsteps crunch, the ground here being entirely composed of cinder and steel slag. The compressed gas facility across the river emits a constant shrill (the company's motto is "Gases for Life"). One can cut into the meadow toward a moody grove of aspen—an unusual tree to find here—surrounded by hearty stands of buckthorn, which are a staple of postindustrial landscapes in this region.[67] Cresting a small hill, you find a congress of tall cottonwoods and a number of box elders. A lone wizened chokecherry. Moody old willows line sections of the river. There must be a roost atop the elevator, for there are always vultures swirling—haunting—over atop the elevator's rusted out headhouse. Geese squawking constantly, and white-tailed deer always rustling. I have seen beaver, fox, hawk, fisher, mink, muskrat, rabbit, turkey, turtle... A coyote makes an occasional appearance.

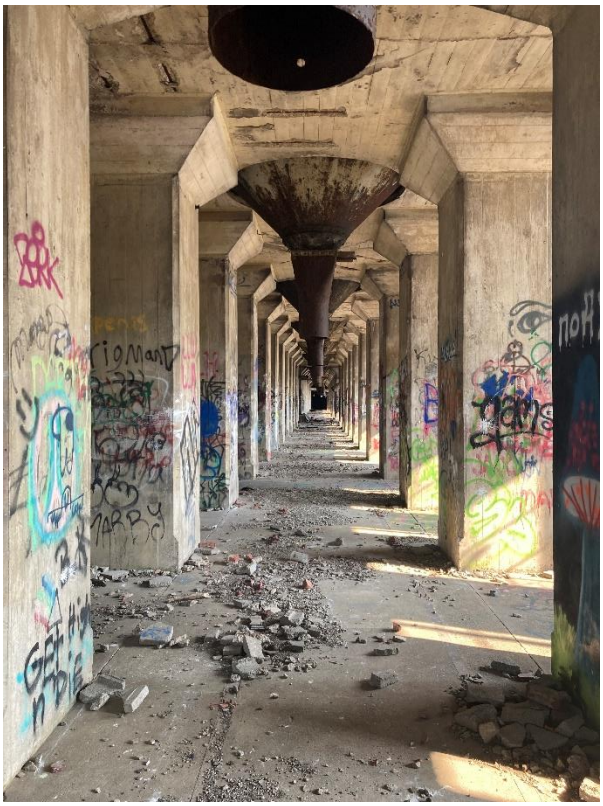
[67] D. Spiering (2019). *Brown Fields and Old-Fields: Vegetative Succession in Post-Industrial Ecosystems of Western New York*. PhD Dissertation in Geography: SUNY Buffalo

Along this stretch of river, people fish for catfish, bass, and trout, occasionally something bigger, like a muskie or walleye. But this is not a public area. It is an abandoned wasteland. If you see anyone here, it tends to be a group of young urban explorers looking to graffiti the elevator or smoke a joint, or both. It is the kind of marginal postindustrial space that Lynda Schneekloth—my other mentor here—describes in an astute and moving article on the Buffalo River. Lynda is a professor emeritus of urban and regional planning at SUNY Buffalo is as wise as she is brilliant. She has an intuitive sense—borne of a lifetime of integrity-filled work—of how to re-conceptualize and re-imagine destroyed landscapes as places of home and belonging. This is evident in her writing about the river:

> There is a wildness in the Buffalo River and its messy shoreline. This is a wildness that attracts and repels because it is a reflection of those parts of human culture that we repress and seek to eliminate. But we need spaces for illicit and unsanctioned activities; many people need to break out of socially accepted norms, especially young people and those on the margins of legitimate society. The spaces of disorder not only permit a kind of retreat, recklessness and abuse, they sanctify it in their own state of wildness. The Buffalo River is generous and permissive: its unruliness is an important condition for human life…[68]

Lynda speaks here of a postindustrial wildness. This landscape is a remnant of industrial destruction that—having outlived its industrial usefulness—has no frame of reference in contemporary urban life. It is illegible. It represents the transformation of Ellicott's wilderness back into a wilderness. And like any wilderness, Lynda praises this postindustrial one, realizing that it, in fact, serves as an expression of unruliness that besets any and all human life. Yes, *Anthropos*: people live and die in places. The river's generosity and permissiveness, the landscape's unruliness: these are necessary places where grief and pain can be felt and expressed. The inassimilable parts of us require them. Beyond the grid, these are places that elicit the Dionysian forces of reunition and tolerate both the ecstasy and horror that reunition provoke. Lynda's humanism—her humanity—requires that there be places capable of witnessing and dispelling the inhumane urges that are part of human life. This is belonging.

[68] L. Schneekloth (2007). "Unruly and Robust: an Abandoned Industrial River" In K. Franck & Q. Stevens (Eds.) *Loose Space: Possibility and Diversity in Urban Life*. New York & London: Routledge, 262.



There is currently an active campaign to restore—in this case, read: gentrify—this stretch of the river, especially by making it more accessible to suburbanite kayakers and hikers through the development of the Buffalo Blueway and Greenway, respectively. The river has already been made proper at Canalside. Additionally, CSX is currently entrusting the land at Concrete Central to the Buffalo Niagara River Land Trust, but their plans for it remain undisclosed. Its fate is still—in all senses of the word—speculative. At least for now, the place remains generous and permissive.

Only a generation or two ago, this was a barren toxic place. Just upriver from this site was Republic Steel and—the most toxic plant in the region—Buffalo Chemical, which produced most of the artificial indigo for the country's iconic blue jeans of the 1960's and 70's. The factories have both been gone now for decades and much of the toxic residue dredged and reburied elsewhere. The site was declared an "Area of Concern" under the 1972 Great Lakes Water Quality Agreement, which set out to restore the 43 most toxic sites throughout the Great Lakes basin, so there have been continued efforts to restore the river (more on this in Chapter 4). For a person my age—born shortly after deindustrialization—this partial resuscitation makes it exceedingly difficult to imagine the height of Buffalo's industrial era. It is even more difficult to imagine this as a pre-European landscape. I am tempted to call it a pre-European ecology or ecosystem, but—even though "landscape" is still weighty with European conceptuality—the scientificity and contingency of these other terms assigns to the historical place something that demands caution. I have come to doubt whether these words are even appropriate to postindustrial sites such as this. Definitions of "ecosystem" often insist that it is a volumetric or

areal concept,[69] but I am not so sure this is how relations work exactly; perhaps not everything is of the same kind of relation by sheer dint of its shared proximity. Regardless, the difficulty of imagination is not only mine. The histories that press in upon us in this scene are extraordinarily difficult to recognize, for the elements they contain are—by anyone's account—"natural." These cottonwoods and these coyotes, this river and this lake, this wind and this ground… are these not what this world has always been made of? Are these elements not natural? How can it be that a cottonwood then is different than a cottonwood now? And yet.

I have been to this site hundreds of times over the past several years. It is one of the sites along the Buffalo's waterfront in which my project is rooted. So many visits distill research down to very basic questions: what *is* this place? What *was* this place? What will this place become? It is more of an epistemological than ontological inquiry: rejecting that it finally *is* this or that, my inquiry is into how this place has become naturalized through certain ways of seeing and knowing it. I have become especially interested in understanding how ecological conceptuality gets enfolded into and endorsed by various social forces seeking divergent geographical and economic paths. While my own analysis is empirical, it is not scientific and does not purport to knowledge. At best, it is "interpretation," as Adorno speaks of it: the central activity of what he calls "natural history." Pointing to Benjamin, he notes, "interpretation presupposes the decay of systems. Moreover, inasmuch as those systems contained any truth, that truth has now—if it has not evaporated entirely—retreated into the details, into the individual parts of the system, and now forms the object of study of interpretation." Interpretation is what is left of philosophizing after system-building is rendered an errant, even quixotic, project. Whatever is left of that project surrenders to the details, and it is in these details that one finds the historical trends and tendencies. The particularity of those details offer extraordinary insight into what the system purported—into the totality it wished to claim.

As soon as I began delving into the particular details of this postindustrial landscape, I quickly realized that everything I thought I knew about its history and ecology were simply wrong. My general assumption—and this is the general idea that most people in the area have—is that this is place is a symbol of resilience. After the devastation wrought by industrialization, the ecosystem has revived itself. *Natura rediit*. Or, alternatively—according to local environmental non-profits and the Army Corps of Engineers— with good environmental regulation, restoration, and management, nature has returned under the watchful eye of experts and authorities. One has to admit that it does appear to be the case. But the ecological narrative of resilience and restoration does not stand scrutiny. Japanese knotweed was the first to indicate this to me. Ecological restorationists revile the plant as a "noxious invasive weed." But in what sense is it invasive? In the era of high economic botany, a doctor for the Dutch East Indies Company snatched it from the hills of Nagasaki and introduced to the west, hoping it would bring him wealth, whether as a garden ornamental, medicinal, or livestock fodder. Japanese knotweed is a volcanic ruderal plant, its roots adapted to emerge through scree and solidified magma. In Japan, the plant indicates ecological disturbance; it *is* a sign of a resilient landscape. Knotweed is a first succession plant. It colonizes bare ground and eventually the center of a colony opens up, creating a niche for second succession plants. But in the postindustrial west, this adaptive process it totally out of joint. Well-suited to concrete and asphalt-ridden soils, its omnipresence in postindustrial landscapes points to the fact that industrial society has had the

[69] For Example, K. Weathers, D. Strayer & G. Likens (Eds.) (2021). *Fundamentals of Ecosystem Science, 2nd ed.* London & San Diego: Academic Press, pg. 3: "An ecosystem is the interacting system made up of all the living and nonliving objects in a specified volume of space."

impact similar to that of a volcano. Only, absent its plant community, the plant simply does what it does, attempting to yield life where life was destroyed. Nowhere in the details of the knotweed does the ecological framework of invasion or restoration help to explain the persistence of this plant throughout the postindustrial landscape. Nowhere do invasion ecologists understand that the history of industrial destruction mediates the proliferation of the plant.

More importantly, the framework of resilience actively obscures the postindustrial scene, since it appears to offer a scientific explanation that begins by assuming that what we see is part of a natural cycle. Since nature has proven resilient, the industrial transformation of Buffalo's waterways can be taken to be a form of natural disturbance. And this mistake does real political and economic work on a shoreline where ecological restoration is a necessary precursor to real estate speculation. But the presence of knotweed undermines the entire narrative. Its presence indicates ecological rupture. It points to a history of destruction, well beyond the limits of ecological explanation.

Aerial photograph of the river during the industrial period offers further qualitative evidence of this destruction. The first photograph is from 1983, and it nicely demonstrates the state of the landscape in the early deindustrialized period. We are looking to the north-northwest over the Buffalo River with the edge of downtown in the upper middle section of the photo. Lake Erie inside the breakwall is barely visible to the left. On the river peninsula left of center (on the south side of the river) Concrete Central stands prominently in front of a large lawn. Decommissioned for almost 20 years at the time of this photo, the extensive rail yard that was in front of it has already turned to grass. Across the bridge that cuts across that lawn is where Red Jacket Park currently is. Just upriver from that, on the smaller peninsula is the notorious section of the Buffalo Allied Chemical Factory known as Area D. This is where the chemical company stored much of its toxic waste. Environmentalists lost the battle over what to do with it, and the Army Corps ultimately edged it with steel pylons and capped the area with clay. Upriver from that is the rest of Allied Chemical. Across the river is the sprawling Republic Steel factory, its slag heaps in the lower left quadrant of the photo. In the upper left quadrant, on the river, one can see Silo City and, above it, the skyway and Outer Harbor. As Margaret asked above, "What species lived here? What ecosystem remnants are left?"

There is a smaller aerial photograph of the Delaware-Lackawanna Bridge just upriver of Area D: Buffalo Chemical is on the right of the river and Republic Steel across it. An oil slick on the river is visible, and indeed this was from the post-war era when the river would regularly

catch on fire. Photographs like this can be found of almost any city across the globe. What I wish to emphasize, for the sake of my argument, is the totality of the physical transformation of the landscape. Every meter has been remade to accommodate commerce and industry. Which is to say that this is not a human-disturbed landscape but a human-destroyed landscape. What we are looking at in this photograph is a moment of abyssal rupture between the region's preindustrial ecosystems and anything that comes after.

§8 – *Destruction is not Declension*

It is a caesura, but the line that picks up afterwards is a totally different poem. But it may still be a poem. As Lynda shows us, this epicenter of destruction can still be a place of grief, love, and belonging. It is a place where non-belongingness belongs: life and death in the margins. And this is yet another lesson from the knotweed. Does knotweed not mourn its loss of relations too? Stretching its rhizomes to fill every bare patch of ground, establishing its colony, and undergoing central die-back with the biological understanding that the plants with which it is primordially entwined will come to occupy the nest it has created? Only once they have settled in the knotweed's nest does the slow succession into a forest begin. Only then can the knotweed pass on in peace until the next volcanic eruption offers it new ground unto which it might contribute life. What anxiety this loss of relations must create. Of course it presses on to find its companions, until it can rest. What longing. Instead, teams of environmentalists seeking to support native species plants don rubber gloves, backpacks full of poison, and an exterminator's eye. The method for killing knotweed is particularly violent and macabre. Knotweed is sometimes called false bamboo, since it has a hollow stem. Those practicing "invasive species management" crouch down to the base of the stem and with a forceful thrust, puncture the stem with an oversized hypodermic needle, injecting glyphosate intravenously into the plant. I have seen demonstrations of this. A group of twenty or thirty onlookers peering over each other's shoulders in anticipation of the injection with that strange sense of foreboding and glee that acts of sanctioned violence seem peculiarly good at conjuring. Sometimes, it succeeds in killing the plant. I am on several online Japanese knotweed groups and threads: mostly homeowners looking to identify and exterminate. The active hatred toward the plant is alarming.

The narrative is that knotweed's aggression drives out native pollinators. In fact, bees adore the knotweed's late and flush of flowers. Stepping into a patch of knotweed in early October, like the one pictured to the left, one can easily lose oneself in the hum and drone. Ecologists remind you that native plants provide multiple and more consistent sources of pollen that extend throughout the season. Invasives tend to provide only punctuated pollination. But there seems to be little understanding that *no plant is native to postindustrial land*. No plant is native to this infrastructure. You cannot simply plant natives in a postindustrial landscape and expect them "restore" a native ecology without considering the physical integrity of the land. Without the plants with which they co-adapted to particular landscapes, the knotweed is left to index histories of human destruction and to grieve its own fate. This makes knotweed an exceptional companion, indeed. I have fallen in love with the plant in the way a student loves a great mentor. It is one of my great teachers here, along with Margaret and Lynda. Pictures of it fill my phone, and my only portraits are with it. Here is one with me at Concrete Central standing in front of knotweed (background) and mugwort (foreground). I interviewed Peter del Tredici for this project. Peter was a senior research scientist at Harvard's Arnold Arboretum and authored an important paper on the history of knotweed's introduction in the United States. He also wrote a field guide called *Wild Urban Plants of the Northeast*,[70] which is full of vernacular urban plants without much heed paid to the distinction between native and invasive. The entry for Japanese knotweed shows a photograph of Del Tredici—the only of him in the text—standing beneath and looking up at the plant, which arches high above his head. He told me that he tried to give the book a subtitle for its second edition: *Plants of the Future*. It has stuck with me. However much glyphosate gets injected into its stems, the future of this landscape includes knotweed. We share this landscape: neither good nor bad—nor ecological fact.

This small dedication to knotweed is also a note meant to signify that a natural history of destruction is not the same as a declensionist environmental history, even if it dwells in the obliterative transformation caused by destruction. There is no lost golden age. As this morality tale about knotweed makes clear, efforts to ecologically restore native landscapes are borderline eugenic. The path backwards is full of the worst kinds of ethnonational atavisms. But a disinclination towards an ethics of autochthony does not mean we are flatly to affirm or celebrate the ruins because life can still be found amongst them. They may be places of love, grief, and belonging, but these are subjective processes. One may feel free in these landscapes, but this does not make them places of freedom. Natural histories of destruction must work to remember

[70] P. Del Tredici (2020). *Wild Urban Plants of the Northeast: a Field Guide, 2nd ed.* Ithaca: Cornell University Press.

the past not in order to return to it but to allow that past to shudder the constraints the present has put on it. I am plagued by something Marx quoted from Henry Lewis Morgan, the late 19th century ethnographer of the Haudenosaunee.[71] Morgan was from Rochester and spent much time in Western NY with his key informant, Ely Parker,[72] trying to learn—and problematically imitate[73]—the lifeways of the Iroquois. In Marx's late writings on the archaic commune he positively quotes Morgan, who called for "a return to the archaic in a higher form."[74] We must return to something more primitive, Marx suggests, but do so as Enlightened, modern, rational people. We must decide on it. What I would want to say is, yes, but, this is not a positive thing. The "higher form" represents separation from and destruction of the earth the bore us. We are condemned to reconstruct a more meaningful world out of whatever is left: this is the hugely political task of belonging. But there is nothing natural or ecological or even all that fanciful about engaging the task. Reunition is ecstasy; it is horror. We are condemned to the higher form.

§9 – *Conclusion: Infrastructuralization*

What we have in Hill's map then is a vision of New York's geography "improved" into an infrastructure for commerce in a settler colony. The title page of Hill's text on the history of waterways and canals in New York begins with two telling quotes, not about canals at all: the first, from George Washington, states that "Commerce and industry are the best mines of a nation." Hill ascribes the second to the canonical German geographer, Carl Ritter: "Commerce is the greatest combiner of all the activities in the world." What I have demonstrated in this chapter is that commerce is not "natural." It requires the production of a physical and social nature that accommodates it. In North America, the settler colonial character of its landscapes is inextricable from these political economic processes. I call this logic infrastructuralization, and it literally overwrites the environmental and social relations that previously constituted the land. Infrastructuralization transforms complex environmental milieux into a nature designed for extraction, trade, and speculation. What I wish to emphasize is that infrastructuralization also requires that the transformation of the physical landscape becomes forgotten but always present. In the Marxist lexicon, this kind of infrastructure—dialectically ideological and physical—has gone by the name of second nature.[75] The method of unearthing second natures—and infrastructures—is, after Theodor Adorno, natural history. This is the topic of my next chapter.

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[71] H.L Morgan (1984 [1851]). *League of the Iroquois*. New York: Citadel Press

[72] See A. Simpson (2014). *Mohawk Interruptus: Political Life Across the Borders of Settler States*. Durham & London: Duke University Press: Ch. 3

[73] See P.J. Deloria (1998). *Playing Indian*. New Haven & London: Yale University Press: Ch. 3

[74] K. Marx (1983 [1881]). "Letter to Vera Zasulich: First Draft." In Ed. T. Shanin. *Late Marx and the Russian Road*. New York: Monthly Review Press

[75] In actual fact, the idea of infrastructuralization comes from Maurice Merleau-Ponty's idea of nature and it relation to "institution," which is based in his reading of Edmund Husserl's idea of *Stiftung*. But that is a long philosophical inquiry that lies beyond the scope of the current investigation. It will be the topic of a future study. See my unpublished essay, P. Campanile (2021). "Instituting Another Landscape: A Preliminary Sketch on the Problem of *Paysage* [Landscape] in *The Visible and The Invisible.*"

Ch. 1 – Toward a Natural History of Destruction as Method

> Laws of nature not to be taken literally, not to be ontologized.
> - Adorno, *History and Freedom*

§1 – *Introduction: representing postindustrial landscapes*

Infrastructuralization connotes an historical process by which pre-modern, pre-imperial environments were negated in order to become legible as Nature through physical transformation *for the sake of* exploitation, commerce, and colonization. This includes the process of naturalization—the way in which environments come to be known and understood as Nature. Such transformations require a taxonomic ordering that represents environments scientifically and aesthetically in ways that make sense—in the instance of the Great Lakes, say—to settler capitalism. All infrastructure is moral, since it implies what land is "good for." It is also representational and ideological, and this can be interpreted in maps and symbolic renderings, but ultimately infrastructuralization has to be interpreted through the physicality of a landscape itself. If infrastructuralization marks an anthropogenic transformation of environments into a medium for commerce, it is also a process of environmental negation. Infrastructure either appropriates, marginalizes, or destroys the environments that precede it. It reorganizes environments to serve another logic. But former environments leave material traces, archival traces, and cultural traces—even if scant.

Natural history is one method by which these destroyed environments can be resurfaced, remapped, and—in some cases—reimagined. In the previous chapter, I attempted to reinterpret Marx's statement that "The bourgeoisie, historically, has played a most revolutionary part." I demonstrated that a key part of this revolution was a total transformation of the physical environment. This revolutionary impact on the physical landscape I am calling destruction. This historical revolution marks an outside to ecological conceptuality. This does not mean that ecological concepts have nothing interesting to say about it. Indeed, I look to ecology often to help explain the quality of this transformation. But destruction is exogenous to ecology. It impacts ecology and its effects can be partially analyzed ecologically, but it is a historical, anthropogenic process that requires historical explanation. When ecology seek to internalize destruction to its concepts, it yields historical contingency to a temporal paradigm internal to ecology. This has the effect of naturalizing destruction and thereby obscuring the violent and racialized forms of dispossession contained therein. By translating destruction into a moment of ecological succession, ecology, in effect, creates a totality. It creates what in Marxist debates would be considered a "closed dialectic."[1] For instance, in the path of resilience, there is disturbance followed by the overcoming of disturbance, resulting in a higher form (greater adaptability). To treat destruction as disturbance, artificially—and ideologically—surrenders destruction to ecological conceptuality. Destruction, I am arguing, is *not* disturbance and cannot be explained within the paradigm of ecological succession.

So much attention has been given over the past century to overcoming the nature/ culture dualism of bourgeois Enlightenment that it has become practically simultaneous to critical thought itself. But this too has become unquestioned truism that flatly explains the violence of European destruction. The critique is both right and wrong. Or, it is only the half of it. The

[1] Most of "Post-Marxism" involves "opening" the dialectic, so there is a vast literature on the topic. I follow Adorno's version of that move in this dissertation. For a clear and insightful explanation, see B. Ollman (2003). *Dance of the Dialectic: Steps in Marx's Method*. Urbana: Illinois University Press.

presumption in the critique of dualism is that we need to overcome bourgeois conceptuality with a holistic way of thought and action that proceeds from relation. Ecology often stands in as this way of thinking. However, this totally misses the historical fact that ecology too has also been harnessed over the past century as a critical tool of bourgeois governance. Despite its potentially radical beginnings in the postwar cybernetic paradigm shift, ecology has matured into a bourgeois science whose aim today is the modelling and management of bourgeois ecosystems for the sake of their persistence. It is also a form of environmental domination, a key driver in the production of space. Moreover, the Anthropocene hypothesis has re-charged the old nature-culture dualism and transmogrified it into a potentially radical form: it insists that humans *are* different from the natural course of things. The point I am trying to make is that both are right, both are wrong; both liberatory, both reactionary. While this dissertation is far more focused on addressing the ways in which ecology, in practice, tend toward the reproduction of violenced landscapes, the point is that these two frameworks are not truth forms that must be decided on once and for all. They are discourses that must be, in effect, dialectically waged against each other.[2] The dualistic tendency negates the totalizing tendency of ecology, ecology negates the taxonomic tendencies of dualism. Each offer insight, each are limited. These are not the only thought forms: the resurgent interest in an animistic form of vitalism may yet be another structuring and negating approach.[3]

Through the concept of resilience, it is possible to trace the ontologization and metaphorization of ecological conceptuality into bourgeois morality, urban planning, governance, academic thought, scientific management, psychology and elsewhere. It almost always prioritizes management over politics. The ontologization of the ecological idea of disturbance obscures prior and future natures. What resilience has made most resilient is bourgeois universalism. A natural history of destruction functions as a kind of forensic approach to landscapes that details moments of rupture in order to resurface the otherness of premodern landscape and to denaturalize the ecological structures and processes by which contemporary landscapes have been transformed into and managed as infrastructures. The suggestion is that destruction is not necessarily erasure but instead a kind of production of invisibility, which when made visible again, penetrates the new context with a different meaning. Among other things, the method of natural history efforts to make historical ecologies visible. It also demonstrates how social forces must continually render those historical ecologies invisible.

This chapter develops a theory and method of a natural history of destruction. It clarifies what is meant by "natural history" and "destruction" while also offering a brief intellectual history of the ascendency of disturbance in ecology and its transformation into a way of seeing. While in my empirical chapters, I am more concerned with the ontologization and metaphorization of ecological concepts in urban planning and governance, I offer an example of how the ontologization of disturbance grounds new materialist thinking, with whose approach to Anthropocene landscapes I contrast my own.

While the qualitative social scientific methods I have employed throughout my dissertation are standard—primarily: interviews, participant observation, and archival research—they only matter insofar as they part of an iterative landscape-based approach to fieldwork.

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[2] I had a wonderful professor at SUNY Buffalo, David Johnson. After a long talk on Hume and Kant, I asked him where he came down on the debate. He said, no: the work is to Kant Hume and Hume Kant. This is what I am getting at here. These discourses can be used at cross-purposes, not to wield truth but in an attempt to execute what one might call a political ecology.

[3] See, e.g., A. Ghosh (2021). *The Nutmeg's Curse: Parables for a Planet in Crisis*. Chicago: Chicago University Press.

Returning to the same four sites over and again—hundreds of times over three years—demands its own set of introspective subjective practices, including physical, psychological and embodiment practices, as well as a variety of observational and descriptive practices. In conjunction with these practices, I developed a certain kind of intuition and appreciation for these places that helped to overcome any lingering sense of being an "objective observer." To the contrary, my iterative fieldwork forced me to realize that I was very much a denizen and inhabitant of this very postindustrial landscape. It being my milieu, there are doubtless aspects of it that became unconscious to me as well, perhaps repressed. However, the purpose of the ethnographic and archival methods that I employed throughout my time was to resituate own conscious and perceptive capacities in these landscapes. By interrupting learning with walking and walking with learning, histories became visible. Coming to know these landscape histories and what for now I will call their ecologies, I came to learn what remained legible of those histories and ecologies and how to bear witness to them. I have also come to realize that while shards of history abound—often in the "natural" elements of the landscape—many aspects of landscape history are totally invisible to observation and analysis. In some respects, this apparently total invisibility—this moment when the specters of the past cease haunting—became the most troubling. In the postindustrial landscapes that constitute my field sites, it is as difficult today to imagine their pre-settlement ecologies as it is to imagine the height of industry. I was born in 1981, a few years into Buffalo's deindustrialization period. By the time I became conscious of these landscapes at all, most of the buildings and traffic were long gone. I have relied on others' accounts to inform me about buffalo during its industrial height, but there is almost no record of its pre-settlement ecology. What records there are, of course, are suspect. Precious little work has been done reconstructing the historical ecologies of the Great Lakes—and especially the lower lakes (Erie and Ontario), which were settled first.

Since landscape itself is indistinguishably material and representational,[4] and since representations of landscapes are instrumental to our understanding them, I rely heavily—as my introduction makes obvious—on visual analysis and interpretation as well. I offer many images. They are not meant to be neutral or merely descriptive. Each—or sometimes each group—requires interpretation. But these representations of landscape are not the landscapes themselves, which exist without a clear framing device. Postindustrial landscapes are incredibly rich and confusing places to study, since what is present—even and especially in its most natural-seeming—is an artifact of some indistinguishable mixture of anthropogenic and non-anthropogenic processes. This is made additionally confusing by the fact that landscape itself is

[4] This statement, admittedly, requires an entire study unto itself. Tsing, in her reading of the Cosgrove/ Olwig landscape debates of the 1990's, firmly comes down on the side of Olwig—or at least on her reading of Olwig. In conversation with me, she said her interest was in "bracketing" the symbolic aspects of the landscape that Cosgrove centers in his study. Her interest in the—after Olwig—the "substantive" landscape, or the materiality of the landscape. Cosgrove and Olwig are extremely illuminating foils and that both tell us something crucial about the landscape. In my reading, *neither* tell us that it is possible to separate the substantive and symbolic—what I have rendered "material and representational"—aspects of the landscape. The cultural landscapes debate covered many responses and counter-responses. See most centrally, D. Cosgrove (1998). *Social Formation and Symbolic Landscape*. Madison: University of Wisconsin Press; S. Daniels & D. Cosgrove (1988). "Iconography and Landscape" In Eds. D. Cosgrove & S. Daniels. *The Iconography of Landscape*. Cambridge, UK: Cambridge University Press; K. Olwig (2002). *Landscape, Nature, and the Body Politic: From Britain's Renaissance to America's New World*. Madison: University of Wisconsin Press; K. Olwig (1996). "Recovering the Substantive Nature of Landscape." *Annals of the Association of American Geographers* 86(4): 630-653. Unfortunately, I do not take up the full problem of landscape as it pertains my research in this dissertation.

largely a contested concept and, more than that, a contested object of analysis.[5] For instance, in my study, I frequently have to make the impossible decision of whether and how to conceptually or methodologically differentiate ecosystems from landscapes. Different theories of landscapes—e.g., one for which "landscape" and "ecosystem" are synonymous—require different methods and generate different kinds of knowledge about that landscape. That I am studying urban postindustrial landscapes already signifies that my object of analysis has certain historical and theoretical parameters that require further investigation. My project critically engages ecological forms of urbanism.

§2 – *Is the City an Ecosystem?*

The "ecological approach to the city" dates back at least a century[6] to Park and Burgess's 1925 classic, *The City*, which became the foundational text for the Chicago School and the field of "human ecology" it produced.[7] Park and Burgess's urban ecology posed that cities are environments like any others, operating according to predictable laws of growth and differentiation, and decay cycles. After Darwin—or the Spencerian reading of him—they posed that competition for dominance proved the driving force in the development of urban structure and function. As Park noted in an article from a field-defining article, "Human Ecology," in 1936, "The principle of dominance operates in the human as well as in the plant and animal communities. The so-called natural or functional areas of a metropolitan community…each and all owe their existence indirectly to the factor of dominance, and indirectly to competition." Pertinent to the current study, he adds, "The area of dominance in any community is usually the area of highest land value."[8] Human ecology, it is important to note, was not a fringe science or worldview. It applied the scientific management strategies used for natural resources on to the city, and it was executed in municipal governance, real estate, city planning, and so on. The idea that a "close correspondence existed between patterns of human life in urban environments and patterns of plant and animal life in the natural world" shaped the scientific rationale for segregation, urban renewal, and other mainstays of 20th century urbanism.[9] The viewpoint remained remarkably salient through the postwar period—no doubt buoyed by cybernetics—so that in 1968, Roderick McKenzie[10] could flatly naturalize race, class, and political economy, in a chapter called "Cultural and Racial Differences as Bases of Human Symbiosis." There, he states, "Plants live in symbiotic relations by virtue of differences in species. Human beings effect

[5] Indeed, a reassessment of the classic landscape debates that fractured geography a century ago is long overdue. In some very important ways, my approach to landscapes still relies on aspects of Sauer's classic: C. O. Sauer (1963 [1925]). "The Morphology of Landscape." In Ed. J. Leighly. *Land & Life: A Selection from the Writings of Carl Ortwin Sauer*. For a response and critique of Sauerian landscape that attempted to define the discipline of geography scientifically against Sauer, see R. Hartshorne (1939). *The Nature of Geography*. Lancaster, PA: the Association of American Geographers: esp. Part V.

[6] For an excellent intro, see M. Gandy (2022). *Natura Urbana: Ecological Constellations in Urban Space*. Cambridge, MA: MIT Press, Introduction

[7] R. Park & E. Burgess (2019 [1925]). *The City*. Chicago: University of Chicago Press

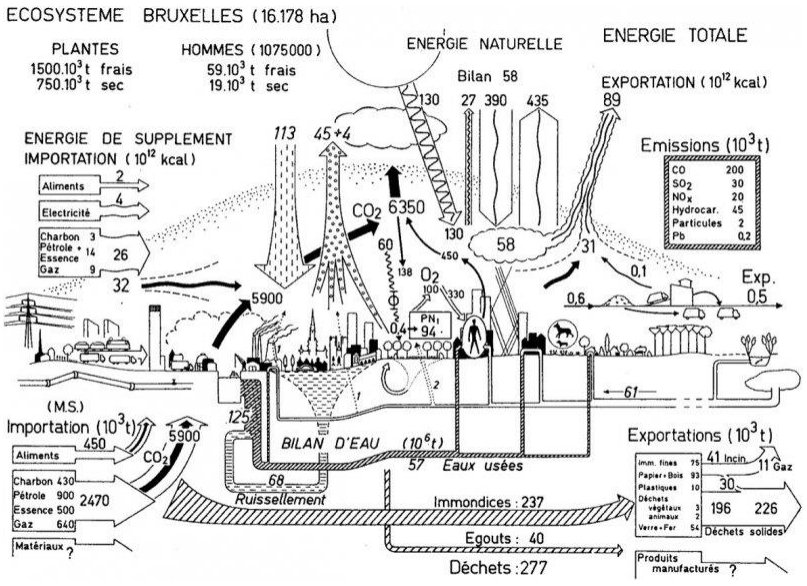
[8] R. Park (1936). "Human Ecology." *The American Journal of Sociology* 42(1): 1-15

[9] The quote is from Jennifer Light's account of this, which is excellent: J. Light (2009). *The Nature of Cities: Ecological Visions and the American Urban Professions, 1920-1960*. Baltimore: Johns Hopkins University Press: 3, 37.

[10] Roderick McKenzie is, in some editions, listed as a co-author of *The City* and has a chapter in it, "The Ecological Approach to the Study of the Human Community."

similar sustenance relations within their own species by means of division of labor."[11] Much of the literature tends to treat the Chicago school as using ecological metaphors or analogies to think about the city[12] but this is not exactly right. In the likes of Park and McKenzie, there is no moderating comparison: cities *are* natural environments that follow the same laws as any other environment. The analysis is not through analogy but through, what I am calling elsewhere, ontologization—the process of turning contingent historical tendencies into permanent natural law that, in this case, provides a foundation for understanding urban form and process.

By the early 1970's, as Odum's trophic energy flow diagrams became a new quantitative basis for the burgeoning field of ecosystems ecology, urbanists began applying this more scientific method to the study of cities. Like the Chicago school, this was also an ecological approach to the city, but the Odum-inclined approach more explicitly conceptualizes "the city as an ecosystem in itself."[13] Paul Duvigneaud, a pioneer in the field,[14] developed his "*Ecosysteme Bruxelles*" ["The Brussels Ecosystem"] and, more generally, his 1974 *La Synthèse Écologique* [*The Ecological Synthesis*], in an attempt to transform all activity—anthropogenic and non—into units of energy in time. Duvigneaud brings the complex relationship between humans and natural action under the control of civilized science by way of measure and model. His urban ecology purports to omniscience by translating quality into quantity of urban biomass. Everything is energy, so if it cannot be measured, it does not exist in the model. Duvigneaud set the stage for contemporary urban ecology, which, as Gandy notes, "has been marked by repeated attempts to fuse the social and biological sciences."[15] In its most contemporary form, this tendency in urban ecology is most evident in two fields: (1) in landscape ecology and urban design, exemplified by the work of Richard Forman and Marina Alberti;[16] and, (2) more quantitatively, in the Baltimore



contemporary urban ecology, which, as Gandy notes, "has been marked by repeated attempts to fuse the social and biological sciences."[15] In its most contemporary form, this tendency in urban ecology is most evident in two fields: (1) in landscape ecology and urban design, exemplified by the work of Richard Forman and Marina Alberti;[16] and, (2) more quantitatively, in the Baltimore

[11] R. McKenzie (1968). *On Human Ecology*. Chicago: University of Chicago Press, 170

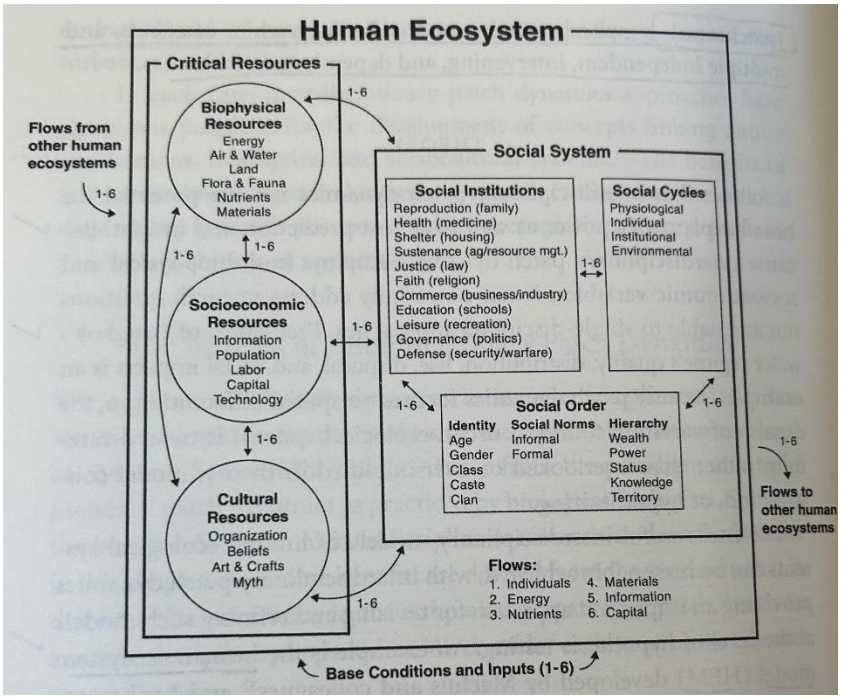
[12] Even Gandy (2022) and Light (2009) do so. Also see E. Gaziano (1996) "Ecological Metaphors as Scientific Boundary Work: Innovation and Authority in Interwar Sociology and Biology." *American Journal of Sociology* 10(4): 874-907

[13] Gandy (2002): 20-1

[14] See J. Lachmund (2017) "The City as Ecosystem: Paul Duvigneaud and the Ecological Study of Brussels." In Eds. R. de Bont & J. Lachmund. *Spatializing the History of Ecology*. New York: Routledge

[15] Gandy (2022): 22

[16] See especially: R. Foreman (2014). *Urban Ecology: Science of Cities*. New York: Cambridge University Press; W. Dramstad, J. Olson & R. Foreman (1996). *Landscape Ecology Principles in Landscape Architecture and Land-Use Planning*. Washington DC: Island Press; M. Alberti (2009) *Advances in Urban Ecology: Integrating Humans and Ecological Processes in Urban Ecosystems*. New York: Springer; M. Alberti (2016). *Cities that Think Like Planets: Complexity, Resilience, and Innovation in Hybrid Ecosystems*. Seattle: University of Washington Press. For foundational texts in this vein, see A. Spirn (1984). *The Granite Garden: Urban Nature and Human Design*. New



School of Urban Ecology: especially in the work of Steward Pickett and Mary Cadenasso.[17] To say only a word about the latter, the Baltimore School vision is analytically and conceptually compelling. They are invested in highlighting the spatial heterogeneity—the "patchiness"—of urban ecosystems, which are greatly impacted by "investment and disinvestment,"[18] whose effect the school tries to measure. The Baltimore School has also developed interesting uses of spatial imagery to emphasize the granularity an unevenness of the urban patch mosaic.[19] Ultimately, theirs is a fully incorporated social-ecological system, not altogether different than Duvigneaud, which should be unsurprising given the common root of Odum. Indeed, if it was drawn out more pictographically, their "Human Ecosystem" diagram would look very much like Duvigneaud's "*Ecosysteme Bruxelles*." This is not at all to suggest a lack of sophistication about their work. I have met several of the scientists working on the Baltimore School project, and they are formidable intellects and caring people whose work is politically justice-oriented. Their approach is formative and deserves a careful read, especially since they do attempt to bring race and historical "legacy" into their analytic. Nevertheless, when I asked Pickett about how historical legacy fit within ecosystems thinking, he referred me to Holling's adaptive cycle, suggesting that history follows the same pattern as disturbance ecology.[20] This ontologization of disturbance ecology into a theory of the

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York: Basic Books; C. Hough (1995) *Cities & Natural Processes: a Basis for Sustainability*. London & New York: Routledge; I. Douglas & P. James (2014). *Urban Ecology: an Introduction*. London & New York: Routledge. For some contemporary engagements, see, for instance K. Orff & SCAPE (2016). *Toward an Urban Ecology*. New York: Monacelli Press; S. Wakefield (2020). *Anthropocene Back Loop: Experimentation in Unsafe Operating Space*. London: Open Humanities Press

[17] All of the Baltimore School of Ecology's research is published at https://baltimoreecosystemstudy.org/. They have published several interesting collections framing their work. Most pertinent to the current study are: S. Pickett, M. Cadenasso, M. Grove, E. Irwin, E. Rossi & C. Swan [Eds.] (2019). *Science for the Sustainable City: Empirical Insights from the Baltimore School of Urban Ecology*; V. Marshall, M. Cadenasso, B. McGrath & S. Pickett (2019).; M. Grove, M. Cadenasso, S. Pickett, G. Machlis, & W. Burch (2015). *The Baltimore School of Urban Ecology: Space, Scale, and Time for the Study of Cities*. New Haven & London: Yale University Press;

[18] Grove *et al.* (2015): 73

[19] See especially, *Patch Atlas: Integrating Design Practices and Ecological Knowledge for Cities as Complex Systems*. New Haven & London: Yale University Press

[20] Indeed, this was an important moment of realization for me. Conversation with the author, 5 Jan 2023. I attended a Fundamentals of Ecosystem Ecology workshop at the Cary Institute, Jan 5-14, 2023, which is where I met Pickett.

historical city is precisely the kind of account which I seek to complicate. Pickett's response proves Gandy's point that "The systems-based approach to urban ecology is marked by an emphasis on the measurable characteristics of urban space, and this reliance on various forms of quantification within a broadly technomanagerial analytical framework allows a segue into contemporary concerns with ecological resilience."[21] Gandy also notes that urban ecology exhibits an "additive" form of disciplinarity that seeks a "higher form of epistemological unity [that] remain[s] rooted in a fundamentally positivist scientific agenda that struggles to make sense of historical change." My work echoes Gandy's thesis.

Given this, how does one make sense of David Harvey's famous and oft-quoted statement that "in a fundamental sense, there is in the final analysis nothing unnatural about New York City…"[22] Or, in another version: "from my perspective there is nothing 'unnatural' or 'inauthentic' in what we do (*even New York City is to be construed as an ecosystem*)…"[23] Harvey is a principle Marxist critic of positivist scientific agendas, and he has carefully considered the problem of historical change. Does Harvey's approach challenge the epistemological unity of urban ecology? To give a bit more context, Harvey adds that

> To term urbanization a 'created ecosystem' may sound somewhat odd. But human activity cannot be viewed as external to ecosystemic projects… Human beings, like all other organisms, are 'active subjects transforming nature according to its laws' and are always in the course of adapting to the ecosystems they themselves construct. It is fundamentally mistaken, therefore, to speak of the impact of society on the ecosystem as if these are two separate systems in interaction with each other…

Harvey is clearly criticizing the aforementioned dualistic bourgeois metaphysics that bracket "society" from "nature." He is also, in these essays, writing against the persistence of this modernist metaphysic among a certain strand of socialist thinkers and activists. As Bruce Braun emphasizes, Harvey's "inversion of bourgeois ideologies" in this statement indicates the larger point that "for Harvey, *all* nature is urban nature," which, Braun notes, has important ethical and political ramifications.[24] But I would also emphasize Harvey's qualifying statements here. He says, *in a fundamental sense*, there is *in the final analysis*, nothing unnatural about New York City. Why does he emphasize this so strongly? Harvey—at least at some level—realizes that such a position may *only* be true in a fundamental sense, or in the final analysis: at a general enough scale, yes, we are all part of the same system. But at a more granular level, it does not produce, to use another of Harvey's terms, a "geography of difference."[25] These qualifiers suggest that, for Harvey, this view also suggests an undialectical ecological ontology that at some gross level flatly acknowledges that "we are all connected." Empirically, such a realization may be insightful and instructive. *Or*, it may be obfuscating. As my brief history of human and urban ecology makes clear, considering social and urban systems as ecologies *also* falls within

[21] Gandy (2022): 26

[22] D. Harvey (1993). "The Nature of Environment: the Dialectics of Social and Environmental Change." *Socialist Register* 29: 1-51

[23] D. Harvey (1999). "Considerations on the Environment of Justice." In Ed. N. Low. *Global Ethics & Environment*. London & New York: Routledge, ch. 6 (my emphasis)

[24] B. Braun (2006). "Towards a New Earth and a New Humanity: Nature, Ontology, Politics." In Eds. N. Castree & D. Gregory. *David Harvey: A Critical Reader*. London: Blackwell, Ch. 10

[25] See D. Harvey (1996). *Justice, Nature, and the Geography of Difference*. London: Blackwell

the domain of bourgeois hegemony. On the other hand, a certain reading of the Anthropocene literature suggests a radical way in which to understand humans as being fundamentally *outside* the laws of ecosystems.[26] Again, part of the project of a natural history of destruction is to put these two tendencies in dialectical tension in a way that resists the metaphysical supremacy of one over the other. This tension helps to better frame the paradoxical situation of modernity: we are both inside of *and* outside of nature. This dissertation efforts to demonstrate one side of this coin in particular: cities are *not* ecosystems. It emphasizes the fact that cities do not at all follow the laws of ecological succession. Moreover, to assume that they do, I argue, results in an ethico-political quandary such that the history of bourgeois destruction becomes "natural." This naturalization looks to guarantee a bourgeois hegemony to-come. Nowhere is this clearer than in the ontologization of disturbance ecology, which I detail below.

§3 – *Some Elements of Natural History as Method*

This dissertation takes its title from WG Sebald. For the English version of his 1997 Vienna lecture, "Aerial War and Literature"—*Luftkrieg und Literatur*—he chose the title *On the Natural History of Destruction*.[27] His lecture addresses the unnerving silence of German literature following the allied bombing campaign of Germany at the end of WWII. Where German writers did speak of the bombings, they tended to obscure the experience by aestheticizing it, which made impossible an investigation into the catastrophe that actually occurred, whether the nature of that investigation be technical, historical, collective, psychological, or experiential. In 1982, Sebald published a precursor to this lecture, "Between History and Natural History: On the Literary Description of Total Destruction," which contains a footnote on Lord Solly Zuckerman. Sebald describes Zuckerman as the scientific adviser on air warfare strategy to the British government and a critic of the bombing campaign's "strategy of wholesale destruction." Once Zuckerman had seen the effects of the air raids on German cities himself, he agreed to write an account entitled "The Natural History of Destruction," but he never carried out the project.[28] Zuckerman's title would have appealed to Sebald on a number of levels, as it names the critical theoretical project with which Sebald was in direct conversation. This project was first outwardly named in Theodor Adorno's 1932 lecture, "The Idea of Natural History." As I lay out below, I believe that a "natural history of destruction" describes the basic procedure of Sebald's entire *oeuvre*, so long as you understand destruction to have certain velocities. If the *Luftkrieg und Literatur* marks a catastrophist approach, concerned with total and immediate destruction, *The Rings of Saturn* marks a uniformitarian approach. The latter examines long, slow, almost imperceptible forms of destruction that happen over decades and centuries. My dissertation is concerned with this uniformitarian approach to destruction. It does not seek Sebald but it seeks what he seeks in this that text.

A full investigation of the of the project of natural history will be the effort of a future volume. Here, I will outline some of the key methodological, epistemological, and theoretical points that have inspired my dissertation.

When speaking of natural history, I am not *not* referring to that period of pre- and proto-scientific inquiry that emerged with relation to European empire, capitalism, and the Enlightenment—especially in the 17th and 18th centuries. This moment of natural history,

[26] I discuss this more in my conclusion.

[27] W.G. Sebald (1999). *On the Natural History of Destruction*. New York: Modern Library

[28] W.G. Sebald (2005 [1982]). "Between History and Natural History: On the Literary Description of Total Destruction." In *Campo Santo*. New York: Random House: 213-4

especially in its will to universal taxonomic classification, its entwinement with settler colonial and imperial logics, and its utilitarian extractavism continues to condition common sense today—especially about landscape. This project is critical of these tendencies. But there was a certain point in the early phase of natural history, before the intensive quest to formalize knowledge, when curiosity was the guiding comportment.[29] The world's doors had suddenly burst open, everything that was taken for granted in Europe seem suddenly strange, contingent, relative. Unnatural. This profusion of world exceeded any theory of it. By the time theory caught up, ideas of space and time, geography and history, were fundamentally transformed. Methodologically, the effort to make sense of a new world led to a great promiscuity. Or at least that is my imagination of it. This dissertation attempts to hold on to some of that curiosity and promiscuity in order to denaturalize the world anew.

When I speak of natural history as method, I tend to be referring to Theodor Adorno's Marxian idea of *Naturgeschichte*, which summarizes Adorno's entire epistemology. Many theses and books have written on both notions of natural history. Here, I simply want to summarize some elements of Adorno's natural history and demonstrate how Sebald works with them in the in hopes of communicating something like a method for my study. For hist part, Sebald handles these two articulations of natural history in *Rings of Saturn*. Sebald addresses the metaphysics of natural history in his reiterant and critical inquiries into Thomas Browne's *quincunx*, through which "one might demonstrate *ad infinitum* the elegant geometrical designs of Nature,"[30] and into Jorge Louis Borges's parodic tract on classification, *Libro de los Serios Imaginarios* [Book of Imaginary Beings]. He addresses the material of natural history in his vignettes concerning the herring, silk, worm, volcanic eruptions, storms, and a menagerie of animals. But the entire text suggests a method of natural history as laid out in Adorno. This dissertation looks to extend, after the Adorno-Sebald line, a natural history of destruction as one possible basis for geographical inquiry.

For Adorno,[31] *Naturgeschichte* expresses the fundamental tension at the heart of Marxist dialectic. Nature and history mediate each other. Adorno quotes a youthful Marx who, he mentions, "expressed the unending entwinement of the two elements with an extremist vigor bound to irritate dogmatic materialists." Marx says, "We know only a single science, the science of history. History can be considered from two sides, divided into the history of nature and the history of mankind. Yet there is no separating the two sides; as long as men exist, natural and human history will qualify each other." Adorno interprets that, for Marx, the "traditional antithesis of nature and history is both true and false." It is true because "it expresses what happened to the natural element" and false in that "it repeats the concealment" of nature's

[29] Curiosity references

[30] W.G. Sebald (1998) *Rings of Saturn* [*: an English Pilgrimage*] New York: New Directions: 21

[31] The literature on Adorno's natural history is not nearly as extensive as one would expect, given that the *Adornoindustrie* has become such a part of the academic *Kulturindustrie*. In geography, it is almost non-existent, which is interesting in its own right. It most likely has to do with how the field of critical geography came to be grounded in Henri Lefebvre's *Production of Space*. A full intellectual history would be required to assess this peculiar absence, given the Frankfurt School's prominence in other disciplines. The texts specifically pertaining to Adorno's natural history are of mixed usefulness. They are exegetical, but pay very little attention to how someone might study *as* a natural historian. Sebald clearly takes Adorno the furthest in the regard. Nevertheless, some of the more helpful pieces include: D. Cook (2011). *Adorno on Nature*. Durham, UK: Acumen; B. Hullot-Kentor (1985). "The Problem of Natural History in the Philosophy of Theodor W. Adorno" PhD Dissertation, Comparative Literature: UMASS; B. Hullot-Kentor (1984). "Introduction to Adorno's 'Idea of Nature.'" *Telos* (60): 97-110; S. Buck-Morss (1977). *The Origin of Negative Dialectics*. New York: Free Press: Ch. 3

mediation of history by history itself. In other words, it is true that history has overtaken nature but expressing it thus conceals the role played by nature in mediating this process. The result is that the historical process of transforming nature comes to appear as natural and the immediate becomes real. The bourgeois world becomes universal. Natural history looks to shatter this immediacy. In his 1964-65 *History and Freedom* lectures, Adorno states that "Marxist critique consists in showing that every conceivable social and economic factor that appears to be part of nature is in fact something that has evolved historically. Thus there is always an element of reciprocity: what appears to be natural is discovered to be historical, while things that are historical turn out to be natural because of their transience."[32] This dialectic founds my geographical inquiry. My aim is to reconstruct all signs of naturalness according to their historical formation and all signs of history, according to their natural element of transience (which, I might add, the ecological concept of "succession" has attempted to turn into a science).

