Spring 2018

Knowing Water: Science and the Politics of Knowledge Production along the Saw Kill

Carlo Diego Raimondo
Bard College

Knowing Water: Science and the Politics of Knowledge Production along the Saw Kill

Senior Project Submitted to
the Division of Social Studies
of Bard College

By Carlo Raimondo

Annadale-on-Hudson, New York
May 2018

Dedicated to Elias Dueker and the rest of the Bard Water Lab

Acknowledegements

To my academic advisor, Yuka Suzuki, who braved the tumultuous waves of my writing, providing an incommensurable amounts of guidance and insight to this project. In entertaining my theorhetical tangents, challenging my overexuburant use of jargonistic language, and finding value in my voice, I am extremely greatful. Thank you for guiding me these last three years at Bard, I cannot imagine how different my life would have been had I not taken 'Intro' with you.

To Laura Kunruether, for pushing me in class and introducing me challenging theories that I would have never pursued myself. Out of all my professor's at Bard you were the one that pushed me to articulate myself as best I could. Thank you for introducing me to the invisible Ratu Kidul and the ever perplexing cyborg, I will hold them close to me as I continue on.

To Michele Dominy, for always showing interest in my work and pursuits outside of class. In my short carreer as student of anthropology, you have taught me to go beyond anthropological literature and find inspiration in the outside world.

To Eli Dueker, for essentially enabling this project, your openess and willing to enage with me is something I wish to embody as leave Bard. Thank you for teaching me that science is for everyone, or at least it should be. Your lessons in and outside of the classroom have been invaluable both to my ethnographic positioning and to my own development as a student and community member.

To Jonah Rubin, thank you for giving me the ethnographic techniques to take on the challenge of senior project, without them I would have never been able to approach this project.

To my Bard Water Lab friends, I will miss those monthly chats we had while processing samples and listening to the Dixie Chicks, I will definetly return to the lab soon!

To my fellow advisee group, Indy, Belmy, and Avalon, the laughs and kind smiles as we passed eachother on Campus. Your critiques and suggestions were undeniably helpful in writing this project, and I cannot thank you enough.

To Deldar, thank you for all your wisdom and love. For teaching that is was okay to be vulnerable but not lose site of my security. Thank you for the late hour phone calls and kline conversations, you are amazing human being and I look forward to reading your senior project next year.

To Emma and Riley, thank you for delighting in my sleepless delirium, for raging about those who shall not be named, and for reigning me in when I went down into my daily theorhetical rabbit holes.

To Olivia, for subtle winks and laughter, your relentless work ethic and your passion inspire me everyday.

To Zoe, my Tivoli Pie partner, thank you for listening to my weekend rants and coming to my room every morning, seeing your smile always brightened up my day.

To Inga, my cat-eyed sea witch, for checking in on me when I was lost in the intellectual perils of this project.

To Shahong, I will miss not having your dry wit around, I will try and channel your hustling ways as I go out into the world.

To Stella, my tiny sultry angel, your kindness knows no bounds and I will miss not hearing your giggle fill the air.

To Sarah, aka Swallock, thank you for all the dance parties, movie nights, massage trains, raunchy jokes, and packy. I hope you know I will be living under your bed next year

Now when I had mastered the language of this water and had come to know every trifling feature that bordered the great river as familiarly as I knew the letters of the alphabet, I had made a valuable acquisition. But I had lost something, too. I had lost something which could never be restored to me while I lived. All the grace, the beauty, the poetry, had gone out of the majestic river!..... I stood like one bewitched. I drank it in, in a speechless rapture. The world was new to me and I had never seen anything like this at home. But as I have said, a day came when I began to cease from noting the glories and the charms which the moon and the sun and the twilight wrought upon the river's face; another day came when I ceased altogether to note them…. No, the romance and beauty were all gone from the river. All the value any feature of it had for me now was the amount of usefulness it could furnish toward compassing the safe piloting of a steamboat.

- Mark Twain, Exerpt from *Life on the Mississipi,* Two Ways of Looking at a River. (1883)

Navigation

Introduction:
Emergence

Showers and Streams

My introduction to the Bard Water Lab (BWL), an environmental monitoring collective observing water quality on the Saw Kill, began many months before I was actually introduced to the collective, and years before I considered it a potential field site for my senior thesis. It all began on the last days of my post-high school summer, August 11th, the day all incoming freshman at Bard College were required to report to the then humid Annandale-On-Hudson campus for the renowned Summer Writing Program, Language and Thinking (L&T). A miasma of humidity and mosquitoes drowned the campus the first days, a condition only exacerbated by the air condition-less dorm that housed me my first year. One option was to open the windows, to let in a somewhat ineffectual night breeze, and with it, pesky mosquitoes. There were screens, but our insect assaulters were driven and in a feasting frenzy.