Adorno takes seriously Lukács's idea of second nature,[33] which "remains the negation of any nature that might be conceived as the first."[34] In light of this negation, "nothing appears outside" of bourgeois consciousness, and "in a certain sense there actually is nothing outside anymore…" This appearance—which Adorno calls "semblance"—is essential to second nature, since it prioritizes the immediacy of contemporary relations, and as Adorno notes, the more this immediacy of historical relations is prioritized—by "relentless socialization"— "the smaller the capacity of men to recall that this web has evolved, and the more irresistible its natural appearance." Second nature—this immediacy—is an illusion for Adorno: "it hides something." Because "it is congealed history it seals off the dynamism contained within itself." In Adorno's reading, Hegel always treated second nature as "impenetrable:" "he is tempted to treat it as something immediate without any reservations whereas, precisely because it postulates itself as immediate without actually being so, it inevitably conceals its own history and thus degenerates into ideology." In contradistinction, "Marx always takes the historical nature of the second, 3rd and 4th immediacy, that is to say, of second nature, far more seriously…" Whereas for Hegel, immediacy ends up as an instance of something postulated by mind, with Marx, one finds "the tendency for the negativity contained in the very naturalness of immediacy…to come to the surface; he assigns to the reflective mind the task of dispelling the solution of naturalness and, in contrast, of uncovering… what lies concealed—while the façade shrivels into mere illusion."[35] Thus, for Adorno, the aim of natural history is, in essence, to destroy immediacy. "To destroy immediacy means dissolving the appearance of naturalness through the critical process. It means demolishing the claim that phenomena that have evolved [over history] are just what they are [in the present]."[36]

By infrastructuralization I mean that contingent historical process of manufacturing second nature as a reality. Beyond trains, canals, roads, and harbors, infrastructuralization indicates the form of bourgeois mediation of the physical environment that yields the condition of possibility—in the Great Lakes—for white settler capitalism. One of the issues with ecology as an empirical science that I find over and again throughout this dissertation is that what it has to say about the nature of the Great Lakes is, in fact, merely a reflection of the nature of

[32] T. Adorno (2006). *History and Freedom: Lectures 1964-1965*. Medford, MA: Polity Press: 135-6
[33] G. Lukács (1974 [1915]). *Theory of the Novel*. Cambridge, MA: MIT Press
[34] T. Adorno (2007). *Negative Dialectics*. New York: Continuum: 357

[35] Adorno (2006): 136-7
[36] *Ibid.* 136

bourgeois infrastructure. One of the reasons why I find ecology to be interesting and that I do refer its findings is that, in fact, it has the opportunity to tell us about historically mediated nature. The slippage from bourgeois nature to nature itself is, in my reading, one of the fundamental ideological infrastructures for the reproduction of settler colonialism. This is not to say that infrastructuralization does not also happen in Europe or across its empires or in non-European empires. Certainly every mode of production intersects with a geography to tend toward a certain set of infrastructural requirements. However, infrastructuralization is particularly important in a settler colony, since the settler is always keen claim that he is the one who rightfully—naturally—belongs in the land. In the case of bourgeois North America, this justifies to the settler that the land, thus, belongs to him. In a settler colony like the US, infrastructuralization must be total and totally forgotten. It must appear natural. This dissertation works to demonstrate that this is not merely a form of appropriation. It is not merely a claim in law or discourse. Infrastructuralization, I argue, doubles as a form of ecocidal destruction

One of the central tendencies in bourgeois thought it thus to transform historical contingency into ontology. Adorno criticizes Heidegger, saying that "The unhistoric concept of history, harbored by a falsely resurrected metaphysics in what it calls historicity, would serve to demonstrate the agreement of ontological thought with naturalistic thought from which the ontological one so eagerly delimits itself." That is, despite the efforts of ontological thought to distinguish "being" from nature, its unhistorical treatment of the idea of history (in the idea of "historicity") actually turns ontology into nature. This tendency—often racializing, as Adorno and Horkheimer address in the *Dialectic of Enlightenment*—allows the ontologizer to "transpose historical specifics into invariance at will." As Adorno notes, "The ontological claim to be beyond the divergence of nature and history is surreptitious."[37]

While Adorno has phenomenology—and Heidegger in particular—in his sights, I am interested in the tendency by a number of groups to take the precepts of ecology, ontologize them, treat them as natural, and ascribe to them certain universal traits. I first became troubled with this tendency in new materialism but it became apparent that this tendency is rampant across the social sciences—both interpretive and applied. It is especially true around the discourse of resilience, as I detail in my chapters. As I demonstrate with an example from Anna Tsing below, the situation is much as Adorno describes, only instead of "historicity," new materialists like Tsing treat the historiography of ecological succession as an unhistorical—i.e. natural—cycle that all relations follow. Contemporary ecology treats "disturbance" as *the* fundamentally quality of the adaptive cycle; it is endogenous to the natural cycle of ecological resilience. New materialists have come to ontologize disturbance, treating human destruction as a form of ecological disturbance that is "naturally" overcome as resilience. Disturbance is affirmed in a secret teleology. Disturbance, I argue over and again, must be differentiated from destruction. The latter is decidedly *not* a natural tendency.

Through the problem of natural history, Adorno reads Marx as the progenitor of the philosophy of non-identity, of negative dialectics. Empirically—and I am primarily speaking of my landscape interpretation and analysis—my project follows in this step. But what does it mean to address landscape according to a negative dialectics? How exactly does one go about dissolving the congealed history that appears as immediacy to reveal the processes that have formed, form, and will form it? Adorno offers a number of approaches to this question, including one in his *Introduction to Dialectics* lectures from 1958, where he develops the dialectic of concept and matter. He notes,

[37] Adorno (2006): *358-9*

> we must remember that the fundamental experience here *must be approached from the side of the matter itself*, from the theory of the object rather than the theory of the subject, from the thing which inspired the dialectic itself, from the experience of the fundamentally dynamic character of the matter; in other words, from the fundamentally historical character of the world itself, from the fundamental experience that there is actually nothing between heaven or on earth which simply is as it is…[38]

Approaching experience from the side of matter itself sets the course from what is required of dialectical thought: to negate the concepts and ideas that reify matter by ossifying by transforming its naturalness into a word that then presents itself as a natural container for that matter. A "negative" dialectic confronts matter with the ideal that claims to hold it, demonstrating that it is never, in fact, identical to this idea. It can never be entirely explained by it. Dialectical thought must "confront the concept with what it intends to the point where certain difficulties come to light between this concept and the matter which it intends." In this sense, negation is radical affirmation of matter and the dynamism always active in its construction. By confronting the concept with matter itself is always going to generate difficulties for the concept attempting to explain it, since the concept never grasps the full qualitative particularity and complexity of matter. However, this does not mean—and this is the mistake Bergson makes—that we can dispense with conceptuality altogether. The quality of any particular matter is going to exceed the concept and force us to alter our process of thought, "but without thereby relinquishing the determinations which the concept originally possessed."[39] That is, despite matter's confrontation with the limits of conceptuality, we still depend on the concept to create a shared and communicable enough semblance of the material world. The alteration of the concept "comes about precisely through criticism of the original concept—that is, by showing how the original concept does not correspond to the matter it seeks to grasp, however well-defined the latter may seem to be—and that thereby does justice to the original concept by insisting that the latter should correspond after all with the matter it sought to grasp..."[40] Adorno is keen not just to express the non-identity of matter and concept but the preference that European science has given to the concept at the expense of the particularity of matter. Nevertheless, science does describe one way of addressing matter that is not "wrong" but partial. What troubles Adorno is its will to total explanation, which he sees not just as a form of idealism—a rejection of the singularity of matter—but of fascism.

Methodologically, however, it is not easy to simply grasp the particular. Adorno speaks of the "false identity between the general and the particular," keenly noting, "the particular already seems so deformed by nature, having internalized and embraced the deformation visited upon it, that the rupture between the general and the particular is no longer properly visible." Adorno calls this a "negative unity."[41] This is why I so painstakingly look to historicize particular sites along Buffalo's waterfront, like Times Beach and Tifft Nature Preserve. A natural history of destruction must labor to "re-form" the particular by tracing its history of destruction in an attempt to bring into relief the rupture between the particular and general: in this case, between particular landscapes and their closure by ecological conceptuality.

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[38] T. Adorno (2017). *An Introduction to Dialectics*. Medford, MA: Polity Press: 9 (my italics)

[39] *Ibid.* 8

[40] *Ibid.*

[41] T. Adorno (2019). *Philosophical Elements of a Theory of Society, 1964*. Medford, MA: Polity Press, 70

This discussion prepares us to understand a thesis from Adorno that grounds this dissertation, from a note to his lecture, "The History of Nature," 5 January 1965: "Laws of nature not to be taken literally, not to be ontologized."[42] The central distinction I attempt to make in this dissertation—between disturbance and destruction—is necessary because the historical emergence of resilience as a fundamental ecological concept has led to the ontologization of disturbance, and to resilience more broadly. The ontologization of natural laws replaces historical process and the "movement of the concept" with predetermined formalistic principles that always already treat matter in its abstractness. In the way commodities abstract quality into exchange value, science abstracts quality into data, that is, into the same essential unit, deprived of the possibility of unevenness or difference. Dialectical thinking is precisely that form of thought that sets out to "struggle against the reification of the world, against the conventionalization of the world, where what is ossified or frozen, where something which has risen historically now appears as if it were something simply given 'in itself'…"[43]

Methodologically, dialectical thinking does not attempt to counter reification by an appeal to another principle—Adorno gives the example of "life." Instead, it seeks to overcome reification "by grasping reification itself in its necessity—that is by deriving the phenomena of petrification, of ossified institutional structures, of the alienation encountered in what confronts us as an alienating and dominating power, from the historical concept…" Dialectical thinking does not simply assert, that is, that matter is simply misunderstood: that Newton treated it as dead stuff when really it is vital. That is the same basic philosophical reification. What dialectical method requires is that one take the concept—in this case "disturbance—and treat it historically in order to demonstrate what in this moment leads to the tendency to ossify relations in this particular way, at this particular time.

§4 – *Disturbance Ecology*

Attendant to the post-war cybernetic revolution and the emergence of systems theory, a paradigmatic shift in the study of the natural world occurred in the late 1960's and early 1970's that shifted scientific epistemology from, nominally, the study of Nature to the study of ecology. First, the object of study changed: while the basic unit of Darwinian biology was the species, ecologists posited that species were inextricable from their environments. If the basic ecological unit was species+environment, their epistemology was no longer based on an *object* of investigation at all but on the dynamics, or relationships constituting a system. Since relationality extends infinitely, many ecologists narrow the spatial scope of investigation to the "ecosystem," which is simultaneously an areal and relational unit. If the first shift reframes what is physical in nature, the second deals with a metaphysical problem: it reassesses the structure/ content relationship of the ecosystem as a question of time. Theories of ecosystem succession—which examine the iterative process of ecosystemic development—became a crucial point of ecological investigation over the 20th century. Inspired by the work of Danish botanist, Eugen Warming, Henry Chandler Cowles—whose work I examine in chapter 3—offered an early theory of ecosystem succession in his studies of Lake Michigan's dunes in 1899. He offered the notion of a "sere"—or an intermediate stage in plant succession: ecosystems moved through these repeatable phases and developed down a somewhat predictable path. Cowles's work was largely overshadowed by the work of Frederic Clements. Clements famously offered a highly

[42] Adorno (2006): 115
[43] Adorno (2017):11

deterministic theory of plant succession in 1916 that moves through a linear sixfold path of development, finally arriving at "stabilization." This teleological "steady state" represented for Clements the climax point toward which that system always tended. For Clements, ecological communities were pseudo-organismic, following the ontogenetic development of individuals; for him, a "climax formation is an organic entity… able to reproduce itself, repeating with essential fidelity the stages of its development."[44] Clements and his adherents thus developed complex taxonomies of plant communities and successional pathways, as exhibited in the classic web diagram from his text, *Plant Succession*. Clements's theory set the standard for the first half of the 20th century. Contrast it with Henry Gleason, Clements's contemporary who first published his work in the mid-1920's but who was largely ignored until receiving retroactive acclaim starting in the late 1950's. Gleason was a sharp critic of Clements's organism analogy for plan succession. Gleason—far more consistent with Cowles—denied the existence of coherent, sharply bounded successional timelines and plant communities. He also emphasized the role of chance and contingency in development. For Gleason, a plant association was not, *contra* Clements, an organism and "scarcely even a vegetational unit, but merely a coincidence."[45] As suggested by the title of his most influential article, "The Individualistic Concept of the Plant Association," Gleason offered a theory stating that plant associations depend entirely upon the phenomena of the individual species. Far from structured, they approach total randomness.

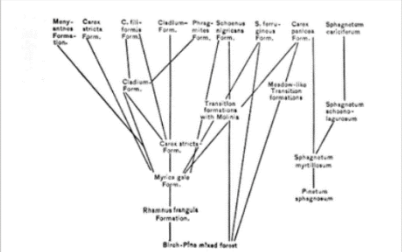

FIG. 40.—Adseres of the hydrosere in southern Sweden. After Sernander.

Spruce vegetation.		Sub-Atlantic period.	Litorina age.
		Sub-boreal period.	
Oak vegetation.		Atlantic period.	
Pine vegetation.	Cladium, Iris, Carex, Pseudocyperus, etc.	Boreal period.	Ancylus age.
	Boreal willows, Dryas, Betula nana, etc.	Sub-arctic period.	
Dryas vegetation with Salix polaris.		Arctic period.	Polar sea age.

These contentions in theories of plant succession gave way in the 1960's to theories of ecosystems succession. Alfred Tansley—a fascinating character in his own right[46]—is credited with introducing the ecosystem concept in 1935 in his renown article, "The Use and Abuse of Vegetational Concepts and Terms." Tansley was interested in developing an integrative concept that combined living organisms and the physical environment into a "whole system." "It is the systems so formed which," he stated, "from the point of view of the ecologist, are the basic units of nature on the face of the earth." He noted that these "ecosystems" are one category of systems whose range extends "from the whole universe down to the atom."[47] However, as Golley points out, it was Eugene Odum's use of the concept as a guiding principle in his widely used textbook, *Fundamentals of Ecology*, that "transformed a specialized technical idea into a concept with vast theoretical and applied significance."[48] In Europe, the concept was rang too close to the racist organismic sciences leveraged by the Nazi regime, but in the US, "the ecosystem concept appeared to be modern and up to date." Golley continues,

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[44] F. Clements (1916). *Plant Succession: An Analysis of the Development of Vegetation*. Washington: Carnegie Institution of Washington; for an excellent discussion of the broad ranging influence of Clements, see S. Kingsland (2005). *The Evolution of American Ecology, 1890-2000*. Baltimore: Johns Hopkins University Press

[45] H. Gleason (1926). "The Individualistic Concept of the Plant Association." *Bulletin of the Torrey Botanical Club* 53(1): 7-26

[46] See F. Golley (1993). *A History of the Ecosystem Concept in Ecology*. New Haven: Yale University Press. Ch. 1

[47] A. Tansley (1935). "The Use and Abuse of Vegetational Concepts and Terms." *Ecology* 16(3): 284-307

[48] Golley (1993): 1

> It concerned systems, involved information theory, and used computers and modeling. In short, it was a machine theory applied to nature. The concept promised an understanding of complex systems and explicitly promised to show how Americans could manage their environment through an understanding of the structure and function of ecological systems and by predicting the responses to disturbance. Further it extended the holistic concept into the modern, post war environment.[49]

By the end of the 1950's, when cultural conflicts began to roil in the US, the ecosystem concept was able—like resilience today—to appear to span a vast political divide. "Environmentalists seized upon the ecosystem concept as a way to maintain their faith in holism... The manager and industrialist found the ecosystem equally attractive. It promised a new way to manage complex natural systems."[50] This dual nature of the ecosystem concept is essential to understanding how ecology and ecological ideas rotate from science to scientific management and back. They are both. Hence, it should not be a surprise when, in 1976, the second version of the Great Lakes Water Quality Agreement proudly became the first piece of environmental law to utilize the "ecosystem" as its organizational concept.

In his seminal paper, "The Strategy of Ecosystem Development," Eugene Odum applied successional concepts not then just to plants but to entire ecosystems. In *Fundamentals of Ecology*, Odum developed a theory of pulsation against the teleology of climax ecology (see Ch. 4). He stated, "While the steady state is often seen as the final result of development in nature, a more realistic concept may be that nature pulses regularly to make a pulsing steady state."[51] In other words, "A more or less regular but acute physical perturbation imposed from without can maintain an ecological system at some intermediate point in the developmental sequence."[52] Which is to say that successional development is not linear but "pulsations" or "perturbations" regularly and beneficially impact succession. For Odum—inspired by his brother's work in electrical engineering[53]—came to see ecosystems as analogous to energy circuits, and these pulsations brough energy—usually by nutrient cycling—into an ecosystem.

In 1973, Buzz Holling published his paradigm-defining paper, "Resilience and Stability of Ecological Systems," thus transforming the notion of succession by making disturbance a fundamental component of the adaptation cycle. For Holling, "An equilibrium-centered view is essentially static and provides little insight into the transient behavior of systems that are not near the equilibrium."[54] Against this, Holling proposes a dynamic theory of resilience in which ecosystems are subject to regular disturbance and adapt in relation to that disturbance. Thus, a resilient system is one that maintains structural and processual integrity in response to disturbance. The system "bounces back," as the popular presses note. Holling contrasts stability with resilience, noting that highly resilient systems can be highly unstable and, in fact, the interplay between resilience and stability offers a new way of understanding the importance of diversity, complexity, and change within ecosystems.[55] Highly unstable ecosystems tend to be

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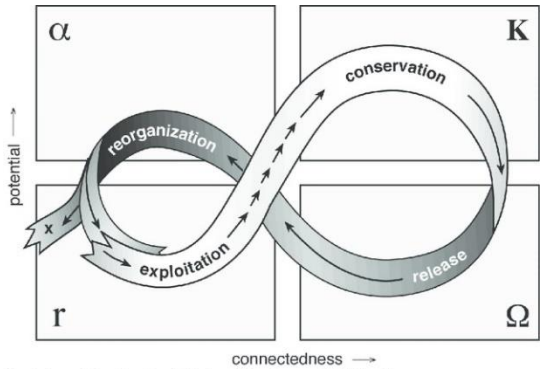
[49] *Ibid.* 2
[50] *Ibid.* 3
[51] W. Odum, E. Odum, & H. Odum (1995). "Nature's Pulsing Paradigm," *Estuaries* 18(4): 547
[52] E. Odum (1971). *Fundamentals of Ecology, 3rd Edition*. Philadelphia, London, Toronto: W.B. Saunders Co.: 268
[53] See P. Taylor (2005). *Unruly Complexity*. Chicago: University of Chicago Press: Ch. 3
[54] C.S. Holling (2010 [1973]). "Resilience and Stability of Ecological Systems." In Eds. L. Gunderson, C. Allen & C.S. Holling. *Foundations of Ecological Resilience.* Washington: Island Press, 20
[55] *Ibid.* 43

highly resilient, since the system emerges with relation to those variabilities; the limits of the system emerge with relation to disturbance. Regime shift—the transformation of one ecosystem type to another—happens when disturbances become too great, whether in size or frequency.

In 2002, Gunderson and Holling published *Panarchy: Understanding Transformation in Human and Natural Systems*, which popularized their Moebius strip diagram of the adaptive cycle.[56] To outline it briefly, the kind of steady state thinking of which Clements exemplifies addresses the development of a system from r→K, in which a system exploits resources available to it and conserves itself at climax, in homeostatic equilibrium. In K, the system is in a state of high connectedness and also high potential, which can only be accessed by a disturbance. The disturbance, which triggers the transition from K to Ω, releases stored up energy and nutrients, which then get reorganized in the α-phase. This reorganized system then exploits resources to rebuild connectedness, and so on *ad infinitum* unless a disturbance is catastrophic and forces the system into a new set of conditions (x). This is adaptive cycle represents the notion that disturbance is integral to resilience and, more, that it is the necessary condition to increase the resilience of a system. If a system can reorganize itself while maintaining certain essential parameters, it has increased its tolerance to disturbance and has become more resilient. If it cannot—if the disturbance is too great or lasts too long—the system undergoes "catastrophic" regime change.



The adaptive cycle (from Panarchy, edited by Lance H. Gunderson and C.S. Holling: Figure 2-1 (page 34). Copyright © 2002 Island Press.

At one point in his 1973 essay, Holling uses the example of Lake Erie eutrophication and overfishing in the Great Lakes as examples regime shift: of the collapse of an ecosystem that—usually—reorganizes around another "domain of attraction," or the relatively stable equilibrium point of a dynamic system. Ecologists have a penchant for studying freshwater lakes, since they can—at least in theory—treat them as self-contained systems:[57] the early limnological works of G. Evelyn Hutchinson and Francois Forel continue to ground the discipline.[58] Since 1940, Holling notes, "there has been a series of… catastrophic changes in the Great Lakes…"[59] In fact, fisheries collapse in Lake Erie happened as early as 1926, when the lake herring population suffered total collapse after being overharvested for WWI rations,[60] but Holling's point remains the same: "The overall pattern emerging from these examples is the sudden appearance or disappearance of populations, a wide amplitude of fluctuations, and the establishment of new domains of attraction.[61] As Holling implies, "sudden appearances" and "wide amplitudes of fluctuations" too great for an ecosystem to adapt to lead the emergence of a new regime, which is indicated in the establishment of a new "domain of attraction" around which that new regime pertains. For Holling, "These examples point to one or more distinct domains of attraction in

[56] L. Gunderson & C. S. Holling (2002). *Panarchy: Understanding Transformation in Human and Natural Systems*. Washington DC: Island Press

[57] Holling mentions as much in his essay, but Golley has an entire chapter that addresses the matter more critically and comprehensively: Golley (1993): Ch. 3, "The Lake as Microcosm."

[58] See W. Vincent (2018). *Lakes: A Very Short Introduction*. Oxford: Oxford University Press, Ch. 1

[59] Holling (2010): 29

[60] M. Bogue (2000). *Fishing the Great Lakes*. Madison: University of Wisconsin Press

[61] Holling (2010): 28

which the important point is not so much how stable they are within the domain, but how likely it is for the system to move from one domain into another and so persist in a changed configuration."[62] As summarized by acolytes of Holling in a paper in *Nature* called "Catastrophic Shifts in Ecosystems," "a loss of resilience usually paves the way for a switch to an alternative state." They continue, "This suggests strategies for sustainable management of such ecosystems should focus on maintaining resilience."[63] I wish to highlight not only the immediate overlapping of ecosystem fact and management but specifically the kind of paradox that this *should* entail for the Great Lakes in particular. What we can imply from Holling is that Great Lakes resilience—and Lake Erie resilience in particular—may be resilient, but the domain of attraction around which its resilience is organized is the result of, not just one but, "a series of catastrophic changes." Thus, when governors, ecologists, community groups, and environmentalists talk about building resilience in the Great Lakes, what exactly are they talking about? If it is the current state of things—the current domain of attraction—around which they desire resilience to be built, then their desire is to surrender a catastrophically-formed lake to the political and historical conditions that issued forth the catastrophe!

This moment is the source of great confusion, a slippage in perception about the relationship between change in human and natural systems. Odum offers an important caveat to his theory of pulse stability:

> It should be emphasized that pulse stability works only if there is a complete community (including not only plants but animals and microorganisms) adapted to the particular intensity and frequency of the perturbation. Adaptation (operation of the selection process) requires times measurable on the evolutionary scale. Most physical stresses introduced by man are too sudden, too violent, or too arrhythmic for adaptation to occur at the ecosystem level, so severe oscillation rather than stability results. In many cases, at least, modification of naturally adapted ecosystems for cultural purposes would seem preferable to complete redesign.[64]

But what happens when there has been a complete redesign of ecosystems for cultural purposes? Is it still an "ecosystem" even? The cultural purpose for which that system has been designed may have been well-engineered to be highly resilient but only on the premise that the formerly-naturally adapted ecosystem is not. It may very well be that "severe oscillation rather than stability" is the condition for stasis in, say, a settler capitalist state. There may be places where humans have modified naturally adapted ecosystems and have become actors within the adaptive cycle. The Great Lakes are *not* one such place. Is not the Anthropocene theory itself a supposition that the earth itself is no longer one such place?

What appears to be necessary is a way to clearly distinguish disturbed ecosystems from destroyed landscapes. I am most concerned presently with the—after Adorno's note—the ontologization of disturbance. What has emerged in contemporary discourse is a tendency to mistake postindustrial landscapes for disturbed ecosystems. Overstating it for clarity, where the latter attended to the natural laws of ecology, the former attend the contingent politics of history. The ontologization of disturbance assumes that, since humans are natural too, they belong to a

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[62] Holling (2010): 31

[63] M. Scheffer, S. Carpenter, J. Foley, C. Folke & B. Walker (2001). "Catastrophic Shifts in Ecosystems." *Nature* 413: 591-596

[64] E. Odum (1971). *Fundamentals of Ecology, 3rd Edition*. Philadelphia, London, Toronto: W.B. Saunders Co.: 269

socio-ecological system that follows the rules of all resilient systems. That is, disturbance is natural. And not only natural but *good*, since it has been assumed that greater resilience is better, since it creates robustness against radical change. This naturalistic fallacy—where things are good that are found in nature—can be found prominently across the new ecological discourse: in new materialism, urban ecology, urban planning, and all manner of environmental management. By treating human-destroyed landscapes as human-disturbed ecologies, purveyors of this discourse purport to manage places according to the laws of nature when they are, in fact, naturalizing the historical destruction of that landscape. I examine variations of this throughout my dissertation, but I would like to focus on one pernicious example here, against which I write, and that is Anna Tsing's treatment of "human-disturbed landscapes" in *The Mushroom at the End of the World*.

§5 – *Tsing and the Ontologization of Disturbance*

While problems with Tsing's immiseration of the concept of landscape and the means to understanding it require far greater space than I have here, her ontologization of disturbance is exemplary, and I will describe in some detail. In an important section of Chapter 11, "The Life of the Forest," Tsing brings together her ideas about landscape, story, noticing, natural history, and—most forcefully—disturbance. Tsing announces, "Human-disturbed landscapes are ideal spaces for humanist and naturalist noticing. We need to know the histories humans have made in these places *and* the histories of nonhuman participants."[65] This statement is ensconced in the concerns of humanist anthropology and less of a concern to geographers, who would have written the second sentence the other way around. For millennia, geography has tended toward environmental determinism, denying that humans were anything but products of their environments.[66] Regardless, note that Tsing highlights "human-disturbed landscapes" as ideal places to practice the twin "arts of ethnography and natural history" that she calls "noticing."[67] "Disturbance," she defines, "is a change in environmental conditions that causes a pronounced change in an ecosystem… Disturbance can renew ecologies as well as destroy them… Disturbance opens the terrain for transformative encounters, making new landscape assemblages possible." In one sense, she is sticking very close to the form and process of disturbance ecology laid out above, even if reframed in her own vocabulary. One question emerges from the second sentence: if disturbance can destroy an ecology, what follows? This is a fundamentally important question to which we will return. Tsing notes that humanists often mistake disturbance for "damage" but for ecologists, it simply works "to stir up ecological relations. Disturbance can be human, but it is certainly not always. It is, moreover, "always in the middle of things": no beginning or end but, like Holling's loop, an endless process. "Disturbances follow other disturbances. Thus all landscapes are disturbed; disturbance is ordinary." For Tsing, it is disturbance all the way down. She does distinguish between "bearable" and "unbearable" disturbance, which is determined by the "reformation of assemblages" that follows. Already, in her figuration of disturbance as an infinite process that structures all landscapes, disturbance becomes ontological—the basis of all nature.

Tsing makes the interesting point that "As an analytic tool, disturbance requires awareness of the observer's perspective." Deciding what counts as disturbance, for Tsing, "is always a matter of point of view." For Tsing, this does not mean that disturbance is a social

[65] A. Tsing (2015). *The Mushroom at the End of the World*. Princeton: Princeton UP: 160

[66] See C. Glacken *Traces on the Rhodean Shore*. Berkeley: University of California Press, *en passim*

[67] Tsing (2015) : 159-160.

construction but simply that different scales of disturbances impact different species and ecologies. The disturbance caused by a human stepping on an ant hill, she notes, is much different form the ant's perspective than from the human's. Thus, "no single standard for assessing disturbance is possible; disturbance matters in relation to how we live." How and, of course, *where*. "Disturbance is never a matter of 'yes' or 'no'; disturbance refers to an open-ended range of unsettling phenomena." Disturbance does carry, then, a dialectical tension in Tsing, which is important: disturbance is universal but always relative, contingent, and situational—a "problem of perspective" based in varying "ways of life." It is everywhere, always, but every example of it is particular. And yet, the noticer cannot help but to find it. Finally—again in alignment with Holling's cycle, and especially in alignment with Steward Pickett[68]—disturbance produces heterogeneity, "a key lens for landscapes." It creates "patches, each shaped by diverse conjunctures." Both living and nonliving entities create conjunctures. Tsing notes, "Ecologists call the effects that organisms create on their environments 'ecosystems engineering'… If we look at the interactions across many acts of ecosystem engineering, patterns emerge, organizing assemblages: unintentional design."

With this, Tsing has created a crossing where humans create ecological disturbances and non-humans do ecological engineering. In this form of posthumanism, all anthropogenic intervention on a landscape gets reduced to "disturbance" and all non-human—living and nonliving—is raised to "engineering," so all action in a landscape is "ecological." All change is natural. This is urbane modernism raised to its negation, and it is totally out of touch of with empirical reality. Like her ecological forebearers, Tsing treats ecology as a totality that precludes the obvious fact that historical human action has fundamentally destroyed and erased environments and peoples in ways that simply do not function as ecological disturbance. They may be related to ecology but only in an absolutely negative sense. The modern destruction of the environment may have led to a "reformation of assemblages," but there is no reason to think that this assemblage has anything at all to do with the ecosystem that preceded it. Tsing ontologizes disturbance and in so doing draws all forms of historical disturbance and destruction into an ecological framework that follows a set of natural laws. It is not that Tsing does not discuss the historical transformations of landscapes. She demonstrates over and again that human and nonhuman histories produces landscapes. But, for Tsing, all of these histories become forms of disturbance that follow the rules of ecology. History becomes nature: this is a classic form of organicism and precisely the kind of reification against which Adorno warns. Somehow, the ruptured ecologies of settler capitalist landscapes become, in Tsing, a reshuffling of the deck of nature. She cites Reice in her footnotes. According to him, "The direct effect of disturbance is to remove individuals from a community. They may be killed or transported away by the direct action of disturbance. The dynamics of the ecosystem following the disturbance is what determines the community structure."[69] Tsing's ontologization of disturbance does the pernicious work of naturalizing this process in human politics and geography. A theory of destruction demands a form of negative humanism, wherein humans—and particular humans at that—are realized as capable of destroying the ecological process altogether.

This pertains directly to the moral underpinnings of ontologizing disturbance. Tsing signs off her chapter thus: "Assemblages, I show, are scenes for considering livability—the possibility

[68] Steward Pickett's earlier work on disturbance in patches and patch mosaics was influential in the development of ecological ecosystems analysis in the 1990's. See his S. Pickett & P. White (1985). *The Ecology of Natural Disturbance and Patch Dynamics*. Orlando & San Diego: Academic Press

[69] S. Reice (2001). *The Silver Lining: the Benefits of Natural Disasters*. Princeton: Princeton University Press: 35

of common life on a human-disturbed earth./ Precarious living is always an adventure." Tsing defines precarity thus:

> Precarity is the condition of being vulnerable to others. Unpredictable encounters transform us; we are not in control, even of ourselves. Unable to rely on a stable structure of community, we are thrown into shifting assemblages, which remake us as well as our others. We can't rely on the status quo; everything is in flux, including our ability to survive. Thinking through precarity changes social analysis. A precarious world is a world without teleology. Indeterminacy, the unplanned nature of time, is frightening, but thinking through precarity makes it evident that indeterminacy also makes life possible.

If precarity is "the condition of being vulnerable to others," it is important to understand that—especially in the appropriation of the resilience framework in the development literature—vulnerability is thought of as the opposite of resilience. Vulnerable states are those for which a disturbance could readily lead to catastrophe. As one UN flier states it, "Vulnerability is the tendency for an entity to be damaged. Resilience is the opposite of vulnerability and refers to the ability of an entity to resist or re- cover from damage."[70] From here, we can assess Tsing's position as one that simply situates ecological laws as ontology. The instability, the shifting assemblages, the flux, the contingency, the indeterminacy: it's disturbance ecology all the way down. Since disturbance is universal for Tsing, the Anthropocene has made precarity so: "Precarity once seemed the fate of the less fortunate. Now it seems that all our lives are precarious." Critical Black theorists have taken issue with this ontologization of precarity in new materialism, noting that that such moves erase difference. Axelle Karera states, "the Anthropocene erasure of race rather anticipates a post-apocalyptic 'recalibration' of anti-black racist practices." It does so, according to Karera, by indulging "two clandestinely insidious discursive inclinations." The first she calls a "hyper-ethics" that is "predicated on the naturalization of relationality, mutual dependency and other narratives of 'species entanglements.'" The other is an "ahistorical and apolitical 'hyper-valuation' of the concept of life.[71] In other words, Karera criticizes precisely the ontologization of ecological conceptuality. Supposing relationality to be a fundamental ontological presupposition, in other words, recapitulates the undifferentiated quality of "Anthropos" and upholds "life" as a kind of "hyper-ethics" that flattens the real history of relations in order to announce, in essence, that "all lives matter." It is "hyper-ethical" because it both excessive and so far above the actually existing earth that, in its undifferentiating universality, it means nothing. Re-introducing a philosophy of negation, Karera calls for a "radically non-relational" perspective of the Anthropocene—one that starts from expressions of power, history, and politics. While disturbance ontologies maintain the cycles of relationality—simply rearranging assemblages in different ways—the theory of destruction I am advancing is sympathetic to approaching the Anthropocene from a radically non-relational perspective.

§6 – *Wastelands and the Ecologies of Redemption:*

> In the day that I shall have cleansed you from all your iniquities, I will also cause you to dwell in the cities, and the wastes shall be builded. / And

[70] There is a vast and growing literature on vulnerability in the interpretive and applied social sciences, let alone in the humanities and psychology. Since it is the "other side of the coin of resilience," it is in all of the same places. This statement happens to be from: SOPAC. "Reducing Vulnerability & Increasing Resilience in SIDS. Fiji: SOPAC. Online: https://www.un.org/esa/sustdev/natlinfo/indicators/idsd/pdf/reducing_Vuln_increasing_resiliency.pdf

[71] A. Karera (2019). "Blackness and the Pitfalls of Anthropocene Ethics." *Critical Philosophy of Race* 7(1):34

> the desolate land shall be tilled, whereas it lay desolate in the sight of all that passed by. / And they shall say, This land that was desolate is become like the Garden of Eden; and the waste, the desolate, and ruined cities are become fenced, and are inhabited.
> -*King James Bible*, Ezekiel 36:33-38

Much has been made about the ideological resonance of resilience with neoliberalism,[72] but less about the theological connotations associated with its morality.[73] For Carl Schmitt, all political concepts are secularized theological ones,[74] but this is not just a one-way road. As science ascended into truth, it became grounds for a new morality. The naturalistic fallacy is evident in both religion and politics: both engage the scientific lexicon in order ground their truths in "reality." But science has a long history of drawing on theological, or mythological, conceptuality as well, and—whether consciously or not—disturbance ecology does just this. In particular, the popularization of scientific conceptuality often requires a moral kernel that allows it to freely traffic as common sense. In disturbance ecology, there is a powerful narrative of redemption that sits very well not only with neoliberalism but as a form of hope and promise in Anthropocene. In the concept of redemption, the New Testament offers a form of wholeness based on overcoming negation—sin.[75] In order to be redeemed—one *must have sinned.* Negation is a necessary step in the process of redemption. In the ontologization of resilience, the negation is called "disturbance." Life adapts *through* negation.[76] It also places resilience into a mythological canon of forms, figures, and concepts whose essential structure is as follows: positive form→ negation→greater version of positive form. Returning stronger from tribulation or rising from the ashes is a very old mythic trope. In the Old Testament, a specific form of communal redemption emerges alongside the restoration of wastelands. When examining the boosterism of the growth machine—which I examine in Chapter 1—redemption in the form of "ecological restoration" plays a crucial public function, sanctioning the work of developers as both economically and environmentally—read: morally—advantageous. To return to Anna Tsing, the redemptive wasteland becomes a path to freedom.

It should be remembered that ecology was from the beginning not only a form of scientific management but a form of spiritual re-enlightening in touch with an immanent earth. In the cultural fervor of the 1960's US, ecology was aligned with holism, and its emergence was part of a cultural environmental movement deeply tied to spiritual and social liberation. This is

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[72] J. Walker & M. Cooper (2011). "Genealogies of Resilience: From Systems Ecology to the Political Economy of Crisis Adaptation." *Security Dialogue* 42(2); D. Chander (2014). *Resilience: the Governance of Complexity*. London: Routledge; D.Chandler & J. Reid (2016). *The Neoliberal Subject: Resilience, Adaptation, and Vulnerability*. London & New York: Rowan & Littlefield

[73] I owe the germ of this conversation to an ongoing conversation with anthropologist of religion, Hillary Kaell, and the Theories of Land working group led by Dana Lloyd and Evan Berry. See P. Campanile & H. Kaell (2023). "Resilience: Ecology and Morality on Climate-Vulnerable Coasts." *Contending Modernities*: forthcoming.

[74] C. Schmitt (2006). *Political Theology*. Chicago: University of Chicago Press

[75] Recall that redemption is translated from *apolutrosis* [ἀπολύτρωσις], where *lutrosis* signifies a ransom paid for the release from bondage. In this case, from the bondage caused by sin. The prefix, *apo*, is "from," but also in *apolutrosis*, carries the connotation of looking back from a distance. As one Biblical exegesis puts it, "For the believer, the prefix (*apó*) looks *back* to *God's effective work* of grace, purchasing them *from* the debt of sin and bringing them to their *new status* (being *in Christ*)."

[76] One can also see how close resilience remains in conceptual form to a Darwinian survival of the fittest, where death begets a better adapted form of life.

tidily summarized by the fact that the first speaker at the Esalen Institute was Alan Watts, the foremost translator of eastern thought into the west at the time. The second was Gregory Bateson, forerunner in ecological thinking. For early ecologists, the intended paradigm shift was meant to extend beyond scientific epistemology and to culture at large. As Bateson's daughter, Nora, tells it, "They were both Englishmen that somehow end up in Northern California on the Big Sur coast tipping the perception frame through what might have then been called 'western culture.'"[77] In his lectures,[78] Watts frequently references the work of ecologists who were overcoming the western comportment to mistake objects for truth.[79] As discussed above, relocation of scientific inquiry from object to relationship served as a basis for this new ecology. Objects are discrete, finite, present. Focusing on relationships changes what Bateson calls the "epistemological unit."[80] Relationships beget relationships: the complex interconnected web of mutually impactful relationships that constitute the Whole. An epistemology of relationships brings the entire universe into the fold: everything is connected. Gaia was simultaneously a scientific and spiritual figure, quantitative and qualitative. In a contradiction that would have greatly humored the likes of Chuang Tzu and perhaps even Herr Hegel, this shift in perception tended toward a peculiarly Enlightened Western bias toward immanent totalities guided by universal Natural Laws. Ecology still traffics in universal Natural Law. If all things are related in nested systems that eventually compose the "earth system," then they must all follow the same basic systems theoretical principles. Since society, politics, history and culture are also systems, they too follow these Laws. Laws, like those of the Western God, must be omnipotent, even if they are non-teleological and indeterminate.

Watts also lectured on what he called "the most elementary lesson," on the coincidence of opposites—on the fact all human perception relies on vibrations, which are the unity of positivity and negativity.[81] I am not denying the physics but am questioning the easy traffic between science and spirituality—the desire to ground ecology as a font of truth rather than to interrogate it as a contingent historical discourse. The unity of opposites has a long spiritual tenure in eastern religion, from the Taoist yin/yang polarity to the Hindu goddess, Shiva, master of destruction also known as The Auspicious One, since destruction begets creation. As critical theorists have tirelessly pointed out, Western thinkers have tended think polarities as binaries, or dualisms. Descartes is the usually called out as the source of wrong-doing, but one can find the tendency at least as far back as Aristotle's principle of non-contradiction. In a non-contradicting way of thinking, creation and destruction oppose—not complete—each other. In the history of natural science, this is clearest in the history of geology, where uniformitarians and catastrophists argued about the formation of the earth for three centuries until, uncoincidentally, in the late

[77] Esalen Team (2016). "Bateson and Watts Conversations Reconsidered by Daughter and Son." Online: https://www.esalen.org/post/bateson-and-watts-conversations-revisited-by-daughter-and-son

[78] Many of Alan Watts's lectures are readily available, perhaps because he has had a more sustained afterlife than Bateson in the "alternative" spiritual community. The podcast series curated by his son, Mark Watts, is particularly good. See A. Watts, 7 June 2021, Ep. 1 – "Following the Taoist Way," *Alan Watts Being in the Way*, Be Here Now Network.

[79] See especially, A. Watts, 24 Nov 2021, Ep. 8 – "Man and Nature," *Alan Watts Being in the Way*, Be Here Now Network.

[80] See Chapter 2

[81] See especially, A. Watts, 11 Aug 2022, Ep. 16 – "A Coincidence of Opposites," *Alan Watts Being in the Way*, Be Here Now Network.

1960's, the two camps agreed that actually each is essential to understanding the other.[82] Disturbance ecology takes up this position by declaring: "Disturbances are paradoxical. What we see and fear is their destructive power, yet these same disturbances help create and maintain [those qualities] that benefits both the ecosystem and ourselves."[83] This mythos of creative destruction as ecological succession tends toward totality: this is simply "the nature of things." Again, the rules get applied to social systems, resulting in a functionalism and organicism that depoliticizes and dehistoricizes ecology, making all ecosystems appear "natural." Even by calling postindustrial landscapes "ecosystems" works to present them unproblematically. At worst, it is simply a landscape that requires rational ecological management. But its history of destruction is silenced.

I have discussed how early climax theories of plant succession are as linear and stagist as any vulgar civilizational teleology. This tendency in thought is evident of another Aristotelian notion: this time, the innate tendency of things to move toward full potentiation. The idea that ecosystems maximalize themselves in ideal states of harmonious equilibrium represents a kind of scientific Eden. However, it is not Eden but the return to it that continues to shade certain forms of ecological thinking. Wastelands are tied to redemption in Judeo-Christian theology. As the epigram from the Prophet Ezekial indicates, wastelands carried religious connotation long before the Middle English *wast*—to devastate damage, spoil, or squander—was nominalized by being combined with *land.*[84] The word carried the old meaning of *westen*—an empty or desolate place of hardship—but inflected into it that the land had become desolate. Theologically, God smote the land when human's displeased him, laying to waste. So despoiled and infertile land became a sign of God's displeasure. Land was turned to waste when humans spoiled or squandered it, gaining to the term a moral inflection: wasteland was a place destroyed by improper *and* immoral usage. This notion became solidified after the publication of the King James Bible in 1611. There, a wasteland is a barren and desolate place as the result of an act of destruction, often by God. "The state of a landscape is thus indicative of its standing in the eyes of the Lord." Wastelands "are manifestations of God's censure, while verdant landscapes ornamented with rivers, meadows, and fruit-laden trees recall Eden and indicate divine benediction."[85]

However—and this is of great importance—it is possible to transform a ruined and desolate wasteland into a verdant Eden, "and such a transformation is proof of redemption and salvation," as indicated in the Book of Ezekiel: "This land that was desolate is become like the Garden of Eden; and the waste, the desolate, and ruined cities are become fenced, and are inhabited." Whereas wilderness—which shares an etymological root with wasteland—tended to refer to a primitive or original state of nature, wastelands, as Di Palma notes, were postlapsarian landscapes. Because wastelands were visible proof of divine censure, they were also filled with the possibility of redemption. The Bible "taught that it was by transforming the wasteland into a garden that salvation was to be achieved." Thus, wasteland "was the landscape whose transformation by a community could result in redemption for all." While one might go into the

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[82] See S. J. Gould (1987). *Time's Arrow, Time's Cycle: Myth and Metaphor in the Discovery of Geological Time*. Cambridge: Harvard University Press; M. Davis (1996). "Cosmic Dancers on History's Stage? Permanent Revolution in the Earth Sciences." *New Left Review* 217

[83] S. Reice (2001). I am referencing this text, because it is one that Anna Tsing references in *The Mushroom at the End of the World.*

[84] V. Di Palma (2014). *Wasteland: A History*. New Haven: Yale University Press: 16-18. My discussion of "wasteland" relies heavily on Di Palma's fascinating study.

[85] *Ibid* 18

wilderness to find one's own redemption, giving oneself over to God, the turning of the wasteland into a garden was an effort of *collective* redemption. Di Palma also emphasizes that these associations between wasteland and "the moral cycle of condemnation, devastation, atonement, and redemption" would have been utterly familiar to any 17th century English churchgoer.

In Tsing, we find a variant of this theology. Matsutake mushrooms—the non-human protagonist of her book—grows best in disturbed environments—often in symbiosis with the pioneer tree, red pine. While red pine is adapted to recolonize lands cleared by forest fire, it does fine after clearcutting as well. Thus, it is an index of disturbance, both human and non-human; it is a wasteland species. Tsing's conceit regarding the Anthropocene—and with this I am in accordance—is that we are all living in the midst of ruinous landscapes. But, recall, Tsing's notion of ruination is ontological: we are living in the midst of disturbance, which is—as per disturbance ecology—only natural. While the Anthropocene can be accounted for historically—through an analysis of capitalism and humanist metaphysics—the ruination it imparts on the earth falls to a natural process. Given Tsing's indebtedness to ecological conceptuality—to indeterminacy and non-teleology—she would not look for a return to Eden. Instead, what she indicates is that redemption is to be found amongst the natural rhythms of ruination. Plucking the fruit of destruction—the matsutake—each of Tsing's human protagonists find what she calls "freedom."

§7 – *On Destruction*

A natural history of destruction and critique of the ontologization of disturbance ecology are built on the possibility of being able to distinguish disturbance from destruction. Given the earth's extensive geological history of both catastrophic and uniformitarian forms of destruction, how is such a differentiation possible—especially without reintroducing a facile form of humanism back into geography?

Destruction, I argue, is decidedly outside of the framework of ecology: ecology cannot understand the historical and political aspects of destruction with its concepts. This is because history and politics do not follow ecological laws and cycles. Ecology can, however, understand the ecological aspects of destruction. Because of its attunement to relations and dynamics, ecology is in fact quite good at telling us about the biogeochemistry of rupture. In this dissertation, I am upholding the importance of ecology but rejecting its extension into social science and, in particular, into urban planning. This does not mean that I have a clear way to differentiate destruction. In what follows, I offer three nagging engagements with Marx that have helped me think about destruction, if not define it with the precision befitting a proper social scientific concept. In the end, it may not be a scientific concept at all.

First, I would like to consider a very simple line form the *Communist Manifesto*: "The bourgeoisie, historically, has played a most revolutionary part."[86] It took me a long time to understand what this line implied. Marx's means this historically, that the bourgeoisie broke the binds of feudal and archaic society and transformed the entire globe after its own image. My theory of destruction says that they played "a most revolutionary part" in an environmental sense too. The historical regime shift executed by the bourgeoisie had at its counterpart an ecological regime shift, aided in large part by the particular way in which the bourgeoisie utilized industrial

[86] K. Marx, & F. Engels (2014). *The Communist Manifesto*. New York: International Publishers

technology. At this time, in 1848, Marx himself admired this revolutionary character and was trying to instigate one such shift. Of course, the Communist Russians and Chinese are not technically bourgeoisie and they destroyed their environments too. So we are talking about a class of moderns inclined toward domination over the environment such that destruction became a marker of modernity itself. "Anthropocene" signifies this quality of modernity.

There is a bigger issue at stake here. Ecologists' struggle over the meaning of succession is an historiographical problem as much as it is a scientific one. My issue is that social scientists have pilfered the cycle of ecological succession, turned it into a theory of history, and took it to be true for humans social systems. In so doing, they relocated politics and governance on to this theory of history. They have snuck a form of stagism in through the back door under the cloak of natural science. Marx was guilty of the doing the same thing, and there is a century's worth of post-Marxist scholarship that develops Marx's dialectic without the organicist and teleological tendencies. Ecology has not had this reckoning. To the contrary, ecological cycles have been used to explain more and more of the world by way of this historiographical device. There is plenty of precedent for such a thing: resilience is a 21st century form of social Darwinism. I interviewed one of the country's topmost urban ecologists and asked him about the idea of "legacy" found in the urban ecology literature. This scholar has worked on issues of race and class, and I thought that asking him to reflect on the contingencies of racialization in American urbanism might challenge urban ecology's effort to treat the city as an ecosystem. He referred me to Holling's resilience cycle. He believed that this is how social history worked too. Moderns are and are not natural. Despite the social scientific consensus, they are not part of ecosystems. The kinds of patterns, rhythms, and forces they create have no analog in any premodern ecosystem. Their actions are unassimilable to anything one could rightfully call an ecosystem. Destruction is the outcome of the unassimilability of these modern patterns, rhythms, and forces. Moreover, mistaking infrastructures for ecosystems only naturalizes the process and politics of their formation.

Does this get us any closer to understanding what destruction is? I said there were three things from Marx that nag me. The second pertains to Marx's thesis on so-called primitive accumulation. Primitive accumulation, he states, "is nothing else than the historical process of divorcing [separating] the producer from the means of production." Marx gives attention to proletarianization. There is another side of the transition into a capitalist mode of production. The "means of production"—the land—requires transformation too. This I have called infrastructuralization. Infrastructuralization bears a necessary relationship to destruction. Destruction is an historical "process of separation." In German, Marx's word is *Scheidungsprozess*. Destruction, I would like to say, is an historical process of the separation of relations on which a new social form is built and maintained. The new social form—infrastructure—depends on the production and reproduction of this separation process. In the case of my dissertation, settler capitalism not only leads to ecological collapse but depends on reproducing it for its ongoing purpose of speculation and commerce. Ecology does have an important normative role here: it can shed light on the biogeochemistry of this separation process. It tells us about the historicization of nature. But it has nothing to say about the nature of history.

Such an interpretation points to the empirical necessity of interpreting modern environments historically. Most such environments are produced and reproduced with relation to destruction, to ecological collapse. A natural history of destruction works to historicize periods of destruction and demonstrate how contemporary political, social, and environmental structures

require this destruction in order to maintain their stability. Such an approach may resonate with certain ideas about the Anthropocene. At best, it can be said to be a radically geographical approach to a geological concept. While destruction may compound on itself and reach a planetary scale, destruction does not occur at the scale of the planet. Destruction happens at the scale of a landscape, sometimes a region. Destruction happens in the unevenness of place and with relation to the contingencies of history. It approaches modern ideas about "space" and "time" with great suspicion. A natural history of destruction indicates that the Anthropocene is a totalizing concept that masks the real unevenness—the radically non-relational—quality of ecological collapse.

Moreover, there is no apotheosis or redemption of ecological destruction like there in disturbance ecology. Unlike disturbance, there is no dialectical sublation that leads to greater resilience or adaptation. Destruction may be negated, but the negation of ecological destruction is not ecological. This leads me to the third thought about Marx. What could a speculative environmental future that acknowledges the politics of environmental destruction look like from the point of view of a modern? Lewis Henry Morgan had one such thought. Morgan, himself is from Rochester, NY, and wrote a confused but important ethnology of the Haudenosaunee, *The League of the Iroquois*, in 1851.[87] He became obsessed with their relationship to the forest. Morgan never saw those forests, since settlers had cut them down. While Morgan's own answers tended toward the violently offensive,[88] he believed it was possible to "return to the archaic in a higher form." That is, he thought it possible to return to Iroquoian landscapes and social forms through the "higher form" of Enlightenment rationality. Rather than be "naturally" part of the forest, we could rationalize ourselves into enlightened relationship with them. Later in his life, Marx became interested in Morgan and began thinking of communism not in light of the utopian scientific modernism of his youth but in light of the anthropology of the archaic commune. In his letter to Vera Zasulich, Marx seized on to Morgan's phrase. He wished to return to the archaic commune in a higher form. A theory of destruction holds that any "return" or restoration ecology is mediated by our condemnation to the "higher" form. That is, destruction is a marker of the "higher" form. And this is where ecology comes in. It tells us that once you have crossed the line into catastrophic regime shift, there is no crossing back or elevating destruction into a higher form of relational integration.