The other option lay just down the hall to the left, the glorious shower, which spewed out cold water, washing away the adhesive-like sweat that glued arms to hips, hair to neck, left calf to right shin. Letting it envelop me, protect me from the looming humidity that I suddenly, once again, was oblivious to. A magical substance conjured from some seemingly faraway place, which was actually so very near, this water became my salvation. Traversing a network of subterranean pipes webbing culture, walls of filters, and diverse materialization of water, from freezing shower jets to constructed koi ponds, all can be followed back it's more natural course: the Saw Kill. As the source of all water on campus, aside from commercially bottled water, the

liquid jetting out of the showerhead was in many ways unrecognizable from the coursing splendor that I would soon immerse myself in both physically and academically.

The hyper-chlorination that cleaned water so that it could clean me dried my skin over the period of summer. Such purifications mark an abstraction of water out of its landscape, not just physically but compositionally, a moment where invisible microbes and dissolved 'muck' were filtered away. And yet, in its chlorinated glory, this water washed away the sweat, oils, and soap that signified my own presence within the humid summer landscapes of a Hudson River Valley. This epidermal cleansing was symbolic of my initial submerging into the Saw Kill, not yet aware of it but completely contingent on it for survival, it took that summer 'stickiness' back with it.

I would soon follow that water, if only figuratively, back to the Saw Kill, where cool water would soon envelop me once again. Providing shelter from the blaring heat of the summer, it became a place of relaxation and play, as we climbed up the waterfall, dived off rocks, and swam under the protective shade of Hemlocks. The Saw Kill once again took something from me, washing me, welcoming my dirt and sweat into its currents, but unlike that initial submerging, this one marked by something gained: the contextual 'ground,' for my social and academic development at Bard. And as ironic as it may be to understand an incarnation of water, like a stream, as the literal and metaphorical grounding of my development at Bard, there is also potency in this irony. 'Ground,' however you may take it (symbolically, physically, metaphorically, ideologically, etc.) represents the base of something—be it body, political movement, or in my case, evolutionary process—a structure to stand on, to belong on. Standing on water is no easy task, and messianic miracles aside, is quite frankly impossible. Attempting to

'stand on water' has, thus, lead me to the invigorating yet slightly overwhelming experience of standing in water.

Classrooms and Communities

Eli Dueker, a microbiologist, Bard Professor, and founder of the Bard Water Lab would mark my formal introduction to the Saw Kill that same year in EUS 101.[1] While the Bard Water Lab had yet to be developed, Eli's class was saturated with the interests that served as the foundation of the monitoring collective. I remember vividly the first day we all shuffled into a classroom in RKC, and Eli started the class with the question, "what communities are you a part of?" An odd question to preface what was supposed to be a class covering basic environmental science; it marked the beginning of my indoctrination into a community-making project that would then become the Bard Water Lab. Most of us, I believe, were tentative in acknowledging what community we had just become a part of (Bard College), or maybe we were not yet accustomed to thinking about this foreign environment as a community at all. Even so, this class set out to make us realize what communities we were newly part of, whether we intended to actively place roots or not, particularly through the required community events we needed participate in. This assignment was designed to highlight our membership within an environmental community that superseded any mythical social cage that was the all-powerful 'Bard Bubble'.[2]

[1] 'EUS' is an acronym used in place of the Environmental and Urban Studies Department at Bard College.
[2] The "Bard Bubble" is an effect of isolation felt most prominently amongst students who live on Bard's Campus. It refers in particular to a social alienation where students, as temporary tenants of the area, are detached from the local political landscapes. This effect can be partially attributed to the spatial placement of Bard Campus, falling equidistantly between the two closest towns: Tivoli and Red Hook. As a result, there is a lack of social integration on the part that Bard campus as it manifests as its own place, rather than spawning off of an established municipality. The isolation is jokingly referred to by Bard Students as the "Bard Bubble," in a sort of self-deprecating way, an acknowledgment that is formed as both a self-critique and a reinforcement of such isolations.

In tandem with community oriented thinking, the class was dedicated to learning how to retool science in an effort to make it more accessible to everyone. Reading Rachel Carson's *The Sea Around Us* and *Silent Spring,* we analyzed both the content of Carson's writing and the manner through which she articulated issues like the effects of Dichlorodiphenyltrichloroethane, or more commonly recognized as DDT, on birds. Rachel Carson provided insight into a field she herself was excluded from, and in recognizing that, we explored the ways that accessibility to science enabled the realization of an environmental community through fostered conversation. In light of the 'bubble' as a socio-spatial imaginary utilized with the explicit intention of alienating Bard from surrounding communities, Eli's mentality was in direct confrontation of this, utilizing concept of a localized environment, to establish connection. The 'environment' provided the grounds through which Eli established connection between two different types of communities, the Bard community and the outside world, something that would manifest clearly in the coming years. The following fall semester became the beginning of my actual involvement in the program, when my enrollment in Eli's two-credit lab class introduced me to the Water Lab, both of which took place in Bard's Field Station.[3] The class was really an extension of the lab in many ways, a place where initial methodologies could be simulated and fine-tuned. Most of us participated during the real sampling events that happened once a month on every second Friday as part of our community engagement for the class.

Neuro-Labs and Numbers

The final episode that lead me to my field site was a moment completely separate from the Saw Kill or the BWL. Following my freshman year at Bard, I decided to accept an internship offered to me at the Feinstein Institute for Medical Research (FIMR), a place where I found myself

[3] Located at the mouth of the Saw Kill, the Field Station housed the Bard water Lab until the months before I started my fieldwork. This is also the building that houses Hudsonia, a local NGO interested in preserving the "ecological heritage" of the Hudson River Valley. (http://hudsonia.org/)

immersed within the complex world of the Laboratory of Immune and Neural Networks (LINN). As a newfound student of social sciences, my work with Eli lead me to believe that I had a rare yet thorough introduction into a world of lab science for student who did not intend to pursue such fields outside of school. LINN, however, was in a league of its own, a world that I was completely alien to. While BWL had standard requirements that needed to be met before you could participate as part of lab, LINN was like a fortress, both through the procedural steps required to gain clearance and in its physical architecture. I myself was only granted access following an extensive amount of training and a background check. Such necessities revealed a more extreme, perhaps 'truer' manifestation of the lab, where access was governed by the expertise held. In many respects my life in this lab was attenuated due to the lack of a useful skill set, to the extent that I could not perform the tasks that the lab was utilized for: surgery and monitoring subjects. Instead, I spent my time handling mice, a practice that was conveyed as a therapeutic experience for them; and building mazes, which in many ways was associated with the looming violence of animal experimentation.

Such tasks, and as a result, the lab itself, were not demanding of my time. In that respect, I was better suited for a more methodical task of data analysis, where strict regulations on expertise were not monitored. I, therefore, spent most of my summer in a windowless office staring at spreadsheets overflowing with data, tracking the synapsis activity in mouse brains. Such extensive, seemingly limitless, sprawls of numbers, which tracked brain activity on a metric of nanoseconds, provided me with a realization of the true capacity of labs. In staring at numbers that were completely meaningless to me, I became aware of the lab's power of abstraction. Here was a power essential to authority of the Lab as an institution, and producer of knowledge, one that justified an extreme translation of the phenomenological processes of brain

activity into numbers. Here was a moment I felt and responded to the potency of hegemony, where I, regardless of extreme ignorance, found value and understanding in a task I conducted, but lacked the knowledge to know why it mattered. In retrospect, it was quite clear that such a task lacked a particular sensitivity that working in the lab mandated and was assigned to me for that reason. In light of these realizations, my relationship to, and understanding of, the Bard Water Lab as a scientific collective, needed to be interrogated.

The Submergence

The convergence of these life episodes is then the constitutive surface that they provide for the narrative development of my ethnographic process. The first demonstrates an initial introduction to a stream that I, Bard campus residents, those beyond, become beholden to. The second, a more formalized introduction to the stream acquired through my encounters with a resident scientist, marks a process where I am taught how to both utilize the Saw Kill as a form of community building and, perhaps contrastingly, community realization. The third marks an explicit introduction to science—as methodological approach to, ideological understanding of, and hegemonic model for—the world. A realization that has made seemingly recognizable and understandable behaviors, like that of monitoring water quality, unfamiliar rituals of knowledge production.