§8 – *Spatializing Ecology*

To conclude this section, I wish to echo the excellent point made by de Bont and Lachmund in the introduction to their collection, *Spatializing the History of Ecology*. Their claim is that

> natural spaces are not only constitutive elements in knowledge production, but that, *vice versa*, scientific knowledge is also constitutive in shaping natural spaces... Ecological knowledge practices serve as ordering devices that culturally and materially intervene into the history of particular places. The ecologist's work, after all, redefines what these spaces are, how they should be treated, and how they relate to other spaces.[89]

[87] H.L. Morgan (1984). *League of the Iroquois*. New York: Citadel Press

[88] P.J. Deloria (1998). *Playing Indian*. New Haven & London: Yale University Press: Ch. 3

[89] R. de Bont & J. Lachmund (2017). "Introduction : Knowing Nature, Making Space." In Eds. R. de Bont & J. Lachmund. *Spatializing the History of Ecology*. New York: Routledge, 2

It is in this respect, they note, that "ecological knowledge-making" is profoundly political. A natural history of destruction follows this insight closely. One does not—cannot—simply grasp the unmediated particular. Thus, in historicizing the particular, the natural historian simultaneously historicizes those mediating forms that shape our understanding of it. Ecology is not the only form of knowledge-making in postindustrial cities, but it is a fundamentally important one, since it establishes the bounds of "naturalness" in the city. As the discourse of resilience in its various forms—coastal, urban, community—find evermore discursive traction in city halls, real estate offices, insurance offices, developers' board rooms, environmental and cultural non-profit centers, etc., ecological knowledge practices will continue to have an outsized influence on the material and intellectual shape of future urban places. This dissertation aims to denaturalize settler capital histories and speculative climate futures by historicizing ecology and landscape as non-identical forces. As a tool, rather than a totalizing analytic, ecology can be utilized for a more just political histories and futures.

Chapter 2: A New Hydrological Regime: Buffalo's Lakefront and the Eco-Mental System Called Lake Erie

You're glumping the pond where the Humming-Fish hummed!
No more can they hum, for their gills are all gummed.
So I'm sending them off. Oh, their future is dreary.
They'll walk on their fins and get woefully weary
In search of some water that isn't so smeary.
I hear things are just as bad up in Lake Erie.

-Dr. Suess, *The Lorax*, 1971[1]

In a talk from 1969 called "Pathologies of Epistemology," Gregory Bateson considers "what happens when you make the error of choosing the wrong epistemological unit."[2] Darwin made this error in his theory of natural selection when he chose the "species" as his. "But today," Bateson says, "it is quite obvious that [the species] is not the unit of survival in the real biological world. The unit of survival is organism plus environment. We are learning by bitter experience that the organism which destroys its environment destroys itself." Bateson goes on to argue,

> There is an ecology of bad ideas, just as there is an ecology of weeds… When you narrow down your epistemology and act on the premise 'What interests me is me, or my organization, or my species," you chop off consideration of other loops of the loop structure. You decide that you want to get rid of the byproducts of human life and that Lake Erie will be a good place to put them. You forget that the eco-mental system called Lake Erie is part of *your* wider eco-mental system—and that if Lake Erie is driven insane, its insanity is incorporated into the larger system of *your* thoughts and experience.[3]

If Lake Erie is polluted, it is a result of the way our bad ideas about the Lake have severed it from the relational "loops" that include it and that it includes. As an "eco-mental system," our bad ideas about the lake filter out the complexity of its material relations, leaving but a paltry image of it—as an sewar for industry. That Bateson calls it an eco-mental *system* indicates that the relationship between our idea of the lake and the "actual" lake itself form a complex pair that conditions our actions. This also implies that Lake Erie is decisively *not* our eco-mental image of it, which Bateson emphasizes when speaks of the eco-mental system *called* Lake Erie. There is an implied disjuncture between sign and signified that the name, "Lake Erie," obscures, and this disjuncture has real material implications. The passage also has a clear moral line. Bad ideas

[1] Dr. Seuss (1971). *The Lorax*. New York: Random House. Egan explains that in 1985, after a dramatic turnaround in the health of the lake, two Ohio State graduate students wrote to Theodore Geisel—aka Dr. Suess—entreating him to change the line, which he did. Egan also states that were Suess alive today, "he'd probably be angry enough [about the state of Lake Erie] to put the line back." See D. Egan (2017). *The Death and Life of the Great Lakes*. New York: Norton: 223-4.

[2] G. Bateson (2000). *Steps to an Ecology of Mind*. Chicago: Chicago University Press, 484-493

[3] *Ibid.* 489

chop of consideration of possible loops—nestings or relations. Better ideas would consider wider possible relations.

In this chapter, which tells a natural history of Buffalo, New York's postindustrial waterfront, I am precisely interested in the "eco-mental system called Lake Erie," and its changing place in our "wider eco-mental system." According to climatologists, the Great Lakes are undergoing a "hydrological regime shift." Climate change has transformed the hydrological patterns that have, up until now, defined what we have customarily called Lake Erie. The first part of this chapter examines in depth the two major effects of hydrological regime change on Buffalo's lakefront: the increased force and frequency of seiche wave events and extreme fluctuation of lake water levels. A natural history of the Lake Erie seiche draws a loop around the lake and Buffalo's vulnerable lakefront. An examination of lake level fluctuations places this loop in a much larger one that includes weather systems in the Pacific and Arctic. If Lake Erie is changing, the relations that compose the "eco-mental system called Lake Erie" have also come under scrutiny: climate change has ruptured the meaning of "Lake Erie." This becomes evident in my examination of the fight over coastal resilience in Buffalo, where developers and environmentalists vie to recapture the lake's meaning—and its future.

While the first part of the chapter details the changes in Buffalo's hydrological cycle caused by climate change, the second attempts to intersect of these urban ecological changes with the efforts of Buffalo's growth machine to develop real estate on the Outer Harbor. In light of Buffalo's history of development on the Outer Harbor and the change in strategy from industrial to real estate after the mid-1970's, it remains an open question whether, or to what extent, changes in the hydrological regime are impacting growth strategies. I draw on the history of a small patch of the Outer Harbor called Times Beach in order to elucidate these dynamic historical relationships between the anthropogenic and non-anthropogenic aspects of the environment. Such lines become very blurry here. By detailing the impact of seiches and fluctuating water levels on Lake Erie's coastline, the chapter highlights the burgeoning social response to the Lake's new hydrological realities by tracing competing frameworks for the concept of "coastal resilience." While new hydrological realities are eliciting a new battleground for groups competing over access to Buffalo's waterfront, the spell of waterfront real estate speculation still appears to command the rhetoric of the growth machine. Even within the framework of coastal resilience, for a group of environmental activists whose understanding of Lake Erie is dynamic and relational, their vision for a buffer island remains outside contemporary political view.

§1 – ~~*Lake Erie,*~~ ~~*Lake Erie,*~~ ~~*Lake Erie,*~~ *Lake Erie*

By the late 1960's, it became commonplace to hear that "Lake Erie is dead." A 1965 *Time Magazine* article gave nationwide reach to the sentiment, showing that industrial pollutants and sewage from Detroit, Toledo, Cleveland, and Buffalo had virtually destroyed the conditions for habitable life in the Lake.[4] *LIFE* ran a compelling photo essay in 1968 looking at the Great Lakes more broadly.[5] In 1969, NBC ran a two-hour long TV documentary by Fred Freed called "Who Killed Lake Erie." The *New York Times* reviewed the documentary, saying "An exceptionally vivid television essay on man's pollution of his environment, his arrogance in

[4] Time Magazine (1965). *Time for transfusion* (Vol. 86, No.8), 20 August 1965. Online: https://content.time.com/time/subscriber/article/0,33009,841998-1,00.html

[5] L. Rothman & L. Ronk (1968). "Disturbing Photographs Show Pollution in the Great Lakes Before the Clean Water Act." *LIFE Magazine*. Online: https://www.life.com/nature/photos-great-lakes-pollution/

assuming that he can tamper with nature's balance and not pay a price, was offered last night…" The reviewer echoed Freed's judgement that "Lake Erie is perhaps the most spectacular example of a world blight. The advances of technology… now invite the question of whether science can control its own abuses or whether the cost of affluence is a loss of beauty." Much of the blame was put on the alliance between governments and corporations. Lake Erie became a nationwide signifier for the excesses of industrialized man whose environmental destruction—it was becoming clear—was tantamount to his own demise. The extent of Lake Erie's metonymic reach is suggested by it serving as a punchline in the first version of Dr. Seuss's 1971 *The Lorax* and the fact that Bateson seamlessly spoke its name in his "Pathologies of Epistemology" talk at the Second Conference on Mental Health in Asia and the Pacific, at the East-West Center in Hawaii.[6] The public swell of awareness of the state of the lake was instrumental in the passage of the Clean Air and Water Acts, the Great Lakes Water Quality Agreement, and in the founding of Earth Day.

However, if we are to use Bateson's suggestion that ecological collapse is akin to insanity, then Lake Erie has suffered several iterations of madness. Lake Erie has been destroyed many times. Dating back to the mid-19th century, industrialists and boosters had drained or filled vast extents of coastal wetlands, altered watershed hydrology, and clear cut many of the lake's surrounding forests.[7] The destruction of the wetlands in particular would have eliminated crucial wildlife habitat and led to important changes in water quality. But there is no clear data on this, so it is difficult to know whether or to what degree the lake was pushed to regime collapse. Certainly, by the end of WWI, the lake fishery suffered total collapse. One of the most productive freshwater fisheries in the world before settlement had been virtually fished out.[8]

[6] Bateson (2000): 486

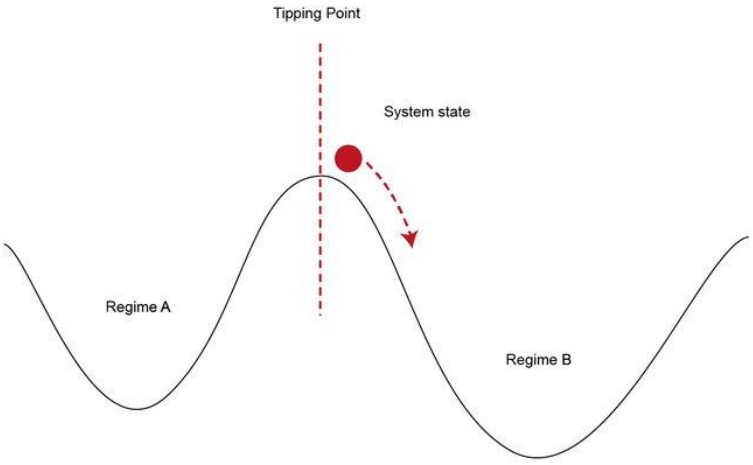
[7] Very little good data exists on these early activities—something I attend in Chapter 3.

[8] M. Bogue (2000). *Fishing the Great Lakes: an Environmental History, 1783-1933*. Madison: University of Wisconsin Press.

By the lake 1910's, some 48 million tons of lake herring were being fished every year from the lake to serve as soldier rations during WWI. The population bottomed out, never to return, its niche taken over by cisco and other feeder fish. There is a black and white photograph from 1918 of a dozen or so fishermen standing on the hull of the Earl Bess in Sandusky Bay, just east of Toledo.[9] The hull of the boat is overflowing with lake herring. The men standing proudly, workmanly, around their days catch. The photograph echoes one that Max Sebald used in *Rings of Saturn.*[10] There, Sebald comments on the sentiment held that the supply of ocean herring was infinite. Industrial fishing proved the sentiment wrong.

After the midcentury death of the lake by industrial pollutants, as discussed above, deindustrialization combined with regulatory and community efforts to ease the toxic constraint on life. But by the late 1980's and early 1990's, the lake was again driven insane, this time by the biological invasion of dreissenid mussels and the goby fish, which were introduced accidentally in ballast from Caspian and Black Sea cargo ships.[11] This so-called Caspianization of Lake Erie's benthic community so altered lake's ecological dynamics that biotic life in the lake became entirely conditioned by it.[12] If the lake has experienced chemical and biological death, it is now undergoing a *hydrological* one at the hands of anthropogenic climate change.

Bateson's invocation of a lake driven insane by industrial pollution maintains a certain moral outrage that gets lost in talking about hydrological regime shift, but the latter may very well indicate a more persistent profound alteration: after all, climate change cannot be cleaned up. To be clear about what it implies, "regime shift" is a notion that comes out of resilience theory and systems theory more broadly. Those ecosystems are resilient that, despite perturbation, remain in the same "regime," which is to say, in that semi-stable state in which the same essential forces and vectors are at work moving energy within and across a system. When some kind of disturbance pushes a system past a tipping point, that system—failing to



[9] https://greatlakes.bgsu.edu/media/472324

[10] WG Sebald (1998 [1995]). *The Rings of Saturn[: an English Pilgrimage]*. New York: New Directions: 54-9

[11] There are many excellent accounts of the introduction of dreissenids to the Great Lakes. See D. Egan (2017): Ch. 4

[12] See, for example, C. Mayer *et al.* (2013). "Benthification of Freshwater Lakes : Exotic Mussels Turning Ecosystems Upside Down." In T. Nalepa & D. Schloesser. *Quagga and Zebra Mussels: Biology, Impacts, and Control*. Boca Raton: CRC Press.

adapt to that disturbance—moves into a new regime conditioned by a different set of relationships.[13] This can happen at and across any ecological scale.[14] The diagram below is common throughout the ecology literature. It is, in essence, a simplified version of Gunderson and Holling's "adaptive cycle," the Moebius strip of resilience discussed in Chapter 2.[15] In the diagram, the ball designates the system state, and the troughs, various potential regimes. As suggested by the trough, a system has a certain inertia or stability so that forces pushing the system up the sine curve still function according to the dynamics of the same basic regime. However, a system state is only so resilient. When exogenous disturbance is too severe or too persistent, it pushes that state past a tipping point, at which point it "falls" into a new regime. My short history of Lake Erie suggests that settler capitalism has pushed the Lake into a series of regime shifts over the past century—or two. This iteration of regime shifts, triggered by various forces, marks an expansive ecology of bad ideas. Hydrological shift indicates a regime shift at a higher scale, or higher order of nesting; it indicates that the bad ideas are part of a much vaster regime shift that we have come to call the Anthropocene. Indeed, it can be instructive to see Lake Erie as an exemplary Anthropocene Lake; through historical investigation into it, we can come to see the uneven geographies of the Anthropocene. But lakes and the way we understand them pose a certain problem to understanding. To a limnologist like Francois-Alphonse Forel or G. Evelyn Hutchinson, a lake is a system of relations based in its biological, chemical, physical, photic, and hydrological aspects.[16] Lakes are geographical insofar as geography dictates climatological and anthropological relations, which are important. But a lake is *not* a geospatial entity. Just because the water is still *there*/ was *there*/ will be *there* in roughly the same abstract coordinates as before is almost meaningless to what it means to be a lake. *A lake is not just a body of water*. Its physical, chemical, and biological relations are far more determining to what the lake is *qua* lake.

In other words, Lake Erie is not. Whatever it is today, Lake Erie is not the Lake Erie of when I was born, is not the Lake Erie that my parents knew, or that their parents knew. I mean this limnologically, *not* ontologically. The negation but persistence of a body of water is not the same as the resilience of a lake. This is another way of saying that *geographical names bring confusion to epistemological units*. One of the things that the Anthropocene quietly suggests is that semiotic units like "Lake Erie" can only be understood as epistemological units undergoing anthropogenic change. The fact of the Anthropocene means that the geographical name bears its own negation. But standing at the tip of the abandoned Michigan pier on Buffalo's Outer Harbor watching the sun arch over the vastness of the lake, it is incredibly difficult to realize the lake is not the lake. When you're standing on the pier with wind and rain tearing at your face, water lapping up your knees during a seiche, thinking "I've never seen anything like this," it is still exceedingly difficult to know hydrological change. The vastness of the water and the timescale of the changes renders invisible to the senses the hydrological transformations taking place therein below the surface and out there, beyond the horizon. Because of its invisibility, one

[13] See C. Folke, S. Carpenter, B. Walker, M. Scheffer, T. Elmqvist, L, Gunderson & C.S. Holling (2004). "Regime Shifts, Resilience, and Biodiversity in Ecosystem Management. *Annual Review of Ecology, Evolution, and Systematics* 35: 557-581

[14] See A. Kinzig, P. Ryan, M. Etienne, H. Allison, T. Elmqvist & B. Walker (2006). "Resilience and Regime Shifts: Assessing Cascading Effects." *Ecology and Society* 11(1)

[15] L. Gunderson & C.S. Holling (2002). *Panarchy*. Washington DC: Island Press.

[16] Forel and Hutchinson are founders of the field of limnology. See W. Vincent (2018). *Lakes: A Very Short Introduction*. Oxford: Oxford University Press

becomes especially reliant on the production of speculative ecological knowledge and the uncertainty of regional climate models to understand what is happening. This chapter examines the political economic struggle over the meaning of that knowledge and over who gets to decide what to do in the face of it.

§2 – *The Great Lakes Hydrological Cycle*

In a precocious 2013 article about modelling Great Lakes water levels, Gronewold *et al.* asked a provocative question: "Have we entered a new hydrological regime?"[17] The question resonates with a statement made by an informant in Dan Egan's popular book, *The Life and Death of the Great Lakes*. An engineer Egan interviewed states, "What appears to have happened is the hydrological regime—the climate—has changed."[18] One cannot overemphasize the significance of such statements, but, then again, it is difficult to understand what they actually mean. Gaining full purchase on the significance of a transformed Great Lakes hydrological regime requires understanding Great Lakes hydrology, global climate change, and the interaction between these nested systems. Nobody understands this yet. And while every scientific paper acknowledges the outsized impact hydrological change will have on the economy and the social patterns of the Great Lakes, hydrologists and climatologists do not appear to have a very clear sense of how municipalities function politically, so their predictions tend to be generic and relatively out of touch with the fact that the impact of new hydrological realities will be mediated by regional political economy.

Before addressing hydrological regime change, it will be helpful to get a basic comprehension of Great Lakes hydrological dynamics. Regional hydrologists understand the Great Lakes as a series of "nested" system. Each lake consists of its own hydrological system—a basin, or watershed—that break down into smaller sub-systems and that, together, articulate with ever more global systems. These multiple levels of nesting are precisely what make a system like this "complex."[19] Seen as a single freshwater hydrological system, the Great Lakes the world's largest. Water flows in a generally eastern direction, from Superior to Michigan-Huron to Michigan, Erie, Ontario, and out through the St. Lawrence River. General wisdom is that the Great Lakes contain five lakes, but from a hydrological perspective Lakes Michigan and Huron function together—kept in equilibrium by the 5-mile-wide (8km), 295-foot-deep (90m) Straits of Mackinac—so hydrologists count four primary basins. Technically, Lake Saint Clair—the small lake between Huron and Erie alongside which Detroit was built—has its own hydrology, but at a meager average depth of 11 feet (3.4m), its water capacity is considered negligible in whole-system analyses.[20] There is some disagreement about exactly what constitutes the Great Lakes watershed. Many watershed maps of the Great Lakes stop at the northeast tip of Lake Ontario, around Kingston, ON, and Watertown, NY, but such maps omit the St. Lawrence River, which serves as the Lakes' outflow. The St. Lawrence flows another 435 miles (700km) past Quebec

[17] A. Gronewold, V. Fortin, B. Lofgren, A Clites, C. Stow & F. Quinn (2013). "Coasts, Water Levels, and Climate Change" *Climatic Change* 120:704

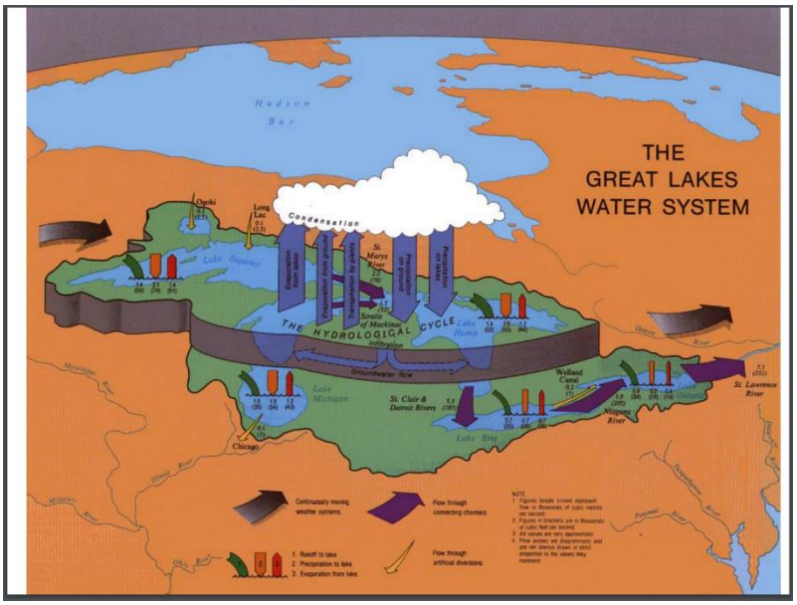
[18] Egan (2017): 285

[19] C. Walloth (2016). *Emergent Nested Systems*. Brussels: Springer.

[20] K. Fuller & H. Shear (1995). *The Great Lakes: An Environmental Atlas and Resource Book*. Chicago & Downsview, ON: Govt of Canada & US EPA

City into the Gulf of Saint Lawrence. The omission relieves the cartographer of having to decide whether or not the Great Lakes includes the full extent of the St. Lawrence watershed. While ecologically arbitrary, the decision to speak of Great Lakes hydrology without the St. Lawrence watershed also omits the St. Maurice and Ottawa River basins. The Ottawa River watershed, whose massive 56,500mi² (146,300km²) basin is larger than all of New York State (55,556mi²; 141,297km²). The outflow of the Great Lakes without the St. Lawrence produces around 7,000 cubic meters per second (cms) of annual discharge, which would make it the 5th largest freshwater system in North America. As the Great Lakes-St. Lawrence system it is the second largest on the continent, at 10,800cms. Only the Mississippi is larger by volume, at 18,400cms. Thus, speaking of the Great Lakes watershed as a hydrological subsystem of the Saint Lawrence River watershed serves to focus analyses, if somewhat arbitrarily, on the lakes themselves.

When addressing Great Lakes hydrology, ecologists tend to start with a "water balance approach."[21] They base their models on a calculation of the "Net Basin Supply" (NBS) for each lake, which accounts for all water entering and leaving a given body of water over a given period of time. Three primary factors determine NBS: over lake precipitation, over lake evaporation, and over-basin precipitation, which runs off into each respective lake. As a simple value, NBS is typically measured as the sum of over-lake precipitation and basin runoff into the lakes, minus lake evaporation.[22] This seems basic enough: lake levels are determined and maintained by inputs minus outputs. But a brief analysis of a hydrological diagram reveals a few important considerations.



The below diagram is a common one. It is from a popular

[21] M. Kayastha, X. Ye, C. Huang, P. Xue (2022). "Future Rise of the Great Lakes Water Levels Under Climate Change." *Journal of Hydrology* 612B

[22] K. Fuller & H. Shear (1995)

sourcebook on the Great Lakes and represents the Great Lakes Hydrological Cycle.[23] The green arrows represent runoff to the lake from precipitation that has fallen within the watershed and the orange arrows indicate over lake precipitation. These are the major inputs. The red arrow indicates evaporation from the lake. The numbers are calculated as thousands of cubic meters per second of waterflow so that the system is comparable to rivers. Looking, for instance, at Lake Superior, one sees that runoff into the lake is 1400cms, over lake precipitation 2100cms, and over lake evaporation is 1400cms. This means that, on average, Lake Superior gains 50% more water by rain that falls directly into it than it does by run-off from across its entire watershed. And as much water is lost to evaporation than is gained by run-off. This speaks to the tremendous surface area of Lake Superior. For riverine hydrological models, precipitation and evaporation are negligible and do not factor significantly into flow.[24] But for the Great Lakes, this play between over-lake precipitation and evaporation proves to be crucial. For Lake Erie, precipitation, evaporation, and runoff are all 700cms: it gains on average as much water in precipitation as it does in runoff and loses half of what it gains by evaporation. NBS does not typically account for lake discharge, but it is an important factor for certain determinations. Note the magnitude of the average annual discharge flowing out of Lake Erie through the Niagara River and Welland Canal. If Lake Erie was a river, 6000cms total discharge would make it the sixth largest system by volume in North America, just below the Yukon River (6400cms). Given Lake Erie's shallowness, this rapid discharge accounts for the brevity of the Lake's retention time, or the amount of time it takes for a molecule of water to move through the system. Lake Erie's is just under three years; Lake Superior's is closer to 175! The dynamics of the NBS are fundamentally important to understanding changing dynamics in lake water levels.

Discovery of a new hydrological regime is still ongoing, but the first indication that such a regime shift may have been underway was that evaporation began to regularly outpace precipitation, resulting in a dramatic decline of lake water levels across the entire basin. Several basins reached record lows in the early 2010. Then, in only a few seasons, the lake water levels surged to record highs, totally flummoxing the regional climate models.

§3 – *Lake Levels and New Teleconnections*

> "The lakes could go up or they could go down—that's entirely true."
> -Andrew Gronewold[25]

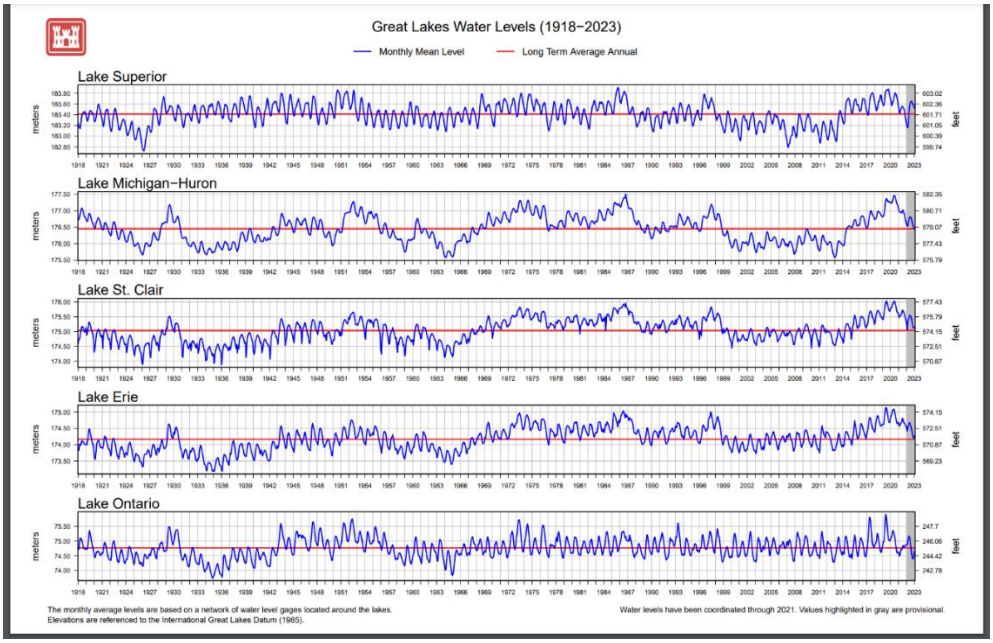
Between 2013 and 2020, the Great Lakes saw an unprecedented swing in water levels.[26] Rather suddenly, in the early 2010's, levels in Superior, Erie, and especially Huron-Michigan fell well below average. In 2013, Huron-Michigan fell to its lowest recorded level, 29 inches (73.66 cm) below its long-term average. And this was after a full decade that, counterintuitively, saw

[23] *Ibid*.
[24] A. Gronewold (2020). "Understanding Drivers of Great Lakes Water Level Variability." 19 Feb 2020. Save the River/ Upper St. Lawrence Riverkeeper: Clayton, NY. Video: https://www.youtube.com/watch?v=xXuWFIpUmBA
[25] Quoted in J. Alexander. "Up or Down: Which Way are the Great Lakes Water Levels Headed?" *Bridge Michigan* 21 Oct 2013. Online: https://www.bridgemi.com/quality-life/or-down-which-way-are-great-lakes-water-levels-headed
[26] All Lake Water Level Recordings from the Army Corps of Engineers: https://www.lre.usace.army.mil/Missions/Great-Lakes-Information/Great-Lakes-Information-2/Water-Level-Data/

above average precipitation.[27] It took a series of well above-average deluges in the spring and summer of 2013 to push levels in Superior and Michigan-Huron up 20 inches (51 cm)—more than double the average annual spring rise—and back to their long-term averages. Then, in 2014, lake levels across the system suddenly surged, and in several of the following years, gauges measured record highs in 2018 and again in 2019.

Lake Erie's long-term mean lake level is 571.42 feet above sea level (174.17 meters). The lake approached record lows in 2013,[28] and it reached a record high of 574 feet (175 meters) in March 2018 and again the next year, finally cresting to more than 3 feet (1 meter) above its long-term average to 574.61 feet (175.14 meters) in June 2019. Out of the top twelve highest lake levels by month on record, eight are from the 2018 and 2019 seasons.[29] Between 2020 and 2023, levels have dropped to about average, and, despite ongoing speculation, model predictions are full of uncertainty.

To be clear, lake levels have always fluctuated in a rhythmical fashion. Douglas Wilcox, an ecologist who studies these changes, points to oscillations on seasonal, annual, decadal and multi decadal (~36 year), and even—possibly longer cycles.[30] Lake Erie in particular additionally experiences more stochastic changes in water levels on hourly intervals due to the seiche activity on the lake (see below). Bt regional climate models for the Great Lakes did *not* forecast this swing in water levels durin the 2010's. What climate models predict now is that lake levels will continue to fluctuate between extremes, but there is increasing uncertainty about when. It is not intuitive, but it turns out that this oscillation of lake levels is an excellent indicator of regional climate change since lake level averages are a symptom of the perennial tug-of-war between precipitation and evaporation across the basin. In turn, rates of precipitation and evaporation point to a number of other hydrological referents like rates of water temperature,



[27] H. X. Do, Y. Mei, A. Gronewold (2020). "To What Extent are Changes in Flood Magnitude Related to Changes in Precipitation Extremes." *Geophysical Research Letters* 47(18). Also see A. Gronewold, J. Smith, L. Read & J. Crooks (2020). "Reconciling the Water Balance of Large Lake Systems." *Advances in Water Resources* 137

[28] Lake Erie's lowest recorded point came as a result of the same alteration in the jet stream that triggered the Dust Bowl. It reached its nadir of 568.18 feet in February 1936.

[29] Army Corps site

[30] D. Wilcox, T. Thompson, R. Booth & J. Nicholas (2007). *Lake-Level Variability and Water Availability in the Great Lakes*. Circular 1311. Reston, VA: US Geological Survey

wind, vapor pressure, ice coverage, and impacts of exogenous weather systems and cycles. Great Lakes water levels are in constant flux, but hydrologists consider the long-term averages to be reliable, since we have very good data going back to 1860.[31] The Army Corps of Engineer graph above, which dates back to 1918 gives a good sense of the constant monthly flux of lake levels (blue lines) compared to the long- term lake level average (red lines). Seasonal fluxes are a result of evaporation-precipitation cycles. Evaporation rates are highest the autumn, when relatively warmer water loses moisture to cold air masses sweeping through the region, resulting in dropping water levels. Lake levels tend to peak in the spring when seasonal rains join snow and ice melt throughout the watershed. Since the 1960's, Great Lakes evaporation rates have increased dramatically: they have more than doubled in Lake Superior, have increased about 45% in Lake Michigan-Huron and Ontario, and 20% in Lake Erie. In the early 2010's, many scientists argued that persistently low lake levels would be the new norm in the Great Lakes. The logic was that as temperatures climbed, evaporation would outpace precipitation and slowly sap the water from the lakes. One image from *Bridge* magazine circulated widely in 2013.[32] Its depiction of Lake Huron as a giant drain captured both the imaginary and the scientific consensus. It was at this time—even before the sudden rise of water levels—that climate modelers like NOAA's Drew Gronewold and other began speaking of a "new hydrological regime."

A number of factors are at play in shrinking waterlines. Following global warming trends, Great Lakes surface water temperatures are rising. Despite extreme cold events, the average annual surface water temperature of Lake Erie is up about two degrees since 1995, from about 51.5º F to 53.5º F.[33] But warmer waters do not have a unilinear impact on Great Lakes evaporation-precipitation cycles, and this is due to the dynamics of ice on the lake. Freezing is fundamentally important to lake water levels, and since the early1980's—in my lifetime—ice coverage is down an incredible 71% across the lakes. Despite significant inter-annual variability, Lake Erie follows this trend.[34] While Lake Erie is the only Great Lake that regularly freezes over, every lake experiences freezing to various extents. The traditional view has been that ice functions effectively as a cap on the lake, preventing further evaporation, and this is true. But a series of studies in the mid-2010's complicated this picture by demonstrating that, in fact, when, where, and how much lakes freeze depends significantly on autumnal evaporation rates.[35] If there is not enough evaporation in the autumn—in essence, if it is not cold enough—not enough heat will be lost from the water, which could delay freezing or stymie it altogether. This lack of ice as a result of lesser autumnal evaporation could lead to increased annual evaporation, since the unfrozen

[31] A. Gronewold (2013). "Understanding Drivers of Great Lakes Water Levels." 30 May 2013. Great Lakes Seminar Series. Ann Arbor, MI. Online: https://www.youtube.com/watch?v=6Vx0tj3ECvw; Gronewold *et al.* (2013)

[32] J. Alexander (2013)

[33] NOAA Coastwatch, Great Lakes: https://coastwatch.glerl.noaa.gov/statistic/

[34] NOAA Great Lakes Environmental Research Laboratory: https://www.glerl.noaa.gov/data/ice/#historical

[35] NOAA GLISA: https://glisa.umich.edu/resources-tools/climate-impacts/great-lakes-ice-coverage/

lake will continue to lose water all winter. Measurements of the western end of Lake Erie show that while evaporation reaches its peak in the autumn, up to 30% of annual evaporation happens in the winter—if the lake remains unfrozen.[36] Colder and increased winter winds also hasten evaporation.

Further, if freezing stops the evaporation process, not freezing actually *hastens* it. This is because snow-covered ice is white and has a high albedo, sometimes approaching 0.9, which

means that almost 90% of warming light is reflected off of it. When there is no ice, especially in the fall and winter when the lake waters are noticeably dark, albedo can drop as low as 0.2 or even 0.1. This means that the lake water is absorbing more light, increasing surface water temperature and, therefore, the difference between the lake and air temperatures. Additionally, if the lake and surrounding areas freeze, the snow and ice melt increase the levels of the lake more than if the same amount of precipitation fell only in rain, since rainy temperatures do not yield the ice that halts evaporation. There are other factors too: bathymetry matters since the lesser depth and volume of water hasten freezing, as do time-lag effects of cooling and warming waters.[37] This number of variables all contributes to make freezing rates and patterns very difficult to model. Moreover, while the relationship between air temperature and ice is something every schoolchild knows, it is incredibly hard to predict the relationship from even from week to week, since even slight increases in surface temperatures can mean the difference between freezing or not freezing. When it comes to Great Lakes hydrology, freezing—to use Bateson's formula—is a difference that makes a difference.[38]

If climate change is yielding higher temperatures, less freezing, and higher rates of evaporation, resulting in lower lake levels, why did the lakes experience record highs levels in 2018 and 2019? In a word, growing consensus is that it is because of the polar vortex. But how did the polar vortex suddenly begin becoming such an important factor in Great Lakes weather and climate? Much of this research is new and ongoing, and conversations with meteorologists and climatologists are always padded with conditionals, but some initial consensus appears to be

[36] *Ibid.*

[37] *Ibid.*

[38] See G. Bateson (2000): 309-337, "The Cybernetics of 'Self': A Theory of Alcoholism."

emerging that Great Lakes weather patterns have become attached to a different—and also changing—set of global weather patterns. They have become nested in a different system: drawn into a different loop. As one paper title puts it, "Recently Amplified Interannual Variability of the Great Lakes Ice Cover [is] in Response to Changing Teleconnections."[39] This to say that over the past twenty-five years, ice coverage from year to year is either far above the long-term average, or far below. This is in response to "changing teleconnections," that is, new relations to large-scale atmospheric circulations. This appears to have begun in 1997/98 after a particularly powerful El Niño cycle. Before that, Great Lakes ice coverage was correlated strongly with the El Niño-Southern Oscillation (ENSO) cycle. After the winter 1997/98, the Great Lakes annual maximum ice coverage started to correlate more strongly with the warm sea surface temperature anomaly in the northeast Pacific Ocean.[40] Changes in this region appears to disrupt the polar vortex—a large circle of frigid air cycling in the stratosphere high above the arctic circle. Typically this air is relatively well contained, but perturbations in the relationship between the polar vortex and the jet stream caused by warming temperatures can result in cold blasts of arctic air being shot out from the vortex over the Great lakes region.[41] This can effectively flash freeze much of the Great lakes. That said, "uncertainty" remains the word on every climatologist's lips[42]: there is a high degree of interannual variability in this system, so the effect does not impact the lakes every year.

When the lakes do freeze under polar vortex conditions, they tend to freeze more extensively than the long-term average. This leads to a drastic reduction in evaporation across the Great Lakes system and generally more snow and ice throughout the basin. The combined impact has been that in the years that do freeze, water levels rise to record or near record levels. In an extremely rare event in early 2019, the Polar Vortex froze large tracts of Lake Michigan, which was crucial to the record high water levels experienced later that spring and summer. The misdirection here is that those long-term averages were based on the ebbs and flows of a totally different cycle. What climate modelers know about this new cycle is that it is one of extremes and uncertainty, but they do not know how drastic the extremes will be, or how unpredictable the uncertainties. While there is broad consensus that this is all driven by global warming, climatologists are still clarifying the mechanisms.

Extreme changes in lake levels such as this wreak significant havoc made more so by the fact that the havoc wreaked is different when the water is high versus when it is low. High water dramatically increases shoreline erosion and flooding. As I detail in the next chapter, it has been a perennial public concern since settling the Great Lakes. At its most extreme, high water can

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[39] Y-C. Lin, A. Fujisake-Manome, J. Wang (2022). "Recently Amplified Interannual Variability of the Great Lakes Ice Cover in Response to Changing Teleconnections." *Journal of Climate* 35(19): 6283-6300

[40] *Ibid*.

[41] See S. Lillo. S. Cavallo, D. Parsons & C. Riedel (2021). "The Role of a Tropopause Polar Vortex in the Generation of the January 2019 Extreme Arctic Outbreak." *Journal of the Atmospheric Sciences* 78(9): 2801-2821; R. Anthony, A. Ringler & D. Wilson (2018). "The Widespread Influence of Great Lakes Microseisms Across the Midwestern United States Revealed by the 2014 Polar Vortex." *Geophysical Research Letters* 45(8): 3436-3444; M. Cellitti, J. Walsh, R. Rauber, D. Portis (2006). "Extreme Cold Air Outbreaks Over the United States, the Polar Vortex, and Large-Scale Circulation." *Journal of Geophysical Research: Atmospheres* 111(D2)

[42] See F. Giorgio (2019). "Thirty Years of Regional Climate Modeling: Where Are We and Where Are We Going Next?" *Journal of Geophysical Research: Atmospheres* 124(11): 5696-5723; A. Foley (2010). "Uncertainty in Regional Climate Modelling: A Review." *Progress in Physical Geography* 34(5): 647-670; F. Giorgi (2010). "Uncertainties in Climate Change Projections, from the Global to the Regional Scale." *EPJ Web of Conferences* 9:115-129

erode land beneath housing and infrastructure, causing it to tumble into the lake. On the other hand, exceedingly low levels can ground transportation and recreational boating to a halt, which has a large impact on local economies. Additionally, concentration of pollutants are higher in lower waters, especially in shallow areas like the western basin of Lake Erie, which is already susceptible to massive harmful algal blooms. To develop coastal resilience in this highly unpredictable terrain represents task well beyond the capacity of most Great Lakes Rust Belt towns and cities.

§4 – *The Seiche*

On October 18, 1844, at about midnight, a wall of water overtook the Buffalo harbor. All accounts and later reports speak of the suddenness of the event. "It came without warning, an avalanche of waters upon a sleeping community."[43] They lined the dead in windrows in front of the courthouse on Washington Street and in the market building, awaiting identification. The dead included steamboat passengers washed overboard, foundry workers drowned at their forges, hotel workers sleeping in their basement bedrooms, and so forth. The bodies of several young women in their night clothes had to be fished out of basement windows. 78 people are said to have drowned but many more went forever missing. Debris lined the shore. Several steamboats were damaged: the St. Louis, Robert Fulton, Jessie Palmer, Commodore Perry, and Indian Queen. And many more brigs and schooners: Potomac, G.H. Walker, Brandywine, Lodi, John Marshall, Georgiana, Europe, Uncle Sam, Captain Miner, Wyandot, Mariam. Steamer Columbus was thrown into a pasture 200 feet off the creek. Some fifty canal boats were driven ashore.[44]

For several days prior to this event, a strong northeast wind had driven the water back up Lake Erie, toward Toledo. On the evening of October 14, the atmospheric pressure dropped, and the wind suddenly changed direction, triggering the event. On that night, the waves that broke over the Buffalo harbor were measured at 22 feet (6.7 meters). The event is called a seiche. And Lake Erie is especially prone to them. A seiche is standing wave, oscillating in a body of water. When explaining it, meteorologists typically use a bathtub metaphor, since seiches are most likely to occur in an enclosed body of water, like Lake Erie. As the above examples indicate, seiches are typically caused when strong winds and rapid changes in atmospheric pressure push water from one end of a body of water to the other. Strong southwesterly winds effectively tilt Lake Erie toward Buffalo and away from Toledo. When the wind stops, the water rebounds and continues oscillating for hours, or days.[45]

On March 29th and 30th, 1848—just a few years after the deadly harbor seiche—another slower forming seiche piled on to Buffalo's lakefront. A strong southwest gale had been blowing for several days across the entire fetch of Lake Erie, this time pushing all of the lake ice toward Buffalo. The persistent gale jammed the winter's ice into the mouth of the Niagara River.

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[43] S. Meehan. "Oct. 18, 1844: 'Great Flood of 1844' Devastates Buffalo." *The Buffalo News* 18 Oct 2014; J. Malloy (2010). The "October Surprise" of 1844. *The Buffalo History Gazette*. Online: https://www.buffalohistorygazette.net/2010/09/the-lake-erie-seiche-disaster-of-1844.html;

[44] J.B. Mansfield (2003[1899]). "The Flood of 1844 in Buffalo." *History of the Great Lakes, Volume 1.* Online: https://www.maritimehistoryofthegreatlakes.ca/documents/hgl/default.asp?ID=s0381844 accts

[45] S. Bolsenga & C. Herdendorf (1993). *Lake Erie and Lake St. Clair Handbook*. Detroit: Wayne State University Press: Ch. 3; R. Widrig & K. Vorenkamp (2021). "Seiche Events on Lake Erie." Oswego: New York Sea Grant. Online: https://www.seagrant.sunysb.edu/Images/Uploads/PDFs/GreatLakes-SeicheEvents-LakeErie.pdf; NOAA. "What is a Seiche?" Online: https://oceanservice.noaa.gov/facts/seiche.html#:~:text=Seiches%20are%20standing%20waves%20with,two%20minutes%20to%20two%20hours).

Reports from the morning of March 30 speak of an eerie silence at Niagara Falls.[46] The perennial roar of the Falls had gone quiet. Millions of tons of ice had plugged the river entirely; the Falls stood still. Mill races empty, the incessant grinding of logs had stopped too. There was nothing to hear but the wind and—as some remarked—the fish laying along the riverbed, gasping and floundering.[47] As news spread, the drying of the Falls quickly became a media and tourist event: the anti-spectacle saw people scavenging the river for muskets, tomahawks, and other relics from the War of 1812. In a strange exhibition of pride and authority, a squad of soldiers of the US Army Cavalry rode their horses up and down the riverbed, heedless of the fish. Workers from the Maid of the Mist—a boat that ferried tourists in and out of Horseshoe Falls—scrambled out into the gorge to blow up the rocks that served as hazards on their daily course, so the sound of explosives replaced the roar of the Falls.[48] In retrospect, it was perhaps the millenarians whose comportment was most befitting to the situation. Upstate New York seconded as the "Burned Over District,"[49] home to the Second Great Awakening—a Protestant revival rife with Doomsday prediction. For the revivalists, this was a sign of the end times. I imagine during those forty hours of silence, preachers in their makeshift pulpits screaming doom to makeshift masses, struggling to make sense of a suddenly accelerated world. Then, the wind turned and the air warmed. The earth let out a terrible groan and creak and then a laugh in the form of a deluge over the Falls, just in time for April Fool's Day.

Lake Erie is some 249 miles (400km) across, along an axis that runs from the southwest to the northeast—from Toledo to Buffalo. Examining the map below, the eastern basin of the lake is shaped like a funnel pointed directly at Buffalo. With an average depth of about 79 feet (24m), Lake Erie is by far the smallest in volume and the shallowest among the Great Lakes. This is not only an important factor in freezing, as discussed above, but in seiche development, since wind can more easily move the shallow water.[50] Buffalo's location at the very eastern tip of Lake Erie is crucial to the city's weather and climate, [51] as well as to the likelihood that seiches impact the city's coastline. As the Department of Conservation's Great Lakes Watershed Coordinator put it, Buffalo receives the entire energy potential of Lake Erie.[52] Winds are common from the southwest, and as they cross the entirety of the lake, they drive water to Buffalo. When a "southwesterly" combines with high water levels, the waterfront is especially vulnerable. One prominent trend that Great Lakes climatologists have already measured is that

[46] R. Berketa (2012). "The Day Niagara Falls Stood Still." *Niagara Falls: A History*. Online: http://www.niagarafrontier.com/fallsstopped.html

[47] J.B. Mansfield (2003[1899]). "The Gale of April 1848." *History of the Great Lakes, Volume 1.* Online: https://www.maritimehistoryofthegreatlakes.ca/GreatLakes/Documents/HGL/default.asp?ID=s042

[48] D. Anderson. "March 30, 1848: The Day Niagara Failed to Fall." *Buffalo News* 29 Mar 2017

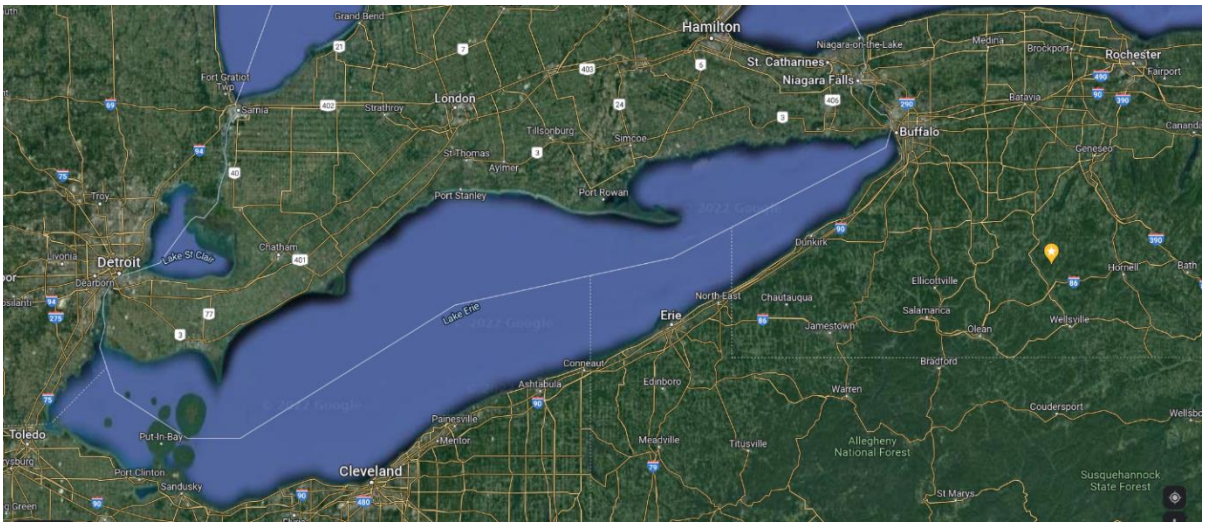
[49] See W. Cross (1982). *The Burned-Over District: the Social and Intellectual History of Enthusiastic Religion in Western New York, 1800-1850*. Ithaca: Cornell University Press; M. Barkun (1986). *Crucible of the Millenium: the Burned-Over District of New York in the 1840's*. Syracuse: Syracuse University Press

[50] Bolsenga & Herdendorf (1993): Ch. 3

[51] Air masses typically move from the west to the east, over the long fetch of the lake, giving them a long time to warm up or cool down, depending on the season. The quality of these air masses can change dramatically from Toledo to Buffalo. As cold fronts move across a relatively warm Lake Erie in early winter months, they pick up moisture from the Lake and return it in the form of Buffalo's infamous Lake Effect snow.

[52] E. Fell (2022). GLAA Partners. Online Webinar

climate change is increasing the frequency of extreme wind events.[53] With greater winds come greater seiches.



The Halloween Storm of 2019 came on the heels of record breaking water levels. The seiche battered Buffalo's Outer Harbor from October 28 to November 1. Wind gusts up to 70 mph brought in 12-foot seiches that slammed into the lakefront and caused extensive flooding and considerable damage to the breakwall. Then-Governor Cuomo declared a State of Emergency and federal money was used to repair the breakwall, piers, and other infrastructure. Then came the Christmas 2022 seiche. It accompanied a "bomb cyclone" and redefined what weather experts believed a seiche could be.