On an ethnographic level, this project is an exploration of the Bard Water Lab (BWL) as an environmentally oriented project concerned with water quality along the Saw Kill stream. More specifically, it explores the social context and subsequent emergence of the scientific methodology, as evocation of the systematic construction of knowledge science participates it. Within a systematizing of knowledge, I explore and analyze the different materializations of methodology, am it imposed spatial organizations or scientific equipment. In this recognition,

this project becomes an exploration of the material systems of scientific methodology as a means through which BWL contends with the complex materiality of their subject: Water. Nonetheless, BWL is not just concerned with water, but a localized 'natural' manifestation.

As environmental initiative, BWL's monitoring of the Saw Kill is then an invitation to analyze how the 'environment,' as a domain, becomes a subject reserved for scientific expertise. This project, is then not only concerned with how science arbitrates authoritative knowledge, but how it comes to be an authority over the environment. BWL provides a great opportunity to interrogate a hegemonic natural science. As an initiative that utilizes both divergent scientific domains (field and lab), and relies on different types of producers, (formally trained scientist and volunteering citizen) to navigate these domains, BWL is in many ways a recombinant mutation of different modes of natural science, which once together, provide a microcosm through which science can be explored broadly.

On a theoretical level, this project is then, first and foremost, ethnography of science, or at least an undergraduate students best attempt at such. In recognizing the oceanic expansiveness of science as literary and intellectual domain, and in light of my own limitations, this project is responding primarily to its application, that is, 'science as practice' and 'practiced science'. This does not imply that the project remains ignorant of the much broader and intellectually overwhelming interrogations of science as a realm of knowledge, method of universalization, and global authority, but rather, that those topics can be explored through examples of its practice, like with BWL. 'Science as practice' provides the theoretical moment where a broader, often unapproachable, and globalized enterprise of Science can be territorialized. The project is then interrogating science as a ways of knowing, one predicated in an explicit curiosity, that is, the need to systematically understand and order the world. A purpose of this project is to inspire

critical thought and reflection on the practice of science, specifically, in order to interrogate the processes through which scientific knowledge are produced.

Following Water: A Methodological Divining Rod for Ethnographic Research

I conducted my initial ethnographic during the summer months of 2017 as an intern for Eli and the BWL. I was able to also conduct less intensive fieldwork for the following seven months due to my continued immersion in my field sites, and with it a continued proximity to my informants. Taking a participant observation approach to my direct work with the BWL, I was introduced to a collective where participation implied full immersion. My involvement with BWL ranged from preparing materials for the sampling events, as well as the extended participation in all phases of the event itself.

Such tasks, however, were few and far between, prompting me to search for other locations to conduct fieldwork. Participant observation then became a tactic to not only engage with Eli and the BWL, but also with the Saw Kill landscape itself. Moreover, in light of Eli's community-oriented philosophy, immersing myself into the Saw Kill as a socio-political landscape teeming with convergence and the reorientation of social discrepancy was also key to my ethnographic research. In other words, in accepting my role as a member of a multispecies collective that was the Saw Kill, I became a contributing voice amongst the cacophonous collective. My very identity as researcher, for both BWL and my own academic pursuits, gave me my in, and in many ways made me a legible community member amongst more permanent residents of the area. Integration, however, was not strictly about getting political and participating in community event. Integrating myself recreationally through swimming and walks along its bank, also served as an illuminating ethnographic practice. More specifically, in contrasting political and recreational involvement in the stream, it became clear that they were

two of a kind, in which political involvement, like with water quality monitoring, could be recreational and recreational swimming could be explicitly political. Integration then allowed me to follow multiple ideological currents, transpiring on top of physical currents, to varying places, moments, and interactions. By participating in the landscape, I gained access to an already fostered collection of communities participating in constant communication, allowing me to participate in events and opportunities not explicitly connected to the BWL.

In addition to participant observation, I also conducted research with individuals of seemingly varying allegiances. Once again, I relied on the practice of 'following water' as a way of meeting the Saw Kill's many subjects. Interviewees included founding members of the BWL, concerned citizens, resident scientists, and more. Interviews themselves ran for about thirty minutes. Structured informally, most were held as conversations between my interviewees and I. Regarding my constituents, most did not care whether their identities were hidden. Despite lacking the imperative to do so, all of my interlocutors are referred to in this project by pseudonyms, unless of course, their identities cannot be disguised.[4] Those whose identities are shared have given me explicit permission to do so.

Chapter 1 revolves around water as a material and medium. Contextualizing how water is considered and contended with along the Saw Kill, I explore a particular scenario where water emerges as resource. As a sort of hegemonic strain of water, the chapter explores how 'water as resource' is universalized, and how such processes play a role in the construction and recognition of our current geological era. Analyzing how such constructions inform notions of water scarcity, the chapter then segues into a historical contextualization of the Saw Kill as subject to

[4] (e.g Eli Dueker is commonly recognized as the founding figure of the Bard Water Lab, therefore, anonymity is a close to impossible guarantee)

conservation paradigms. Noting how this history has a very contemporary effect on the stream, this chapter concludes with a brief introduction to the BWL and the SKMP.

Chapter 2 is a brief but in depth introduction of the Lab-Field dichotomy and the particular knowledge making politics that accompany these deliberate socio spatial alienations. More specifically, the chapter explores a brief genealogy of the lab and field, understanding how both become indebted to the other as the constitutive domains of a contemporary landscape of scientific knowledge production. Following the particular socio spatial relationships between them, it uses BWL and its sampling event as an instance where there is movement between domains, to in turn complicate their dichotomous orientation through notions of borderlands.

Aligning with the chronology of the sampling event, Chapter 3, explores the particularities of 'the field' that is conjured by the SKMP, through the monitoring of water quality along the Saw Kill. More specifically, I follow the methodological practices through which field scientist arbitrate their knowledge of an imagined field, specifically through the lens of a site sheet. Analyzing how the site sheet operates as a sensorial apparatus of the Lab through which the field is made legible, this chapter explores the hybrid behaviors of samplers and how they complicate strict notions of the Lab-Field divide. The chapter then concludes with an analysis of the physical act of extraction, and the collateral effects that the site sheet has on collected samples.

Chapter 4 shifts the focus to the lab, where it relies on three objects to anchor the analysis: (1) the sample bottle, (2) the quanti-tray, and (3) the spreadsheet. Focusing primarily on the assay detecting Fecal Indicator Bacteria (FIB), I follow how protocol helps reify the architecture of both the lab and the field as polarized producers of scientific knowledge. The sample bottle and quanti-tray then become a means through which the lab contends with not only

subject heterogeneity, specifically within an unpredictable materiality like water and more specifically, the ways in which water is constructed as homogenous. The spreadsheet, then represents a curated culmination of collected data, and in turn, sheds light on how the Lab constructs itself as placeless.

Chapter 1:
What is Water?

Figure 1: Tivoli Bays

Looking out over South Tivoli bays all is seemingly still and quiet. The beginnings of fall have finally made their appearances along the Saw Kill as the loud vibrancy of summer life present just weeks if not days before, has begun to dim ever so slightly. The change isn't drastic

but definitely noticeable as rust colored leaves descend from the sky, collecting on the rocks, bed, and banks of the stream. No longer shading the stream, sunlight darts past the barren twigs, branches, and limbs of trees to the waters below. Descending, unperturbed, the light penetrates through the surface water into the three foot depths, illuminating the rocky topography with fallen branches and the occasional brick mixed in. Despite this slight illumination, one's priviness to subsurface happenings is limited at best. A crayfish darts in and out of sight, hiding itself within the crevices of the stream bed as I approach the water. Stillness re-emerges beneath the surface, the actuality of its flux only gleamed from the surface water movement. The slight chaotic ripples of surface water that contrast the invisible motion transpiring right beneath it are difficult to make sense of. Only foam, leaves, and tennis balls let us, very literally, catch glimpse of what's happening, serving as a visual marker for the qualities of flow. Thus, it is these buoyant materials that expose flow for the unconformity that it is, and in demonstrating this variance, we address the conversation between surface waters itself, and that which flows beneath it.

The change in season marks an increase in fallen leaves in the stream, they bob and bounce with the surface water, twirling in circles, sailing from one end of the channel to the other, only to flow back across as they continue down the stream. Some join the collection of rocks, sticks, and assorted foundational materials strewn across the stream bed. Others collect on the banks, the adjacent tree roots, and protruding rocks forming dams of condensed muddy leaves that alter the direction and speed of stream water from the previous day, only to be washed away in the next precipitation event. The leaves that manage to stay afloat are swept away by the stream's currents, disappearing out of sight and immediate relevance into the mysterious and ostensibly distant waters of South Tivoli Bays.