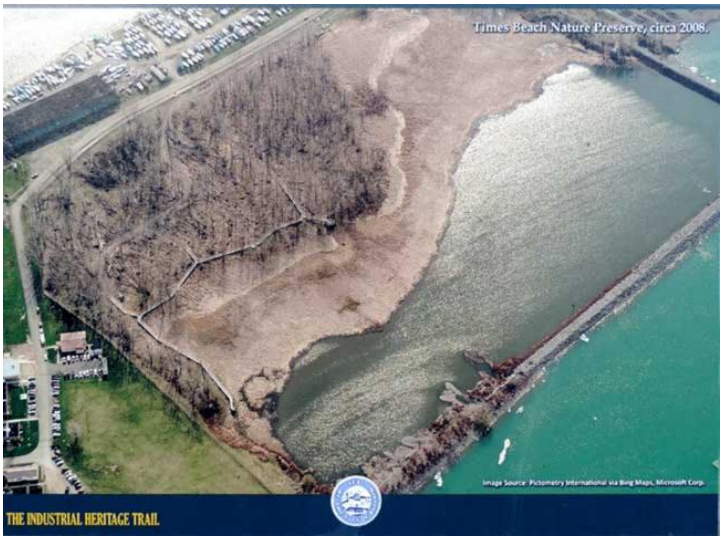
§5 – *Times Beach: an Index of Disturbance*

The Halloween 2019 and Christmas 2022 seiches decimated the part of the Outer Harbor known as Times Beach.[54] As noted in my introductory chapter, the entire 450+ acre Outer Harbor is a manmade transshipment infrastructure made possible by the building of the breakwater in about 1902. The 55-acre section known today as Time Beach is a wooded wetland at the north end of the Outer Harbor that lies between Wilkeson Point and the Coast Guard Station, just south of the Buffalo River's mouth. The earth there is made of dredge spoils. Times Beach is currently a preserve whose protection is the result of a complicated legacy—discussed

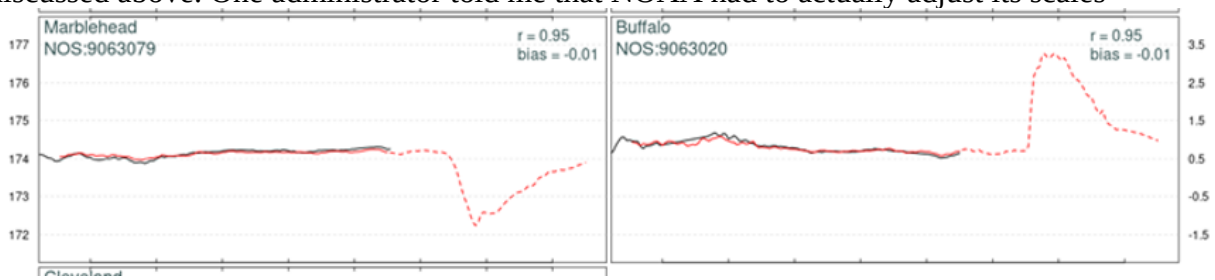
[53] S. Vermette (2017). "Weathering Change in WNY: Climatic Trends Analysis (1965-2016). Buffalo: Design to Live Sustainably. Online: https://weather.buffalostate.edu/sites/weather.buffalostate.edu/files/uploads/photos/PDF/Trend%20Analysis_December_2017.pdf

[54] See the site developed and maintained by Jay Burney, "Friends of Times Beach Nature Preserve": http://www.friendsoftimesbeachnp.org/

below—and is today largely contingent on the insistence of a single local environmental activist. He is an energetic late-middle aged man named Jay Burney—with whom I have worked closely and to whom I owe much of the wisdom of this chapter. As this aerial photo showing Times Beach in 2008 shows, there is a dike surrounding the area, which includes an extensive elevated boardwalk. The forest is almost entirely cottonwood



As the seiches become more intense, this patch of cottonwoods at Times Beach provides one of the best qualitative indices of their force. On Christmas Eve, 2023, Buffalo experienced its second "generational" storm of the season. This one was a "bomb cyclone" event related to polar vortex activity, characterized by 80 mile per hour winds and lake effect snow, which caused a blizzard and, further into the heart of the city, all manner of social chaos.[55] NOAA was estimating that the seiches would reach 29 feet, some 30% larger than the record 1844 seiche discussed above. One administrator told me that NOAA had to actually adjust its scales



for the event, since its old one did not go high enough.[56] The snapshot above is from an early forecast of the storm but gives a good visual representation of the water rising *very* quickly in Buffalo and dropping with equal haste in Marblehead—near Toledo. The water eventually sloshes back and the curves will reverse. In the end, the waves reached to about 20 feet—double the forecast shown here. They were not the record-setters that NOAA expected but they were still incredibly impactful. It should be noted that "seiche" is as yet a relatively unknown word in Buffalo. When I interview people, they do not often know the word or the phenomenon. When there is an expected seiche, the weatherperson still explains every time what it is, how it occurs, and how to pronounce it ("*saysh*"). To be clear, seiches are happening any time the wind blows. They are integral to the circulation of water and nutrients in the lake, but they are usually too

[55] M. Regan, K. Freytas-Tamura, J. Russel (2022). "Winter Leaves Buffalo and Its Region Reeling." *New York Times* 24 Dec 2022; J. Halverson (2022). "The Buffalo Storm Exploded Into a Meteorological Bomb. Here's Why." *Washington Post* 28 Dec 2022; Weather.com Meteorologists (2022). "Winter Storm Elliott Intensified into Bomb Cyclone With High Winds, Blizzard Conditions, Flooding." Weather Underground 24 Dec 2022. Online: https://www.wunderground.com/article/storms/winter/news/2022-12-23-winter-storm-elliott-bomb-cyclone-midwest-northeast-winds-snow;

[56] A representative from the DEC told me this at a workshop, but I have not been able to find documentation of it.

small to be a socially significant. The Christmas bomb cyclone put an exclamation point on the fact that wind events and their accompanying seiches are becoming increasingly impactful. A proliferation of marvelous photographs of ice-covered houses along the lakefront after the event appears to have increased engrained the term further into the popular lexicon.

At Times Beach, the wind, water, ice, and snow toppled about half of the mature cottonwoods, churning the area into chaos. I have spent many days there hence, documenting the impact. I have included a number of photographs below, labelled 1-13, which deserve some explanation. For general orientation, see drone Photos 11 and 12. Photo 12 looks back up times beach with downtown behind it, separated by the river's mouth. Photo 11 is from the same spot, only I have spun the drone around to look out over the lake. One can see the dike wall, the inner and outer break wall, and the open lake—an "inland sea." On the right edge of the photo between the breakwall and shoreline, one can spy the city's water intake. When one is actually in Times Beach, the trees capture the power of the storm: fallen, they create a veritable jungle gym, which one must duck under, climb over, and walk atop. But they are difficult to capture in photos; the boardwalk is more photogenic. Photo 4 shows a series of steel pylons atop which the boardwalk once stood. The Halloween 2019 seiche actually lifted the entire boardwalk up off the pylons, flinging it out of sight. The Christmas 2022 seiche cracked, folded, and twisted the decks like flimsy sticks (photos 2,3,5). Some of the cottonwood here was mature and quite large (Photo 1). Cottonwood grows fast and is thus not a particularly dense wood, so it is apt to fold and crack, and there is much evidence of this (Photo 8), but more commonly, the wind simply blew the trees over, uprooting them entirely. Photos 9 and 10 show this well. Photo 10 in particular show the uniform direction in which the trees fell: gusts from the south/southwest. Photo 6 shows an overturned boardwalk deck with a chunk of vegetal debris clogged atop it, indexing how high the water reached—startling since it would have had to cross both the breakwall and dike wall.

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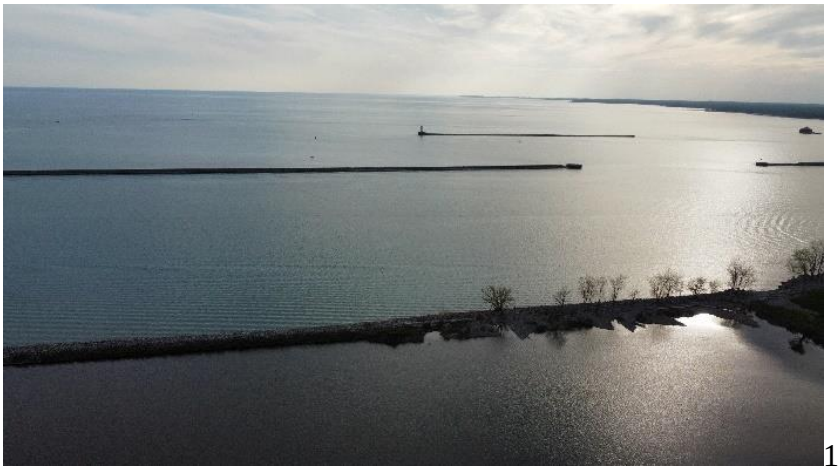
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Photos 7 and 13 are important for other reasons. Photo 7 shows that each one of those uprooted trees created a small vernal pool, which, Jay Burney tells me, has led to boon in frog and amphibian life on Times Beach this year. Photo 13 is a photograph of a red osier dogwood, an important Great Lakes wetland plant, which is spread widely throughout the cottonwood copse. With the decreased canopy, the floor of the wetland has taken off with nettles, brambles, water plantain, and broadleaf arrowhead, along with a typical postindustrial flora like phragmites, Japanese knotweed, and buckthorn. In other words, even though Times Beach is an entirely manufactured and probably toxic landscape, *it offers a perfect demonstration of ecological disturbance and resilience in a manufactured habitat in the face of Lake Erie's storms*. This storm was a large pulse, but it was within the range of tolerance. What we see here is *not at all destruction* but an exemplary demonstration of how a wooded wetland should function in an extreme event such as this. Theoretically, this should spur growth across this small patch of wetland. From an urban resilience perspective, the stand of trees buffered infrastructure further inland from the immediate impact of the storm.

This mitigating capacity is why some local environmentalists believe that the entire outer harbor should be transformed into a buffer island that doubles—in fulfillment of Olmsted's vision—as a public park. This stands firmly against Buffalo's growth machine, which has its own ideal of succession: like the development from grassland to shrubland to forest, the growth machine believes that the natural progress of the city is for industry to be followed by tourism and real estate. This form of neoliberal succession has characterized urban development for the past generation. Tensions between environmentalists and developers over the future of the Outer Harbor go back at least to the 1980's, but climate change and the supremacy of the discourse of coastal resilience has forced a reframing. As we will see, it may only be a reframing, but it is probably too early to tell. As the long-held beliefs of each side get rearticulated through the lens of resilience, the facts of climate change clearly support the environmentalists' position. Instead of facing such facts, developers—it should not be surprising—are carrying on with a "get it while you can" mentality, despite the changing waterfront conditions. The next sections work to frame recent waterfront development proposals both historically and in light of climatological

changes impacting Buffalo's coasts. To note: while a small coterie of environmental activists have a good understanding of climate-induced changes to water levels and seiches, the public is yet to grasp their significance and, once it does, it is not clear if it will change minds about Outer Harbor development. Seiches and high water can cause significant damage and flooding, but it may not be enough damage to deter those want to shop, dine, and live on the waterfront. After all, what evidence do we have of modern settlers balking to establish themselves in ecological vulnerable but economically advantageous areas?

§6 – *Visions of Times Beach*

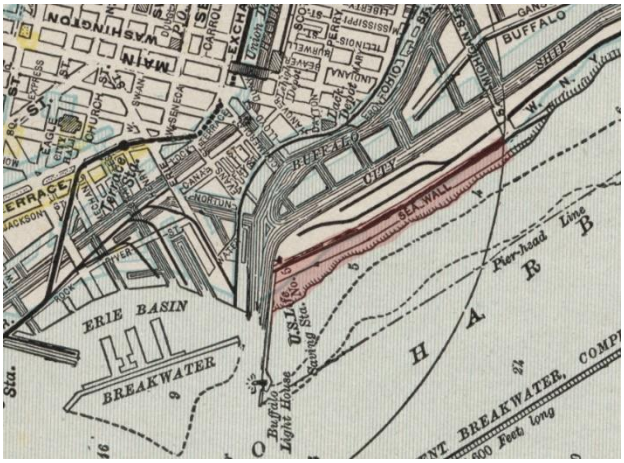
Times Beach has a strange, exemplary history. With only slight fine tuning, the history of Buffalo's waterfront starting with Wilkeson's pier can be accounted for by Molotch's theory of the city as growth machine.[57] Buffalo is a classic example of a city whose areal expression emerges from the interests of a small number of land-based elites whose profits are seen to increase with the increasing intensification of land use in the area where its members hold a common interest.[58] In Buffalo, the formerly industrial waterfront is the most exemplary of a coalition of land-based booster attempting to generate a "growth consensus." Buffalo follows a trend typical to Rust Belt cities: while from about 1815 to 1975, those land-based elites were mostly industrialists, the growth machine of the past half century has been dominated by real estate developers. The municipal government has always strongly advocated for growth, regardless of the paradigm. What I am particularly concerned with here is whether, or to what extent, the pressure put on Buffalo's coastal infrastructure from increased water-level oscillations and seiche activities contest the discursive authority of Buffalo's growth machine. To put it Bateson's terms, changes in climate mean that the loops that make up Buffalo's political economy are being looped in to a new loop structure. How are they responding? The recent adaptation of the coastal resilience discourse by both traditional land-based elites *and* by environmental groups have become the place where, at least for now, this struggle for the future of the city's waterfront is playing out. I offer a lengthy history of Times Beach—a kind of deep social and environmental history of its now ecologically resilient wetland forest—in order to demonstrate the operations of the growth machine on this "patch," as the urban ecologists say.[59] Only in light of its history can current tensions around the meaning of coastal resilience be understood.

[57] Importantly, though I do not have space to go into it here, Logan and Molotch's work represents an important critique of urban ecology. See especially H. Harvey (1976). "The City as a Growth Machine: Toward a Political Economy of Place." *American Journal of Sociology* 82(2):309-332; H. Molotch, Harvey (1993). "The Political Economy of Growth Machines." *Journal of Urban Affairs* 15(1): 29-53; J. Logan & H. Molotch. 1987. *Urban Fortunes: The Political Economy of Place*. Berkeley and Los Angeles: University of California Press

[58] Molotch 1976

[59] Pickett

After the completion of the South Pier whose history I told in the introduction, the city



A rare snapshot of the homes along the shore of Lake Erie in an area called the Beach or Sea Wall. Close to 1,000 residents lived in this community until Mayor Louis Fuhrmann evicted them in 1917.
(From the coll. of Lower Lakes Marine Historical Society)

built an earthen and masonry seawall known as the Seawall Strip, which served as an extra layer of protection for the rapidly growing harbor. It was a 150-300 foot-wide and ultimately 3,770[60] foot-long barrier that ran from the lighthouse (built in 1833), along the lakeshore, just past the foot of Michigan Street.[61] Construction of the strip went on for almost thirty years, form 1838 to 1867. The map above,[62] from 1900, shows the location of the Seawall Strip, which technically curved along the South Pier to meet the lighthouse. The Seawall stood in the path of the lake's littoral currents, which began depositing sand along the Strip, yielding earth where there was once only water: Seawall Beach, which became Times Beach. During the long period of building, the world's first grain elevator was erected (in 1842) across from the South Pier at the mouth of the river. Many of its laborers were Irish immigrants who had escaped the Potato Famine. By the 1850's Irish and Portuguese "Beachers" built a shantytown on the newly formed land, full of dockworkers and fishermen. Dubbed "Buffalo's Bohemia," the area supported an entire village, replete with groceries, churches, schools, bath houses, saloons, bait shops, boat houses, rowing clubs, and brothels.[63] Population estimates range from 1000 to 2300 denizen squatters. The photographer in the image to the left [64] is standing on the South Pier looking east back toward the Buffalo in 1899, with the mouth of the river immediately to their

[60] E. Licata (2018). "Irish WNY/ Life on the Beach." *Buffalo Spree* 8 Mar 2018. Online: https://www.buffalospree.com/wny_life/city_buzz/irish-wny-life-on-the-beach/article_21ac8ae0-77c3-5aba-aa4f-3fd6a7995441.html

[61] S. Cichon. "Torn-Down Tuesday: the Gritty Seawall Community on Buffalo's Outer Harbor." *Buffalo News*. 26 Feb 2019.

[62] S. Eck (2004). "The Dreams of Times Beach." *Western New York History*. Online: https://www.wnyhistory.org/portfolios/more/times_beach/times_beach.html

[63] W. Cheeley (1999). *The Times Beach Area: Environmental Ethics and the Design of Place in Buffalo, NY*. MA Thesis, Landscape Architecture: SUNY Environmental Science and Forestry: 41.

[64] https://nyheritage.contentdm.oclc.org/digital/collection/VHB001/id/8391/rec/20

left. If you follow the curve of the Seawall, the Beachers can be seen in the mid-right portion of the photograph. The lower photograph[65] is from a few years later, in the early 1900's, and looks south from the South Pier, directly toward Seawall Beach, which separates—barely—the squatters' homes from the lake. Immediately behind the homes, one can make out several grain elevators. As this photo makes clear, Seawall Beach was susceptible to seiche activity—especially before the completion of the breakwall in 1902. Storms in 1884 and 1886 wreaked havoc on Squatter's Row, including many drownings,[66] but apparently it was a resilient community. They rebuilt quickly. As industry developed, the land became desirable for roads, railroads, elevators, and so forth. The twenty years from 1897 to 1917 saw the city, with the backing of the US government, slowly began driving out the squatters and replacing them with industry. The industry rag, *Buffalo Commercial*, propagandized: "The strip in question is a dreary stretch of sand—desolate in summer, bleak in winter, worthless at all times without the expenditures of a vast sum; but on its barren acres a score or more of shanties have been erected and have been the homes of as many families." These families, they argued, must be evicted so that industry may prosper.[67] Under the orders of then-Mayor, Louis Fuhrmann, the shanty-town was finally razed in 1917, in a slum-clearance campaign to make way for several grain elevators and a rail line to service them. It was not without resistance. One article recounts a story of one stalwart, Col. John Houlihan, who barricaded himself inside of his home of 25 years, which he had surrounded with three American flags. He sported his rifle, his son an ax, and his wife a pot of boiling water, ready to attack the railroad carpenters sent to tear his house down. In an expression of his own land-based interest, he apparently declared, "I'm on my own property and serve notice that I will defend it to the last drop of blood in me." The railroad stood down and Houlihan died a few years later. Today, Fuhrmann Boulevard cuts through the Outer Harbor and ends at Times Beach. While this is a tale as old as cities, I do want to note that this contestation highlights Molotch's point that land in a city is not an empty container filled by human action. This case highlights that land is not built upon infrastructure but that it is the real infrastructure of the capitalist city that seawall infrastructure is designed to protect. In this case, urban ecology not neutral but designed for the sake of speculative investment in land.

As the depression halted waterfront industry, it also had the effect of—at least early on—increasing the mood for civic works. Despite the razing of the community, many still utilized Seawall Beach for fishing, swimming, hunting, and leisure. In 1931, riding a wave of civic support, the *Buffalo Times* leveraged interests of the municipality create public access to the waterfront by turning the beach into a proper recreation area. The Buffalo City Council unanimously passed the resolution for the cleanup and creation of "Times Beach"—named after the newspaper. Plans were never fully

[65] https://www.wnyhistory.org/portfolios/more/times_beach/times_beach.html
[66] Cheeley (1999): 41
[67] Quoted in S. Chichon (2019)

realized, and by 1935, the Health Department forced the Beach's closure entirely. Police were even stationed there to prevent its use. Untreated municipal and industrial sewage piped directly into the lake generated dangerously high levels of coliform bacteria.[68] Naturally, the city was not in the business of regulating industry or investing resources in non-income generating property. As the Depression wore on, the beach found itself turned back into a squatters settlement, only to be recommissioned again during the wartime boom. Grain transshipment peaked in 1943 and in 1951, Buffalo remained the largest inland port and second largest railroad center in the nation. Above is a picture of Times Beach from 1949.

The post-War era of urban renewal saw a new phase of struggle over Times Beach. In 1953, the Skyway was finished, which served as a traffic artery from the main Interstate I-190 *via* the Outer Harbor to Lackawanna and points south. In 1952, the US General Services Administration gave the city 11 acres of land at Times Beach with the caveat that it be turned into a recreational facility. Debates over water quality and efforts to skirt the deed restriction lasted for more than a decade when, in 1962, the city attempted to purchase the lease from the Department of Interior so that it could develop a more ambitious development plan. Apparently the growth machine hoped for "a top drawer cabana type seashore development…" while Parks Commissioner David Kane envisioned "a marina with launching ramp, extensive picnic area with tables, benches and outdoor grills, play areas for children, paved walks for promenades, filtered swimming bools, teams and basketball courts and ball diamonds."[69] The US Government rejected the bid to purchase the land, and the US Army Corps of Engineer stepped in with its own plan. Due to new environmental regulations—the origins of which I address in the next chapter—the Corps could no longer dump toxic dredge in the open waters of the lake. They had to now put them in a Confined Disposal Facility (CDF), and they deemed Times Beach "the logical location." In July 1968, in a negotiation with the city, the US Senate released land back to the city under the conditions that they create an Outer Harbor recreational area and that they permit the CDF. The Corps remains a powerful land-based interest across the Great Lakes coastline, and they deserve more attention as such.


Aerial Photograph showing Times Beach on October 27, 1949
Buffalo and Erie County Historical Society

In 1971, the Corps created the containment dike that still marks the boundary of Times Beach today, and over the next five years, they pumped in over a half a million cubic yards of toxic dredge from the harbor and river. To great astonishment of those involved, wildlife immediately began using the site as wetland habitat. Indeed, the archaic seed bank buried in the dredge spoils founded a surprisingly diverse habitat with plants and flowers that had not been seen on Lake Erie's eastern shores for more than a century. Ornithologists note that this patch of land has historically served as a migratory hot spot for birds heading to and from the Arctic: more than two hundred species of birds have been seen feeding in the CDF.[70] Interest in

[68] Cheeley (1999): 46

[69] Quoted in Cheeley (1999): 49

[70] In 2019, the area was included in the Niagara River corridor Ramsar designation for being a globally significant wetland. See T. Prohaska. "'A Jewel in the Wetlands of the US': Niagara River Earns World Recognition." *Buffalo News*. 26 Sept 2019

wetlands were burgeoning along with the environmental movement in the early 1970's, and the Corps readily took credit for wetland restoration, even publishing a pamphlet, *Times Beach Diked Disposal Site: An Environmental Success Story*, in the early 1980's. In support of wetland development, the Corps handed Times Beach back to the city in 1976 with the stipulation that the site remain a recreation and wetland area, for which there was significant citizen support. The city established Times Beach as a Nature Preserve, and in 1978, the New York State Department of Environmental Conservation classified it as a Class 1 wetland.

The mid-1970's were also when deindustrialization hit Buffalo. The city quickly looked to join the trend of other industrial waterfront cities, marketing its waterfront for megaprojects, tourism, and condominiums. Times Beach was considered an asset to such development—a waterfront nature preserve that people could enjoy before events or after shopping. Predictably, public, private, and municipal interests were at odds, and, per Cheeley, "The result was a decade long storm of proposals, public meetings, and political maneuverings, but little was implemented along the bulkheads of the Inner Harbor or in the Times Beach Area."[71] Consultants were called in to develop a master plan in the 1980's. Proposals included apartments, hotels, a museum, an underground tunnel to downtown, and so forth. It resulted in more political infighting and no development. In 1996, the Empire State Development Corporation developed another Waterfront Master Plan that aimed to transform the Inner Harbor and Times Beach into a "multi-use, revenue generating, privatized commercial and residential economic development zone for the city." In both of these proposals, Times Beach was imagined as a small park where denizens and tourists could stroll along the boardwalk and find a little spot of nature on the waterfront. The latter plan did result in the development of Canalside—a tourist spot on the Inner Harbor—but it did not impact Times Beach or the Outer Harbor.

In 2005, New York State transferred Canalside and the entire 429-acre Outer Harbor from the Niagara Frontier Transit Authority (NFTA)—who managed the site as a port and marina—to a public-private partnership called the Erie Canal Harbor Development Corporation (ECHDC). ECHDC's mission has been to develop the Outer Harbor. The transfer did not include Times Beach, which—because it is a Nature Preserve—is not eligible for direct development. ECHDC is funded by Empire State Development (ESD), which is funded by the New York State Power Authority (NYPA), whose money comes from selling Niagara Falls hydroelectric power downstate. ECHDC's own narrative is this:

> For decades Buffalo's Inner Harbor and waterfront sat desolate and underutilized until 2005, when ECHDC spearheaded Buffalo's waterfront revitalization, reclaiming the area as one of America's brightest historical treasures. ECHDC's mission is to revitalize Buffalo's Inner and Outer Harbor areas and restore economic growth to Western New York, based on the region's legacy of pride, urban significance and natural beauty.[72]

[71] Cheeley (1999): 53

[72] Empire State Development. "Erie Canal Harbor Development Corporation." Homepage: https://esd.ny.gov/erie-canal-harbor-development-corporation-0

182 acres of the of the Outer Harbor are part of a state park, leaving 247 acres for ECHDC to

develop. Their initial plans were exactly in line with those from the 1980's and 1990's: to transform the Outer Harbor into mixed-use housing and commercial development with significant tourism and recreational facilities. Public pushback and financial unfeasibility has forced ECHDC to curtail their ambitions. Their strategy now appears to be to create several anchoring projects that still leave the possibility open for housing down the line. In the summer of 2020, they completed work on an amphitheater, which is now in use.

Meanwhile, New York State held an open Skyway Corridor design competition in 2019. Buffalo's firmly entrenched Congressman, Brian Higgins, has made it his mission to spur the development of Buffalo's waterfront. Part of his vision has been to remove—or creatively reuse—the Skyway. The roadway takes up hundreds of acres of waterfront land that Higgins believes could be better used as commercial real estate. But it does host the best waterfront views in the city, as every rider knows. The finalists represent an orgy of megaproject-meets-new urbanism mash-up designs with renderings full of happy wealthy people joyfully promenading

and sailing around the harbor.[73] The winner of the competition was from a Rochester design firm, SWBR Architects. The "City of Lights" proposal looks to transform the Skyway into a pedestrian walkway, modelled after railroad renovation projects like the Promenade Plantée in Paris and the Highline in New York City. The plan removes the Skyway ramps and links a skyline trail from a gaudy, curvaceous glass and steel structure at the inner harbor to the "new silos." These silos will replace the Connecting Terminal Grain Elevator but recreate its structure. The Connecting Terminal sits directly across from Times Beach; in the rendering below, the Mercedes SUV and smiling white biker are stationed immediately in front of Times Beach. According to the design, the "new silos," will include apartments, a "boutique hotel," a public market, green roof, a "cultural and technology center," and "entertainment and recreational activities." The fate of Times Beach is undisclosed.

[73] Empire State Development. "Aim for the Sky: Buffalo Skyway Corridor Competition." Homepage: https://esd.ny.gov/skywayideas

Willow Cheeley, in her thesis on Times Beach, connects the logic of this type of real estate developmental to the logic of industrial land use before it. She says there is a "Utilitarian Influence" that guides these land-use decisions, rather than a "Holistic Influence" or an "Environmental Ethics."[74] On one hand, it is difficult to see exactly what was ever "utilitarian" about destroying landscapes and ecologies. As I've stated, the types of land use decisions that explain the efforts of both industrial and real estate development on the Outer Harbor can be explained, by and large, by the viewing the city as a growth machine. It is a capitalism story, and what is important is—as I laid out in the introduction—that capitalists have transformed the Buffalo Waterfront into an infrastructure for capital in such a way actually narrows the scope of "utility" to that which serves it. What is peculiar about the Buffalo's post-industrial growth machine is that it has heretofore been both too weak and too powerful. It has been too weak (i.e. too under-capitalized) to achieve building any of the projects it has proposed. But it has been too powerful, which is to say that it has succeeded in blocking any other project from developing whose essence is not "growth." This has meant stasis for the Outer Harbor.

The more complicated questions arise when putting two-plus centuries of growth machine logic in the context of hydrological regime shift. In light of hydrological regime shift, what are the options for the growth machine? How does it orient itself to these changes? How are environmental groups attempting to establish a countermovement against the growth machine that would see a transformation in the meaning of utility, or more radically, or a transformation in what and whom Buffalo's waterfront infrastructure serves? In Buffalo, this battle is beginning to take shape in and through the discourse of coastal resilience.

§7 – *Coastal Resilience, Coastal Ambivalence*

Since 2020, three different coastal resilience studies have kicked off in Buffalo. One is being conducted by a powerful environmental non-profit in conjunction with a large environmental engineering firm; one is being conducted by the County; and a third by the Army Corps. The studies are in too early of a stage to take away firm conclusions, but the varying scales and groups involved suggest that there is a local competition for discursive hegemony over what coastal resilience means and what ought to be done to ensure it. This is further exhibited by many environmental groups—both locally and regionally—commenting on the

[74] Cheeley (1999): 61

importance of coastal resilience. Resilience is, in the words of Kevin Grove, an "essentially contested concept."[75] Coastal resilience has gained tremendous traction in the environmental management and economic development literature, especially in light of the fact that some of the world's largest and most economically important cities are facing severe threats to their infrastructure due to sea level rise. However, as recent scholarship notes, "Despite its ubiquity," coastal resilience "remains ambiguous and poorly defined in [environmental] management contexts."[76] Moreover, the term's ambiguity is exacerbated by the fact that it may or may not overlap, validate, or contradict the tendencies in urban planning and management toward "urban resilience" and "community resilience." I do not believe this is ambiguity is accidental. The term's polysemy indicates the struggle for authority over it. There is struggle over its authority because this authority pertains to the kinds of human and nonhuman lives that will be supported within its infrastructure.

Some indication of this emerged in the aftermath of the Christmas seiche at Times Beach. As I argued above, Time Beach has demonstrated resilience in the face of this storm. The storm disturbed the wetland, which is now growing back with vigor. Touting the principles of ecological design, environmentalists argue that this kind of natural infrastructure is far superior to the kind of hardscape with which ECHDC has lined the area. Whether it was in direct response to the Christmas bomb cyclone or part of an in-place plan, in early February 2023, ECHDC built a dike wall along Wilkeson Pointe beach, immediately adjacent to the south of Times Beach. In a telling comment about the new dike, then-President of ECHDC, Steve Ranelli, said, "Over the years past, we've seen sections of the beach go away, and we've tried to upgrade. But at this point, we felt it was time to really bring in enough stone and bring [the beach] up by a couple of feet."[77]

[75] K. Grove (2018). *Resilience*. London: Routledge: Ch. 2

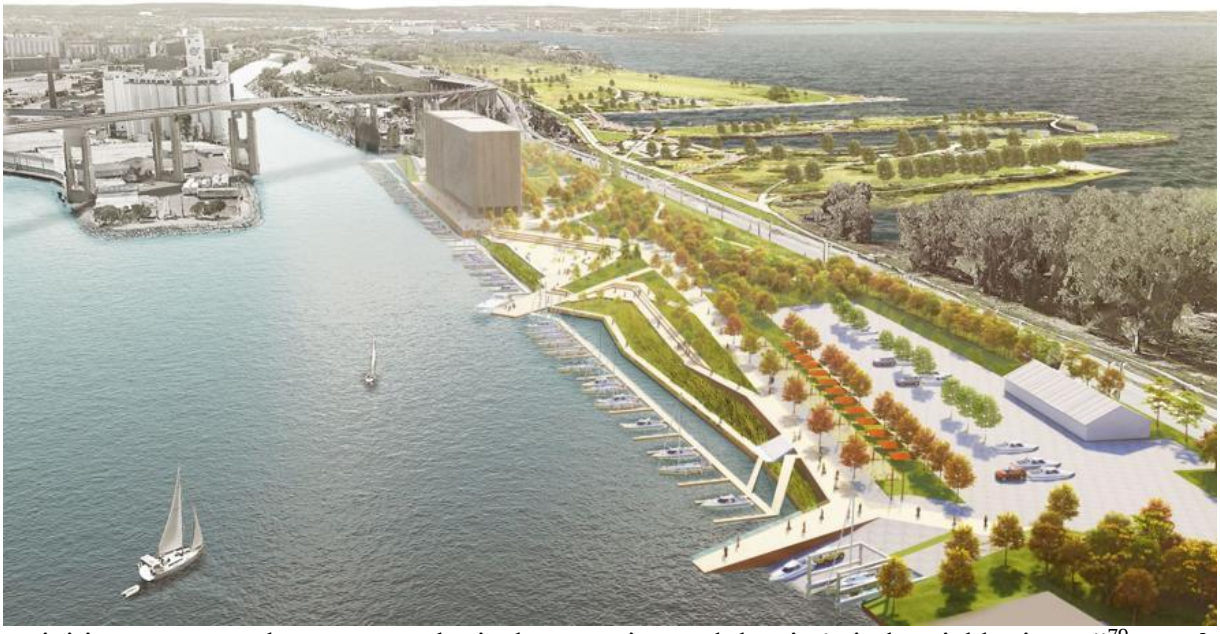
[76] G. Masslink & E. Lazarus (2020) "Defining Coastal Resilience." *Water* 12(5)

[77] Y. Person. "Renovations Underway at Wilkeson Pointe Beach." *7 WKBW Buffalo*. 13 Feb 2023. Online: https://www.wkbw.com/news/local-news/renovations-underway-at-wilkeson-pointe-beach

Ranelli's statement that "we've seen sections of the beach go away" is marvelously opaque. Of course, beaches don't just "go away." But Ranelli and ECHDC have come under fire by local environmental groups for continuing to build infrastructure on the Outer Harbor, in the path of increasingly violent storms. His purposeful avoidance of any mention of weather, seiches, or storms—let alone climate—makes the point even more loudly than if he had said it directly: climate changes on the eastern end of Lake Erie in the form increasingly powerful seiches is not only destroying tourist infrastructure but—and this would be more damaging to Ranelli—the image that has persisted for the past forty years of the Outer Harbor as a beacon for economic growth. The rip-rap thus secures both the infrastructure and image of the Outer Harbor as a development zone. Compare this the statement made by Burney about the impact of the seiche: "The future is kind of unknown at this point except that things are changing. I think that climate change is definitely having an impact on how we look at the waterfront."[78] If Ranelli's statement promotes obscurity and ignorance about the changes on the Outer Harbor, Burney's is in line with what climate models tell us: the future of Times Beach is uncertain but it is certainly going to be impacted by climate change. More adroitly, Burney notes that it is not only that the fact of climate change will change the waterfront but it will change "how we look at it." This is precisely what concerns ECHDC: that Buffalonians will begin to measure coastal resilience against real estate development. The growth machine theory demands that the material and ideological features of land be thought carefully in relationship to each other. At this point, Burney is speaking for a small but growing number of Buffalonians, and for nobody in positions of power. But could it be that in the same way seiches erode the Outer Harbor shoreline, they are beginning to erode people's vision of the Outer Harbor as a fully developed housing and tourist destination?

[78] Quoted in: B. O'Brien. "A Generational Blizzard Leaves a Changed and Damaged Shoreline in its Wake." *Buffalo News* 10 Jan 2023

The struggle over coastal resilience is exemplified in counterproposals between ECHDC and Our Outer Harbor. ECHDC offered its revised master plan to the public in early May 2019. The public backlash compounded by the financial unfeasibility of establishing housing on the Outer Harbor forced the revised plan to be considerably more park-like, as evident in the rendering. The rendering looks south, and Times Beach is in gray in the middle right-hand section of the image. ECHDC followed the public demand, putting "a priority on leisure



activities, access to the water, ecological restoration and the site's industrial heritage."[79] But they did their best to manage for the possibility of housing and tourism in the future. The development of the amphitheater, which is not part of the 2019 rendering—and which happened quickly and without public discussion—is a case in point. In the autumn of the same year, Our Outer Harbor, in conjunction with the community think tank, Partnership for the Public Good, released a counter proposal, *Buffalo's Outer Harbor: the Right Place for a World-Class Park*.[80] The plan is a public-facing document aimed at strategically convincing stakeholders that the Outer Harbor should be protected in perpetuity as publicly-accessible parkland. Among the many reasons for turning it into a park, the plan notes that "A park offers the ability to resolve contaminated soil and water issues through longer-term, less expensive, and more environmentally appropriate regeneration methods, and to build climate change resilience and adaptation strategies appropriate for a fragile and exposed location."[81] It agrees with the Local Waterfront Revitalization Plan (LWRP) that the Outer Harbor should "maximize coastal resilience,"[82] The LWRP was yet another initiative announcing a new standard for waterfront

[79] M. Sommer. "Take Your First Look at the $125 Million Master Plan for the Outer Harbor. *Buffalo News* 5/2/2019
[80] S. Magavern (2019). "Buffalo's Outer Harbor: the Right Place for a World-Class Park." Buffalo: Partnership for the Public Good. Online: https://ppgbuffalo.org/files/documents/environment/buffalos_outer_harbor_the_right_place_for_a_world-class_park.pdf
[81] *Ibid.* 2
[82] *Ibid* 30. The Local Waterfront Revitalization Plan can be found here: https://dos.ny.gov/system/files/documents/2021/06/buffalolwrp.pdf

redevelopment that was adopted by Buffalo's Common Council in 2018, approved by the state in 2019, and concurred by the US Office for Coastal Management in 2020. The plan speaks of "actively engaged communities in coastal resilience planning, promoting the use of green infrastructure, natural protective features, land use regulation, and strategic structural protection." Nevertheless, the proposal to make the Outer Harbor a park remained short on specific design solutions and in fact underplayed the vision that some of Our Outer Harbor's members had for a radically regenerative climate-resilient landscape, including transforming the entire area within the breakwall into wetlands.

In January 2021, Our Outer Harbor sent a letter of concern to Steve Ranelli and ECHDC arguing that their General Project Plan (GPP) did not address coastal resiliency. The letter reads,

> Although the Outer Harbor serves Buffalo as a buffer to Lake Erie storms, the GPP does not address the need to restore and maintain its resilience in the face of increasingly severe lake storms, and flooding from climate destabilization. The Environmental Assessment answers all questions about minimizing damages and risks by checking the box "no impacts." (LWRP Coastal Assessment Form #9) This is not acceptable. Severe impacts from storms and flooding in just the past two years have not been addressed. Is it a wise use to invest $44M in improvements that are repeatedly damaged by increasingly severe storms? This is like building a house (and a money pit) with no solid foundation.[83]

Our Outer Harbor turns the tables on ECHDC, accusing it, in effect, of not being properly utilitarian. A utilitarian plan would be one that took climate models seriously and built the necessary infrastructure to address the fact of larger, more impactful storms. Even a capitalist, they insinuate, should want to protect his investment. Of course, developers speculate not invest, but the rhetorical strategy is to insist that coastal resilience (1) needs to account for hydrological regime change and (2) should not facilitate a speculative money grab. In response to calls for greater ecological restoration, ECHDC announced a $14.8 million dollar project in collaboration with the Army Corps of Engineers to fill in one of the slips on the Outer Harbor in order to create a wetlands wildlife habitat and fish spawning area. This slip is the one between Wilkeson point and the (presently) abandoned Michigan Street Pier. There is currently no sign of this project going forward, but—whether it is put in place or not—the plan it instructive. It calls for a breakwall to be built at the end of the slip with a small opening that allows fish and kayakers in but contains silt from being swept into the lake. With the addition of root wads, logs, and gravel piles, ECHDC says the area will be transformed into a "7-acre oasis for fish and wildlife" and provide recreational opportunities for fishermen and paddlers. Ranelli said, "This is a

[83] Our Outer Harbor. Letter to Steve Ranelli, 7 Jan 2020

project that's going to bring coastal resiliency to the Outer Harbor, and it's going to allow another place for people to come out and enjoy the waterfront."[84]

Whether Ranelli's is a direct response to Our Outer Harbor's proposals or not, the invocation of "coastal resilience" here takes an almost Orwellian turn. Coastal resilience is precisely *not* an oasis but, even in the most milquetoast versions, a management strategy to improve the capacity of systems to restore themselves after a disturbance event. In no objective sense does this proposal mitigate storm potential or create a more elastic Outer Harbor. This plan for a wetlands wildlife habitat is, at best, a token of resilience that actually undermines the possibility for a more comprehensive restoration of wetland habitat. By asking—as a growing number of critics have—"resilience for whom?,"[85] we realize that what is resilient in this proposal is ECHDC's plans for developing the outer harbor. In the face of disturbance by environmental groups like Our Outer Harbor, ECHDC has come up with a plan that superficially responds the call for ecological wetland restoration while substantively preserving the speculative potential of the waterfront.

§8 – *Conclusion*

This chapter has documented the importance of the Great Lakes' hydrological regime shift on the problem of coastal resilience in Buffalo's lakefront. It has worked, after Bateson, to show how climate change compels a change in the epistemological unit. Rather than viewing Lake Erie as a basin defined by its geospatial coordinates, the recent hydrological shift asks us to understand it in its many overlapping relations. In particular, this chapter emphasizes the way climate change brings into relief Lake Erie's exaggerated impact on Buffalo's coastline and, at the same time, its teleconnections with global weather systems.

By detailing the impact of seiches and fluctuating water levels on Lake Erie's coastline, the chapter also highlights the burgeoning social response to the Lake's new hydrological realities by tracing competing frameworks for the concept of "coastal resilience." These responses reinscribe political partisanship into the language of coastal resilience, which vacillates between being scientific, authoritative, and morally superior. This suggest that while new hydrological realities are eliciting a new battleground for groups competing over access to Buffalo's waterfront, the spell of waterfront real estate speculation still commands that the rhetoric of the growth machine, epitomized by ECHDC. Even within the framework of coastal resilience, for that group of environmental activists whose understanding of Lake Erie is dynamic and relational, their vision for a buffer island remains frustratingly outside contemporary political view.

The study, in general, sheds light on the way climate change is impacting ecologies, politics, and imaginaries in small to medium sized postindustrial cities. The growth machine dynamics in places like Buffalo are proving to be more resilient than its lakefront. In building an amphitheater in the hopes of eventually filling the Outer Harbor with housing and tourist infrastructure, community leaders are choosing vulnerability over resilience. It's not yet clear if, for them, this is a calculated risk, or whether the new hydrological realities have yet to set in

[84] D. McKinley & T. Belke. "Creating a Wetlands Wildlife Habitat at Buffalo Outer Harbor." *2 WGRZ*. 9 Dec 2021. Online: https://www.wgrz.com/article/tech/science/environment/creating-wetlands-wildlife-habitat-at-buffalo-outer-harbor/71-9dc1d823-ebbe-4d6c-a206-6888a7092080

[85] S. Meerow & J. Newell (2019). "Urban Resilience for whom, what, when, where, and why?" *Urban Geography* 40(3): 309-329; S. Dobie, P. Doran, R. Norton, S. Hughes, M. Goode (2022). "Defining Coastal Resilience in the Great Lakes: A Systematic Review and Critical Comparison." *Journal of Great Lakes Research* 48(6): 1361-1374.

here. Even once they do, there remains little evidence to suggest that the old political realities will change in accordance with them. This disjuncture between political and hydrological, or climatological, reality remains a stubborn feature of life in the Rust Belt.

Perhaps part of the problem is that, as a municipality, Buffalo already *is* resilient to increasingly powerful and frequent seiches and fluctuating lake levels. That is, there remains, at least for now, a strong sense of urban resilience. Certainly, the outcomes of floods and seiches can be destructive or merely inconvenient, but there is little to suggest that even the largest seiche waves could batter the city into regime change. To relinquish the vision of a developed lakefront will take more than a wave. Regardless of how much Lake Erie changes, if there is no corresponding change to the eco-mental system called Lake Erie, there is little reason to hope for a restored waterfront. My normative hope is that this chapter contributes to such a change in that eco-mental system.

Chapter 3 – Lake Levels & Wetlands: Steady State Ecologies & the Precursors to Coastal Resilience

It is strange that man does not readily recognize the importance of recurrent changes in water level in a natural situation…
-Eugene Odum (1971) *Fundamentals of Ecology*

The important point is that the root-tree and canal-rhizome are not two opposed models…
-Deleuze & Guattari (1980) *A Thousand Plateaus*

§1 - *Introduction: Steady States*

This chapter concerns the development of scientific management strategies for Great Lakes coastlines over the past 125 years. In particular, it examines the developing relationship between lake level fluctuations and coastal wetlands. By tracing the emergence of the coastal ecosystem as an object of governance, it offers insight into how the ontologization of disturbance ecology has come to order the discourse of coastal resilience. The discourse of coastal resilience presumes that cities ought to be managed as "urban ecosystems," something this chapter criticizes for obscuring histories of destruction and depoliticizing the urban environment. I argue that the ontologization of ecological conceptuality into governance practice—and especially in certain interpretations of urban ecology—points to post-political techno-managerial strategy of managing the politically charge of Great Lakes coastlines in an era of climate change. While it marks a change in epistemological paradigms, urban ecology in the Great Lakes has been utilized to support the same basic exploitative and speculative forms of capitalism that have characterized the region since the earliest days of settlement.

In the late 20th century, certain slippages between ecological ways of knowing and ecological ways of governing produced the possibility for a contemporary framework of coastal resilience that undergirds the future management of the Great Lakes ecosystem. For our purposes here, we can follow Mark Bevir in saying that "Governance refers…to all processes of governing, whether undertaken by a government, market, or network, whether over a family, tribe, formal or informal organization, or territory, and whether through laws, norms, power or language."[1] In particular, Bevir traces a modern form of governance that he calls "system governance," which refers to post-war strategies for governing markets and networks.[2] This chapter is concerned with the governance of ecosystems but, more, it concerns the historical development of the logic of ecosystems governance that finds a pseudo-scientific justification in the conceptual framework of ecology itself. By way of tracing a history of the relationship between Great Lakes water level management and wetland ecology, I show that the scientific management of ecosystems based on the principles of ecology obscures histories of destruction and renews the efforts of total domination over ecosystems. Part of what is at issue here is that—given ecology's emergence out of the post-war cybernetic movement—there has never been a firm line between ecology as an empirical scientific framework and ecology as form of scientific

[1] M. Bevir (2013). *A Theory of Governance*. Berkeley: UC Press; M. Bevier (2012). *Governance: A Very Short Introduction*. Oxford: Oxford University Press

[2] M. Bevir (2013): Ch. 9

management. It is difficult to grasp the stakes of coastal resilience without fully understanding this ambivalence.

In his *Seeing Like a State*,[3] Jim Scott offers his famous formulation of the authoritarian high-modernist disposition to make nature legible in order to control and dominate it. As his subtitle suggests, his interest tended toward the dialectic of nature: not just how "certain schemes to improve the human condition have failed" but about how the hyper-rationalization of nature generated a sclerotic simulacrum of it, which was unable to adapt or respond to any kind of crisis. For Scott, the exertion of high modernist power and authority yearned for totality but often ended in significant overreach, the result being a brittle state that killed the dynamism of both nature and culture. The bigger they were, the harder they fell. But the Owl of Minerva flies at dusk, and by the time Scott published his book, in the mid-1990's, neoliberal state ideology had enervated the high-modernist tendencies of state management. New forms of technical administration over nature developed. Following Michel Foucault's work on governmentality, political ecologists began to investigate "eco-governmentality," looking at how government agencies, public and private institutions, scientists, planners, and other knowledge producers like non-profits and even grassroots organizations constructed something called "the environment" or related to something called "the ecosystem." The ecosystem here is both an object of knowledge and a sphere within which soft—technical or administrative—types of management are deployed in the effort to govern the relations that constitute that ecosystems. In such a system composed of relations, it became effective to model and manage relationship tendencies rather than try to exert control over the entire thing. This form of management—governance—depends on the internalization and dissemination of an ecological sensibility among individual actors and institutions. One of the central differences in the high-modernist and eco-governmental approaches it that the latter understands humans as external to and above nature while the latter sees humans as part of the nature that needs managing. One of the things a natural history argues is that neither, or both are correct.

As I laid out in the Introduction, ecology in general and resilience in particular emerged as a rejection of the idea that natural succession and adaptation result in a "steady state." This chapter is most concerned with the emergence of disturbance as a central aspect of ecological succession and its subsequent transformation into an historiographical thesis. Ecologists like Buzz Holling and Eugene Odum transformed the paradigm by demonstrating that disturbance does not disrupt some teleological path toward homeostatic equilibrium; instead, disturbance—or as Odum calls it more neutrally, "pulsation"—is endogenous to resilience, or to the adaptive capacity of a system. Playing with the term "steady state," I want to submit that the kind of authoritarian high-modernism proposed by Scott carried with it a strong idea of a hierarchical and "steady" state. The incorporation today of the ecological theory of resilience into a theory of the state has—and has not—changed what it means for a state for be powerful or "steady." A steady state is now one that is designed to easily adapt to stress, to change, and to disturbance of all kind—ecological, social, political, economic. A resilient state is comparatively non-hierarchical and flexible. But at no moment has the state—or, municipality—become *less* steady with the incorporation of ecological models. Nor has it become more "ecological," in the common sense of the word: sustainable, green, etc. By incorporating ecological management into its essence, the ecological state has found a new form of stability, a new kind of power through a new mode of governance.

[3] J. Scott (1996). *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed.* New Haven: Yale University Press. Especially Chapter 3.

There is an ontological insinuation here too: the relationship between "state" and "stasis" is obvious enough in English. What ecology tells us is that "stasis" is not static. For something to be in stasis, it must be dynamic, always responding to, and exerting force upon, the multitude of factors that compose its stasis. In fact, there is no "thing" at all, only a dynamic network of information and relation: ecosystem. For much of the last fifty years, embracing ecology as a subjective and political ontology has seemed an anti-statist—"rhizomatic"—position. But what happens when ecology becomes the *modus operandi* of the state itself? When "ecology" becomes tantamount to "reality," politics and history become so many bits of information to which ecological models simply have to adjust. As such, there is no counter-hegemonic discourse. Speaking only of the Great Lakes, new disturbances—and especially the kind offered by climate change—create more opportunities for the growth machine to further its administrative management. That grassroots groups and non-profits also believe in ecology as a way to understand and manage the contemporary Great Lakes only, in the end, reinforces the adjudicative authority of cities, counties, and states to reproduce the Lakes' destruction by reproducing their settler-capitalist role as an infrastructure for commerce. One also recalls that, in ancient Greek political history, στάσις [*stasis*] is also civil war; it is partisanship, faction, and sedition that, for Nicole Loraux—in her ecologically-minded thesis—is the calamity necessary for the creation of the beautiful, unitary city.[4] Perhaps this mode of *stasis* has become necessary in approaching ecology. What is required is a dialectical, rather than ontological, approach to ecology that will negate the unity of ecology as a simultaneous way of knowing and governing.

The argument for this chapter largely builds around an archive of institutional reports issued by the International Joint Commission concerning the relationship between water level and wetland management in the Great Lakes-St. Lawrence River Basin. In the previous chapter, I spoke of the Great Lakes hydrological cycle and its long history of water level fluctuation. In attempting to infrastructuralize the entire Great Lakes basin, the US and Canada have exerted a will to manage these fluctuations. This will to manage preceded the will to know, and once ecologists began to understand the systemwide importance of lake level fluctuations as they pertain to wetlands and the critical role wetlands play in basin-wide ecosystems, lake level stabilization schemes came to be looked at less favorably. In the case of Plan 2014, lake level stabilization on Lake Ontario was even reversed to some degree, though not without significant controversy.

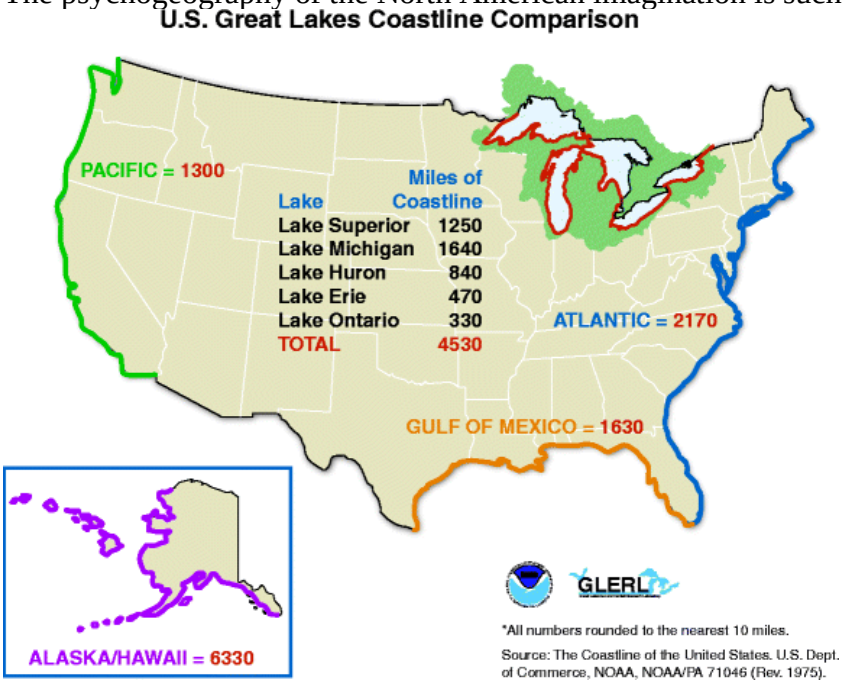
§2 – *Great Lakes Coastal Resilience*

As the previous chapter made clear, the problem of coastal resilience puts hydrological change in immediate relation to urban infrastructure, municipal governance, and waterfront real estate. How these factors are thought to interact is what is up for contestation. Throughout the climate change discourse, the problem of coastal resilience has centered on those oceanic geographies most susceptible to monotonic sea level rise: New York and Miami, Bangkok and Manila, Amsterdam and Hamburg, Lagos and Dubai, Kolkata and Shanghai, and so forth. Indeed, part of the collective vision of climate change persists in the image of glaciers melting into a sea that rises slowly and inexorably to inundate the world's great coastal cities. As can be deduced from the discussion of fluctuating lake levels, this is decidedly *not* the situation in the Laurentian Great Lakes. Cities along the Great Lakes are going to have to deal with drastic variability in water levels. The problems that Buffalo or Toronto or Detroit or Chicago or Milwaukee or Toledo or Cleveland faces when the water is high—like flooding and exacerbation

[4] N. Loraux (2001). *The Divided City : On Memory and Forgetting in Ancient Athens*. New York: Zone Books

of storms—are considerably different than the problems that arise when water levels dip—like trade ships running aground in straits and increased concentrations of pollutants in drinking water. Each of these scenarios presents drastically different forms of institutional and municipal preparedness.

The problem of variability is compounded by the sheer scale of the Great Lakes coastline. The psychogeography of the North American imagination is such that people consider the Great Lakes to be a "regional" concern, but the region is vast and there is a high level of differentiation across it. The coastal resilience of the Great Lakes is an enormous project that arguably exceeds comparable considerations on the Atlantic, Pacific, and Gulf of Mexico seaboards. While it may be mystifying to refer to them, like some have, as "inland seas," comparing the Great Lakes coastlines to those of the North American oceans creates a sense of the scale of coastal uncertainty. To speak only of the US (leaving out Canada), the Great Lakes contain some 4530 miles (7290 km) of coastline. The American Atlantic, Pacific, and Gulf of Mexico coastlines *together* add up to only slightly more: 5100 miles (8207 km). Including the Canadian coasts, the Great Lakes account for approximately10,500 miles (16,898 km) of shoreline—three times the continental US oceanic coasts![5] By comparison, the Mediterranean Sea coastline is about double the Great lakes, extending some 28,600 miles (46,000km).



Meanwhile, the estimated population of the Great Lakes region is 100 million people (85 million US; 15 million Canada). By comparison, the entire Atlantic Coastal population in the US —practically a single megalopolis—is about 112 million; the Pacific, about 53.5 million; and the Gulf Coast, about 64 million. Economically—even in the postindustrial era—the Great Lakes region supports a $6 trillion dollar annual "gross regional product," meaning that if the region was its own country, it would be the third largest in the world.[6] Moreover, the coastline contains an exceedingly valuable resource: 20% of the world's fresh surface water supply. If you're counting, that's about six quadrillion gallons.[7] As rightly skeptical as we must be of these abstract flyover numbers—which fundamentally collapse important geohistorical differences—I mean them to indicate that from a political, administrative, logistical, and ecological point of

[5] K. Fuller & H. Shear (1995). *The Great Lakes: An Environmental Atlas and Resource Book*. Chicago & Downsview, ON: Govt of Canada & US EPA

[6] Council of the Great Lakes Region. "The Great Lakes Economy: The Growth Engine of America." Online: https://councilgreatlakesregion.org/the-great-lakes-economy-the-growth-engine-of-north-america/

[7] That's 6,000,000,000,000,000 gallons

view, the problem of Great Lakes coastal resilience is on the same general scale as that of oceanic America. It is only twice as complicated to manage.

On Buffalo's lakefront, seiches and fluctuating lake levels are ecologically and socially consequential. High lake levels exacerbate shoreline erosion, worsen weather events, and endanger infrastructure. Low levels have deleterious impacts on shipping and recreation and can lead to high concentrations of sewage, agricultural run-off, and other pollutants. Seiches can clearly transform shorelines and knock out infrastructure. But very few people I interview have a sense of the teleconnections between global warming, increased interannual variability of ice coverage, fluctuations in lake levels, seiche events and Buffalo's beleaguered shorelines. That said, in Buffalo, there has been a growing interest—at least in name—in developing infrastructure for coastal resilience. What this means exactly depends largely on who you speak with.

The Buffalo Coastal Resiliency Study is still underway, but it marks the most ambitious study of its kind to date in the region. It is being funded by the Ralph C. Wilson Jr. Foundation, whose namesake was the former owner of the Buffalo Bills and a founding figure of the National Football League. His foundation has dedicated $200 million to Buffalo and Detroit—where Wilson grew up and had ties—for the formation of two large waterfront parks named in his honor.[8] As part of the Foundation's investment in coastline development, they have given another $750,000 to the study of climate change impacts on 16 miles of Buffalo's waterfront, to be conducted by a local—but influential—environmental non-profit, Buffalo-Niagara Waterkeeper in collaboration with the environmental engineering firm, Ramboll.[9] Waterkeeper is outspoken about the impact of climate change on Buffalo's coasts. In the announcement of the Resiliency Study, executive director, Jill Jedlicka, stated, "We know that climate change is real and that we are not immune to the effects here in the Great Lakes region… We are already experiencing the increased frequency and intensity of extreme weather events that result in more damaging lake seiches, coastal, and inland flooding."[10] Importantly, unlike many environmental inventories and assessments, the Resiliency Study is actively engaging community members on waterfront risks. The study will lead to a series of proposals that form the basis of future infrastructural development.

What is more interesting to me here is the way the Buffalo Coastal Resiliency Study frames resilience. In it, resilience has been reduced to flood-preparedness. In their public presentations on initial findings, coordinators of the study have several times shown the same graph, which tells a story of Lake Erie's water levels are rising.[11] However, as detailed above, this is only half the story. As established in the previous chapter, Lake Erie water levels are rising, but they are also falling. It just depends on the year (let alone the season, the day, the hour). Nowhere does the report follow what regional climate models detail: lake levels will oscillate in the extreme over coming decades. I'm not sure why the coordinators of the study wish to frame resilience in this way. Flooding is certainly more tangible than "resilience," and the coordinators have already focused on evaluating assets and risks, and this makes clear sense

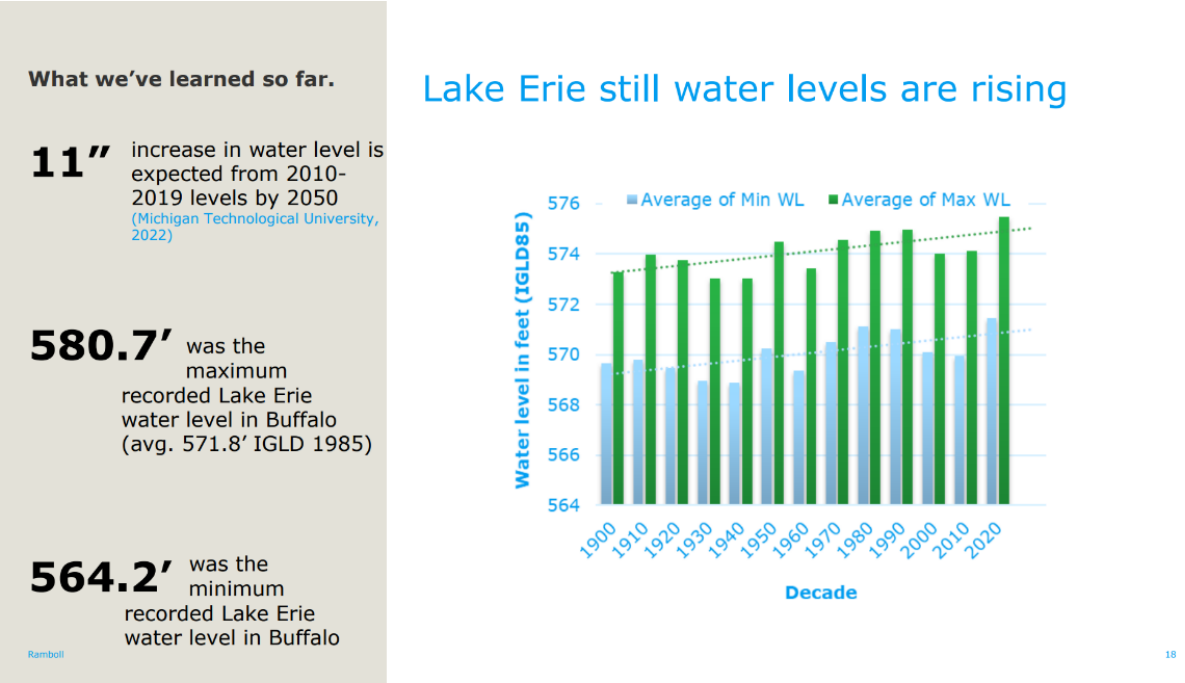
[8] See The Ralph Wilson Park Conservancy website: https://rwparkbuffalo.org/about/

[9] M. Sommer. "Study to Assess Effects of Climate Change on Buffalo Shoreline: 'We are Not Immune Here.'" *Buffalo News* 6 Dec 2022; I have had conversations with the leaders of the study, from both Buffalo-Niagara Waterkeeper and Ramboll.

[10] Quoted in *Ibid*

[11] See public meeting slides and videos. Online: https://buffalo-coastal-resiliency-study-rambollglobal.hub.arcgis.com/pages/existing-conditions

when talking about flooding. But by reducing resilience to flood preparedness and asset protection, the study assumes form the beginning that resilience should prioritize urban or community resilience over ecological resilience and that bigger harder infrastructure will likely be required to guarantee community resilience. This implies less that Buffalo's floodplains should be protected from flooding and—incidentally—Buffalo's waterfront should be made safe for further development. Or not incidentally?



This runs counter to arguments made by members of Our Outer Harbor, a coalition of environmentally-minded groups throughout the area specifically concerned with building a resilient waterfront in Buffalo. While many of the groups' members are also concerned with conserving and restoring habitat for bird, fish, and other wildlife, they are committed to turning the Outer Harbor into a barrier island wetland. This nature-based solution would protect the heart of Buffalo from flooding and storm damage during high water and provide essential filtration during low water by naturally extending wetlands. Indeed, they argue, wetlands are specifically *the* type of ecology that *depend* in interannual changes in water level.[12] Wetlands are uniquely suited to the kinds of fluctuations that climate models predict. For Our Outer Harbor, resilience takes the facts of climate change and instead of creating a defense wall around the city, works to provide infrastructure protection and habitat rehabilitation while also providing much needed public access to a waterfront park during the sunny days.[13] However, this would require a trade-off with urban resilience, which would tend to protect coastal real estate development.[14] If it was

[12] Personal Communication with Our Outer Harbor Steering Committee Members

[13] S. Magavern (2019). "Buffalo's Outer Harbor: the Right Place for a World-Class Park." Buffalo: Partnership for the Public Good. Online: https://ppgbuffalo.org/files/documents/environment/buffalos_outer_harbor_the_right_place_for_a_world-class_park.pdf

[14] Compare definitions of "urban resilience" to those of "coastal resilience." They are often at odds. Let alone "community resilience," which accounts for yet another set of factors. See, for instance: S. Meerow, J. Newell & M.

turned into a barrier island, the Outer Harbor would have no new construction and, depending on which Our Outer Harbor members you speak with, neither would the Buffalo River.

"Coastal resilience" masks real political tensions over what different stakeholders believe resilience infrastructure should be designed to protect. As Meerow and Newell's framework asks, "Who determines what is desirable for an urban system? Whose resilience is prioritized? Who is included (and excluded) parenthesis from the urban system?"[15] In their "Defining Coastal Resilience in the Great Lakes," Dobie et al. alter the Meerow and Newell's questions, asking "What is the domain (i.e., subject or system) of resilience? What is the sub-domain of resilience?" The authors made this change because "many of the stakeholders [they] examined may view a system other than the urban system as the subject of resilience, such as the built environment/ structural systems or ecological systems." The authors include the "sub-domain" to capture specific groups such as groups of people types of ecosystems types of infrastructures and so on.[16] Based on the incredible difference across these questions, it is clear that "coastal resilience" is not so much an analytical ecological category that objectively models humans as a sub-system of the urban ecosystem but instead a zone of intense urban political contestation. The history of lake-level and wetland management in offer in the following sections provide a complementary way to understand this long-standing conflict over who has a right to the coast.

§3 - *Lake-Level Stabilization:*

No proper history of lake-level stabilization schemes exists, but it is not possible to understand the political ecology of the Great Lakes coastlines and their history of physical transformation without it. Lake-level stabilization schemes exhibit that unwavering tendency among modernist technocrats to exhibit an oversized confidence in the State to serve as the arbiter of scientific and technological progress. Stabilization schemes are attempts to master external nature, drastically simplifying its complexity to something more legible and predictable, without regard for historical and geographical context. What differentiates them from Scott's examples of "authoritarian high modernism" is the relative lack of any tragic reversal.[17] Great Lakes water level stabilization schemes primarily served the dictates of industry, commerce, and hydroelectric energy production but also the interests of shoreline property owners, who play an outsized role in governing the lakes. For what it's worth, none of these industries require that lake levels be stabilized, leaving the schemes malodorous with that peculiar stench of domination for domination's sake. That said, the evaluation of these schemes changed dramatically after 1980, when ecological arguments could be made against them. Because of the interrelationship between wetlands and lake level fluctuation, the emergence of wetland ecology was particularly impactful in halting a lake level stabilization scheme proposed for Lake Erie in the early 1980's and again in the 1990's. In fact, the influence of wetlands science led to a destabilization

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Stults (2016). "Defining Urban Resilience: A Review." *Landscape and Urban Planning* 147: 38-49; T. Beatley (2009). *Planning for Coastal Resilience: Best Practices for Calamitous Times*. Washington DC: Island Press; C. Seavitt Nordenson, G. Nordenson & J. Chapman (2018). *Structures of Coastal Resilience*. Washington DC: Island Press; Masslink & E. Lazarus (2020). "Defining Coastal Resilience." *Water* 12(5); On a certain slice through community resilience, see F. Berkes & H. Ross (2013). "Community Resilience: Toward and Integrated Approach." *Society & Natural Resources* 26(1): 5-20

[15] S. Meerow & J. Newell (2019). "Urban Resilience for whom, what, when, where, and why?" *Urban Geography* 40(3): 309-329

[16] S. Dobie, P. Doran, R. Norton, S. Hughes, M. Goode (2022). "Defining Coastal Resilience in the Great Lakes: A Systematic Review and Critical Comparison." *Journal of Great Lakes Research* 48(6): 1361-1374

[17] See J. Scott (1996): Chapter 3 *et passim*

management plan for the Moses-Saunders dam in the 2010's, known as Plan 2014. Ultimately, the history of lake level stabilization programs offer insight into how states transitions from dominating nature to managing ecology. Importantly, when it comes to the Great Lakes, I am not talking about a single state. The Great Lakes are run bi-nationally by the US and Canada under the auspices of the International Joint Commission, so there is no single state that controls these waters. There are eight US states and two Canadian provinces, along with some 120 First Nations and Métis communities. In New York state alone, there are 18 counties and more than fifty towns in the Great Lakes basin, and in New York State This is relevant, because New York is a "home rule" state, which means that the state has delegated land use planning to each municipality. This decentralized approach makes it a politically impractical task to develop, say, a watershed planning code, since watershed and political boundaries are not remotely contiguous.

In the previous chapter, I discussed the natural historical quality of lake levels to fluctuate with relation to climate over various time scales. Levels fluctuate on a seasonal, annual, and decadal basis, and in some geographies, seiches can drive large lake-level changes over hours or even minutes. Douglas Wilcox demonstrates that centennial and millennial changes are also relevant. While measurement of lake level fluctuations on the Great Lakes is comprehensive—going back to 1860—Wilcox has noted that it is possible that scientists have been measuring one large cycle. His lake-level and climatological reconstructions show lake-level cycles of around 30 years and again of around 160 years.[18] Over longer scales, climate has intersected with geology as well to alter lake-levels. In one of his reports, Wilcox includes an incredible aerial landscape photograph: it's of a strandplain—parallel belts of sand ridges and swales. This one, from the northwest corner of Lake Michigan, was the result of glacial isostatic rebound. Freed from the weight of the glacier, the earth rebounds and rises up, often causing tilting on the other

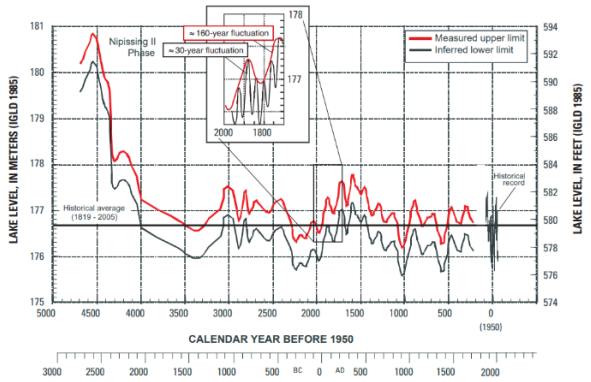


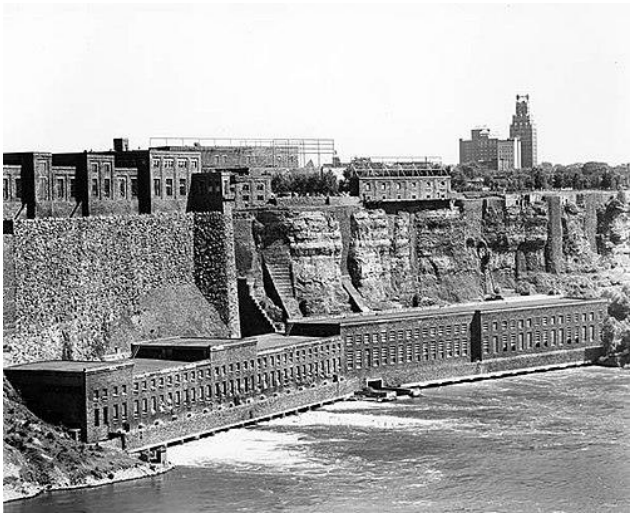
Figure 8. Hydrograph of late Holocene lake level and historical lake level for Lake Michigan-Huron. The red line is interpreted from beach-ridge studies, whereas the lower black line is an inferred lower limit using the range of the historical record as a guide.

Figure 7. Oblique aerial photograph of a strandplain of beach ridges near Manistique, Michigan. In this photo, individual tree-capped beach ridges are separated by intervening vegetation-covered swales.

end. Over the scale of centuries and millennia, this changes relative lake levels tens of feet and can effect wholesale changes in the hydrological regime.

[18] D. Wilcox, T. Thompson, R. Booth & J. Nicholas (2007). *Lake-Level Variability and Water Availability in the Great Lakes.* Reston, VA: US Geological Survey, Circular 1311; D. Wilcox, T. Thompson, R. Booth & J. Nicholas (2007). "Great Lakes Levels in Constant Flux." *Michigan Science* No. 5

There seems to have been a certain cognitive disposition among rational European Christian settlers to take what appeared before them in the world as reality, rather than as a snapshot of a larger dynamic reality. Whether there was a cognitive effect or not, the dictates of capitalism to transform this ever-changing world into a stable-state infrastructure for commercial trade, resource exploitation, and settlement, compelled settlers toward the domination fantasy of lake-level stabilization. Lake-level stabilization infrastructure imposes stability on to an inherently instable environment, propagating the illusion that nature is—or ought to be—a fundamentally a static enterprise.



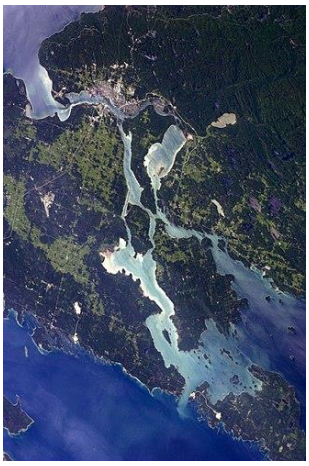
There are two lake-level stabilization infrastructures on the Great Lakes: the compensating works in Sault St. Marie, which manages Lake Superior, and the Moses-Saunders, which manages Lake Ontario. They are overseen by the International Joint Commission, which was established by the Boundary Waters Treaty of 1909 between the US and Canada. By the late 19th century, disputes over water were creating tension along the border with settlers from Montana and Alberta creating canals to divert water for their own use. Moreover, disputes over Niagara Falls were coming to a head, and it was increasingly clear that the two countries needed a management plan that could balance the growing demands for hydroelectric power, navigation, and tourism.[19] The world's first hydroelectric generating station opened in Niagara Falls in 1895, and the following year, Nikola Tesla used his new alternating current system induction motor to transmit electricity to Buffalo. That same year, Jacob Schoellkopf built his power station at Niagara Falls and transformed electricity into a commodity.[20] Diverting too much water threatened to effectively reduce Niagara Falls to a trickle. Today, the average summer daytime flow of 100,000 cubic feet per second is halved at night time for hydroelectric power on both sides of the border. During the winter, it is halved again, so that only a quarter of the daytime summer average flows over the falls. For all of its apparent wildness and magnitude, Niagara Falls is an entirely managed system. In creating the International Joint Commission (IJC), the Boundary Waters Treaty created a binational body to oversee such matters.

A key function of the IJC is to regulate water levels in the Great Lakes and—in particular for the more developed and populous lower lakes. This is made at least somewhat possible by holding water back in Lake Superior basin.[21] Despite Lake Superior being the largest lake in the world by area, its outlet through the St. Mary's River is tiny. The proportion is reflected in Lake Superior's retention time of 191 years, which is to say that the water flowing out of Lake Superior today first entered the basin at the dawn of its settlement, in the early 1830's.

[19] International Joint Commission. "The Boundary Waters Treaty of 1909." https://www.ijc.org/en/boundary-waters-treaty-1909

[20] Niagara County Historical Society. "Jacob Schoellkopf". http://www.niagara2008.com/history166.html

[21] H. Hartman (1988). "Historical Basis for Limits on Lake Superior Water Level Regulations." *Journal of Great Lakes Research* 14(3):316-324.



In its 1914 Order of Approval, the IJC established the basic objectives and limits to the regulation of Lake Superior's outflow and completed the Compensating Works in August 1921.[22] The building of the Compensating Works began in 1901 and, even before that, Lake Superior's levels were manipulated from 1888-1900 by the construction of the International Railroad Bridge and the Chandler Dunbar Power Canal.[23] The Compensating Works span 968 feet across the St. Mary's River just past the eastern tip of Lake Superior. It is a 16 sluice gate structure with gates 1-8 in Canadian waters and 9-16 in American. The IJC uses the gates to control the level of Lake Superior within a certain parameter. In a particularly low year, for instance, the Works let out water from Lake Superior to raise Huron-Michigan in order to ensure the depth of the Mackinaw Straits for ship navigation. More tension arises during unseasonably high waters, as happened in the mid-1980's, with lower lake states calling on Lake Superior to exceed the maximum established by the 1955 International Great Lakes Datum (IGLD)—the elevation reference system used to define water levels.[24] Because of changes in the earth's crust due to glacial isostatic adjustment, "the datum," or reference point, must be—according to the dictates of instrumental reason, at least—corrected every 25-30 years. The IGLD was adjusted in 1985 and again in 2020. For its part, the IJC updated its Orders of Approval in 1979, which aimed to keep Lake Superior's levels between

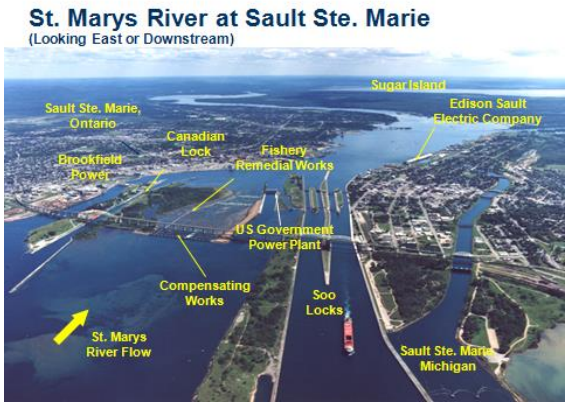
[22] International Lake Superior Board of Control. "A Balancing Act: Lake Superior Regulation and the St. Mary River." *International Joint Commission Newsletter* 21 May 2014. Online: https://www.ijc.org/en/balancing-act-lake-superior-regulation-and-st-marys-river

[23] F. Quinn (1978). "Lake Superior Regulation Effects," *Journal of the American Water Resources Association* 14(5): 1129-1142

[24] Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data (1995). "The Establishment of the International Great Lakes Datum (1985)." Interim Report. https://tidesandcurrents.noaa.gov/publications/Establishment_of_International_Great_Lakes_Datum_1985.pdf

599.6 and 603.2 feet above sea level—within about two feet up and down of the lake's long-term average, 601.7 feet. This is all to say that determining and controlling lake levels is a layered, administrative international task designed to mediate hydrology and geology, perceived as necessary to the protection and smooth running of Great Lakes *as* infrastructure.

On the other end of the lakes, the Moses-Saunders Power Dam, opened in 1958, regulates the water levels of Lake Ontario. At 195.5 feet above sea level and 3,212 feet long, the dam spans from Massena, New York to Cornwall, Ontario across the St. Lawrence River. Threshold levels for Lake Ontario change based on the time of year but the IJC looks to sustain levels optimal for navigation, hydroelectric power, and municipal water usage. The Dam was part of the



greater St. Lawrence Seaway project—a project that beamed of post-war high modernism. The St. Lawrence Seaway was an infrastructure plan for the entire Great Lakes basin; a new system of locks, canals, and channels would "improve"

the basin so that ocean-going vessels could enter through the St. Lawrence River and travel all the way to Duluth without requiring transfer of goods. It was an economic blow to Buffalo, since it allowed for the bypassing of the Erie Canal for waterborne transport. It was more than just infrastructure that was at stake. In *The Death and Life of the Great Lakes*, Dan Egan describes the world-historical vision of transforming the Great Lakes into what boosters agreed would be a "manmade Mediterranean."[25] As one *Newsweek* reporter put it, while in Buffalo on the bank of Lake Erie, "You can stand here today and see tomorrow—the multitude of ships flying the flags of world, turning the Great Lakes into a Mediterranean and turning the lake cities into world cities…"[26] This idea that the Great Lakes would be to the Modern world what the Mediterranean was to the Classical world reeks of histrionic bombast in hindsight, but the Great Lakes were the center of industrial—and military—production in the world, and the expectation was that was the

[25] Quoted in D. Egan (2017). *The Death and Life of the Great Lakes*. New York: Norton: 23
[26] *Ibid.*

region was going to expand into a single megalopolis, combining with the east coast to be the center of the Western world.[27] The building of the St. Lawrence Seaway and the near total control of the lakes was, to boosters, evidence of this speculative future where nature could be brought into the purview of political economy. The entire 10,500 miles of coastline could be considered commercial infrastructure. That such coastlines could even be considered ecologically would not become discursively possible for another decade, at least. Incidentally, by the time the locks were constructed, they were already too small for the largest ocean going vessels. Ocean-going traffic through Seaway today economically almost irrelevant, but ecologically impactful, since ballast from these ships has introduced several novel species that have fundamentally altered the ecology of the lakes.

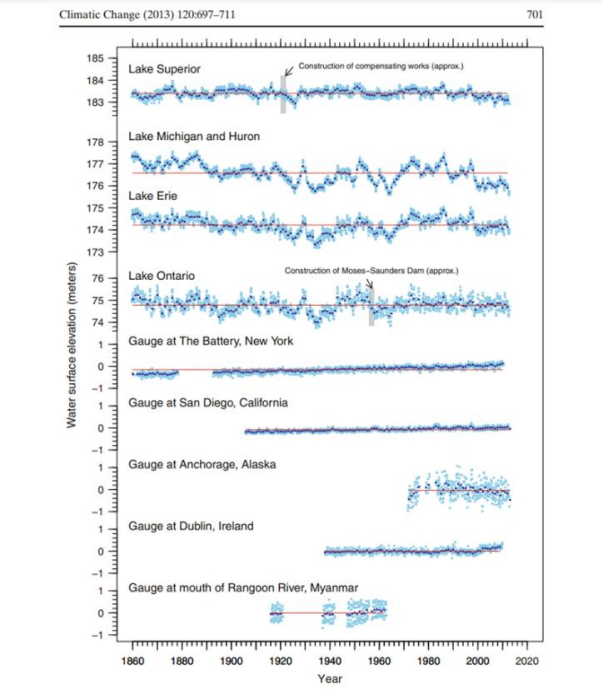


Fig. 3 Historical monthly and annual average surface water elevations in the North American Great Lakes and at other gauges from around the world. Annual average water levels are represented by black dots, and monthly average water levels are represented by light blue dots. Average elevations for each period of record are represented by horizontal red lines. Surface water elevations are referenced to either the 1985 International Great Lakes Datum (for the Great Lakes) or mean sea water level and are plotted at the same vertical scale. Breaks in the y-axis values between Great Lakes data sets reflect elevation changes through the St. Marys River, Niagara Falls, and the St. Lawrence River, respectively

As evident in the graph, Lake Superior and Ontario water levels began oscillating more tightly around their long-term annual averages after the building of the Compensating Works and Moses-Saunders Dam, respectively. Without understanding anything of their ecological importance—or that they could even be important— governing bodies treated the seasonal and water fluctuations as aberrations that should be managed in order to create a Great Lakes system that served *as* energy and transportation infrastructure.

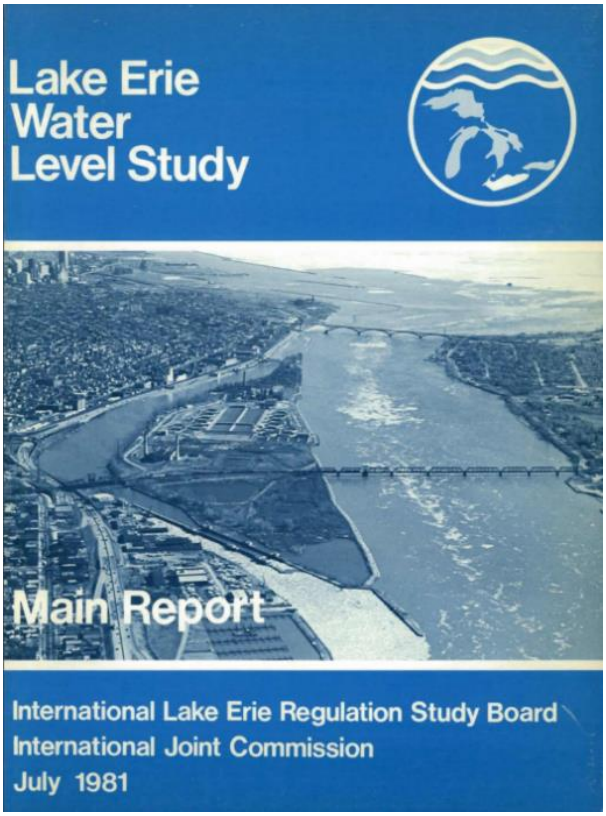
This comportment toward state-based control saw a resurgence in the early 1970's and again in the mid-1980's—whenever the lower lakes experienced periods of unusually high water levels. In the 1970's, then-record high water levels in Lake Erie "resulted in extensive flood and erosion damages to shoreline properties on the lakes."[28] Owners of properties along the lake—many of them powerful magnates of waterfront business and owners of lakefront mansions—swayed the IJC to conduct an exploratory study on controlling Lake Erie's water levels more stringently. Since Lakes Michigan and Huron function hydrologically as the same lake and since they are immediately impacted by Lake Superior's outflow, it is more feasible to manage their levels. If waters are high, it is possible to hold water back from Superior. But Lake Erie's inflow and outflow cannot easily be managed, since increasing outflow at Moses-Saunders will not change the rate at which

[27] C.A. Doxiadis (2005). "The Emerging Great Lakes Megalopolis." *Ekistics* 72 (430/435): 167-188

[28] International Lake Erie Regulation Study Board (1981). *Lake Erie Water Level Study*. Washington DC & Ottawa: International Joint Commission. Online: https://www.ijc.org/sites/default/files/K43.pdf: 4; Also see Herdendorf (1975). "Shoreline Changes of Lakes Erie and Ontario." *Proceedings of the Conference on Changes in the Physical Aspects of Lakes Erie and Ontario, Nov. 1-2, 1973*. In Ed. R. Sweeney. *Bulletin of the Buffalo Society of Natural Sciences* 25(3): 43-76.

Lake Erie flows into the Niagara River and over the Falls. The IJC's 1981 *Lake Erie Water Level Study* investigated a number of dizzying high-modernist schemes aimed at lobotomizing the lake.

The 250-page report conducted a detailed analysis of three possible "regulatory works plans" that would decrease the level of Lake Erie by increasing the outflow of Niagara River by 2-12% beyond its long-term average of about 200,000 cubic feet per second (cfs). The first plan would have modified the then-existing Black Rock Navigation Lock to provide an outflow increase of 4,000 cfs. The second would have created a diversion channel across Unity Island (then called "Squaw Island"), which would have been equipped with a control structure to provide an outflow increase of about 10,000 cfs. The third would have enlarged the channel of the Niagara River and placed a compensatory structure near the Peace Bridge—the main vehicle artery between Buffalo, NY, and Fort Erie, Ontario—which would have increased the outflow by about 25,000 cfs.[29] To their credit, the investigators determined that while "limited regulation of Lake Erie water levels could be achieved," the study "SHOULD BE TERMINATED," since it proved an economically unjustifiable means to mitigate flood and erosion damages for a fractional group of wealthy landowners. Soberly, the report suggested that "Appropriate authorities should be encouraged to act to initiate effective coastal zone management practices and structural setback requirements to reduce future damages in the flood and erosion hazard areas on the Great Lakes."[30] The report also proposed that the IJC should initiate a public information program with the aim "to eliminate the confusion and misconceptions that currently exist." It notes, "There is a lack of clear understanding by some of the public of the various natural and manmade factors affecting the Great lakes water levels and the reasons for the extreme high and low water levels."[31] While the IJC did organize such a public information campaign in good faith, whatever impact it had was worn off by the mid-1980's—and certainly by the late 2010's—when other periods of high water led to a panicked public calling for the IJC to do something about the high water.



§4 – *The Scope of Ecology: Living With the Lakes*

At the time of the *Lake Erie Water Study* publication in 1981, the IJC had begun implementing other kinds of reasoning into their logic as well. While the relationship between lake level fluctuations and wetlands had been documented in the scientific literature as far back

[29] *Ibid.*

[30] *Ibid:* 244

[31] *Ibid:* 6

as the 1940's,[32] wetlands continued to be considered functional wastelands—especially in urban areas—until at least the 1970's. By the early 1980's the scientific investment that followed the momentous environmental legislation of the early 1970's had begun to matriculate into official discourse. In a long section of the *Study* on the impacts of potential projects on various wetland types, the authors note, "The productivity, biological composition, and size of the wetlands of the lower Great Lakes are highly dependent on the long-term water level regime. The regulation plans would change the long-term water levels, thereby altering wetland conditions." The study examined probable hydrological changes most meaningful to wetlands: "long-term annual mean; range of fluctuation; high water levels; low water levels; frequency and duration of high and low water levels; and seasonal distribution (timing) of water." It concluded that environmental changes of wetlands would be significant and that this should be a consideration in any decision that impacted lake levels.

Then came what an IJC task force referred to as "the high lake level crisis": a "period of critically high water levels on most of the Great Lakes" that began in 1984 and lasted until early 1987.[33] In the midst of the so-called crisis, the Governments of Canada and the United States issued a Reference Request to the IJC, asking it—yet again—"to examine and report upon methods of alleviating the adverse consequences of fluctuating water levels in the Great Lakes-St. Lawrence River Basin." The Request continues,

> In doing so, the Governments acknowledge previous Commission reports on regulation of Great Lakes levels, which have encouraged appropriate jurisdictions to institute improved shoreline management practices. The Governments note that the previous reports were based upon recorded water supplies which have subsequently been exceeded, that economic conditions have changed, and that improved analytical techniques may now be available. The Governments conclude, therefore, that further investigation is now required to revise previous reports and develop appropriate methods to alleviate the adverse consequences of fluctuating water levels.[34]

The Governments asked the IJC to propose and evaluate measures that they could take—"under crisis conditions"—to "alleviate problems created by high and low lake levels" and to revise their previous engineering, economic, and environmental evaluations.[35] One senses the tension here between the ways in which state governments and the IJC understood the problem of lake-level rise. While the US and Canada were still looking for major infrastructural solutions, the IJC, under the sway of ecology, began to offer a much different way of understanding lake-level fluctuations and the Great Lakes basin more broadly.

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[32] Laing (1941), Low and Bellrose (1944), McDonald (1955), and Kadlec (1962) had studied changes in aquatic vegetation associated with changing water levels. Johnsgard (1956), Weller and Spatcher (1965), and Weller and Fredrickson (1974), have documented changes in bird species abundance and distribution related to water level and vegetational changes in glacial marshes or impoundments of the northern Great Plains. Bibliographical review online: https://www.seagrant.wisc.edu/wp-content/uploads/2022/06/GreenBayWetlandsProject_FINAL_interactive-1.pdf

[33] International Joint Commission Task Force (1988). "Interim Report on 1985-86 High Water Levels in the Great Lake-St. Lawrence River Basin." Online: https://legacyfiles.ijc.org/publications/ID591.pdf

[34] J. Clark. "Reference Request." 08/01/1986. https://ijc.org/sites/default/files/Docket%20111%20Reference%20on%20Fluctuating%20Water%20Levels%20in%20the%20GL%20Can.%20Letter%201986-08-01.pdf

[35] *Ibid.*

The result of the request was a massive seven part IJC report that came out in 1989 called *Living With the Great Lakes: Challenges and Opportunities* along with a number of follow-up reports, the most important being the *Levels Reference Study*,[36] which was billed as a "comprehensive study to investigate all alternatives available to address lake level issues."[37] The title, *Living With the Great Lakes* itself is suggestive, playing on the idiomatic sense of "living with." The title expresses the need for toleration: it emphasizes that States and communities must learn to live *with* the lakes—rather than against them—by allowing the lakes to live according to their natures. This interpretation suggests that the lakes may not, after all, be reducible to mere infrastructure. Additionally, the title echoes an overcoming of resignation, like those self-help books that take a positive spin on what appears to be a bad situation: "living with diabetes/ depression/ disability/ etc." This indicates a move away from domination as the guiding sensibility. From the beginning of *Living with Great Lakes*, the IJC appears insistent to communicate to the US and Canadian governments that lake level fluctuations are normal and what is needed is better building codes, policies, and hazards planning—for both low and high lake levels. After stating that the Great Lakes are a shared international resource, they make an ecological point:

> Its water levels have fluctuated for thousands of years, reflecting the climatic conditions in the basin. There are those times when nature, in its vagarious moods, subjects the lakes to extreme fluctuations, rendering hardshisps to many, civilization in particular. This has never been truer than in the last several decades, during which time the governments of Canada and the United States have forwarded several references to the International Joint Commission (IJC) to investigate the fickle nature of the lakes.

In highlighting the Lakes' "vagarious moods" and "fickle nature," the IJC highlights the certainty of lake level uncertainty, admonishing the US and Canadian governments for their overbearing and unrealistic demand to control them. The IJC suggests that the hardships caused to "civilization" are not the fault of lake-level variability but the fact that civilization has set to control something endowed with such inherent moodiness. The lakes are an infrastructure for the IJC, but now they are also independent ecological systems to which political and economic systems must accommodate themselves.

It is important to make clear who the US and Canadian government is representing here. At the time, these were record high lake levels, but they were comparable to previous high levels. So for whom was this a crisis? While it may have been broadly inconvenient and while it may have taxed infrastructure, the driving force behind framing a crisis was a small but powerful group of wealthy lakeside land owners,[38] overly represented in their respective governments. While scientific consensus was that large storms were far more responsible for erosion, these landowners became concerned that high lake levels would erode the land atop which their houses—in many cases, mansions—were built. They convinced themselves that the only solution to protect their property value lie not in smart regional planning but in large-scale hardened

[36] Levels Reference Study Board (1993). *Levels Reference Study: Great Lakes-St. Lawrence River Basin*. International Joint Commission: 57. https://graham.umich.edu/media/files/water-levels-ijc-reference-study-1993.pdf
[37] D. Miller (1988). "Where is Great Lakes Water Level Policy Headed." *The Great Lakes United Newsletter* 3(3)
[38] Yonker estimates a Basin-wide interest group of about 100,000 shoreline landowners out of about 42 million total denizens.

infrastructures. In the lead up to the publication of the *Levels Reference Study*, Terry Yonker, then-Executive Director of the IJC watchdog group, Great Lakes United, alerted that

> A small, vocal coalition of lake front owners is stepping up its demands for control of water levels and flows in the Great Lakes and St. Lawrence River. In an eleventh-hour effort to influence the recommendations of the Levels Reference Study Board of the IJC, a group of shore owners is playing politics with the Great Lakes Basin Ecosystem. They are lobbying for the construction of dams, dredging of connecting channels, and manipulation of water levels with the mistaken notion that control of natural variations in water levels will prevent most of the damage to shoreline properties subject to serious erosion and flooding.[39]

Yonker himself was on the Level Reference Study Board, a sprawling group of government officials, environmental non-profits, consultants, engineers, academics, and politicos of diverse interests split into a number of working groups and task forces. By and large, the IJC report sided with Yonker and the vision laid out by his predecessor at Great Lakes United, David Miller. Commenting on the record lake levels of 1985 and '86, Miller begins a think piece by saying, "The Great Lakes, in their natural mystique, have shown residents that they truly are unpredictable."[40] This emphasis on unpredictability is not something to be controlled by Miller but rather indicates a dynamism toward which humans must accommodate their action: "the challenge is to choose a policy which allows the natural fluctuations of the Lakes while providing benefits *within* those bounds."[41] In the end, Miller offers, "Our philosophy must be based on *stewardship*, rather than *manipulation* for short-term gain." He calls on citizens to "Let the Great Lakes be Great."[42] Miller's stewardship model that has humans living within the natural rhythms of the Great Lakes marks a step towards the a more integrated "whole-system" model that *Living With the Lakes* ultimately proposed in *Annex D: The Great Lakes Ecosystem Perspective*.

While the IJC proposed an ecosystem model in *Annex D*, the 1978 revision of the Great Lakes Water Quality Agreement—which I discuss in greater detail below—marks the introduction of the ecosystem concept not only into the Great Lakes but into environmental management more broadly. The model of ecosystems governance is the culmination of a generation of work by ecologists and activists to transform governmental management and public understanding of environmental issues. In the early days of Great Lakes activism, when toxic pollution was the immediate concern, priority was on "end-of-the-pipe" monitoring of source point pollution. As the field of ecology developed, so did a more a holistic perspective that looked to understand—and manage—the multitude of forces composing "the ecosystem." *Annex D's* "Executive Summary" follows this lead by re-thinking the relationships between lake levels and broader social forces. Functional Group 5—the authors of the report—develop what they call a "whole-system perspective"[43] for addressing issues related to fluctuating levels and

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[39] T. Yonker (1993). "Shore Owners Play Politics with Great Lakes." *The Great Lakes United Newsletter* 7(2-3)
[40] D. Miller (1988)
[41] *Ibid.*
[42] *Ibid.*
[43] All quotes from this section from: Functional Group 5 (1989). *Living With the Lakes, Annex D: The Great Lakes Ecosystem Perspective*. Washington DC & Ottawa: International Joint Commission, D1-2. Online: https://ijc.org/sites/default/files/ID690.pdf

flows within the Great Lakes basin. The report notes, "Such a perspective was seen as a means of enhancing understanding of the context for mediating the hydrological, ecological, human and institutional forces relevant to alleviating the adverse consequences of fluctuating water levels." The group thus examines mutual mediations between (1) climate and hydrology; (2) the "natural" ecology of the system (those are even their scare quotes around "natural"); (3) human activities related to socio-economic interests; and (4) "governance processes." Being linked to various social and natural factors, "Level issues are systemic in nature and they are constantly changing in relation to changing conditions, changing values and changing institutions." They are not only dynamic then but "multifaceted": "Fluctuating levels and flows affect interests in different and often opposing ways and actions to alleviate the adverse consequences of fluctuating waters will almost inevitably result in both positive and negative effects depending on particular interests and their perceptions." Unlike the high modernist position of total domination, *Annex D* adopts an explicitly ecological epistemology wherein "positive" and "negative" are merely contingent relative values based on one's position in the system. Thus, it is "unrealistic to think in terms of one-time solutions." "Rather,"—and this evidences the profound shift to the iterative and processual characteristics of ecological management—"the inescapable conclusion is that issues related to levels and flows must be managed over time and, that ideally, such a management process should take place within a policy and institutional framework that is sensitive to the systemic dimensions of the issues involved." Given this new way of seeing, "engineering solutions are not sufficient in and of themselves." What Functional Group 5 therefore suggests is a much more flexible and techno-managerial form governance over the Great Lakes Basin. The US and Canadian governments should "build upon previous knowledge" in order to (1) develop general agreement principles that serve "to guide in managing issues"; (2) develop an overall strategy for "deploying measures and selecting and implementing a range of actions" that would help alleviate the adverse consequences of changing flows; and (3) assess "governance arrangements" to help identify "opportunities for institutional innovations." Crucially, statements like this conflate ecological epistemology with ecological management. The point of ecology in such a document is not a liberated perspective on the dynamism and dialectical mutualism between part and whole; the ecology is always already a sophisticated form of management that Foucault would call governmentality but which can be understood as a mode of governance, or management, that merely accompanies the paradigmatic epistemological shift from Nature to ecology. Importantly, while its techniques are different from the Authoritarian form of high-modernism laid out by Scott, they are, no less total in their aim. The transformation of ecological difference into data, the constant monitoring, and the iterative tinkering may be less fascistic, but they are more controlling: you may get away with your life, but it will kill your soul.

§5 – *Great Lakes Wetlands*

Wetlands are the biological expression of lake-level fluctuations. In order to understand the ecological impact of lake level stabilization infrastructure, it is necessary to have some sense of the ways in which lake-level fluctuation mediates wetlands. Great Lakes wetlands are fundamentally important to the environmental health of the Great Lakes. And over the past two centuries, they have mostly been destroyed. Altering hydrological processes alters wetlands. In the best cases, industrialization, urbanization, suburbanization, and agriculture have combined to destroy 60% of Great Lakes wetlands, and what remains is severely compromised since these remnant wetlands are fragmented: disconnected from each other and from larger coastal

processes. In many regions, 90% and more are gone. Historically, settlers destroyed them wantonly or out of sheer negligence, but their destruction has been regulated and carefully administered for the last half century. In 1994, one Chicago area environmentalist, Jerry Paulson, wrote, "Water and wetlands cannot be hydrologically separated, or the wetland will cease to exist. That is an obvious ecological fact. But," Paulson continues, "government agencies, programs, and policies are not structured to follow the basic laws of ecology or hydrology."[44] Paulson's statement rings true rhetorically. In meeting after meeting that I have been to, regional activists continue to pit ecology against the logic guiding regulation and development. What this section is attempting to demonstrate however, is that in fact, government agencies and programs—along with speculative developers—*have* become structured, to follow the basic laws of ecology. At the same time, ecologists—under the banners of resilience and "adaptive management"—have developed a particular taste for governance. And wetlands are no better off.

Douglas Wilcox, now retired from the USGS and his post at SUNY Brockport, is one of the most prominent lake-level and wetlands experts in Great Lakes. During his twenty year tenure as editor-in-chief, he was instrumental in bringing the journal, *Wetlands*, to prominence. In my interviews and correspondence with him, an environmentalist's passion for the lakes and for lake wetlands clearly grounded his impressive body of scientific research. He writes, "Water-level fluctuations in the Great Lakes are of great ecological importance in the coastal zone because even small changes in lake level can shift large areas from being flooded to being exposed and vice versa."[45] Fluctuations are principally important for both plant succession and coastal morphology. Because of this, of course, they are crucial to the development of habitat. In short, water level change is important to wetland ecosystems because they are a principle source of ecological disturbance. The impact of lake-level fluctuations on the physical structure of coastlines changes with a variety of factors like the morphology, composition, and the dominant processes of a particular coast. Lake level variability causes erosional and depositional processes over time, depending on even slight changes in elevation. Storm surges and seiches during high lake levels have the most dramatic effect, both short and long term, since they both flood low-lying areas and erode mobile substrates. "These storms can liberate sediment from upland areas, feeding the littoral system, and can ultimately nourish downdrift shorelines. The effects of this nourishment may not be seen until times of

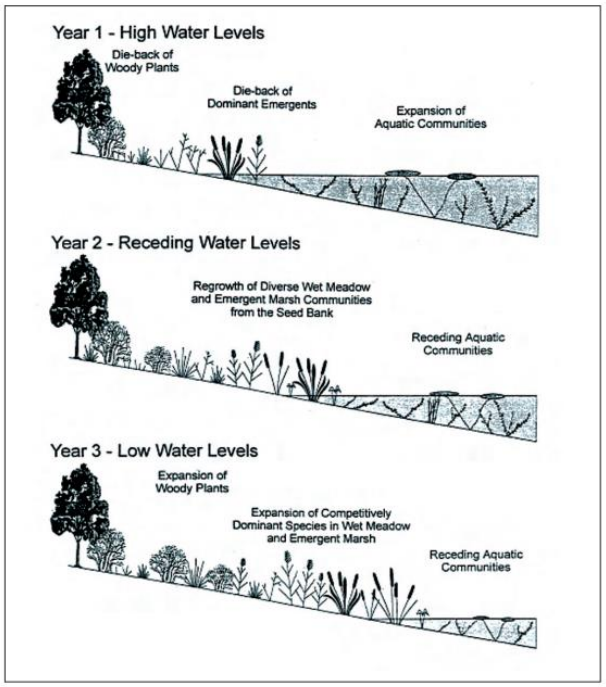

Figure 11. Simplified diagram of the effects of water-level fluctuations on coastal wetland plant communities (from Maynard and Wilcox, 1997).

[44] J. Paulson, (1994). "Great Lakes Wetlands Restoration: Linking Wetlands Restoration and Watershed Planning" *Great Lakes Wetlands* 5(1): 1

[45] Wilcox *et al.* (2007): 13

low water levels when exposed sand bars, widened beaches, and dune growth are evident."[46] Erosional and depositional processes also play an important role in the development and stabilization of dunes. Thus, there are number of complicated spatial and temporal ecologies at work in the creation of the physical habitat of the coastline, and of course this is inseparable from the development of plant communities in those coastlines.

The polyrhythm of lake level changes over different time scales means a constantly shifting and highly diverse habitat regime whose principle variable is floral life. "The variety of water-level fluctuation… demonstrates that, under a natural hydrologic regime, wetland plant communities in the Great Lakes developed and are maintained in a hydrologic environment with great variability."[47] Wilcox offers several helpful diagrams that help demonstrate the impact of changing water levels on plant communities. They explain that individual plant species and plant communities have "affinities and physiological adaptations" for particular water depth ranges. Thus, "Changes in water level add a dynamic aspect to the species/ depth relationship. Water-level dynamics result in shifting mosaics of aquatic vegetation types."[48] As Wilcox describes it, water level fluctuations are vital to Great Lakes wetlands since they "serve to perpetuate cycling of successional processes and maintain wetland diversity." Due to their periodicity, high lake levels occasionally eliminate competitively dominant emergent plants. "When levels recede, less competitive species are generally able to grow from seed, complete at least one life cycle, and replenish the seed bank before being replaced through competitive interactions…"[49] It would seem to make sense then that water level fluctuations are tied to plant succession then, but because of their stochastic capriciousness, there is really never enough time for any kind of idealized successional process to occur. An important and frequently cited paragraph from Baedke and Thompson's 4700-year chronosequence of Lakes Michigan and Huron, explains that successional concepts related to upland plant communities are less relevant to wetland plant communities, which are entirely tied to hydrological dynamics.

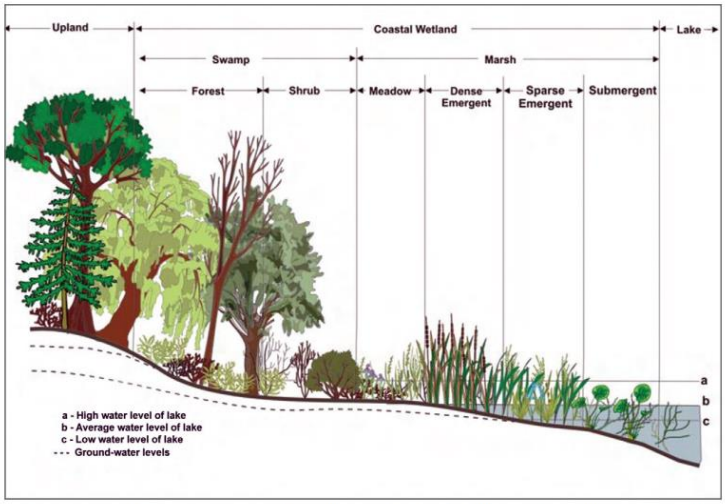

Figure 12. Profile of a typical coastal marsh from lake to upland showing changes in plant communities related to lake-level history (from Environment Canada, 2002).

Traditional successional concepts have limited usefulness when applied to wetland dynamics. [Great Lakes coastal] wetlands typically remain wet over time exhibiting a wetland aspect rather than succeeding to upland vegetation.[50]

[46] Wilcox *et al.* (2007)
[47] *Ibid*
[48] 225
[49] D. Wilcox (1993). "Effects of Water Level Regulation on Wetlands of the Great Lakes," *Great Lakes Wetlands* v4(1): 1-2
[50] Charles Herdendorf is an expert in Lake Erie geological and biological systems. He explains: Lake Erie coastal wetlands differ in basic ways from inland wetlands, which undergo a process of senescence during which they slowly fill in with sediment and eventually become another type of ecosystem altogether. See C. Herdendorf

> Changes that occur may not necessarily be directional or orderly and are often not predictable on the long term. Fluctuating hydrological conditions are the major factor controlling vegetation pattern. The role of allogenic factors, including chance and coincidence, must be given new emphasis. Cyclic changes should be expected as water levels fluctuate. Catastrophic events such as floods and droughts also play a significant role in both modifying yet perpetuating these systems.[51]

Great Lakes wetlands do not perform according to the regular rules of steady state ecologies; they epitomize disturbance ecology, and lake level variability is the disturbance according to which coastal wetlands adapt, modify, and develop. Per Wilcox, "The variety of water-level fluctuation… demonstrates that, under a natural hydrologic regime, wetland plant communities in the Great Lakes developed and are maintained in a hydrologic environment with great variability."[52] That is, the polyrhythm of water fluctuation disturbance actually creates and maintains biodiverse wetland environments across lake basins. By moderating the fluctuating environments, lake level stabilization schemes narrows the condition of possibility for wetlands.

§6 – *Pulse Stability*

In a 1993 article from *Great Lakes Wetlands*, Janet T. Planck of the Canadian Wildlife Service in Ontario talks about her research on historic wetland change in the Great Lakes. She develops two "fundamental findings" that should now be familiar: 1) water level fluctuations are "integral components of the Great Lakes ecosystem"; and 2) lake-level variations over time and space "have been a driving force in the creation, adaptation, and evolution of both life and landforms in Great Lakes wetlands." Fluctuations, she concludes, are not external to the wetland ecosystem but necessary to the maintenance of its productivity, diversity, and extent.[53] She states that this follows from "a unique characteristic of Great lakes wetlands known as 'pulse stabilization.'"[54] This concept of pulse stability comes from Eugene Odum, and it emerged from his research in the coastal wetlands of the Florida everglades. Pulse stability, for Odum, provides not only a general theory of wetlands but accounts for ecological change from atomic to astronomic scales—and everything in between. In his statement paper on the subject—not incidentally, in the journal *Estuaries*—he calls it "Nature's Pulsing Paradigm."[55]

Pulse stability is a form of disturbance ecology and marks a paradigm shift in environmental thought away from steady state equilibrium. With its (Western[56]) origins in organismic biology, early systems theory proposed that systems strive toward homeostasis and

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(1992). "Lake Erie Coastal Wetlands: an Overview." *Journal of Great Lakes Research* 18(4): 533-551; S. Bolsenga & C. Herdendorf (1993). *Lake Erie and Lake St. Clair Handbook*. Detroit: Wayne State University Press: 363-408.

[51] After I interviewed him, this was the one article that Wilcox insist I read. S.J. Baedke & T.A. Thompson (2000). "A 4,700-Year Record of Lake Level and Isostasy for Lake Michigan." *Journal of Great Lakes Research* 26(4): 416-426. See also: D. Wilcox (2004). "Implications of Hydrologic Variability on the Succession of Plants in Great Lakes Wetlands." *Aquatic Ecosystem Health & Management* 7(2):223-231; W. Mitsch & J. Gosselink (2000). "The Value of Wetlands: Importance of Scape and Landscape Setting." *Ecological Economics* 35(1): 25-33.

[52] Baedke & Thompson (2000)

[53] Incidentally, she notes that the strongest correlations between lake levels and wetland communities could be found at Turkey Point, Ontario, on the north side of Lake Erie, 90 miles west of Buffalo.

[54] J. Planck (1993). "Historic Wetland Changes in the Great Lakes." *Great Lakes Wetlands* 4(1): 3-7.

[55] W. Odum, E. Odum & H. Odum (1995). "Nature's Pulsing Paradigm." *Estuaries* 18(4) 547-555

[56] Even Von Bertalanffy acknowledges that Eastern thought is endowed with a systems theory dating back some 2500 years.

equilibrium. In ecology, this is reflected in early theories of plant succession, which were almost religious in their teleological determination. In the late 1960's and early 1970's, Buzz Holling's work on resilience and Eugene Odum's work on pulse stability offered that, disequilibrium—disturbance—was not a detrimental exogenous force interrupting the path to homeostasis. Instead, even seemingly exogenous forces were endogenous to the adaptive capacities of the system. As Odum proposes in the 1971, 3rd Edition, of his field-defining textbook, *Fundamentals of Ecology*, "While the steady state is often seen as the final result of development in nature, a more realistic concept may be that nature pulses regularly to make a pulsing steady state."[57] In other words, "A more or less regular but acute physical perturbation imposed from without can maintain an ecological system at some intermediate point in the developmental sequence."[58] To be sure, the point of origin for this theory was wetlands: what he referred to as "fluctuating water-level systems."[59] As he states, "It is generally accepted that the key to wetland function and structure is the pulsing water-flow regime, or the hydroperiod. Organisms not only adapt to the pulse but may also utilize the waterflow energy to enhance productivity." But beyond wetlands, pulsing is a universal natural phenomenon, according to Odum: "In all the scales of nature from tiny fast systems of biochemistry to the largest galaxies of the cosmos, we observe systems that pulse… [Growth] of one part of nature consumes and pulls down another part of nature temporarily. Then a cycle is completed with retrogression and regrowth."[60] Further, pulsing is that occurrence or event that ties the organic and inorganic world. Odum argues that pulsing of nonliving systems—through, for instance, rains, tides, and floods—is "one of the main ways that the earth participates in ecosystems."[61] Wetlands, he notes, are exemplary.

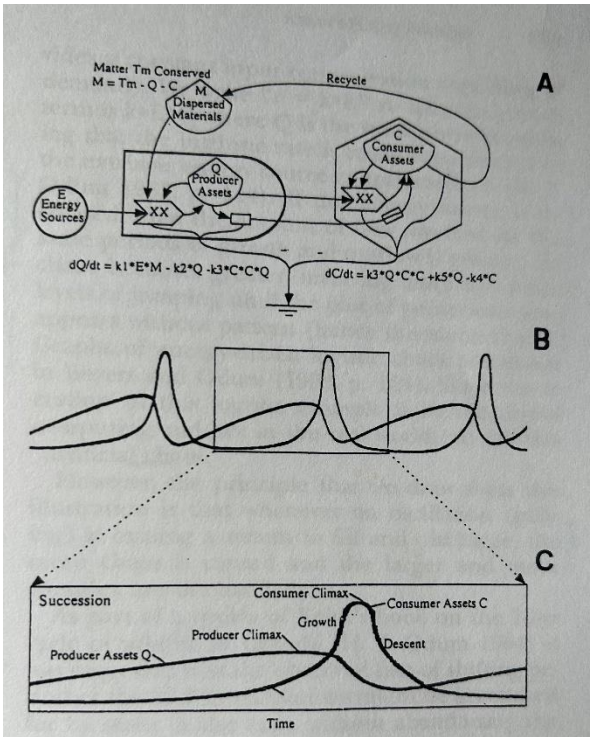

Fig. 7. Pulsing alteration of production, consumption and recycling in the internal oscillating Alexander model (H. T. Odum 1983): (A) systems diagram and equations; (B) typical oscillations; and (C) modified use of the classical names "succession" and "climax" suggested for regions of sustainable pulsing.

Odum includes a diagram in his "Pulsing Paradigm" essay that helps to visualize the process: I am more interested in parts B and C for the current discussion. In diagram B, the section of shorter wavelength and higher amplitude represent the pulse, for instance a large seiche event. The curve beneath the pulse represents, say, seasonal growth in an ecosystem. The onset of the pulse produces a disturbance, represented by the sharp downward turn of the underlying ecosystem. However, after the pulse has finished the transfer of nutrients and materials leads to a direct increase in growth. Of course the regularity represented in B is

[57] Odum, Odum & Odum (1995): 547
[58] E. Odum (1971). *Fundamentals of Ecology, 3rd Edition*. Philadelphia, London, Toronto: W.B. Saunders Co.: 268
[59] W. Odum, E. Odum & H. Odum (1995) : 547
[60] *Ibid.* 552
[61] *Ibid.* 553

idealized, since pulses are often stochastic, uneven, and have variable results. Still, we get the sense of both difference and repetition and of positive negation contained in the pulse paradigm.[62] Despite their high degree of similarity, the linearity of Odum's configuration differs from Holling's Möbius strip of resilience, which connotes more of an eternal return quality.[63] In diagram C, we see Odum struggling to rename the classic ecological notions of "succession" and "climax" to accord with the new paradigm.

While Odum is no stranger to ontologizing ecology and remodeling the entire world as a system of energy flows,[64] he makes an essential empirical point as pertains to pulse stability:

> *It should be emphasized that pulse stability works only if there is a complete community (including not only plants but animals and microorganisms) adapted to the particular intensity and frequency of the perturbation.* Adaptation requires times measurable on the evolutionary scale. *Most physical stresses introduced by man are too sudden, too violent, or too arrhythmic for adaptation to occur at the ecosystem level,* so severe oscillation rather than stability results. In many cases, at least, modification of naturally adapted ecosystems for cultural purposes would seem preferable to complete redesign.[65]

What Odum makes clear is that most (modern) anthropogenic stressors are precisely *not* a form of disturbance. In Odum's lexicon anthropogenic stressors are not pulses, since they do not or cannot occur "at the ecosystem level": nothing in the system has adapted to modern forces. Unless anthropogenic stressors mimic ecological ones, the stressors drive ecosystems into "severe oscillation," which is a form of asystematicity. Systems don't just *have* patterned regularity, they develop it over long periods of time. It's not only that anthropogenic stressors exceed the intensity and frequency of ecosystemic forces; Odum implies that they introduce an alien force: something that the ecosystem cannot assimilate. Implied in Odum's statement is that even if the forces of modernity are organized as a system, that system does not get confused as an ecosystem. The conceit is that (modern) human action is not in any sense "natural" or "ecological." While Harvey may technically be correct to say that "In a fundamental sense, there is nothing unnatural about New York City," the statement is a cheap ontological nicety; another way of saying "it's all connected." When addressing the specific relationships between historical and ecological dynamics, Odum introduces a certain form of negative humanism that is essential to empirical understanding. Odum distinguishes modern anthropogenic from non-anthropogenic action: humans demonstrate a unique ability unlike the earth's other animals. This is a form of humanism that the modern philosophical lexicon—often taking its cue from ecology!—has worked diligently to dispute and undermine. But for Odum, the uniqueness of (modern) human action is its ability to destroy ecosystems. Hence, his management suggestion at the end: "modification of naturally adapted ecosystems for cultural purposes would seem preferable to

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[62] Of course, "difference and repetition" refers to Nietzsche (and Deleuze) and "positive negation" to Hegel. The deeper philosophy of ecology is the theme for another study. Nevertheless, this simple diagram offers something of a rapprochement of Nietzsche and Hegel that, for instance, new materialists have artificially turned into foes.

[63] These underlying metaphysical niceties—I would add—are of great importance, especially when these models are ontologized on to social, cultural, political, and economic systems: the ideological structure that ensues depends on them. More than Nietzsche, on the Eternal Return, see M. Eliade (2018). *The Myth of the Eternal Return: Cosmos and History*. Princeton: Princeton University Press.

[64] Inspired by his brother's work in electrical engineering, see diagram above

[65] E. Odum (1971): 269. My emphasis.

complete redesign." Moderns can modify naturally adapted ecosystems, or they can destroy them. Modification could mean "improvement," but an ecosystem improvement means making technical interventions to support an ecosystem in doing what it already does. What distinguishes the anthropogenic forces of modernity are their destructive capacity—not their Enlightenment. This seems to me a dangerous but necessary reintroduction of humanism back into a discipline which has often justified dispelling humanism.

§7 – *From Annex B to Plan 2014*

In a key statement from *Living With the Lakes, Annex B: Environmental Features, Processes and Impacts*, Functional Group 2 uplifts the importance of coastal wetlands by folding the basic principles of disturbance ecology into their theory of lake-level management. "Water level fluctuations… are integral to the Great Lakes-St. Lawrence environment, not an outside force imposed upon it. Fluctuations are especially important to coastal wetlands, the most productive and diverse component of this ecosystem."[66] More than "normal," lake-level variability is necessary to Great Lakes coastal wetlands, which, the authors now recognize as the most productive and diverse environments in the Great Lakes, essential to their sustained health. Championing the ecological function of the Great Lakes over its infrastructural one, the authors note, "Life and landforms found throughout the Great Lakes-St. Lawrence coastal zone have evolved under conditions of fluctuating levels and continue to be shaped by them." Due to the dependency on this variable lake-level fluctuations, stabilization risks destroying whatever wetland system remains in the basin. By referring to an evolutionary timeline, the statement has the rhetorical effect diminishing the short-term "civilizational" requirements of the basin. It continues decisively: "From the perspective of the biophysical environment, fluctuations are a truly positive force. Indeed, levels comparable to the historical range are necessary to maintain the productivity, diversity, and areal extent of wetlands." Taking the perspective of the biophysical environment to defend wetlands against the kinds of institutional and industrial destruction leveed under the laws of the US and Canadian governments marks a radical moment in the uneven history of the IJC. In barely uncertain terms, the IJC authors are saying that shoreline stabilization will result in ecological disaster: "Measures to address the adverse consequences of fluctuating water levels have the potential to cause environmental change which, for those measures directly affecting water levels and flows, may be significant and even irreversible."

Having acknowledged the destruction of half of the Great Lakes wetlands by European settlers, the authors demand caution for any future coastal development, especially because humans seem to be particularly unaware of their impact. The important ecological concept of "uncertainty" emerges as a concern for the others: "considerable uncertainty exists regarding the future of the coastal zone environment of the Great Lakes - St. Lawrence system. The extent of continued human alteration is an ongoing factor." They precociously add, "A related concern (because it may largely be a result of human activity) is the possible results of large-scale climate change." The authors understood that long-term water fluctuations were a function of climate change, and that if anthropogenic climate change was occurring, it too risked further destroying the long-term ecological health of the Great Lakes. The authors then ask an existential question about the nature of the relationship between humans and the ecosystem they inhabit. "When all is

[66] Unless noted otherwise, all quotes in this section from: Functional Group 2 (1989). *Living With the Lakes, Annex B: Environmental Features, Processes and Impacts*. Washington DC & Ottawa: International Joint Commission. Online: https://ijc.org/sites/default/files/ID688.pdf

said and done, the basic question posed by fluctuating water levels is whether humans will adapt themselves to the Great Lakes-St. Lawrence ecosystem, or continue to seek further changes in the ecosystem to suit their purposes." This is a dizzying reversal from the high modernism of the St. Lawrence Seaway project. To the contrary, the authors propose that humans ought—like the wetlands—to adapt to lake fluctuations, rather than to resist the natural rhythms of the water in pursuit of an anti-ecological goal. They continue, "As long as society keeps looking for a solution outside itself (such as "full regulation"), other approaches, especially non-structural measures which have been recommended in previous studies, but which still face substantial obstacles to effective implementation, will not receive full implementation."

This notion of "non-structural measures" is important. The delineation between structural and non-structural measures and the authors' assignation of those measures as external or internal to society illuminates a basic eco-ethical position that the IJC has adopted from basin activists—many of whom sat on their working committees. For the IJC, structural shore protection "refers to any community-wide construction along the shoreline to reduce the impacts of flooding and/or erosion. Dikes and levees are common forms of flood protection, while revetments, seawalls, breakwaters, groynes and headland embayment structures are more commonly used to reduce erosion damage."[67] In another report, authors note, "Structural varieties of shore protection… include: a. dikes and levees to protect against flooding; b. various types of stone, concrete, timber and steel walls installed along the shoreline or protruding into the water to protect against erosion from wind and wave action, currents and fluctuating levels."[68] Non-structural shore protection measures refer to methods such as "beach nourishment, using vegetation to stabilize bluffs, and building and maintaining protective sand dunes."[69] Additionally, "Nonstructural varieties… found to be effective include: a. building up beaches; b. vegetation to stabilize shorelines, particularly steep shorelines; c. protective sand dunes."[70] As per the eleven "Principles" set out by the IJC in their *Levels Reference Study*, "Reduction of damage to existing development from fluctuating water levels… will be based on the use of both non-structural and structural measures…"[71]

The concern of Functional Group 2 is common to many mitigation strategies in a technologically-bound society: rather than focusing on smaller non-structural solutions that have widespread impact, "society" will continue to look outside itself, for large-scale technical solutions that offer "full regulation," or at least the illusion of it. That non-structural solutions "still face substantial obstacles to effective implementation" is probably as close as the IJC can come to calling out municipalities for continuing to undermine mitigation strategies through lax codes and industry-friendly planning. If a society looking for "full regulation" is a society looking for a solution "outside itself," the implication is that smaller, softer, more malleable solutions to shoreline erosion and flooding represent society looking "inside itself." This implication follows the "ecosystem management" approach developed after the Great Lakes Water Quality Agreement, which takes society as internal to the hydrological dynamics of the Great Lakes. It also implies a certain comportment toward infrastructure. Structural solutions are

[67] Levels Reference Study Board (1993): 57

[68] International Joint Commission (1993). *Methods of Alleviating the Adverse Consequences of Fluctuating Water Levels in the Great Lakes-St. Lawrence River Basin: A Report to the Governments of Canada and the United States*. Washington DC & Ottawa: International Joint Commission: 12. Online: https://ijc.org/sites/default/files/ID1007.pdf

[69] Levels Reference Study Board (1993): 56

[70] *International Joint Commission* (1993): 12

[71] Ibid 27

infrastructures beyond the purview of everyday life and fully given over to technical management—to engineers. There, it is blind to the public and splits apart from any kind of political process: departments execute governance over regions with efficiency and absoluteness, and people are ignorant to this management until it fails them. At that moment, they blame "nature" and call for larger more draconian control over the system. The adaptability of non-structural solutions to the particularity of communities and their historical landscapes asks that infrastructure remain in the purview of a community's comprehension and vernacular understanding. It may very well recede into the landscape and become "natural," but if and when it fails or weakens, the failure will be specific and relational rather than absolute. The implication is that these infrastructures are active, political, and debated. They are defended by sensible planning and policy. They are governed first by the vagaries of the system to which they must adapt. This sentiment is heightened when Functional Group 2 concludes, "It is our belief that the opportunity lies ahead for the human element of the Great Lakes-St. Lawrence ecosystem to become more in harmony with its natural surroundings and to move towards a sustainable way of life for us all."[72] Rhetorically, the move away from "society" or "humankind" and toward "the human element" reinforces the fact the notion that humans constitute one part of the system. The call to "harmony"—a word from the 1970's—and "sustainability"—which will gain so much cache in the 1990's—also indicates an important transitional moment in the discursive and scientific figuration of ecology that is going to become prominent thereafter. However, what I wish to emphasize is that ecological management is—or has become—itself a form of what Functional Group disparages as "full regulation." While "structural solutions" betray a straightforward steady-state bias—in the political and environmental sense—ecological management carries with it a similar bias. But from an ecological management perspective, political ecological steady states do not happen "straightforwardly"; instead they happen through the management of disturbance.

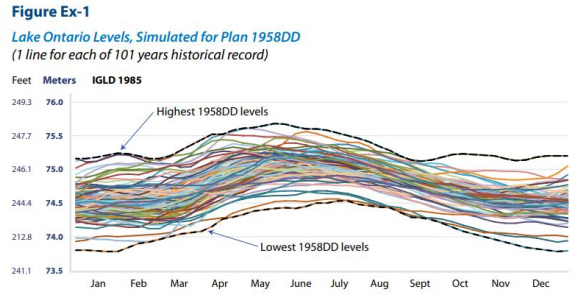
For the authors of this report, management arises as a key feature of ecology. A look over their eleven principles shows that "management" and "decision-making" emerge as the central features of an ecological epistemology. For the authors, this occurs through the intensive quantification and mapping of the Great Lakes system. For ecological management, ecosystems must be translated into data; thus, "For decisions affecting the future, it is essential to have the best possible information available so that measures can be properly evaluated and their consequences well understood."[73] The authors extol the importance of environmental impact statements, which, they declare, are "best understood in a spatial context," through GIS. GIS will "facilitate an integrated evaluation of complex and multi-faceted data sets and related physical and biological processes." Per the report, this then becomes crucial for the communication of this information in the public sphere. Given the contemporary political ecological context, my argument is not against this tactic, but it is an attempt to delineate the relationship between the production of environmental knowledge and the relationship of this knowledge to forms of environmental management. Even though ecological knowledge tends toward "non-structural" fixes that are "internal" to society, the form of management it proposes is nevertheless a form of "full regulation."

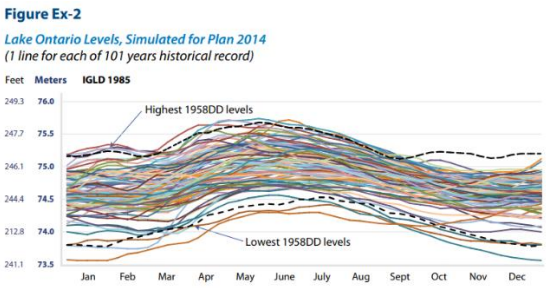
Plan 2014 marked a new course for lake-level control on Lake Ontario through the manipulation of the Moses-Saunders dam. Plan 2014 aimed to "decompress" lake levels, allowing for greater variability, in order to rehabilitate coastal ecosystems. After almost a decade

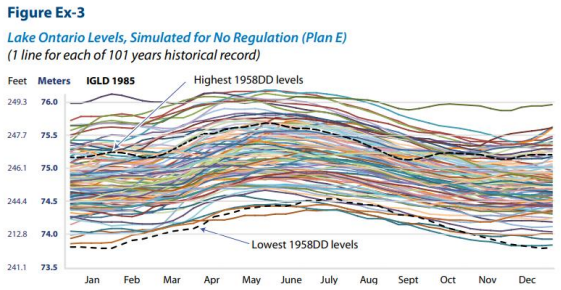
[72] 7-8

[73] Levels Reference Study Board (1993): 57

and half of scientific studies, model simulations, public outreach, and political wrangling, the IJC implemented the plan in 2017. The IJC found that the original 1952 and 1956 Orders of Approval and Plan 1958DD—the guidelines for managing Lake Ontario—had, for the last fifty years, led to an extensive degradation of the coastal ecosystem.[74] As per the original rules, the range of water levels was compressed, particularly at the beginning of the year, "when lower levels mean less productive wetlands." The IJC report is up front in admitting that the "effects of the regulation of water flows and lake levels on ecosystems were not fully understood or considered" when the original Order of Approval was created. Since the field of ecology and the notion of an ecosystem were still in their infancy at that time, it is no wonder. "However," the study states, "robust coastal ecosystems are now recognized as essential in both countries, and the IJC finds that the effects on ecosystems should now be considered along with effects to other interests and uses." The new plan relaxes the compression but "with the upper levels still substantially controlled to protect Lake Ontario riparians." A "riparian" is the technocratic word for a shoreline homeowner.







These graphs represent Lake Level variability for three scenarios: the original 1958DD rules (upper left), Plan 2014 (upper right), and for no regulation (lower left). The plan is clear based on the simulation: allow for slightly lower waters but do not permit waters to climb much past the summer maximum: 248'. The long-term average water level of Lake Ontario is 245.31' feet above sea level, so the plan keeps the maximum height of the water within about three feet of its long-term average. The greater variability allowed for by Plan 2014 was explicitly an effort to resuscitate Lake Ontario's dying wetlands and by means of this, to support its fisheries. On one hand, this is an incredible political and ecological achievement. When I interviewed Douglas Wilcox—who conducted much of the ecological modelling for the study—he was distinctly proud of his advocacy for Plan 2014 and believed it to be a truly transformative moment for Great Lakes ecology. Wilcox is one of the foremost Great Lakes wetlands ecologist of the past century; I trust his assessment and honor his good work. Still, it represents a compromise, and we should be curious about what was compromised exactly.

The report notes, "Plan 2014 represents a return to more natural level variability for Lake Ontario." Importantly, it is not actually a return to natural variability—it only represents one. This is ecological management *par excellence*: by using a hybrid infrastructure of both high-

[74] All quotes in this section from: International Joint Commission (2014). *Lake Ontario St. Lawrence River Plan 201: Protecting against extreme water levels, restoring wetlands and preparing for climate change.* Washington DC & Ottawa: International Joint Commission. Online: https://ijc.org/sites/default/files/IJC_LOSR_EN_Web.pdf

modernist dams and ecologically-minded models, the strategy is to understand ecological processes well enough to simulate them. In this simulacrum, ecosystems will be permitted to operate within the dynamic ranges necessary to maintain their efficiency but no more. It appears to be a perfect analogy for political power, but it is not. It is not a perfect analogy, because it is not an analogy: the ecological methods are those of techno-managerial administration. Only the objects of management are different. Nevertheless, the implementation of Plan 2014 almost immediately fell apart.

Plan 2014 went into effect in 2017. That year, the waters of the Great Lakes reached near record-levels, as high as the simulated highs for Plan 2014: 248.72', 3.41' above average. Then in 2019, the water climbed even higher: to a record 249.05'—3.74' above average—almost as high as any simulation of Lake Ontario *without* controls. I remember that summer clearly. I visited a friend at a lakeside rental near Wilson, NY, about 35 miles north of Buffalo on the southwest coast of Lake Ontario. The lake submerged the bottoms of ladders that formerly went down to a beach. Flooding and erosion led to hundreds of millions of dollars in property damages. It was a massively confusing and politically contentious moment, and it seemed clear to residents and politicians that the IJC's Plan 2014 was the reason for the flooding. While Plan 2014 admitted that increased fluctuations could have an impact on shoreline properties, it resolved that issues would be minor, especially in comparison to potential ecological benefits.

By October 2019, then-Governor of New York State, Andrew Cuomo, declared that the state was taking the IJC to court over flooding damages. He blamed the IJC for "gross misconduct" and bloviated, ""They have failed to manage the lake level, period. End of story. It was their job. They failed."[75] By the end of the year, New York State senator Chuck Schumer was already calling for a "major overhaul" of Plan 2014. For his part, he wrested $1.5 million from the Congressional budget to be allocated for the IJC to spend on returning to the plan. He called on the IJC "to fix and improve the mechanisms and to control Lake Ontario's water level and better fend off this intense, repetitive risk of flooding."[76] Since the IJC cannot legally be sued and since the $1.5 million is a fraction of what it would cost to revise Plan 2014, these may be considered political stunts. But they were direct responses to real vitriol expressed by lakeside residents toward the IJC for "causing" the flooding. Against Cuomo's hollering, Don Paul, a Buffalo meteorologist, wrote a *Buffalo News* editorial trying to explain the history of lake level fluctuations across the Great Lakes, declaring that lawsuits cannot stop high lake levels.[77] But the audience proved deaf. Paul was in agreement with the IJC, noting that lake levels were at record highs across the entire Great Lakes basin. Both blamed high precipitation, which—as I examined in Chapter 3—turns out to be a contributing but not causative factor. In early 2020, the IJC began a review of Plan 2014, but in a press release, the commission stated the obvious: "No regulation plan will be able to prevent the extremely high water levels and flows experienced during these periods of record-setting supplies."[78] In January 2020, the IJC increased outflows from the dam from 2.43 to more than 2.8 million gallons per second—the most ever. This was up from 1.64 million gallons per second the previous January. For the Canadians, this is particularly problematic, since, as the IJC noted in another statement, "It is important to recognize that increasing the flow to remove one inch of water from Lake Ontario raises the level of the St.

[75] T. Prohaska. "New York State to Take IJC to Court over Flooding Damages." *Buffalo News*, 10/9/2019
[76] J. Zremski. "Congress Sets Aside Money to Force IJC to Review Plan 2014." *Buffalo News*, 12/16/2019
[77] D. Paul. "No Lawsuit Against the IJC Can Stop Lake Ontario Water Levels." *Buffalo News*, 10/15/2019
[78] J. Zremski. "IJC to Begin Review of Plan 2014 in Hopes of Averting Lake Flooding." *Buffalo News*, 3/3/2020

Lawrence River at Montreal by 11 inches… Releasing more water from Lake Ontario this past spring would have had devastating effects downstream."[79]

Over the past several years—as I detail in Chapter 3—scientific consensus has emerged that these record high water levels are a result of the impact of climate change on the polar vortex: arctic air swoops down over the lakes and flash freezes them, short-circuiting the evaporation process, which is the main way by which the lakes lose water. High precipitation may have been a mitigating factor, but even in years of record low lake levels—2013-14—precipitation was consistently well above normal. In other words, the IJC was powerless to impact lake levels in any meaningful way: this was not a simple case of bad management but of a poorly misunderstood ecosystem. Just like in the mid-1970's and again in the mid-1980's, the high lake waters of the late 2010's brought forth an intransigent group of shoreline property owners demanding—against all ecological reason—for governments and institutions to "do something now." The outcry from the "riparians" alludes the fact that, at the end of the day, people continue to want "full regulation" of the environment and zero regulation on their property. Developers have proven especially guilty of politicizing this disposition.

§8 - *Conclusion: Contesting the Ecological City*

The history of the discovery of Great Lakes coastal ecology is simultaneous to management over it. The difficulty of differentiating ecology from ecological management is not a problem for ecological thought. It has always been central to it. This slippage between empiricism and governance finds its contemporary form in the problem of coastal resilience. Given this long history, how do we understand coastal resilience? As Masselink and Lazarus[80] note, "Ambiguity pervades the rapidly growing academic literature that invokes resilience. Scholars who have tracked the term in environmental literature suggest that resilience is trending toward becoming a buzzword devoid of meaning, both amorphous and overused." Moreover, "Coastal resilience means little without a clearly defined spatial and temporal framework." What this chapter aims to demonstrate is that, in fact, coastal resilience means little without a clearly defined *geographical and historical context*. The abstraction of geographical and historical context to "spatial and temporal framework" indicates a strategy for governing cities as "urban ecosystems" that this chapter shows is an act laden with politics and ethics. Local advocacy for coastal resilience in the Great Lakes today pays little heed to coastal ecology outside of plans for token habitat restoration. In large part, this is because coastal resilience is an historically and political proscribed force. Those who have most sway over coastal management suffer from an extreme form of presentism, which takes contemporary urban form as that infrastructure whose resilience needs supporting. Rather than understanding the contingent politics of historical and geographical difference, coastal managers see various stakeholders who will compromise on some future infrastructure without ever inquiring into the historical and political economic foundations of that infrastructure. Only politics allows for such questioning. Framing the city as an urban ecosystem surrenders all politics—and all forms of difference—to the city's infrastructure.

[79] T. Prohaska. "Lake Ontario Outflows Set Record; Shoreline Residents Urge Fairer Water Levels." *Buffalo News*, 1/10/2020

[80] Masselink & Lazarus (2019)

Chapter 4 – Ruptured Environments: On the Destruction of Buffalo's Coastal Ecologies

> Every image of the past that is not recognized by the present as one of its own concerns threatens to disappear irretrievably.
> – Walter Benjamin, thesis V

> It is obvious that the end products of some of man's exploitation of his habitat are not subject to restoration. Areas that are devoted… to heavy industry, such as the Buffalo, New York, region… are, so long as our present culture continues, likely to remain in a completely altered and unnatural state.
> -- F. Raymond Fosberg, 1966

> With its murky and unstable surface, its incalculable and terrifying depths, the bog was landscape as dissimulator, as trickster, ready to engulf the unwary in its muddy, suffocating embrace. But the bog was unsettling in other ways too. Made neither purely of earth nor water, the bog was a combination of both elements, a muddy mixture that resisted simple categorization of liquid or solid. Perhaps more than anything else, it was this indeterminacy, this resistance to characterization, that made the bog a disquieting landscape of particular potency and led to its eliciting in commentator after commentator a reaction of visceral disgust.
> – Vittoria di Palma

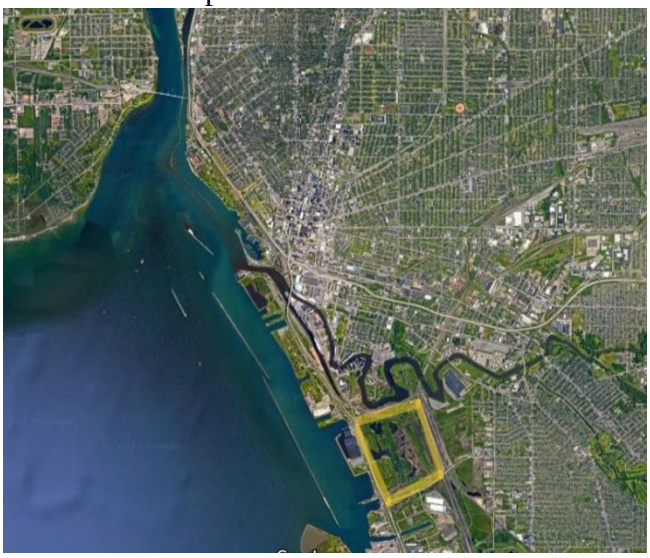
Part I: §1 – *Introduction: Destruction & Creation*

The ontologization of disturbance mistakes disturbance for destruction. When an ecosystem is destroyed, its structure and function have been irreparably ruptured. There is no transformation, continuity, or historical reference between what comes before and after. What persists is location and, often, major geomorphological features. Location is powerful to certain human imaginations—like moderns—who hold on to the idea that a place is somehow separable from the ecological processes that happen "in" it. In this variant of dualism, all ecological processes that happen in a place must be related, since they are contained by the constancy of the abstract coordinates in which they are thought to happen. Under the sway of this thinking, ecosystems come to be thought of as something that happens "in a place" rather than as complex relations constituting place. By dint of happening in such and such coordinates destruction is thought to be ecological destruction since something came along to take the place of what preceded it. What came before and after, it is thought, must be connected. With this slippage—where all destruction is merely disturbance—even radical ecosystemic ruptures can be redeemed.

The Great Lakes are a hydrological and ecological remnant of the most recent glaciation. They did not exist before it. The glaciers were world destroyers. Waves of ice undulating across the landscape sheared the surface of the earth, and when they retreated, what was left was something entirely different. The ecosystems that developed in the wake of glaciation are chronologically but not ecologically related to it. Their structure and function are not fundamentally tied to the structures and function of glaciation—only to its aftermath. Modern

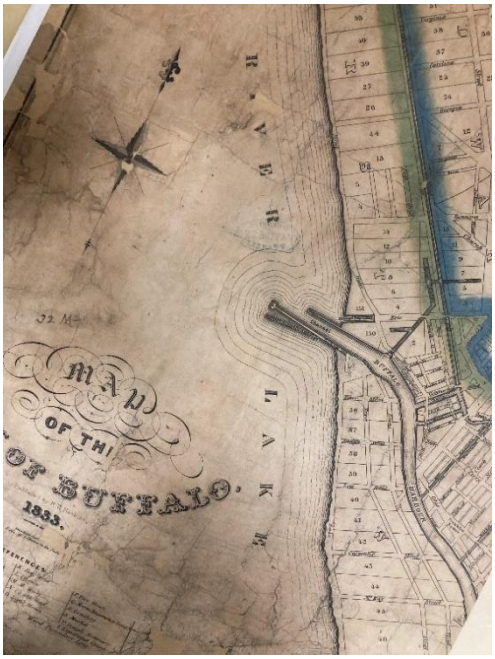
European settler destruction of the Great Lakes coastal ecologies are as radical as glacial destruction. Settlers executed fundamental changes to the cultural, physical, biological, and chemical integrity of these lake systems. This fact yields two important questions for me: 1) what is implied in distinguishing anthropogenic from non-anthropogenic forms of destruction; and 2) when ecologists are studying a destroyed ecosystem what are they studying exactly? Or, to put it more pointedly, does their science naturalize the historical contingency, politics, and power of anthropogenic destruction?

This chapter examines the destruction—not disturbance—of the coastal ecology of Lake Erie. It offers a partial reconstruction of the wetland and dune complex at the Buffalo River/ Lake Erie junction, which would become the future site of Buffalo's transshipment and industrial infrastructure. In tracing the destruction of the wetland and dune complex and its transformation into commercial infrastructure, this chapter offers a natural history of destruction of this landscape. The chapter offers the case study of Tifft Nature Preserve, in Buffalo, NY, which contains one of the few "remnant wetlands" in the entire Lake Erie watershed. Tifft's history exemplifies the difficulty in understanding the ecology of a postindustrial landscape. The satellite image below shows the Buffalo River winding itself out into the very northeastern tip of Lake Erie as it narrows into the Niagara River. 264-acre Tifft Nature Preserve is highlighted in yellow toward the bottom of the image. It is across the street from the southern portion of the Outer Harbor.



§2 – *Historical Ecology of Coastal Dynamism*

The Buffalo River is the last outlet along the southern coast of Lake Erie before it narrows into the Niagara River. In certain maps, such as the one below, from 1883, the Buffalo River and the South Pier that secures its exit are taken to be the line that separates Lake Erie and the Niagara River. Of course, the lines are arbitrary, but it is a geographical convenience I will



maintain. Predominant southwest winds track along the fetch of the lake, making this corner of the lake particularly susceptible to regular wave action, seasonal seiches, and annual ice shear. It is a notoriously tempestuous coastline that has sunk many ships[1] and drown many people. The dynamism of Lake Erie's waters is mirrored in the lake's coastal ecology—not by analogy, but by adaptation. The physical environment—the coastal wetlands, dunes, sand bars, and forests—were dynamically attuned to lake's tempestuousness. This historical ecology has been completely forgotten and written out of the public discourse. A natural history of destruction requires that one attempts to re-map key features of the pre-settler coastal ecology: first, in order to de-naturalize the present waterfront and alienate its proprietorship. Remembering this landscape will lay the foundation for understanding what it means that settlers destroyed it. This sets up the latter part of the chapter, which asks what it means to understand this place ecologically.

Compared to the western end of the lake, these are not optimal conditions for the establishment of vast coastal wetlands. The seasonal seiches in particular tend to prohibit the establishment and succession of wetland plants. Nevertheless, before European settlement, near the mouth of the Buffalo River was "located one of the most extensive wetlands on the South Shore of Lake Erie."[2] The archive is parsimonious and laconic when it comes to wetlands; there are only a few descriptions from European traders and settlers. Wetlands were an obstacle to settlers, not a feature. They were long destroyed before they could be described in any kind of scientific mode. What record there is indicates that at the beginning of the 19th century, coastal wetlands extended northwards from Little Buffalo Creek to the Niagara River.[3] Southward, wetlands

[1] Apparently Lake Erie has one of the world's highest concentrations of sunken ships. In part, this reflects the amount of traffic through the lake, but also the rapid and unexpected turns of condition capable here. These conditions are outlined in chapter 2.

[2] T. Wolfe (1983). *Tifft Farm: A History of Man and Nature*. Buffalo: Junior League of Buffalo: 2

[3] J. Sloan (1902 [~1865]). "Adventures and Recollections of a Pioneer Trader: with an account of his share in the building of Buffalo Harbor." In F. Severance (Ed.) *Publications of the Buffalo Historical Society, Vol. V*. Buffalo: Buffalo Historical Society: 235-6

extended into present-day Lackawanna—probably as far as the bluffs in Hamburg. Inland, they reached the general vicinity of present-day Hopkins Street, including present-day Tifft Nature Preserve and South Park.[4] Along with coastal wetlands, there were significant barrier wetlands, built up behind sand dunes that bordered the mouth of the river, and riverine wetlands, along significant stretches of the Buffalo River.[5] The aerial photograph above[6] is from 1951 and shows what would have been the approximate eastern boundary of the wetland. This entire scene and more would have been wetlands. In this photo, Lake Erie is just out of view to the left (west) and the river toward the top (north). In the lower right hand corner is Frederick Law Olmsted's South Park, and the building in the far corner is the Botanical Gardens. Olmsted created a park system throughout Buffalo, but industrialists stymied his plan for a waterfront park, forcing him to move South Park inland. The wetland complex behind the park was part of the original design, and to this day, there are several fragmented wetlands filling in low-lying areas beyond the park boundary, like this one along a railroad track. The lower left quadrant of the 1951 photograph shows the northern tip of Bethlehem Steel's sprawling 1300-acre plant, which only a few years prior to this photo—during the War—was the world's largest steel manufacturer. Notable is the area of exposed ground in the middle of the photo on the other side of the railroad tracks—what today is the Marilla Street Landfill. This vast area was wetland that became dumping ground for slag. For every ton of steel produced—depending on the grade—anywhere from 250 to 1,000 pounds of slag was produced, so steel companies sought out surrounding wetlands to dump their waste. The result here was a massive stretch of brownfield, a veritable no-man's land between the

[4] Wolfe (1983): 11

[5] The literature on wetland classification systems is extensive and controversial, since classification is the groundwork for wetland policy, which all builders must follow. I follow a relatively straightforward system laid out for the Great Lakes in particular in: D. Albert, D. Wilcox, J. Ingram, T. Thompson (2005). "Hydrogeomorphic Classification for Great Lakes Coastal Wetlands." *Journal of Great Lakes Research* 31(1): 129-146.

[6] https://www3.erie.gov/aerial-photos/erie-county-aerial-photos-1951

lakefront and South Buffalo. In the verdant spring, it appears a postindustrial Oz. In this photograph, the train is coming toward my wife, who sits looking northward, toward the city skyline. This is but a slice of the 107-acre landfill. The site was in operation from 1930. It "has not received hazardous waste" since my year of birth, 1981 and was closed in 1989.[7] In the quest to get their hands on a new batch of brownfield tax credits, there has been a "battle"[8] between developers over the past few years about whether to turn the site into a golf course or a "community solar field."[9] For now, it is a reliable place to take a walk, run the dogs, observe wildlife, and study the meadow: the viper's bugloss, milkweed, Indian hemp, hedge bedstraw, and wild garlic have been noteworthy this year. The American white water-lily, exemplary. It has become one of my preferred places to cloud watch. In a State of the Lakes Ecosystem "Conference Background Paper," I learn that wetland habitat losses to due to physical change like filling and bulkheading are "likely irreversible." This is what we are left with.

Because of the Buffalo River's low hydraulic gradient, the waterway winds slowly through its final stretch, and had built up riverine wetlands all along its itinerant lower route, also depositing sediment at the mouth of the river, forming a delta and extending the shoreline further into the lake.[10] Within the current city limits, additional riverine wetlands would have straddled Cazenovia Creek, which joins the Buffalo River in present-day South Buffalo, and Cayuga Creek, which joins it in present-day Kaisertown. The hydrogeomorphic delimitation of coastal, riverine, and barrier wetlands is convenient for classifying Great Lakes wetlands,[11] but these are amorphous distinctions. Barrier wetlands would have become coastal after a flood, coastal would become barrier after strong winds shifted the dune, and riverine could become either/or during or after a large storm. The more important quality to these

[7] Malcom Pirine, Inc. (1989). "Marilla Street Landfill. Buffalo, New York, BOF Dust Area Closure Plan." Cleveland, OH: LTV Steel Company. Online: https://www.dec.ny.gov/data/DecDocs/915047/Report.HW.915047.1989-01-01.dustarea-closureplan.pdf

[8] J. Epstein. "South Buffalo Solar Project Wins Rezoning of Site Sought for Golf Course by Kevin Gaughan" *Buffalo News* 22 Dec 2021

[9] Source Renewables. "Source Renewables Granted Re-Zoning Approval to Develop the Marilla Street Landfill for Community Solar Projects in South Buffalo." *Globe Newswire* 24 Sept 2021. Online: https://www.globenewswire.com/en/news-release/2021/09/24/2303047/0/en/Source-Renewables-Granted-Re-Zoning-Approval-to-Develop-the-Marilla-Street-Landfill-for-Community-Solar-Projects-in-South-Buffalo.html

[10] Wolfe (1983)

[11] Albert *et al*. (2005)

wetlands is that they were dynamically interrelated to the interacting hydrological regimes of the river and lake.

Early reports from traders indicate that the Buffalo River was a small stream with intermittent flows. At its mouth, the river spread out into a delta and, at one point, formed a large cattail marsh.[12] At low summer levels, it was just enough to float a canoe; reportedly, pioneers heading west could literally leap across the creek.[13] Likewise, the waterway's mouth was a seasonal affair. Lake Erie's currents and littoral drift meant that the sand bar at the mouth of the river was constantly shifting. Note in the "Generalized map of dominant alongshore drift and bottom currents in Lake Erie"[14] that the "inferred littoral drift" travels along the northern and southern coasts of eastern Lake Erie in the same direction, meeting at Buffalo. Because of this, even minor changes in wind or current activity would unpredictably shift the sand bar. The stochasticity of the river mouth was further compounded by the action of the river and amount of sediment it carried. James Sloan, an early 19th century boat captain offers a compelling account. He noted that before Samuel Wilkeson built the South Pier, "Buffalo flats and creeks were anything but inviting… Buffalo Creek previous to the construction of the harbor was exceedingly difficult to enter, a long outer bar confining its channel in shore, and causing its entrance into the lake nearly parallel to the shore…" Sloan cautions boatmen against entering the river at all, lest he risk getting barricaded in by the constantly shifting matrix of land and water:

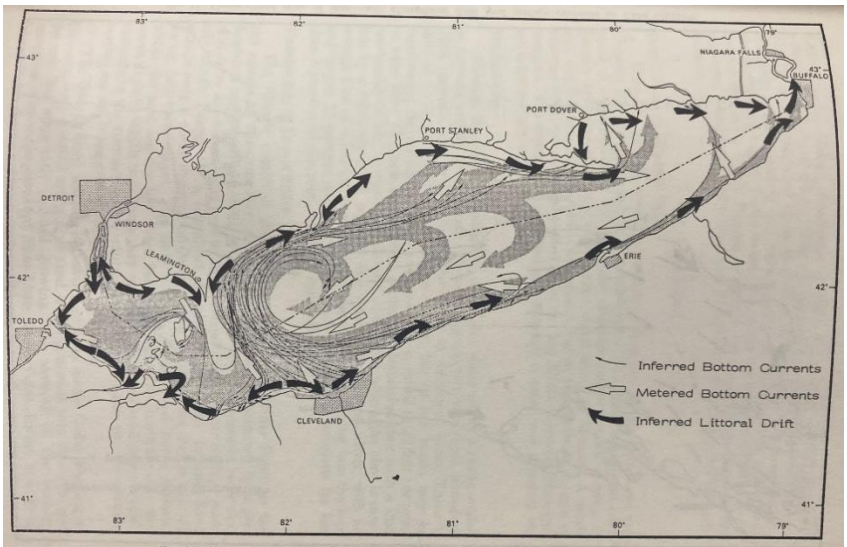


Fig. 10. Generalized map of dominant alongshore drift and bottom currents in Lake Erie.

> When the action of the sea [Lake Erie], as was often the case, would confine the creek by shifting the bar in shore, the creek would then break through the bar, washing a better entrance into the harbor. It was always, however, unsafe to enter when there was a sea on the outer bar, even when there was sufficient water to do so. The channels made by the creek across the bar would gradually fill up again, thus causing a continual shifting of the channel of the creek by the action of the sea and current of the stream. Other streams of the lake were at about right angles with the lake shore, making their entrance more direct and safe.[15]

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[12] Buffalo-Niagara Waterkeeper. "Get to Know the Niagara Ricer Watershed." Website: https://bnwaterkeeper.org/our-niagara-river-watershed/

[13] Wolfe (1983)

[14] Herdendorf (1975). "Shoreline Changes of Lakes Erie and Ontario." *Proceedings of the Conference on Changes in the Physical Aspects of Lakes Erie and Ontario, Nov. 1-2, 1973*. In Ed. R. Sweeney. *Bulletin of the Buffalo Society of Natural Sciences* 25(3): 43-76.

[15] J. Sloan (1902 [~1865]). "Adventures and Recollections of a Pioneer Trader: with an account of his share in the building of Buffalo Harbor." In F. Severance (Ed.) *Publications of the Buffalo Historical Society, Vol. V*: 234-5

With the river deep and broad form dredging, it is difficult to imagine this constantly shifting delta today, emptying dutifully into the lake. Here is a view of the mouth of the river today with Times Beach in the foreground, looking north past the lighthouse.[16] The angularity, hardness, and stability of the mouth are noteworthy.

Along with the shifting river mouth, there were extensive dune systems. In the same passage in which he discussed the capricious river mouth, Captain James Sloan also recalls the sand dunes north of the river. Prior to the War of 1812,

> there was a rim or bank from near Buffalo Creek to the Niagara River higher than the land inside. This ridge or bank elevated into sandhills [dunes], at a point between Buffalo Creek and Niagara River, some 40 feet high, and more than a half a mile in length, the whole rim or bank covered with forest… There was a wide and beautiful sand beach between the bank and the lake.[17]

Today, the Interstate-190 run flatly along this stretch. As the last glaciers receded, approximately 10,000 years ago, a large plain was formed along Lake Erie, built up with soil deposits. With seasonal melt, flooding, and storms, the Buffalo River carried large amounts of silt to the river mouth. When the river currents encounter the wave action of the lake, they weaken, and the sediment suspends in the water. The waves wash the sediment back up along the shore, where it piles up and dries in the sun. The winds pick up the sediment and plants secure it, building extensive dunes on either side of the river's mouth. The picture below is looking southward across the mouth of the Buffalo River, at the Coast Guard lighthouse. Storm activity inland led to high sediment buildup in the river, but moderate seiche activity caused the lake to confront the river, nearly stopping it in its track. Prior to widening, canalization, and dredging, the flow of the river would have been less massive, and waves would have washed this water back ashore, depositing some of the sediment in the delta and some aside the mouth of the river. The infrastructuralization of the river has hastened its entropy, and the sediment simply flows into the lake and up the Niagara River. Thus, the most active dunes tend to be at the mouth of rivers and are regulated by the supply of sand and the relation of the coastline to the prevailing winds. The predominantly southwest winds responsible for Lake Erie's wave action blew the river sediment

[16] Author photo, using drone.

[17] J. Sloan (1902 [~1865]) "Adventures and Recollections of a Pioneer Trader: with an account of his share in the building of Buffalo Harbor." In F. Severance (Ed.) *Publications of the Buffalo Historical Society, Vol. V*: 235-6

along the shoreline, leading to barrier dunes heading north from the river, to the mouth of the Niagara and south, along present-day Fuhrmann Boulevard, beneath the present-day Skyway. Once built up, the winds would shift the dunes, causing them to impede or even entirely block the exit of the river, causing a riverine and barrier wetland system to develop behind them. It would take a seasonal flood to push the river back through the barrier, creating a different mouth elsewhere along the coast. While they have been considerably altered in their own right, the dunes at Bennet Beach, in Angola, NY—about twenty miles south of Buffalo, at the mouth of Big Sister Creek—help to approximate an image of what we might have seen closer to Buffalo.

The photograph below looks southward across Buffalo's lakefront from a drone. Visible are the Outer Harbor in the middle, the breakwater to the right, and the Skyway to the left—sloping to the south. The road running alongside the Skyway and immediately to the east of Times Beach is Fuhrmann Boulevard, named after Louis P. Fuhrmann, the meatpacker-turned-Mayor of Buffalo from 1910-1917. From atop the skyway, one glances over the guardrail to capture the city's best view of the lake—especially grand at sunset. Our effort is to imagine this historical ecology: sand dunes following the near curvature of the Skyway. Bearing witness to its memory, one imagines stepping into the dune, foot sliding slightly back, glute and thighs beginning to burn, breathing slightly increased, perspiration cooling quickly in the wind. One's gaze moves toward a placid horizon, or perhaps pauses with concern to see bad weather coming in from the west. The effort is not to imagine a bucolic scene but to learn that the hardened stillness we see today across this landscape is tantamount to its destruction. This destruction happened by severing the relations between river, lake, coast, plants, wind, and sun. Thought about elementally, the dune and coastal wetland system is composed of a shifting

balance of earth, water, sun, stone, and plant. As infrastructure, relations are reduced to juxtapositions.

§3 – *The Dynamics and Destruction of a Dune*

At the end of the above-quoted passage about Buffalo's dunes, Captain James Sloan reflects, "There had apparently no change taken place either in the beach or the bank for a long time previous to the cutting of the timber off the banks, apparently not for centuries."[18] Perhaps it is a boatman's psychology of perception, but Sloan's remarks on the dune are in marked contrast

with his observations of the constantly shifting river mouth. The dune's large stands of trees evidenced to him that they were a relatively changeless environment. But Sloan is exactly wrong about the constancy. The relationship between plant and dune is fundamental to our story. Understanding it foretells our discussion of Tifft Nature Preserve while also getting a better glimpse into the origins of ecological thought. This glimpse will help to distinguish disturbance from destruction—the difference between cutting one tree from the dune and all of them.

As it happens, the field of ecology is intimately tied to Great Lakes sand dunes, and precisely because of their dynamism. Henry Chandler Cowles developed his theory of plant succession on the Indiana Dunes in the southeastern tip of Lake Michigan. Cowles was inspired by the Danish botanist, Eugen Warmer, who published his *Plantesamfund - Grundtræk af den økologiske Plantegeografi* in 1895, translated into English in 1909 as *Oecology of Plants: an Introduction to the Study of Plant Communities* but which may be literally translated as *Plant Communities: an Introduction to the Ecology of Plant Geography*. In the dedication page of his dissertation, Cowles notes his "great indebtedness" to Warming, saying, "his textbook on ecology and his treatises on the sand-dune flora of Denmark have helped greatly to make clear

[18] J. Sloan (1902 [~1865]): 235-6

the true content of ecology..."[19] In his review of the English translation, Cowles called Warmer's book "epoch-making" and notes that the work "will be for all time the great ecological classic."[20] Through Warming, Cowles introduced the word and concept of "ecology" to an English-speaking readership. Warming transformed the scientific understanding plants by thinking about them in dynamic relation to their environment and to each other. Recall that the predominant Linnean botanical system taxonomized plant species according to their relative similarity to other plants: like was classified with like. For Warmer—and for his acolyte, Cowles—plants should not be understood as discreet species organized according to similarity. The "relation" replaced the plant as the primary unit of analysis: the relations within "plant communities" and between them and their respective environments. Hence, theirs was an ecology of plant geography, since plants were understood to be situated in dynamic relationship to the other dynamic processes in a given area. The "species-plus-environment" relation replaced the ontological unity of the biological species.[21] In Cowles words, "the province of ecology is to consider the mutual relations between plants and their environment." The province of ecology is "mutual relations."

If Sloan's considered the dunes a steady state, Cowles believed that Lake Michigan's dunes were ideal places to study plant succession precisely because they are dynamic and unstable. As he puts it in the powerful introduction to his 1899 *The Ecological Relations of the Vegetation on the Sand Dunes of Lake Michigan*, "Perhaps no topographic form is more unstable than a dune. Because of this instability, plant societies, plant organs, and plant tissues are obliged to adapt themselves to a new mode of life within years and centuries, the penalty for lack of adaptation being certain death."[22] For Cowles, the instability and changeability of the physical environment requires plants to adapt quickly. Cowles recognizes that plants exist not just with relation to each other but achieve a dynamism that accords with the dynamism of the physical geography—what he calls "physiography."

> The ecologist, he notes, employes the methods of physiography, regarding the flora of a pond or swamp or hillside not as a changeless landscape feature, but rather as a panorama, never twice alike. The ecologist, then, must study succession of the plant societies in the development of a region, and must endeavor to discover the laws which govern the panoramic changes. *Ecology, therefore, is a study in dynamics.*[23]

As a study in dynamics, ecology investigates laws governing change. And what is dynamic here? First, the ecologist employs the methods of physiography as a "panorama" but one that is never twice alike. Panorama can be taken both literally and metaphorically here. Either way, we are still in the scopic regime of modernity in which Cowles carries on with some remove from the scene, even if a panorama is a landscape that *surrounds* a viewer. Cowles panorama suggests not a snapshot but a relatively steady background in which constant changes are underway. The changes are not random but follow patterns of succession across plant communities. Thus, there are two simultaneous but mutually related dynamics: "the development of a region" and the

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[19] H. C. Cowles (1899). *The Ecological Relations of Vegetation on the Sand Dunes of Lake Michigan.* Chicago: University of Chicago Press: 5-6

[20] H.C. Cowles (1909). "Book Review: Ecology of Plants." *Botanical Gazette* 48(2): 149-152

[21] It is hardly a surprise that Warmer also inspired Robert Park in his theory of human ecology and his concept of the city.

[22] H. C. Cowles (1899): 4

[23] *Ibid* 3, my italics

succession of plant communities. Despites Cowles's search for laws governing landscape, his laws are not abstractly tied to time and space; they are laws dialectically tied to the particularities of history *qua* development and to geography. Cowles's natural laws "governing" as if from above are still stuck in the 18th century but his dialectic of developmental and geographical change paves the way for the 20th. A Newtonian reality gives way to an ecological one .

Change in the deep time of Newton's astronomy, Lyell's geology, or Darwin's evolution is far too slow and its relations far too vast for human perception. In order to bear witness to an ecological world and to overcome the apparent timelessness of natural ontologies, Cowles sought to find plants that are "actually changing at the present time in response to varying conditions. Plant formations should be found which are rapidly passing into other types by reason of a changing environment." These requirements are met "*par excellence* in a region of sand dunes." Cowles describes the process:

> The advancing dune buries the old plant societies of a region, and with their death there pass away the influences which contributed so largely to their making… [In] place of the complex reciprocal relations between the plants, as worked out by struggle of centuries, the advance of a dune makes all things new. By burying the past, the dune offers to plant life a world for conquest, subject almost entirely to existing physical conditions.

Ecological dynamics, for Cowles, are in a tight interplay with death. There remains a certain poetry here. Once Odum interprets "dynamics" as "energetics," death becomes a process of decay that feeds nutrients back into a system, and ecology becomes a function of inputs and outputs. Cowles, in the late evening light of Victorian biology, emphasizes that for a plant, it is adapt or die. But Cowles sees that plant species are not solitary wanderers; they are part of a complex set of constantly changing relationships with the dune. Changes in physiography create different pathways and patterns for plant succession. Nevertheless, adaptation to a rapidly changing environment must happen rapidly, and it often does not. The dune overtakes the plants—in all of their complex relations worked out over centuries—and simply buries them. While this may mean destruction for the plant, it is only disturbance for the system. In burying the past, the dune offers to plants a new world for conquest, only under the condition that the plants live according to the dune's temporality, its capriciousness.

That said, *the life of the dune is reciprocally dependent on the plant*. There is, he states, "a symbiotic growth between dune and grass." With "restless energy," Cowles notes, wind will simply blow what previous wind has deposited and while some sand may accumulate in front of an obstacle, it will not result in a dune. "The formation of beach dunes, then, depends on something more than wind and sand. An obstacle is needed which will grow, *pari passu*, with the dune…"[24] Cowles describes the life history of one of the "most typical and successful of all dune-forming plants," the sand reed, *Ammophilia arundinacea*. The sand reed is fundamentally important to the development of the embryonic dune. "The radial propagation of the tuft of grass causes an areal extension of the miniature dune. So too, there is an increase in altitude, since the grass constantly grows higher in its endeavor to lift itself above the sand. This upward growth enables more sand to accumulate." The grass and the dune grow outwards and upwards in lock step. There are large "dune builders" too, including some shrubs and trees, especially cottonwood and balsam poplar. Because cottonwood are the tallest tree, cottonwood dunes are

[24] *Ibid* 35

the tallest dunes. *Pari passu*: with an equal step. As the plant grows, so the dune grows along with it.

FIG. 2.—Embryonic dune on the beach at South Chicago, formed by the sand reed, *Ammophila arundinacea*. Leeward trail of sand at the left.

FIG. 4.—Embryonic dunes on the South Chicago beach. Tuft of grass in the foreground just beginning to collect sand, also with a leeward trail. Dune at the center formed by many tufts of Elymus acting together.

What does it mean to destroy a dune then? The life of the dune and the life of the plants on it are a simultaneous, reciprocal, unity-in-difference. There is nothing about the dune that can be said to be dead or at a standstill. The plant extends its life beyond itself to the sand, which, rising with it, supports of the life of the plant.[25] But what gives life on one hand also taketh: the dune may shift and kill certain plants—but not an entire plant community. The dune itself would

[25] This is the Gaia hypothesis localized, or rather, it becomes easy now to understand that Lovelock and Margulis applied ecological principles at a planetary scale: J. Lovelock (2016). *Gaia: A New Look at Life on Earth*. Oxford: Oxford University Press.

"die" if no plant colonized it. While Cowles does not state it himself, the germ of disturbance ecology is clearly there. The disturbance beset upon the plant community be the instability of the dune leads to plants that are adapted to the dune disturbance. Over time, better-adapted plants yield more resilient dune systems. Cowles has sought plant-dune ecologies because they demonstrate a larger truth about ecological systems: they do not exist in a steady state. Steady states are a form of death-thinking that lack empirical rigor if the perspective is that of the system, rather than the individual plant or species.

Given the dynamism and relationality of this kind of dune ecology, it takes a special kind of force to kill the system, but given the necessary contributions of so many interconnected systems in the building and maintenance of dunes, death could come in many ways. For instance, one could cut down all of the trees, as Captain Sloan says they did in Buffalo: during the War of 1812, "US troops cleared the timber for the construction of barracks and for fuel." If no other plants colonized the dune, the sand would simply blow away. To kill a dune, one could also cut off the dunes' supply of fresh sediment by, say, dredging and canalizing its water source, like they did of the Buffalo River in the late 1810's and many times hence. Though it seems almost unimaginable, one could theoretically kill a dune by preventing waves from picking up the sediment and washing it ashore. Buffalo's nearly 5 mile-long breakwater, built in 1902, did exactly that. You could even kill a dune by destroying it directly: by using its sand to backfill the barrier wetlands that had developed behind the dune. This is what speculators and industrialists did. This infrastructuralization of the waterfront destroyed the dune. Destroyed here means that the rhythms are held to a standstill, and that no speculative future could conceivably imagine their restoration based on any trend in contemporary politics or political economy.

§4 – *Forgetting Wetland Destruction*

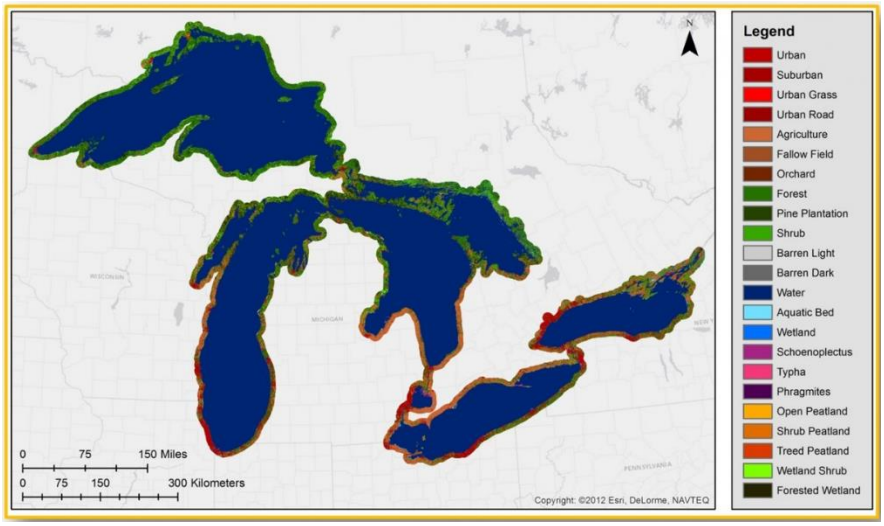
One cannot overestimate the importance of wetlands to the life of the lakes. Wetlands mediate the entire trophic chain of the lake. The vast majority of fish, birds, mammals, and amphibians—to say nothing of the lesser animals that make up the bottom of the food web, or those who migrate through—depend on wetlands for some part of their life cycle. Moreover, wetlands act as great filters for runoff and sediment into the lake as well, so the destruction of wetlands also impacts chemical, photic, and physical characteristics of the water too. The destruction of Great Lakes wetlands is tantamount to the destruction of the life of the lake. Destroying the wetlands destroys the lake. But the destruction of Lake Erie's wetlands is all but forgotten and what wetlands there are remain vastly misunderstood. The next several sections account for the history of wetland destruction in Lake Erie. By developing a natural history of this destruction, the present ecology of the lake and remnant wetlands comes into new light. We come to understand that there is no ecological continuity between then and now based on disturbance cycles. The process of infrastructuralization marks a ruptured ecology in whose wake something entirely different—historical, political, modern—emerges.

By a number of crass and ingenious engineering methods, European settlers destroyed 60-90% of Great Lakes wetlands, and up to 100% in some areas. The esteemed Great Lakes ecologist, Charles Herdendorf, estimates that inland and coastal wetlands on the Western end of Lake Erie "have been reduced to less than 5% of their original expanse."[26] Estimates from Kathryn Hohmann of the Sierra Club support this; she notes that "less than ten percent of the

[26] C. Herdendorf (1987). *The Ecology of the Coastal Marshes of Western Lake Erie: A Community Profile*. Biological Rept. 85(7.9). Washington, DC:U.S. Fish & Wildlife Service

300,000 acres of wetlands originally found along the shores of Lake Erie exists today."[27] However, it is unclear what was "original." Finding out the current extant of wetlands is difficult—and controversial—given the changing definitions, classifications, and statuses, and so forth. The Michigan Tech Research Institute has a long-term monitoring project called Great Lakes Coastal Wetland Mapping, which gives some sense of the extent of land-use change along the Great Lakes coastline. Around Lake Erie, the American section of coastline is almost entirely urbanized in Buffalo, Erie, Cleveland, Toledo, and Detroit. Ontario's southern peninsula is almost entirely agricultural (Lakes Erie and Ontario moderate the peninsula's climate making it good cropland). The Michigan Tech project maintains a more exacting and real-time map of land type across the Great Lakes,[28] but again the map is contemporary and does not indicate historical wetlands, nor then the extent of their destruction. As author and activist William Ashworth notes, there are many ways to kill a coast, like, for instance, "by polluting the waters off it to the point where they are no longer much good for anything." But, "There are other ways. You can fill coastal wetlands, for example: This is done under the misguided assumption that wetlands are wastelands…" While his 35 year old statistic marks an underestimation, Ashworth states that 70 percent of Lake Erie's shoreline "is covered by housing, commercial, or industrial development." He smartly notes that "We are always building something[,and]…much of this building has actually taken place *in* the Lakes rather than beside them, on fill."[29] Today, one would be hard pressed to find a patch of coastland that has not been absorbed into an infrastructural operation.

While these numbers are clearly estimates, they do instruct us to imaging the scale of hostility with which settlers approached wetlands and emboldened their infrastructure. That said, ecosystem function is not in direct relation to size. Structure and function inseparably form an ecosystem, so fundamental changes to wetland structure—by erasure or fragmentation—are likely to undermine its function long before 90% of wetlands are lost. As basic resilience theory makes clear, a 20% loss of wetland structure may not significantly alter its function, but 25% loss may push the ecosystem past a tipping point and toward collapse. Equally, restoring even a vast acreage of wetlands by no means indicates that engineers are restoring function. To highlight the importance of physical integrity for wetlands, one paper notes that while "losses caused by biological and chemical changes have the potential to be reversed," those losses "due to physical change" are likely to be "irreversible."[30] By



[27] K. Hohmann (1990). "The North American Waterfowl Management Plan: Saving Wetlands and Wildlife in the Great Lakes." *Great Lakes Wetlands* 1: 2

[28] Online: https://www.mtu.edu/mtri/research/project-areas/environmental/wetlands/coastal-wetland-mapping/

[29] W. Ashworth (1986). *Late Great Lakes: an Environmental History*. Detroit: Wayne State University Press: 7-8.

[30] D. Dodge & R. Kavetsky (1995). "Aquatic Habitat and Wetlands of the Great Lakes." 1994 State of the Ecosystem Conference Background Paper. Environment Canada & US EPA Report 905-R-95-014: v

highlighting the irreversibility of wetland destruction and the importance of physical changes in understanding wetlands, I mean to emphasize that, despite the astounding resilience of wetlands with relation to water level fluctuation, settlers approached Lake Erie's wetlands with a kind of ecocidal fanaticism that exceeds straightforward quantitative measure.

But of these historical ecologies, we know almost nothing. In fact, we are still lacking basic knowledge about *extant* Great Lakes wetlands. In a 1992 "Call for Research on Great Lakes Wetlands" in a special issue of the *Journal of Great Lakes Research*, the authors state that "Fundamental questions reveal the primordial state of knowledge about [wetlands] systems" and that despite there being "several extensive areas of disjunct wetlands" remaining in the Great Lakes, "only a rudimentary understanding of a few quantitative processes and their underlying mechanisms has been attained."[31] This accords with a 1994 State of the Lakes Ecosystem Conference paper on the "Aquatic Habitat and Wetlands of the Great Lakes" that begins "Aquatic habitat loss and degradation is insufficiently documented. Data that would shed light on the larger picture and its repercussions are almost non-existent."[32] Despite advances in remote imaging technologies that can be utilized to map wetlands, things have barely changed. In the 2021 Great Lakes Coastal Assembly's "Framework to Advance Great Lakes Coastal Wetland Conservation," the first objective listed by the Executive Summary is to "Establish existing baseline extent and condition of Great Lakes Coastal wetlands."[33] There is an invisibility when it comes to wetlands. Forgetting them reinforces their destruction.

There are admittedly, several political barriers to knowledge about Great Lakes wetlands, some of which I discussed in the previous chapter, but there is more than politics here. The wanton destruction of the Great Lakes wetlands has had an agnotological impact: their early and total destruction served to produced ignorance about them. This scientific, cultural, and representational ignorance, in effect, *un*-marks or *un*-names them, creating the conditions for their being forgotten. Without a cultural structure in place to remember them, the negation of the wetlands is negated by landscapes that *appear* "natural." There is a "shifting baseline syndrome" for landscape too, such that disappearances are forgotten and new generations of people assume that what exists today bears some essential relationship to what has been. Today, the wetlands presence themselves only in negation. They are evidenced by the extensive infrastructure that serves to reproduce their destruction: dams, dikes, locks, canals, levees, rip-rap, drains, fill, dredgers, concrete blocks, corrugated steel seawalls, and every manner of underground pipe. These hydraulic works are not designed to destroy wetlands necessarily, but they reproduce their originary destruction, and in so doing, conjure their absence by reproducing it. Moreover, limnological analyses, like the sort offered by the EPA and Environment Canada in their annual *State of the Great Lakes* reports[34] obscures the history of the lake's destruction by straightforwardly addressing the Lake Erie as a singular ecological object characterized by an ecosystem with an ontologically consistent line running through its history.

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[31] K. Krieger, D. Klarer, R. Heath & C. Herdendorf (1992). "Coastal Wetlands of the Great Lakes: Current Knowledge and Research Needs. *Journal of Great Lakes Research* 18:525-528

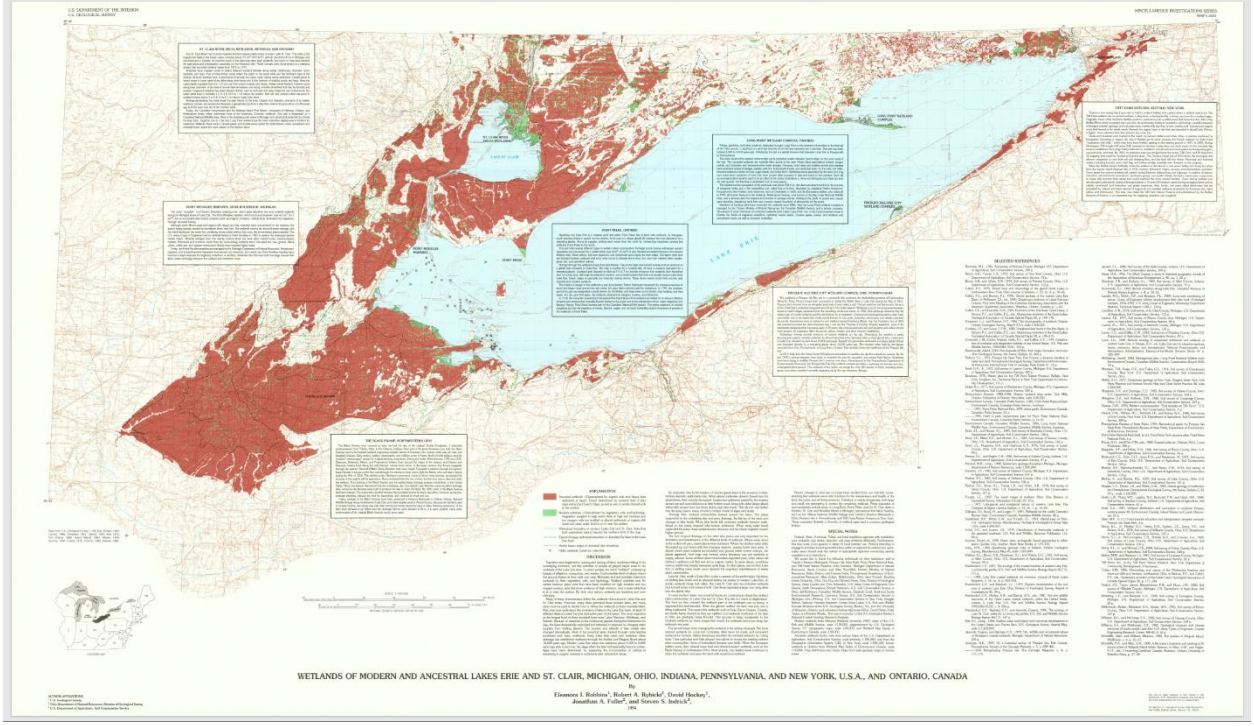
[32] Dodge & Kavetsky (1995)

[33] Great Lakes Coastal Assembly (2021). "Framework to Advance Great Lakes Coastal Wetland Conservation." Online: https://www.greatlakescoastalassembly.org/uploads/1/3/2/8/132872018/glca_coastal_wetland_conservation_framework_9.24.21.pdf

[34] State of the Great Lakes website: https://stateofgreatlakes.net/

§5 – *Ancestral Wetlands*

I could find one map that worked against this agnotological tendency and attempted to document the pre-settler extent of wetlands. Its title was confusing at first: "Wetlands of Modern and Ancestral Lakes Erie and St. Clair."[35] I have become troubled by this map: obsessed with it even. It is almost beyond my imaginative capacity. I first learned about it from a 1993 article in *Great Lakes Wetlands* that mentioned a new set of maps that US Geological Survey (USGS) was designing. In the article, two of the producers of the map, Eleanora "Norrie" Robbins and Andre Bush, note that there was a plan to produce such maps for each of the five lakes, but Norrie later told me that only the one for Lake Erie was published. The USGS team apparently completed research for the other lakes, but, for lack of money and momentum, never published them. The origins of the map are in the quest for extraction. According to Robbins, the entire project resulted from a Presidential directive dating back to Nixon to search for coal across the Great Lakes basin. This was presumably tied to the 1973 oil crisis; with OPEC embargoing the US and other nations supporting Israel during the Yom Kippur War, Nixon called on USGS to find domestic sources of fossil fuels. As Robbins explained it to me, one indicator for potential coal reserves is peat, so Robbins and a team from USGS were doing core samples across the Great Lakes looking for archaic peat bogs that may have coal beneath them. In so doing, they were able to map out where organic matter was layered atop clay, a proxy for former wetlands.[36] Thus, this singular document mapping the history of wetland destruction was accomplished under the banner of extraction.



Most obviously, the USGS map represents the incredible extent of wetland loss around Lake Erie. For Robbins and Bush, the goal of the map was typically geologic: "to bring time and

[35] E.I. Robbins, R.A. Rybicki, D. Hockey, J.A. Fuller & S.S. Indrick (1994). "Wetlands of Modern and Ancestral Lakes Erie and St. Clair, Michigan, Ohio, Indiana, Pennsylvania, and New York, USA, and Ontario, Canada." USGS: IMAP 2451. Online: https://pubs.usgs.gov/imap/2451/plate-1.pdf

[36] E. Robbins. Interview with author, May 5, 2023

depth into discussions of Great Lakes wetlands and to explain the myriad of geological and climatic processes that create wetlands, and, in addition to human activity, cause wetland loss." Already in this goal, wetland loss due to human activity gets collapsed into losses caused by geological and climatic processes. That is, the map makes no distinction between disturbance and destruction, or between anthropogenic and non-anthropogenic destruction. This naturalization of human destruction does lead to certain ambiguities about what the map represents exactly. It does not distinguish between (1) geological change; (2) wetland disturbance caused by hydrological change; (2) wetland disturbance by First Nations inhabitants in the area, starting about 10,000 years ago; or (3) European settler-induced wetland destruction. However, several of the insets sharply document European settlement as the most profound agent of wetland destruction. In developing the map, Robbins became curious about the cultural and natural histories of the places she visited, so she decided to incorporate these cultural insets explaining historical wetland loss across the basin. She became particularly interested in the history of the Great Black Swamp.[37] At approximately1500 square miles, the swamp was one and half times the size of the Florida Everglades, stretching from present-day Toledo some hundred miles to the southwest to Fort Wayne, Indiana, and occupying the entire Maumee River basin. Even contemporary writers try to justify its drainage, vilifying the wetlands as a "mosquito-plagued morass"[38] Perversely, pioneers found that the underlying clay necessary for the formation of the wetland made excellent drainage tiles, which they fired, forming terracotta-like cylinders of various diameters. Once buried, the tiles effectively lowered the water table to the level at which they were buried, leaving drained soil above to be exploited by pioneer commodity agriculture. By 1890, the nation's first systematic drainage program had destroyed the Great Black Swamp. With the invention of the steam-powered Buckeye Traction Ditcher in 1894, drainage of the entire expanse took barely more than a half century. The project turned the wetlands into fertile agricultural infrastructure. Dan Egan makes the point that the ditch digging did more than destroy the swamp, "In a way, it also broke Lake Erie." Ecologically, the swamp functioned as a "grand filtering system that turned muddy rainwater flushing off the land into crystalline flows by the time they reached the lake."[39] Once ditched, the waters ran directly into the lake. Today runoff from this valley provides the nutrient loads that trigger annual toxic Harmful Algal Blooms in Lake Erie.

Despite the vastness of the Great Black Swamp, the USGS map indicates that the wetland complex around the Western bend of Lake Erie was, in fact, far vaster than typically understood.

[37] E. Robbins & J. Forsyth (1993). "The Black Swamp of Ohio, Indiana, and Michigan." *Great Lakes Wetlands* 4(4): 3-4

[38] M. Krick (2020). "Tile Mills Help 'Drain the Swamp." *The Van Wort Independent* 07/29/2020: https://thevwindependent.com/news/2020/07/29/tile-mills-ditching-machine-both-help-drain-the-swamp/

[39] D. Egan (2017). *The Death and Life of the Great Lakes*. New York & London: Norton: 212-3

Beyond the Great Black Swamp, there were another thousand square miles of wetlands continuing north-northeast, past the Point Mouillee Marshes encircling Lake St. Clair and present-day Detroit, and continuing into Ontario.

The USGS map indicates some existing "remnant" wetlands, pieces of the old swamps, but ecologically speaking, these fragments are something altogether different. Fragmenting wetlands deleteriously impacts the structure and function of wetlands. Thus, the suggestion that the green dots among the sea of red are remnants of the Great Black Swamp is ecologically unsound, since these parts do not function as the whole once did. Wetlands are not fractal but exceedingly particular, even as they combine to create complex hydrological systems. The extensive loss of wetlands preceded the emergence of wetland ecology, so studies of coastal wetland fragmentation in the Great Lakes are sparse, and the issue is understudied, but what research there is paints a clear picture. One study in Lake Huron suggests that wetland fragmentation "may have substantial and long lasting effects on wetland biota." The authors state that the "magnitude of the impact is likely associated with the area of vegetation removed coupled with the potential for pelagic water to penetrate remaining fragments."[40] Once wetlands are established, dense thickets of roots and rhizomes slow the intrusion of fresh lake water. Meanwhile, organic material builds up and breaks down among the rhizomes. This creates "distinct physical and chemical conditions associated with specific vegetations types and densities."[41] These conditions, in turn, impact the kinds of biotic communities that predominate. Moreover, in their study of wetland plants in Switzerland, Lienert and Fischer make clear that habitat fragmentation "reduces size and increases isolation of plant habitats and increases the ratio between edge and center area." This impacts not just the densities of plant communities but their morphologies, degrees of herbivory, susceptibility to disease, breeding patterns, genetic variability, pollination, and so forth.[42] This is all to say that what is represented in green on the "Ancestral Lakes" map can hardly be called "remnant" habitats, even if some areas do still contain "native" plant communities. Even if they are structurally similar, the function of these remnant wetlands has been destroyed. Similarly, when groups speak of "restoring" tens of acres of wetlands, they may be restoring some bit of structure but from the perspective of function, it is difficult to see these as much more than token habitats.

Beyond the vast destruction of Lake Erie wetlands, there is a second natural history implied in the map: the relationship between the Holocene glaciation, changes in the lake hydrology, and the development of wetlands. This map records the wetlands of "modern and ancestral" Lakes Erie and Lake St. Clair, meaning that it traces wetlands not just of the current Lake Erie but of its many predecessors in the postglacial period. As the title by Domlesky and Manaugh suggests, we in the Great Lakes are "Living in the Glacial Afterlife." Herdendorf notes that in a relatively short span of geological time, fluxes in global and regional climate have driven the Great Lakes to undergo "dramatic changes in water levels with attendant shifts in shoreline configuration." In particular, Lake Erie "has had the longest and perhaps most complex glacial and postglacial history of an of the Great Lakes."[43]

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[40] D. Uzarski, T. Burton, R. Kolar, & M. Cooper (2009). "The Ecological Impacts of Fragmentation and Vegetation Removal in Lake Huron's Coastal Wetlands." *Aquatic Ecosystem Health and Management* 12(1): 45

[41] *Ibid* 46

[42] J. Lienert & M. Fischer (2003) "Habitat fragmentation Affects the Common Wetland Specialist *Primula farinosa* in North-East Switzerland." *Journal of Ecology* 91(4): 587-599

[43] C. Herdendorf (2013). "Research overview: Holocene Development of Lake Erie." *Ohio Journal of Science* 112(2): 24-36

Like slow moving waves, glaciers too had the their rhythms and pulses—advancing and retreating, and leaving behind moraines that shaped and reshaped the basin and its boundaries. After the glaciers' most recent retreat some 10,000 years ago, the land beneath them underwent a process known as glacio-isostatic rebound. Relieved of the weight of the glaciers, the land around the Great Lakes literally uplifted tens and even hundreds of feet, drastically altering and alternating the shapes and sizes of lakes, their outlets, and the direction of their flow across the region. Lakes Grassmere and Lundy—two of Lake Erie's early manifestations—extended west all of the way to present day Fort Wayne and north past present day Detroit. Slipping beneath the retreating glacier, Lake Lundy reached eastward all of the way to present-day Utica, draining east out the Mohawk River and south, down the Hudson to the Atlantic.[44] In fact, geologists speculate that the sudden change in direction of waters from west to east blasted a broad and level path for the Mohawk river valley, literally carving a path for the Erie Canal.[45] During later glacial retreat, present day Lake Huron—then, Lake Stanley—discharged at North Bay, Ontario, connecting directly with the Ottawa River and out the St. Lawrence. This bypassed present day Lake Michigan—then, Lake Chippewa—and Early Lake Erie, shrinking the latter down to stagnant isolated local basin. It was only once the isostatic rebound uplifted the north coast of Lake Huron that it drained southward again through the St. Clair River and into Lake Erie. Hough's early diagrams of the retreat continue to astound.

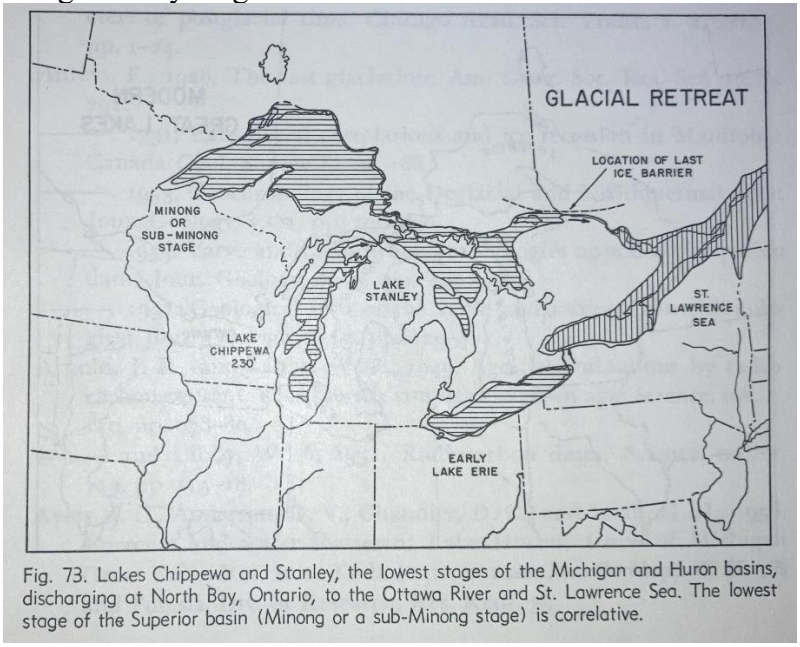


Fig. 73. Lakes Chippewa and Stanley, the lowest stages of the Michigan and Huron basins, discharging at North Bay, Ontario, to the Ottawa River and St. Lawrence Sea. The lowest stage of the Superior basin (Minong or a sub-Minong stage) is correlative.

[44] J. Hough (1958). *Geology of the Great Lakes*. Urbana: University of Illinois Press. See especially the "Lake Stage Maps," pg. 284-296

[45] D. Spanagel (2014). *DeWitt Clinton and Amos Eaton: Geology and Power in Early New York*. Baltimore: Johns Hopkins University Press: 21. For a fuller account of the peculiar glacial formation of the Mohawk River, and the natural historical—and even theological—speculation about it during the 18th and 19th century, see Spanagel's excellent account.

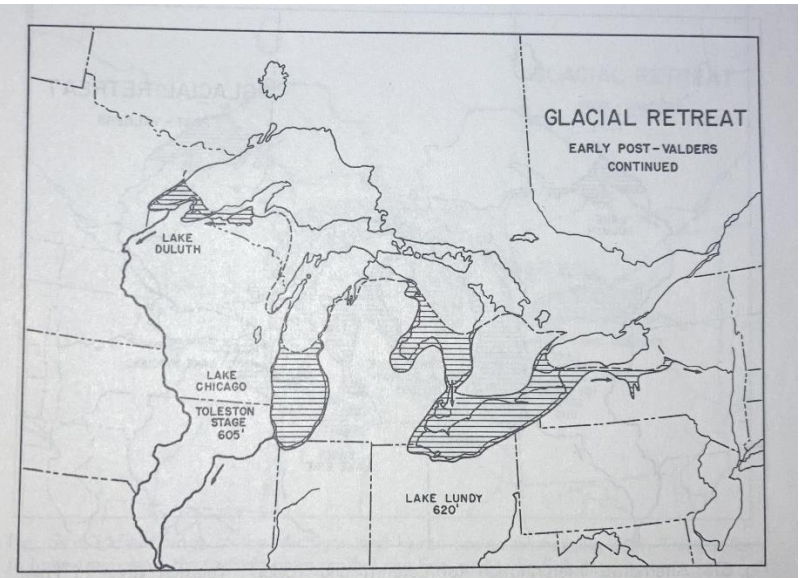
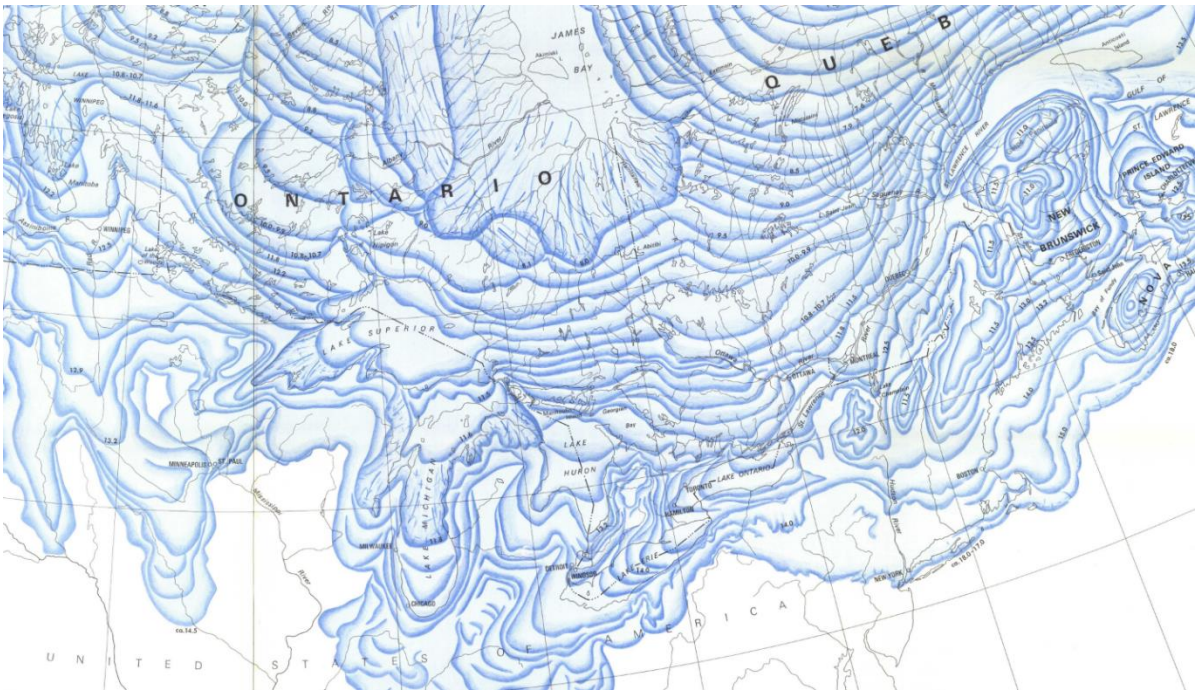


Fig. 66B. Alternative interpretation (of Bretz); Toleston stage of Lake Chicago, and Lundy stage of the Erie and Huron basins which discharged eastward.

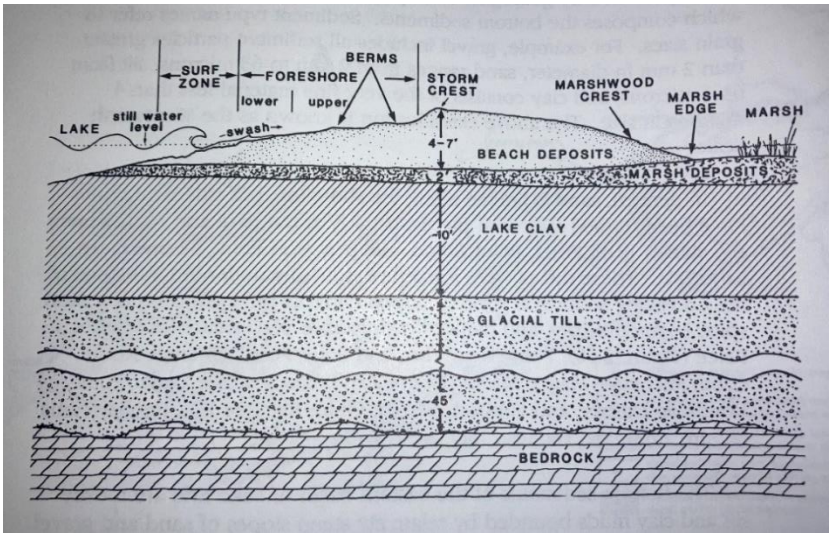
Astonishingly, at least fifteen different lakes have occupied Lake Erie's basin over the past 14,400 years: Maumee, Arkona, Ypsilanti, Wittlesey, Warren, Wayne, Grassmere, and Lundy during the Wisconsin-era oscillations. Lakes Algonquin, Nipissing, and many different configurations of "Lake Erie" since. Lake Erie reached its current height only about 3,500 years ago, whereupon the present landforms, islands, embayments, beaches, and spits began to form. Thereafter, erosion and violent storms altered the lake still more, shrinking it to its present boundaries. The basin has undergone profound and rapid change. The Great Lakes were never in a "steady state" ecology; they are dynamic and changeable ecosystems. From a geological perspective, they experience an extraordinary degree of flux that borders on chaos. The image below is a zoom-in of the Great Lakes from an extraordinary Geological Survey of Canada map that records the retreat of the Wisconsin glacier, giving a sense of its pulsations while also suggesting the geological and hydrogeomorphic realities that reshape landscapes and histories.[46] Glaciation demonstrates the totality of destruction; to call it disturbance only make sense only with reference on continental and geological scale.

[46] Geological Survey of Canada (1969). "Retreat of Wisconsin and Recent Ice in North America." Map 1257A: zoom-in over Laurentian region. Full map available online: https://geoscan.nrcan.gc.ca/starweb/geoscan/servlet.starweb?path=geoscan/fulle.web&search1=R=109206



It is not irrelevant that humans first inhabited the Great Lakes basin some 14,000 years ago, which means—incredibly—that all iterations of this lacustrine basin evolved with relation to human habitation, occupation, and—at least until European settlement—something like reverence. As we know its outline today, Lake Erie is only about as old as the Mycenean and Babylonian Civilizations of the Near East. It is astonishingly young and is better thought of on an anthropological time scale rather than a geological or even evolutionary one. In no way is it an Edenic place of prelapsarian purity.

The impact of glacial retreat on the region's hydrology also had a profound developmental impact on its coastal wetlands. As the write-up on the USGS map details, when meltwater streams from the glaciers flowed into lakes, their velocity decreased, and clayey sediments suspended in the stream spread out and fell, joining older glacial till eroded from shorelines during high lake levels. This formed a flat-lying lake-bottom mud. The underlying clay and flat lay of the land created poor drainage conditions, which—combined with changes in lake levels—promoted the conditions for wetland plants. Poor drainage crossed with variable terrains promoted different wetlands



types across the lake basins. Where water stood all year, marsh plants predominated; where seasonal fluctuations predominated, swamp and forest trees grew; where plant material accumulated over limestone-providing calcium, fens, and without calcium, acid bogs; and so forth. Where conditions were particularly stable, swamp trees grew large. In other places, "storms from Lake Erie or shifting water levels never allowed the long-lived establishment of stable plant communities."[47] As lake levels fell, wetlands established themselves on newly exposed lake-bottom sediments; when they rose, wetlands migrated to higher ground. The cross-section above is of the barrier sand spit formed between Lake Erie and Magee Marsh on the southwest shore of the lake. Note that it is not to scale. The glacial till is 4.5 times thicker than the clay, whose tiny particles settle out last, atop the till, creating little chance for drainage.[48]

This anthro-glacial history of the lakes greatly challenges my attempt to delimit destruction to a force of modern humans. The human restructuring of the physical integrity of the lakes—what I have been calling infrastructuralization—is paltry by comparison to this glacial history. What can I say? At some level, all things *are* all connected. Humans are as natural as the ice. Any distinction is arbitrary, fallacious, interpretive. And this is precisely their beauty; it is what gives them meaning. Without this distinction, we are placed back into the great oneness—into pure ontology. Humans, merely natural, are reducible to the cycles of nature: unaccountable, apolitical, without ethics. They are systems like any other. They shall disturb and be disturbed, violence and be violenced. If they end up being an asteroid, well then so be it. Asteroids have come and gone, and here we are. They are nature too. But this marks the elimination of geographical conceptuality: measured from far enough away, even the topography of the highest mountains is negligible. This represents pure content without form. This is precisely what Adorno criticized Bergson's duration for: without the dialectical interruption in pure duration by history, word, or concept, duration is just a form of abstract time unknowable and meaningless because it is not communicable. Indeed, *ecology itself is a form of this interruption*. Which is to say it is a relative form and one way in which humans have come up with to describe what Kant calls "the manifold"—the unorganized flux presented to the senses. This is why ecology can be useful and meaningful—as it is to me—without being the absolute referent for all life. Geographical conceptuality requires *meaningful difference*: human places are writhing with struggle, unevenness, politics, violence, history, solidarity, and distinction. "Natural history" represents that dialectical tension between the fundamental transience of nature and the historical signification that interrupts that transience with meaning. For a human geography, these forces require each other. In this project, destruction is one such meaningful difference. It is a transformation of geography by the forces of modernity that rationalize place to the dictates of capital and empire and, in the process, destroy the meaningful relations that theretofore composed that place. For glaciers, we need another signifier: annihilation could be a good choice.

Part II: §6 - *Tifft Nature Preserve: disturbance and/or destruction*

> You've showed us that men can use garbage to make a beautiful world,
> but [men] can also make an ugly world.

[47] Robbins *et al.* (1994)

[48] S. Bolsenga & C. Herdendorf (1993). *Lake Erie and Lake St. Clair: Handbook*. Detroit: Wayne State University Press: 78

-Child interviewed in 1976.[49] Quoted in Wolfe

> All of the roughness of the process arises out of the park's earlier condition…
> -Robert Smithson, Quoted in J. Skinner, *Birds of Tifft*[50]

One does better to sit with Jonathan Skinner, a writer who authored a book on Tifft during his time studying ecopoetics at SUNY Buffalo. Throughout *Birds of Tifft*, Skinner returns time and again to "Tifft Log." Sixteen of his forty-three poems go by this title. The poet returns, like the waves, iteratively to his station to observe. Each time the same, each time anew. It is a pilgrimage marked by difference and repetition, eternal return, rather than transect. One such iteration goes like this:[51]

> Tifft is stripped
>
> 3 geese trumpet
> over the flat frozen
> marsh, crows galore
> jay clink
> marsh creaks
> shadows stretch
> fat redtail
> fluffed its white
> feathers — hunts
> along the tracks
>
> ROADWAY truck
> everything's low & clear
> boardwalk fades
> in the lean light

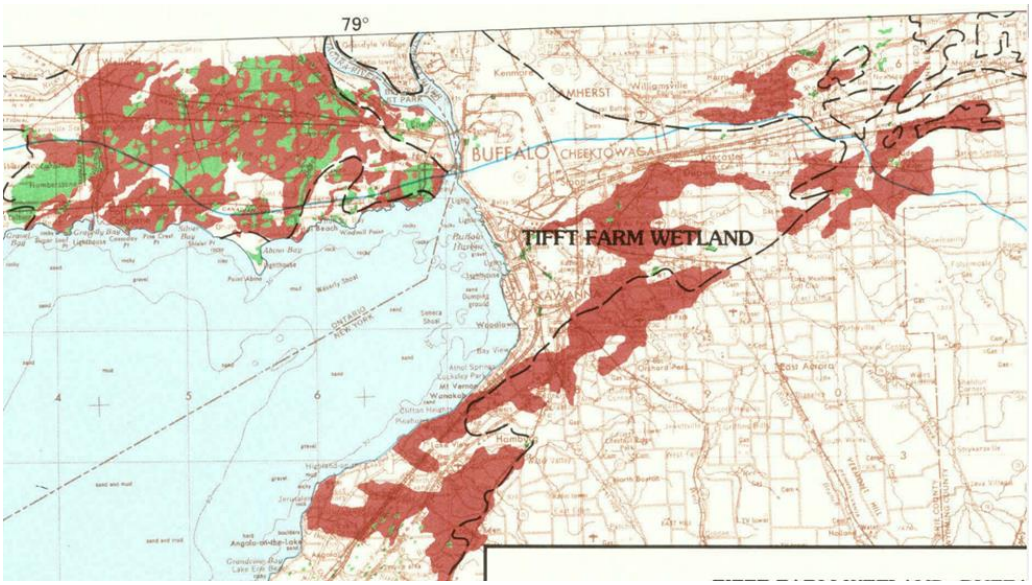
This winter scene captures the constant drone of Skyway traffic brought to attention by the roar of a semi shifting gears to climb the onramp, overlaid by the subtler everyday sounds of the log panorama. The redtail hunts along the abandoned railroad tracks. The scene typifies the strange juxtapositions that proliferate in studying urban nature. Skinner is fond of counting how many animals he sees—in this poem, 3 geese, crows galore—but one understands that this is a qualitative counting. He counts to communicate how many crows, muskrats, or deer in his scenes populated with animals, encountered out of patience, iteration. The numbers shy from meaning anything else; they float in the interstice between information and data. His is not a community population study. His opening line shudders with paradox: "Tifft is stripped." Although this three word statement is one of the simplest forms offered by English grammar, its passive voice dislocates the subject and we are left to face a proliferation of realities: as many realities as there are possible subjects. On one hand, winter has stripped the scene bare. The leaves are gone and

[49] T. Wolfe (1983)
[50] J. Skinner (2011). *Birds of Tifft*. Buffalo: BlazeVOX
[51] Skinner (2011): 82

the underbrush matted down to expose, unadorned, the greys and browns of Tifft's hardened structures. The one who has stripped Tifft here is same agent who rains when English speakers say "It's raining." It is a version of "nature" but more ambient, less ideological. On the other hand, humans—settlers, Europeans, industrialists, speculators, engineers—have stripped Tifft. To begin the poem thus, points to a reading whereupon humans have destroyed Tifft and the life that fills the scene is a sort of incidental aftermath. It's the accounting of what has survived: a kind of salvage ecology. In light of this reading, one might interpret the counting different: one senses a survey of survival after the stripping bare. It is a novel ecosystem in formation after destruction.

This story of survival in the wake of destruction marks a basic insight into this landscape: Tifft Nature Preserve is not the story of an ecosystem that has undergone a disturbance cycle and is now, by dint of its spectacular resilience, better adapted to the region's environmental conditions. Look, for instance, at the statement made by Ecoplans, Inc.—the landscape architecture firm that designed the preserve in the 1970's. They noted, "The Tifft Farm nature Preserve is more than an underdeveloped open area of land or a formal open space like a city park. It is a complex system of soil, water, climate, plants and animals interacting with one another in ways that are determined by both natural and human development and use, as these have occurred in the past and present."[52] The implication is that the complex set of human and nonhuman relations that compose the site share a continuity from past to present. On the contrary, I am arguing that the wetland that remains at Tifft today has almost nothing at all to do with what was there before its destruction. It is a different, modern, formation.

What Robbins et al. label the "Tifft Farm Wetland" on the USGS "Ancestral Lakes" map would have been a combination of coastal, barrier, and riverine wetlands prior to settlement.



From the perspective of the regional geographical vernacular, Robbins is not exactly correct to label this entire area Tifft Farm Wetland. She said that she was looking for something to call the eastern basin wetlands, and she spoke with someone from Tifft, and—lacking any other name or signature feature—called it thus.[53] The fact there is no other name for these wetlands that once characterized the entire

[52] Ecoplans, Incorporated (1973) *Tifft Farm Nature Preserve: A Unique Natural Resource in the Heart of Buffalo*. Saratoga Springs, NY: Saratoga Associates: 4

[53] E. Robbins. Email correspondence with the author. May 20, 2023

waterfront strikes me as noteworthy. The wetlands here were never named before they were drained, so Robbins had little to go on. She named the region after this strange remnant.

Tifft is seen as a great success story, and with good right. It is the largest urban nature preserve in the country and an important research center. As many have noted, it is one the few instances where the city came together with its citizens to develop a plan that met the needs of all. Going there, it is easy to sit on the boardwalk looking north at the reflection of the City skyline in the wetland, watch waterfowl, and find a moment of quiet. The place feels substantially wilder than a city park, and—while you can't exactly get lost, given that the wetlands keep you on path—you can push eastward and find yourself alone, if not soothed then sated. I have seen turkey, deer, fishers, muskrat, fox, coyote, possum, and raccoon all here. There are signs of beaver. At moments, it can feel untamed or undomesticated. Tifft also runs a successful environmental education program, and children from all over the region come to learn the basics of ecology and, hopefully, find a dash of wonderment. But there persists confusion about what Tifft is exactly.

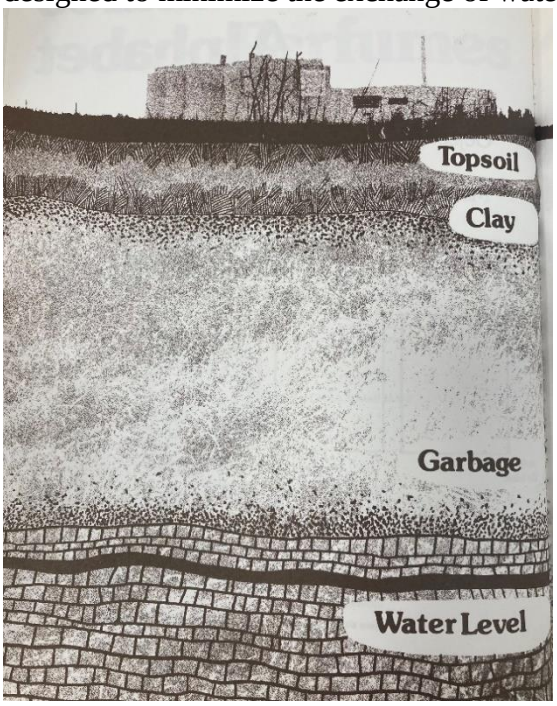
One must resist turning Tifft Nature Preserve into a story of redemptive ecology or into something overly poetic or sentimental, about "the power of nature to heal herself." This urge greatly oversimplifies matters, erasing histories in order to too easily offer hope about "sustainable urban futures." What happens when we slow this urge? Perception is an admixture of empirical fact and ideological fantasy, and it is easy to understand why—looking across the expanse from atop Tifft's mounds—one might lean toward latter. From atop the mounds, one recalls the illusory romance that Wordsworth was able to fill himself with in "Composed upon Westminster Bridge," where, from a distance, he could look upon dawn lit London and find "A sight so touching in its majesty." The seething heap becomes an idyll. Just down from the mounds, one can view what is probably the last fifty acre remnant of coastal marsh in all of western New York. This is possible because one is standing over 1.6 million cubic yards of trash. Tifft was saved by turning it into a dump. This juxtaposition was made possible by a Faustian bargain that may very well have been the only one left on the table. But it is easy to forget the trash, the history, the bargain. And, watching the clouds roll in, interlaced with hawks, gulls, tern, vulture, geese, duck, it is easy to forget that you've forgotten, whereupon Tifft Nature Preserve becomes, simply, picturesque. The monsters cease haunting and the ghosts appear as friends.

The mounds are eerie. Something is just a little bit off. Standing atop them, one can indulge in a bucolic urban vista of reclaimed post-industrial expanses abutting lake Erie, or cozier scenes of wooded ponds and remnant wetlands. The mounds are the highest outdoor vantage point in the city and a good place from which to watch the weather change. It is an urban refuge, and at the time when the preserve opened to the public, in 1975, it probably felt even more so like one. Bounded by rail and barge traffic, smokestacks belching to south and east, one could take reprieve from the city, even catching a moment of wonder or curiosity. Despite the traffic buzzing up and down the Skyway, it remains a placid scene, especially in the early summer when the grass in the meadows is long and verdant. Just down from the mounds is a seventy-five acre cattail marsh that—by historical accident—never achieved its "highest and best use" as a dump for steel slag and other industrial waste. Below are some scenes from late spring 2023, looking—in order—to the north, west, south, and the final two photographs are to the east.

In the early 1970's, rising ecological consciousness manifested in the Clean Water Act, which funded a Federal Pure Waters Program that supported the Buffalo Sewar Authority (BSA) to update its waste-water treatment plant. The BSA decided to build a waterfront plant on what was then called Squaw—now Unity—Island,[54] just up the Niagara River in Black Rock. For the century and half preceding, Squaw Island had been used as a the city dump. As part of the plan to build the new facility, the City purchased Tifft Farms from Republic Steel with a plan to relocate the waste there. After the Lehigh Valley Railroad abandoned its plans to develop the site in 1946, Tifft was left to waste as an unofficial public dump. But over thirty years of relative inactivity, parts of the site had returned to wooded marsh and become a favorite place for

[54] "Squaw" is a racially derogatory term used toward Native Americans and especially Native American Women. Buffalo adopted the new name in 2015 after a petition.

birdwatchers and fisherman around the city. They organized to protect the site. During the many months it took barges and trucks to move the trash, the Tifft Farm Committee worked with Ecoplans, Inc., of Saratoga Springs, NY, to design a site that would meet the needs of both city and citizen. For two years, from 1973-75, nearly two million cubic yards of waste was shaped into four giant mounds. Engineers surrounded the garbage with a twenty-two foot clay wall designed to minimize the exchange of water and waste. A system of drainage pipes at the base of the clay wall removes leachate to the municipal sewar system.[55] An educational pamphlet designed for school children neatly diagrams the mound (above).[56]



These mounds deserve our attention. In writings about Tifft, the mounds have come to represent a compromise, widely lauded, between the city, the landscape architects, and the locals fighting to save the park. They were deemed a welcome concession and creative solution. But there are perversions here—not least of which is the fact that the mounds are filled with the city's historical waste. This perversion is obvious enough: the essence of the nation's largest urban nature preserve is that it would never have come to pass without turning it into an official landfill first. This is the kind of paradoxical—even dialectical—image that increasingly common phrases like "urban natures," "novel ecosystems," "anthropogenic ecologies," and "Anthropocene landscapes" intend to capture. The increasingly mundane quality of this contradiction works through the technique of juxtaposition between nature and artifice. This power of this technique is fading into cliché and without rigorous historicization, it tends to reproduce the modernist aestheticization of destruction that, in the Rust Belt, takes shape as the post-industrial sublime. In Buffalo, photographers pay to gain access to abandoned grain elevators and other industrial ruins, which populate many shiny books of photography and sleek websites. Post-industrial ruination sparks fascination and imagination, but the increasing wildness of the sites in which they sit obscure the histories that produced them. As they fade into the nature of the lands, they begin to seem natural to it. One recalls Thomas Cole's famous 1843 painting, *Roman Campagna*—Roman Countryside—in which the ruins of Rome's aqueducts become part of the landscape, resembling the trees and rocks he painted throughout the Hudson

[55] Wolfe (1983)

[56] Tifft Farm Nature Preserve (1980). *The Tifft Farm Guide*. Buffalo: Tifft Farm Nature Preserve

Valley. The grain elevators come to appear as decreasingly strange the more antique they become. The mounds even more so.

What I take to be the more fundamental perversion is that the mounds are a simulacrum of nature, standing in the very place sand dunes once stood. Only, they are an entirely sterile form. Recall Cowles's dunes, rising dynamically in height *pari passu* with the vegetation: shifting, consuming, living, killing. The mounds are precisely the opposite: rigid and dead—without the capacity to sustain life. This is exemplified by the rather strange fact that the site is an entirely treeless meadow. As one commentator notes, "The mound area, representing a forty acre landfill site, presents a difficult situation for vegetative adaptation." The first several feet of topsoil on the mounds is designed to drain very efficiently and so remains quite dry. Beneath it is the clay barrier, which is necessary to prevent the movement of leachate into the surrounding park but which creates a layer of very wet conditions. "This phenomenon makes it extremely difficult for trees to survive on the mounds. A tree adapted to dry conditions will grow well for the first years of growth, but then will die when its roots reach the moist refuse. A tree adapted to wet soils will die within the first year of growth." [57] The Preserve Steward at Tifft offered a slightly different account: he told me that most of the topsoil is dredged from one of Tifft's ponds and is thus too high in organic matter; it absorbs and holds water too readily when it is wet and parches quickly when it is dry. He noted that there was a plan at one point to reforest the mounds, but lack of funding led Tifft staff to purchase what was cheapest and most readily available: pasture mix, which is what continues to grow on the mounds.[58]

These "soil conditions" have been called "unique," but we call this anthropogenic ground "soil" merely out of habit. It is a destroyed landscape atop which something else has been built that provides a simulacrum of naturalness that obscures the destruction. Additionally, as dune simulacra, the mounds represent the enforcement of an entirely unnatural steady state ecology. Given this, it was bizarre to discover a proposal circulated by several different sources to return the Tifft mounds to sand dunes by simply covering them with sand! One may dress a corpse in fine garments, but this will not bring it back to life. This proposal is as exemplary as it is farcical. It exhibits a total lack of understanding that coastal ecosystems are dynamic and integrated. If the dune formation requires the intersection of ecosystemic patterns related to river sedimentation, wave action, appropriate plant life, and wind, the mounds only have access to wind. If one were to simply cover the mounds with sand, this unchecked force would blow the sand directly into the remnant wetland, effectively filling it. As discussed above, the sand for the original dunes is the sediment brought down the river and washed ashore by the waves, but the river is canalized, and the breakwater quells the waves. Certain grasses could theoretically stabilize the sand, but even so, such a landform might appear to be a dune, but it would have neither the structure nor function of a dune. The mistake betrays a significant lack of ecological understanding and exemplifies a strange form of hyperreality where consciousness cannot distinguish between an integrated ecosystem and the semblance of one. But because sand dunes *represent* complex coastland environments, they are desirable. It is pure aesthetics masked as holism.

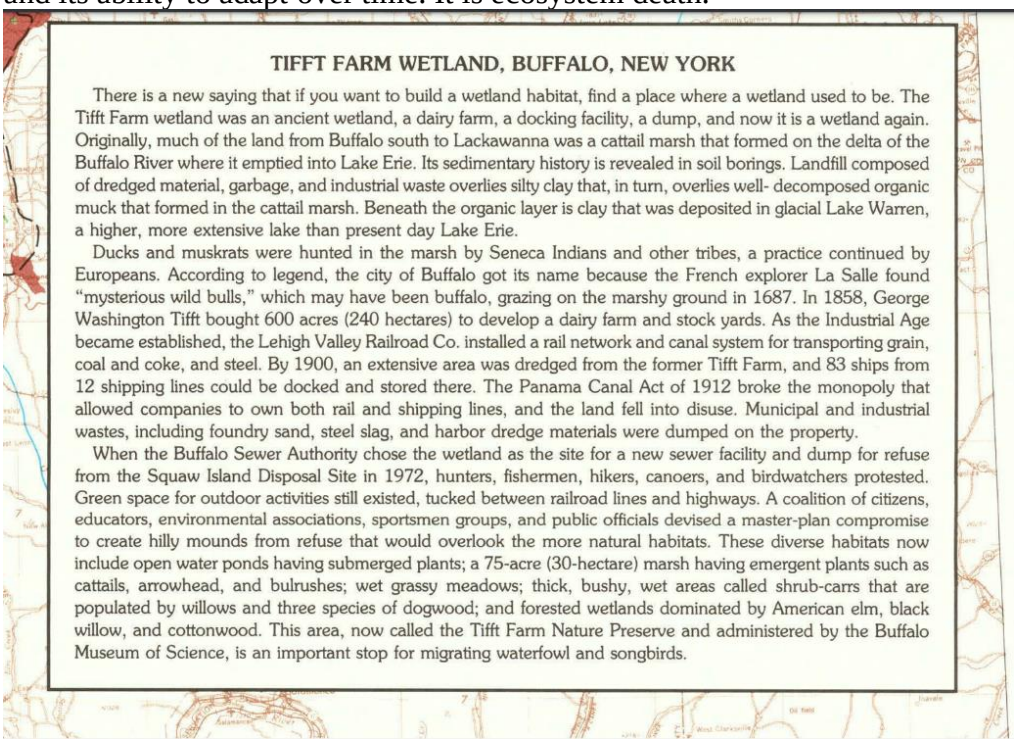
Robbins's text box about Tifft on the USGS map (below) exhibits some confusion about this too. The text box begins thus: "There is a new saying that if you want to build a wetland habitat, find a place where a wetland used to be. Tifft Farm wetland was an ancient wetland, a dairy farm, a docking facility, a dump, and now it is a wetland again."[59] Robbins appears to be

[57] *Ibid* 56.

[58] Interview with author, May 2023

[59] Robbins *et al.*

referring to George H.W. Bush's "no net loss" wetlands policy, adopted in 1989. The policy required that if wetlands were destroyed on account of new development, they should be replaced elsewhere, as though a wetland acre is a universal abstraction that can be balanced on a ledger. This policy created demand for places to build new wetlands, and places where there *used* to be wetlands tended to be viable places for new ones. Robbins runs through the list of land uses for Tifft since becoming a wetland "again": a dairy farm, a docking facility, and a dump. There appears to be some idea that if there was a wetland before and there is a wetland now, then there is a persistence or continuity of wetland at work, or that a cycle was interrupted that can now be brought into movement again. From an ecological perspective, this is dubious. Wetlands are complex ecological systems in dynamic relation to other systems, like dunes, rivers, lakes, climates, fisheries, bird migration, and so forth. Destroying a wetland system and the other systems with which it is in relation indicates a structural and functional cessation of the system and its ability to adapt over time. It is ecosystem death.



TIFFT FARM WETLAND, BUFFALO, NEW YORK

There is a new saying that if you want to build a wetland habitat, find a place where a wetland used to be. The Tifft Farm wetland was an ancient wetland, a dairy farm, a docking facility, a dump, and now it is a wetland again. Originally, much of the land from Buffalo south to Lackawanna was a cattail marsh that formed on the delta of the Buffalo River where it emptied into Lake Erie. Its sedimentary history is revealed in soil borings. Landfill composed of dredged material, garbage, and industrial waste overlies silty clay that, in turn, overlies well- decomposed organic muck that formed in the cattail marsh. Beneath the organic layer is clay that was deposited in glacial Lake Warren, a higher, more extensive lake than present day Lake Erie.

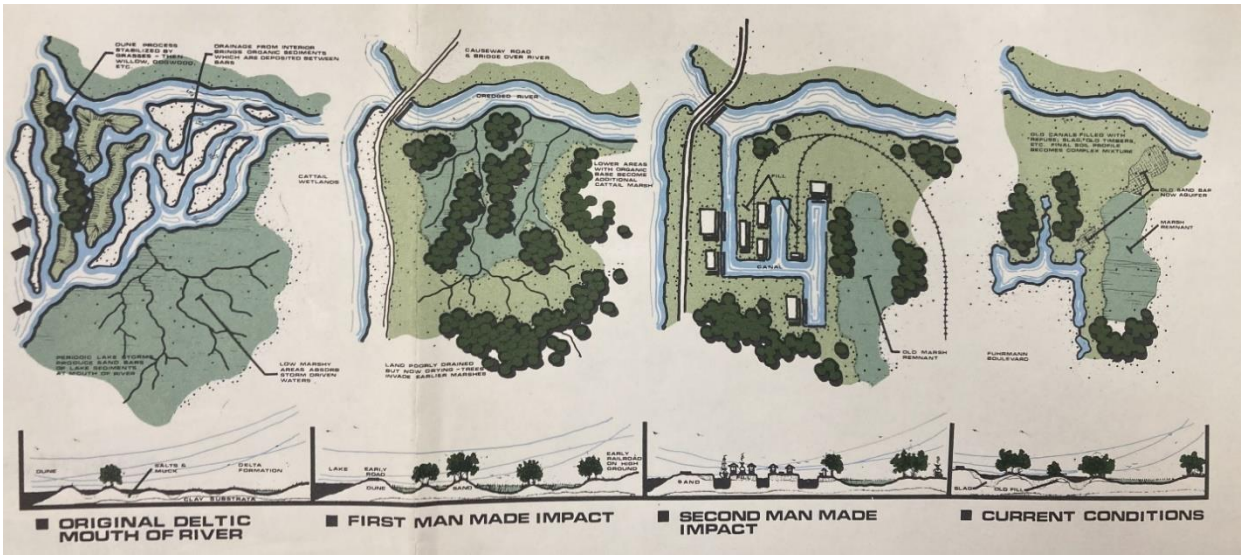
Ducks and muskrats were hunted in the marsh by Seneca Indians and other tribes, a practice continued by Europeans. According to legend, the city of Buffalo got its name because the French explorer La Salle found "mysterious wild bulls," which may have been buffalo, grazing on the marshy ground in 1687. In 1858, George Washington Tifft bought 600 acres (240 hectares) to develop a dairy farm and stock yards. As the Industrial Age became established, the Lehigh Valley Railroad Co. installed a rail network and canal system for transporting grain, coal and coke, and steel. By 1900, an extensive area was dredged from the former Tifft Farm, and 83 ships from 12 shipping lines could be docked and stored there. The Panama Canal Act of 1912 broke the monopoly that allowed companies to own both rail and shipping lines, and the land fell into disuse. Municipal and industrial wastes, including foundry sand, steel slag, and harbor dredge materials were dumped on the property.

When the Buffalo Sewer Authority chose the wetland as the site for a new sewer facility and dump for refuse from the Squaw Island Disposal Site in 1972, hunters, fishermen, hikers, canoers, and birdwatchers protested. Green space for outdoor activities still existed, tucked between railroad lines and highways. A coalition of citizens, educators, environmental associations, sportsmen groups, and public officials devised a master-plan compromise to create hilly mounds from refuse that would overlook the more natural habitats. These diverse habitats now include open water ponds having submerged plants; a 75-acre (30-hectare) marsh having emergent plants such as cattails, arrowhead, and bulrushes; wet grassy meadows; thick, bushy, wet areas called shrub-carrs that are populated by willows and three species of dogwood; and forested wetlands dominated by American elm, black willow, and cottonwood. This area, now called the Tifft Farm Nature Preserve and administered by the Buffalo Museum of Science, is an important stop for migrating waterfowl and songbirds.

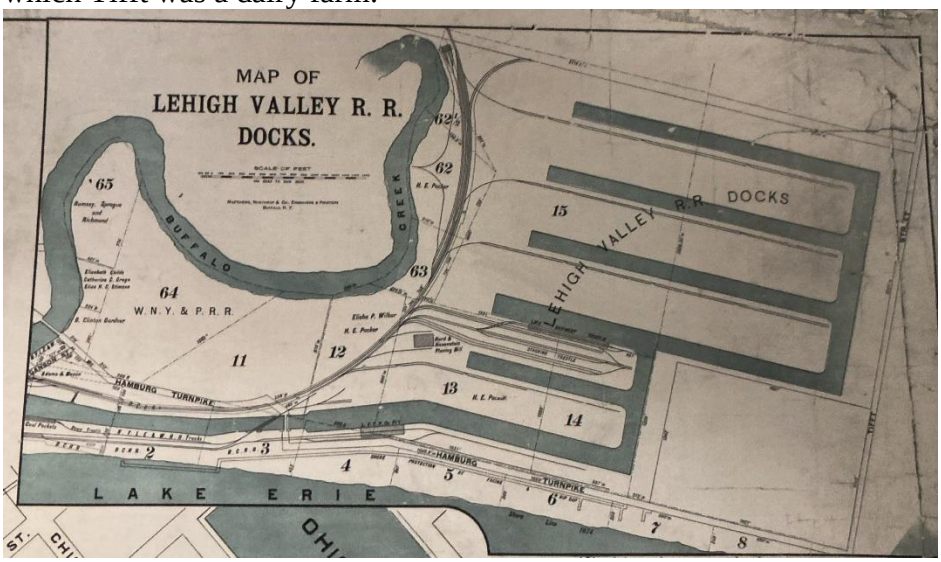
We see this error committed by Ecoplans in a diagram it included in both its masterplan and summary pamphlet as well.[60] The diagram contains a kind of condensed timeline that is, in reality a sequence of four idealized landscapes. The first is the "Original Deltic [*sic*] Mouth of River," which outlines the simultaneous process of wetland, delta, and dune formations, with the contravening river and lake hydrologies. In the lower right portion of the quadrant, the "low marshy areas absorb storm driven waters." The crosscut below it shows a sinusoidal undulation of dune, delta, and wetland composed out of muck on top of a clay substrata. The "First Man Made Impact" is the dredging and canalization of the river. To be clear, this is incorrect—and

[60] Ecoplans, Incorporated (1975). *Master Plan for the Tifft Farm Nature Preserve, Buffalo, NY*. Saratoga Springs: Ecoplans, Inc.; Ecoplans, Incorporated (1973) *Tifft Farm Nature Preserve: A Unique Natural Resource in the Heart of Buffalo*. Saratoga Springs, NY: Saratoga Associates

telling. The wetlands of this region were long established hunting and fishing grounds of Native



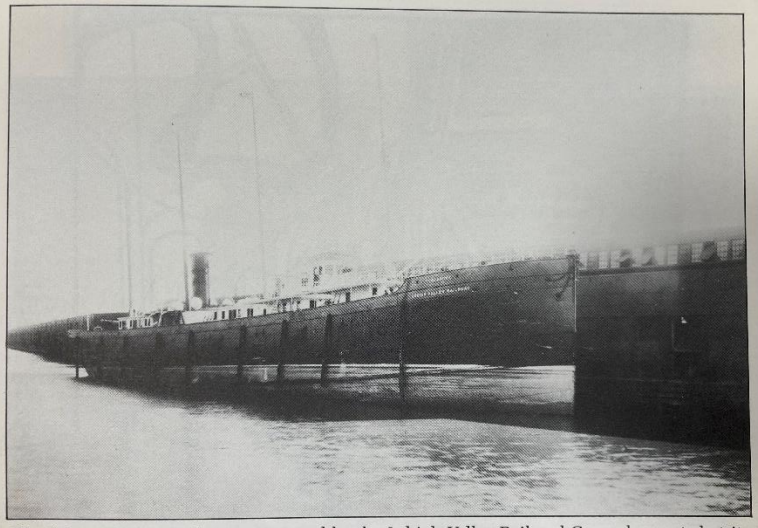
Americans in the region, especially the Erie and Wenro tribes and—after the establishment of the Buffalo Creek Reservation—of the Haudenosaunee (mostly Seneca). Anthropogenic disturbance is literally as old as the site itself, given the geological history I outline above. By "First Man Made Impact," we should read something closer to, "the first phase of anthropogenic destruction," as settler infrastructuralization. Beyond canalization, the dunes are leveled and filled in, and a road run over the top. A bridge spans the river, now broader with the totality of water running through it. The marsh remains poorly drained but begins to dry, no longer fed with water. In place of the marsh plants, shrubs and trees begin to "invade" the drying landscape. Cattails (typha) take over the lower areas of the former delta. The represents the period during which Tifft was a dairy farm.



In the third panel, map, and several arial photographs, we see the changes made by the Lehigh Valley Railroad Company beginning in 1888, though, as one commenter notes, "The facilities there were enlarged, altered, and improved through the years to serve the fluctuations in the world market for Great Lakes goods."[61] With the extension of the City Ship Canal, Lehigh Valley dug out several canals to create a series of docks in Tifft Farm. Using dredged material and additional fill, the company built up the marsh so that it could run rail line between each dock. The Buffalo Creek Railroad bounded the site to the north.[62] The inset from *Mann's Map of Buffalo Harbor* shows the full proposal for the Lehigh Valley Terminal at Tifft, but the three easternmost docks were never completed, sparing the "old remnant marsh."[63] Even incomplete, the size of these canals is difficult to grasp in a birds-eye views: the two freight houses that

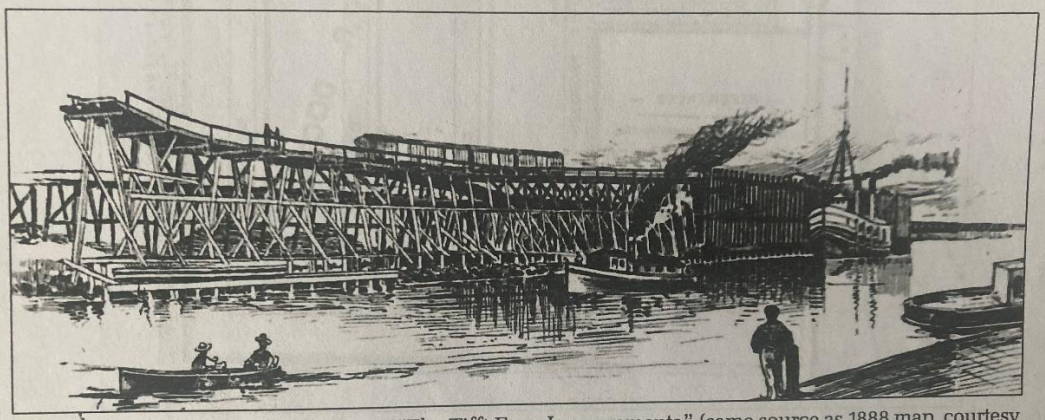
[61] Wolfe 12
[62] *Ibid* 14
[63] *Mann's Map of Buffalo Harbor and the Island*, 1888. Shows terminal as built but in fact, this is only the proposal.

flanked the main canal were nearly a mile long. The photograph below of "The Tuscarora," one of Lehigh Valley's steel steamships docked at Tifft, gives a better sense of scale.



The "Tuscarora," a steel steamer owned by the Lehigh Valley Railroad Co. and operated at its Tifft Farm docks between 1890 and 1920. (courtesy of the Western New York Railway Historical Society, Inc.)

By 1890, New York City was the world's second busiest port and Buffalo was the sixth. In the twenty-five years from 1862 to 1887, coal tonnage shipped to Buffalo skyrocketed from 132,371 to 3,437,818 tons, much of it on Lehigh Valley rail, shipped north from Pennsylvania and taken by the company's steamships to other ports further up the Great Lakes. Since it located its terminal at Tifft, the grounds figure prominently in this trade.[64] In its hopes of becoming a strategic break-in-bulk point, Lehigh Valley built elevated coal trestles that allowed for the advantage of gravity when transferring coal from rail to ship. A large portion of the site was also occupied by lumber yards: during the 1880's six lumber companies had their yards there.[65] There were stockyards, iron ore facilities, grain warehouses, and more than a dozen other buildings so that by 1900, 12 permanent shipping lines consisting of 83 vessels operated from Tifft. During the winters—especially before the construction of the breakwater—the docks were also the preferred place to put ships in winter storage, since they were protected by Erie's tempestuousness.



Side view of the coal trestles shown in "The Tifft Farm Improvements." (same source as 1888 map, courtesy of E. Webster Dann)

[64] Ecoplans, Inc. (1975)
[65] Wolfe: 13, 29

As if it needed to be said, Ecoplans notes that "As commerce boomed on the Tifft Farm, the marshy character of the site receded. By 1900, no marshland existed in the western half of the site." The construction of the south harbor breakwater in 1902 further accelerated the loss of the wetland by curtailing the intrusion of lake water into the area, whereupon the western part of Tifft effectively dried up. The 1915 Panama Canal Act stipulating against transshipment monopolies broke up companies like Lehigh Valley that had networks of both rail and barge, thus slowing traffic at the site. The depression dealt another blow, and in 1934, the large freight house caught on fire and burned down, taking a large decommissioned ship with it. Without adequate maintenance and dredging, the site quickly fell into decline, and the channels filled in. The site became a kind of hobo village, an unofficial dump, and an *ad hoc* recreational area. One oral history speaks of the Tifft dump as always on fire with firemen coming up to three times per day to put out fires, which were often kept alive by flaming rats that ran around quickly lighting another patch. The Buffalo Creek Railroad Company filled in the City Ship Canal in 1946, blocking ship access to Tifft and effectively ceasing industrial operations there. Companies and citizens alike continued to use the site as a dump, and in 1955 Republic Steel purchased Tifft in order to dump slag, which quickly covered the previous fill. From 1951 to 1972, the site slowly filled in, starting from the southwestern part of the site and heading northward.[66]

The fourth panel represents the state of Tifft at the time Ecoplans developed its masterplan in 1975, the canals filled with industrial waste, slag, old timber, and so forth. The marsh remnant remains off to the east. I have spent time describing the industrial activity that pertains to the third panel in order inquire into its relationship to the second and fourth panels. The four panel sequence implies a set of ecological processes that it most certainly is not. The panels are chronologically sequenced, implying a common x-axis time scale, but across these diagrams, chronological time and ecological succession have come to imply each other in a way that buries ecological rupture. The panel implies a disturbance cycle that will eventually return Tifft—if let be—to an originary state. One Ecoplans document notes, "By 1970, Tifft Farm was almost totally reclaimed by nature." I am arguing that this is explicitly *not* the case. Already the second panel marks a rupture in coastal hydrological systems significant enough to destroy deltaic and barrier wetland processes. By the third panel—even taking into consideration the remnant marsh—industrial activity has destroyed the integrity of the wetland complex and destroyed its connection to coastal cycles.

In this scene, the meaning and ecology of the remnant wetland come confounded. On one hand, much attention is given to the fact that this remnant marsh has never been developed. It's seventy-five acres has come to represent the lone archaic and ancestral piece of Buffalo's pre-industrial ecology. But of course it is a completely isolated and managed ecological niche. While the canal-turned-pond at the western portion of Tifft is tied to Lake Erie's water levels through culverts running beneath Fuhrmann Boulevard, the remnant marsh is separated from the lake system by a small weir and from the river by hardscape. Water levels in the remnant marsh are managed strategically—and wisely. A few years ago, Tifft raised the water in order to drown the invasive phragmites that was overtaking the marsh. This encouraged cattail—which grow better in deeper water—to overtake the marsh, which in turn spurred muskrat populations, which eat cattail. When water levels recede to expose the soil where the muskrat has eaten the seedbed activates, and new plants grow to fill this niche. This creates a heterogeneous plant mosaic that increases biodiversity and resilience. Later, Tifft lowered water to plant native wetland trees. Invasive buckthorn was taking over the understory, and there was a very little tree regeneration,

[66] Wolfe, ch.2

so the Steward decided he had to manage the system in order to mimic disturbance cycles at Tifft. He outlined the fact that since there was very little research on natural water level changes in the wetland, it remains difficult to know what the best strategy is. "It could probably be modelled," he noted, "but it would be incredibly expensive." "And probably not much more reliable than a roll of the dice," I added.

This move toward "adaptive management" actually mark a significant change in philosophy at Tifft that represents the shift in ecological thinking I developed in the previous chapter. In the early 1970's, conservationists at Tifft believed that by simply letting the preserve follow its own trajectory, it would return through succession to a natural homeostatic state. Even if it wasn't pristine, it would be "natural." In their masterplan pamphlet, Ecoplans, Inc. echoed what continues to be the popular sentiment: "The message and theme of Tifft Farm are that nature has prevailed."[67] "Quietly, as though working in secret, nature first began to close the wounded earth and cover it with the soft green of living plants…" In place of what Culture accomplishes for Hegel, here the work of nature closes the wound of the earth: as Ecoplans notes, "What Man Abandons, Nature Reclaims."[68] In a similar vein, Ecoplans explains in the Acknowledgement section to the masterplan,

> Primary credit goes to Nature, and her refusal to abandon an area abused and rejected by man. The Tifft Farm even today is an eloquent and powerful statement of Nature's ability to reclaim an environment abandoned by man. Because of this steady, restorative processes of nature, the Tifft Farm has advanced to a fairly high stage of ecological complexity and diversity. Already [before putting the plan into action], the Tifft Farm is an area of significant value to urban man—provided that urban man steps back and accepts a new partnership with nature.[69]

Man's role here was to "step back," and simply to let nature carry on, as though it would simply "heal itself" after being destroyed. There is an aesthetic problem here similar to pouring sand over the dunes: if it *looks* like nature, it must be a healthy ecosystem. Since trees and birds returned to Tifft, it must have returned to its former premodern successional rhythm. People mistake a novel ecology for an "original" one.

This idea of Nature as that which heals, reclaims, renews, and restores those lands that Man has put to waste was premised on the assumption of nature's adaptability: "If the Tifft Farm expresses any clear historical phenomena, it expresses the marvelous adaptability of nature and the capacity for renewal of the land even after substantial disruption and degradation of the original ecosystem."[70] In her short but comprehensive history of Tifft, written a decade after Ecoplans, in 1983, Teresa Wolfe echoes their language, stating, "Tifft Farm stands as a tribute to the adaptability and resiliency of nature. Here a viable and diverse community of plants and animals has become established where an ecosystem had been substantially disrupted."[71] This formulation that emphasizes "substantial disruption" ensures that the process happening at Tifft—just like that implied in the panel—remains within the purview of natural succession. The understanding is that disturbance—even "substantial"—is part of a natural process and that

[67] *Ibid* 2
[68] *Ibid* 3
[69] Ecoplans, Inc. (1975): 1
[70] *Ibid* 10
[71] T. Wolfe (1983): 14

nature maintains the capacity for restoring the "original ecosystem." My point here is that there was not "substantial disruption" at Tifft but ecosystemic rupture—destruction—such that, whatever novel ecology ensues, cannot be thought of as a continuation of what preceded it.

Interestingly, the issue that Tifft now has is a distinct *lack* of disturbance in the system. The adaptive management and active stewardship that guide the Tifft Steward today demand that he follow the logic of ecology and introduce disturbance back into the wetland complex. The "let Nature be" conservation approach of the 1970's and '80's led to declining biodiversity at Tifft, where cottonwood, buckthorn, and phragmites, white-tail deer, and Canada geese came to drive the dynamics of the preserve. As the Steward explained to me, Tifft is severed from all the main sources of natural disturbance that made it a dynamic ecosystem. His job as he sees it is to reintroduce strategic forms of disturbance into the system in order to increase biodiversity. The primarily way he does this is by manipulating water levels in the remnant swamp, mimicking lake level fluctuations. For him, Tifft is something closer to a model wetland—an estimation of what such a place could have looked like. He studies some of the relatively healthier wetlands in the region, like those at Beaver Island State Park on Grand Island and Iroquois National Wildlife Refuge, some thirty-five miles east of Buffalo on the site of the remnant sixth Great Lake, Lake Tonawanda. At the same time, the Steward must minimize disturbance caused by white-tailed deer, whose populations are more dense than they ever have been, given the lack of natural predation. Culling has so far been out of the question, since the general population has resisted the idea that killing deer is appropriate to a nature preserve. There is a particular group of citizen photographers who maintain a particularly strong connection to and fascination with white-tail deer; they have been outspoken opponents to any population control.

What the history of Tifft makes clear is that the land we call Tifft today used to be a wetland, and it is a wetland today, but there is no continuity between these wetlands—even the sole remnant that was never drained. The land we call Tifft today used to host an extensive dune complex and now there is a landfill whose mounds approximate the shape of the dunes. From an ecological vantage point, these formations have nothing to do with each other. There is no disturbance to which the modern formations have adapted. When considering these formations, their continuity in place only makes sense if we consider the history and geography of the region. This history is settler colonial, it is capitalist, it is modern, it is industrial, it is destructive. A natural history of destruction recognizes that the ecosystems there today reflect these forces more profoundly than the natural forces leading up to the era of destruction.

Conclusion – Forward Toward the Archaic: On the Possibility of a Geographical Anthropocene

While harnessing ecological knowledge to understand urban history, this dissertation has argued against conceiving the city as an ecosystem. It has taken issue with the organicist tendencies of interpretive and applied social science, which reduce contingent and uneven urban geographies to matters of ecology. Ecological conceptuality, I have demonstrated, often mystifies[1] settler colonial pasts and speculative climate futures in the Laurentian Great Lakes. This dissertation has been particularly concerned with the social scientific appropriation of ecological succession as a historiographical model. Such an appropriation, I argue, has been made possible through the ontologization of disturbance, especially glaring in the discourse of resilience. I have demonstrated that postindustrial urban landscapes represent a form of historical rupture that proves unassimilable to ecological conceptuality. A "natural history of destruction"—the alternative approach to postindustrial landscapes proposed here—takes this inassimilability as its object. A natural history of destruction aims to ruthlessly historicize everything "natural." It simultaneously historicizes a landscape *and* ways of knowing of that landscape, so that it does not mistake ecological truths for social ones. A natural historian of destruction aims to demystify second nature, showing how particular landscapes negate the explanatory powers of ecological concepts. That said, it may use ecology to do so. As an analytic, ecology looks to understand articulations in a landscape; it is proficient at identifying changes and transformations in those articulations. But to explain the past, present, or future of a postindustrial landscape, ecology must itself articulate with other modes of social, historical, and geographical analysis. In contemporary environmental discourse, this has largely been the purview of those studying the Anthropocene. However, a natural history of destruction sits uneasily alongside the Anthropocene as a way of seeing and understanding. In this conclusion, I would like to situate my study with relation to the Anthropocene discourse. Instead of a theoretical review of the Anthropocene and its internal debates,[2] I want to interpret a recent announcement that encapsulates the fundamental difference between my approach to landscape and that offered by the central institutional purveyors of the Anthropocene—the Anthropocene Working Group (AWG). With this, it should be possible to move toward the concept of an Anthropocene landscape.

One could consider the Anthropocene hypothesis a negation of resilience thinking, and *vice versa*. The two hold each other in a certain dialectical tension. In bringing all particularities into the operation of the ecosystem concept, resilience thinking can be considered a posthumanist framework. Humans are natural too and they do not transcend the basic laws of ecology or biology: we are never outside nature. At some level, this is true. On the other hand, the Anthropocene hypothesis claims that humans alone—however you want to define them ("capitalists" is probably better)—have definitively transformed global ecological systems: they *do* transcend ecosystems, only negatively. At some level, this is true too. If the first is of the order of ontological or biological truths, the second is a historical one. We can't have the one

[1] I follow Adorno's formulation of Marx here: "The so-called law of nature that is merely one of capitalist society, after all, is…called 'mystification." In T. Adorno (2007). *Negative Dialectics*. New York: Continuum: Adorno, T. (2007) *Negative Dialectics*. New York: Continuum: 354

[2] There are, at this point, almost too many to count. The two engagements I find most compelling and in line with the present study are: C. Bonneuil & J-B. Fressoz (2017). *The Shock of the Anthropocene*. New York & London: Verso; A. Karera (2019). "Blackness and the Pitfalls of Anthropocene Ethics." *Critical Philosophy of Race* 7(1)

truth without the other. One constitutes the other in negating it. The point regarding natural history is that humans are natural but not reducible to naturalism. To put it another way, history mediates naturalness. When one declare that they know something about nature, they also declare that they have a contingent way of knowing it. This is a basic Marxian thesis. So is this: when capitalism mediates knowledge about nature, nature is efficiently and brutally exploited. The Anthropocene hypothesis can be read as marking a definitive end to historically unmediated nature. On one hand, this is concordant with my own attempt to delineate disturbance from destruction. A statement common to climatologists like "Earth will never go back to Holocene levels…" confirms destruction. But does this planetary acknowledgement have anything to do with any particular place on Earth?

The Anthropocene has a geography problem. Stuck in geological reason, Anthropocene thinking is shrouded by the abstractions endemic to an undialectical planetary thinking. Shrunk to the size of a cue ball, the earth would be smoother than any cue ball ever machined.[3] This is the Anthropocenic earth: with the planet as a referent, it is exceedingly difficult to understand the literal and historical unevenness that characterizes particular landscapes. The Anthropocene hypothesis allows ecologists and earth system scientists to address "history" but only in the abstract; geography, but only in the abstract. From the planetary perspective, history becomes generic. It becomes something quite close to the ontological form of history—historicity. Adorno was so critical of this form because of its false mastery of contingency. All place becomes space, and geographical difference is methodologically bracketed. If the Anthropocene offers a geological and planetary approach whose broad view flattens planetary environmental crisis, a natural history of destruction, in contradistinction, marks a landscape-based analysis that highlights the incredible amount of geographical, historical, and social difference that the crisis continually reproduces. The purpose is not to dismiss the view of the Anthropocene—just as it is not to flatly dismiss those sciences which permit our knowledge of it—but to dialectically delimit its universal tendencies.

The Anthropocene's geographical problem is illuminated in the AWG's recent declaration that Crawford Lake—a small lake in Ontario just 85 miles northwest of Buffalo—should represent the start of the Anthropocene.[4] Several other places were in the running for such a status, including a peat bog in Poland, a different lake in China, the Antarctic ice sheet, and the San Francisco Bay.[5] But the AWG scientists determined that the muck at the bottom of Crawford Lake most clearly demonstrates the "golden spike," or the uptick in environmental proxies representing transformative anthropogenic activity at a planetary scale. It appears a common and unassuming place. For the purposes of my argument, the proximity of Lake Crawford to Buffalo is incredibly important, since the same historical trends shaped these two places. Of course, there are important differences too, but both of these places are products of the settler capital infrastructuralization occurring, in concert, in the lower Great Lakes. What is the logic of the AWG's declaration? Crawford Lake is limnologically peculiar. Its surface area is quite small—a mere six acres (2.4 hectares). A below average swimmer could easily splash across it. By proportion to its surface area, it is unusually deep at 79 feet (24 meters). It is a "sunken lake," formed when a limestone cavern collapsed beneath a previous lake in the same place. Its long

[3] Niel DeGrass Tyson, interview. Online: https://www.youtube.com/watch?v=hrjWzBY_dLw

[4] See: D. Carrington. "Canadian Lake Chosen to Represent Start of Anthropocene." *Guardian* 11 July 2023; S. Kaplan. "Crawford Lake shows Humans Started a New Chapter in Geologic Time, Scientists Say." *Washington Post*, 11 July 2023; A. Witze. "This Quiet Lake Could Mark the Start of new Anthropocene Epoch." *Nature* 11 July 2023

[5] N. Middleton. "The Search for the Golden Spike." *Orion Magazine*, 14 Jul 2022

cylindrical shape yields limnologically aberrant characteristics. Most notably, Lake Crawford's surface waters do not mix with its deepest waters. Thus, any sediment that falls into the lake settles in to very flat sheets of undisturbed sediment. Each summer, the warming of the lake causes calcium carbonate to precipitate out of the water, which falls to the lake bed and shows up in the core sample as a white line. So the core sample produces an extremely accurate annual calendar, making it possible to distinguish what happened in, say, 1950 versus, say, 1952. Scientists can test radioactive particulate, fossil fuel particulate, pollen, spores, and other substances that serve as proxies for various human activities—both regionally and globally.

The decision to select one such exemplary place as the representative of the Anthropocene indicates a strange idea about geography. As a microcosm of the Anthropocene, Lake Crawford is no longer a geographical entity but a symbol. As a symbol of the Anthropocene, the lake is no longer *this* lake but a metonymic device that dislocates the lake and substitutes it for a planetary process. It is, in fact, an anti-geographical declaration that can be described, after Adorno, as one that makes the destruction of the lake *identical* to that of the planet. But Lake Crawford is non-identical to the Anthropocene, and for the Anthropocene to mean anything meaningful *here*, it must encounter its negation in the particular historical destruction of Lake Crawford. The Anthropocene tends *not* to be a case of the whole being more than the sum of its parts. In use, it is often a case of "if we look from a far enough distance, we can generalize institutional and imperial histories by reifying measurable matter as proxies for those histories." I am arguing that for the Anthropocene to mean anything, it has to let Lake Crawford be Lake Crawford in all of its unevenness. If my dissertation has demonstrated anything, it is that the kind of destruction this region has experienced does not epitomize the planetarity of the Anthropocene. It is a particular instance of settler capital infrastructuralization that conditions the universalism of the Anthropocene. This does not mean the universalism of the Anthropocene is unimportant: it tells us that wherever we look on Earth, there will be a particular natural history of destruction that requires examination.

This set of tensions shows up in debates about Lake Crawford in two primary ways. The first is exemplified in a statement by the leading scientist who took the core samples from the lake. Francine McCarthy, a micropaleontologist from Brock University in St. Catharines,

Ontario, took core samples from the lake in 2019, 2022, and 2013. According an article in *Nature*, "McCarthy does not plan to collect cores at Crawford Lake again. The lake is sentient according to Indigenous groups who live or have lived in the area, and taking samples from the lake violates that personhood."[6] The article does not tell us exactly what McCarthy herself things or believes about the lake's personhood. Perhaps the reader can presume that McCarthy had some kind of conversation, epiphany, or long-lingering guilt that—now that her work is done—she can indulge. Perhaps it is an act of political solidarity. In a certain respect, it doesn't matter. What I wish to highlight here is that whatever McCarthy, or the ambiguously alluded to prior indigenous inhabitants of the area believed about the lake, those thoughts, beliefs, and feelings are geographical. They pertain to *this* lake in *this* place. This lake has a violent past and McCarthy, at some level, agrees that her core samples violenced and violated the sanctity of the lake for the sake of universal reason. Perversely, this attitude reproduces the binary logic of science vs. sentience by simply reversing it. She has not overcome the specious dualism between western scientific rationality and indigenous belief; she maintains it by merely negated it. Rather than being on the side of universal abstraction, McCarthy has decided that she will be on the side of radical particularity. McCarthy protects western scientific rationality's self-image as universal and dubiously denies the possibility that indigenous rationality contains a universal aspect. The position may or may not be preposterous or ideological, but it is not empirical. The planetary history extracted by the core samples is inseparable from, for example, the extermination of the Neutral and Huron-Wyandot Nations from this region by the British-backed Seneca and Mohawk during the Beaver Wars. The core samples even contain material elements—spore samples, fossil fuel debris, pollen, etc.—that could serve as proxies for this violence or for the centuries-long process of infrastructuralization that transformed western Ontario into the most populous region of Canada. The idea that once the science is done, the lake should rest in its sentience may or may not be disingenuous. But it is epistemologically skewed toward an empiricism that prioritizes geological abstraction at the expense of geographical contingency.

This pertains directly to the debate over the timeline of the Anthropocene. After considerable debate, the AWG has come to the determination that the Anthropocene begins with the nuclear era, indexed in the core samples as traces of radioactive plutonium from atmospheric nuclear bomb testing. This means that the beginning of the Anthropocene will have begun—almost comically—in either 1950 or 1952. The Red River Métis scholar, Zoe Todd, is quoted in the *Nature* article, saying "For Indigenous and other displaced and dispossessed peoples who were impacted by massive forms of violence that characterize the last 600 years, everything that leads up to what makes this global shift possible starts much earlier."[7] Todd suggests that for exterminated, displaced, and dispossessed cultures, the Anthropocene has come and gone: their worlds have been destroyed. My dissertation is in part an attempt to indicate the ruptural quality of this historical destruction. If we follow this reading, what the Anthropocene indicates is a concern not so much for the end of "life itself" but for the end of bourgeois culture, which—quite literally—cannot conceptualize a life beyond its meaning. The triumphal return of high modernism in the form of geoengineering is just one sign of bourgeois culture doubling down on itself.

This ideological quality of the debate over the very logic of a golden spike is further evident in the prompt resignation from the AWG of one of the stalwart defenders of the Anthropocene concept, Earl Ellis. Ellis, an environmental scientist, has been an important voice

[6] Witze (2023)

[7] Quoted in Witze (2023)

in the Anthropocene debates, even penning *A Very Short Introduction to the Anthropocene* for the Oxford Press series of popular pamphlets.[8] In his resignation letter,[9] Ellis indicates that since the mid-2010's the AWG coalesced around the nuclear timeline and began politicking out those members who disagreed with the position. At that time, the AWG began to "promote one single narrow perspective." There was "no room for dissent." Without using the word, Ellis calls the decision is ideological. It is, he notes, "no longer possible to avoid the reality that narrowly defining the Anthropocene in the way AWG has chosen to do has become more than a scholarly concern. The AWG's choice to systematically ignore overwhelming evidence of Earth's long-term anthropogenic transformation is not just bad science, it's bad for public understanding…" Clarifying, he notes,

> To define the Anthropocene as a shallow band of sediment in a single lake is an esoteric academic matter. But dividing the Earth's human transformation into two parts, pre- and post-1950, does real damage by denying the deeper history and the ultimate causes of Earth's unfolding social-environmental crisis. Are the planetary changes wrought by industrial and colonial nations before 1950 not significant enough to transform the planet? The political ramifications of such a misleading and scientifically inaccurate portrayal are clearly profound and regressive.

Ellis's statement and resignation stand out for identifying that the AWG's Anthropocene mystifies its political content by establishing a clear quantitative scientific-seeming delineation. This points to the regressive implication that Western culture may have produced the crisis but it is also the only one proper to addressing it: for the AWG, the West must be saved. While my dissertation strongly defends the fact that changes wrought by industrialization and colonialism *are* significant enough to transform the planet, I am at odds with Ellis's implication in the first sentence of the passage. Defining the Anthropocene as a shallow band of sediment in a single lake is not, in my reading, an esoteric academic matter. In fact, it summarizes the very issue that Ellis has with locating its origins in the 1950. The issues is that defining the Anthropocene through this band of lake sediment is anti-geographical. If, on the other hand, the object of study is Lake Crawford *qua* landscape, there becomes little choice but to contend with precisely the histories that Ellis blames the misconstrued timeline for bracketing. My argument is that the Anthropocene resides in and through landscapes, which reflect, in Ellis's words, "the deeper history and ultimate causes of Earth's unfolding social-environmental crisis."

What seems apparent to me is that there needs to be an approach that is richly empirical and capable of holding together negating tendencies. When, in the context of a natural history of destruction, I speak of an Anthropocene landscape, this is what I have in mind. I intend "Anthropocene landscape" to be a contradiction in terms, itself a negative dialectic between geological and geographical tendencies of thought. Conceptually, Anthropocene and landscape repel but require each other. Many of the processes and institutions that shape landscape histories are exogenous forces; they are marked and molded by technologically-mediated capitalism, colonialism, racial and gendered difference. One needs an understanding of the forces of planetary destruction capable of mediating the particularity of the landscape. In concept, the Anthropocene has the power to represent the co-articulation of these forces. It represents or

[8] E. Ellis (2018). *A Very Short Introduction to the Anthropocene*. Oxford: Oxford University Press

[9] E. Ellis (2023). "Why I Resigned from the Anthropocene Working Group." Letter to the AWG. Online: https://anthroecology.org/why-i-resigned-from-the-anthropocene-working-group/

reflects the processes of destruction at a planetary level. But how does it do this? The Anthropocene requires abstraction to the level of earth history. To account for socio-ecological forces on a planetary level, the Anthropocene seeks measurable proxies for these forces. The amount of carbon dioxide in the air stands in as proxy for the political economy of fossil fuel production and consumption, for example. Without any further analysis, the proxy becomes reified as the problem itself: if we simply get the carbon count right, we will have solved global warming. The Anthropocene discourse readily traffics in such fetishisms and risks becoming a force for techno-managerial governance as a result. From the perspective of a natural history of destruction, one comes to the Anthropocene through landscape history. If the Anthropocene abstracts, landscape differentiates. All of those planetary processes and forces come up against myriad resistances emerging endogenously from a places contingent history and geography. From the point of view of a natural history of destruction, what makes the Anthropocene a viable concept is that one could go anywhere on earth and discover destroyed nature *there*. Lake Crawford is everywhere and only there. Starting from there, the Anthropocene concept comes to reflect a highly differentiated, contingent, political planetary destruction.

The general belief is that there is much at stake here. As Bonneuil and Fressoz argue, "The challenges of the Anthropocene demand a differentiated view of humanity, not just for the sake of historical truth, or to assess the responsibilities of the past, but also to pursue future policies that are more effective and more just…"[10] One Stanford scientist and representative from the AWG agrees that future governance is at stake: "Earth will never go back to Holocene levels, but what we don't know is where it's going to settle out. We yet have agency to drive which direction we go."[11] Or, for Jürgen Renn, director of the Max Planck Institute for the History of Science in Berlin, which supported the AWG's research: "We have to address [the Anthropocene] as a phenomenon that is multiply connected. And we have to make an effort to understand it and adapt our societies accordingly."[12] The Anthropocene, in other words, demands concerted action: politics. And earth system science may not actually be able to determine those politics, but it can discursively frame our perception of where politics need to head and what they need to do. Along with Bonnuil and Fressoz, Ellis's concern is that defining the Anthropocene as a nuclear age phenomenon points us toward a form of governance—an exceptionally ecologically-minded one—that treats the Anthropocene as a technical issue that must be managed without regard to the problem of justice. This form of governance looks to secure the earth as a technical exploitable object for a resilient capitalism—liberal or not. Burdened and joyed by the particularity of the landscape, a natural history of destruction generates a different—uncanny—perspective. Through its lens, one is always home and alienated from one's home: one grieves the death of a landscape and reveres the strange forms of life that persist in it. Part of the paradox that this perspective is that one maintains an eye for transformation. One is still a speculator, looking for ways to make a place more habitable to less urbane lifeforms. One remains, in this sense, condemned to the higher form—always looking to transform the landscape not "back" but forward toward the archaic.

[10] Bonneuil & Fressoz (2017): 71
[11] Middleton (2022)
[12] Kaplan (2023)

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