A single heron is perched upstream by the waterfall, its white feathers making it almost invisible within a backdrop of highly mobile whitewater. Its beak pierces into the water, perhaps for a tessellated darter or maybe a cutlip minnow. As soon as it becomes keen of our presence it takes flight, gliding through the trees off into the refuge of the Tivoli Bays, where it can hunt without disturbance. Moving closer upstream, the physical orientation of the stream corridor undergoes a drastic transformation. Below the cascading water, the stream runs wider and shallower as a relatively rocky streambed transforms into larger slabs of stone. It is shallow enough that you can see the grooves cut by years of water running over that rock and stone. Iridescent yellow-green acorns collect in these grooves and pockets, their oval shape warped and mis-magnified by moving water. These carvings act an indicator for how water moved in the past. At the stream's edge, easily accessible banks rise into high reaching stone faces on either side creating a pronounced aisle that water moves through, an appropriate thought in light of the term 'stream corridor' which was utilized consistently to define the physical and ecological arrangement of the Saw Kill and the surrounding physical environment. The stream is then, suddenly, split into two channels by a small island populated sparsely by trees, both standing and fallen; plants beyond my knowledge most notably a strip of dry grass near a sampling site; and a stone fire pit with matching stone benches at the western point of the island. And while I have never seen it used, I am constantly greeted by the presence of freshly burned wood and the occasional empty beer bottle, a reminder that despite being off the road, people, for whatever their reason, still find their way to the stream.

Turning back to Tivoli Bays, the channel on the right is wider, deeper, a visually more active section of the stream. On the left side, resides much slower moving water, trickling slowly through a thin channel. Far more rugged and rocky, the left channel connects the island to the

'mainland' through a pair of man-made stone bridges.[5] The water is high today, extremely high for the left channel, so high that the first bridge remains submerged beneath a coat of vibrant green duckweed and dead leaves, a layer so dense that it hides the liquid state of what lies beneath it. Looking across to the mouth of the stream, where the right channel feeds into the Bays, there is a similarly dense island of the same Duckweed that is unwavering despite a constant flow of water that would carry it further into the bays. In this moment the Saw Kill is met with a resistant movement of water, most visually present in the left channel—it is high tide in Tivoli South Bays. Suddenly the Hudson River's proximity becomes more apparent despite being visibly hidden, from my vantage point, by train tracks that run along the west side of Tivoli South bays. They serve as the boundary and convergence point between the Hudson River and the Saw Kill, a relationship that makes this special stream a tributary of the Hudson River and susceptible to the influence of the Atlantic Ocean.

Figure 2: The Mat of Duckweed

[5] 'Mainland' is in reference to the side of the SawKill that is part Bard College's Campus.

Water is Life : Water as Resource

"Water is Life. Bard is Under A Drought Watch. Conserve Water" reads the laminated sign taped to the bathroom mirror, as I washed my hands that summer. The sign, which hangs in almost every bathroom at Bard, situates the campus and its students in the contemporary geophysical era recognized popularly as the anthropocene. Such environmental conditions are especially concerning for Bard College, which is only one of many constituencies that rely on the Saw Kill Watershed in some way or another. As the main source of water on Bard Campus, the Saw Kill (stream) also serves as a receptacle for all of campus's treated waste. Evidently the Saw Kill is a major actor in the daily workings of Bard and as an ecologically imperative feature of the local area it helps sustain the landscape in its current form. The presence of drought is, thus, very alarming within such a water reliant environment such as this one. And yet, what is more concerning than the drought, is that it does not exist, at least not anymore. The signs, which were posted in bathrooms across campus, came about in response to drought conditions that manifested in late Spring of 2016, a condition that continued until the Fall of the same year. I myself became aware of this meteorological affliction from my Environmental and Urban Studies (EUS) 102 class, where we drew possible connections between the drought conditions and the most recent El Niño. Flash forward to the Summer of 2017, while I am in the midst of my fieldwork, and I see that these signs still hang on the bathroom mirror. I cannot say for certain why these signs were left, perhaps out of a desire to inspire consvering mentality or maybe because they were simply forgotten about after the drought dissipated, nonetheless, they provide great insight into how the Saw Kill is positioned within a 21st century environment.

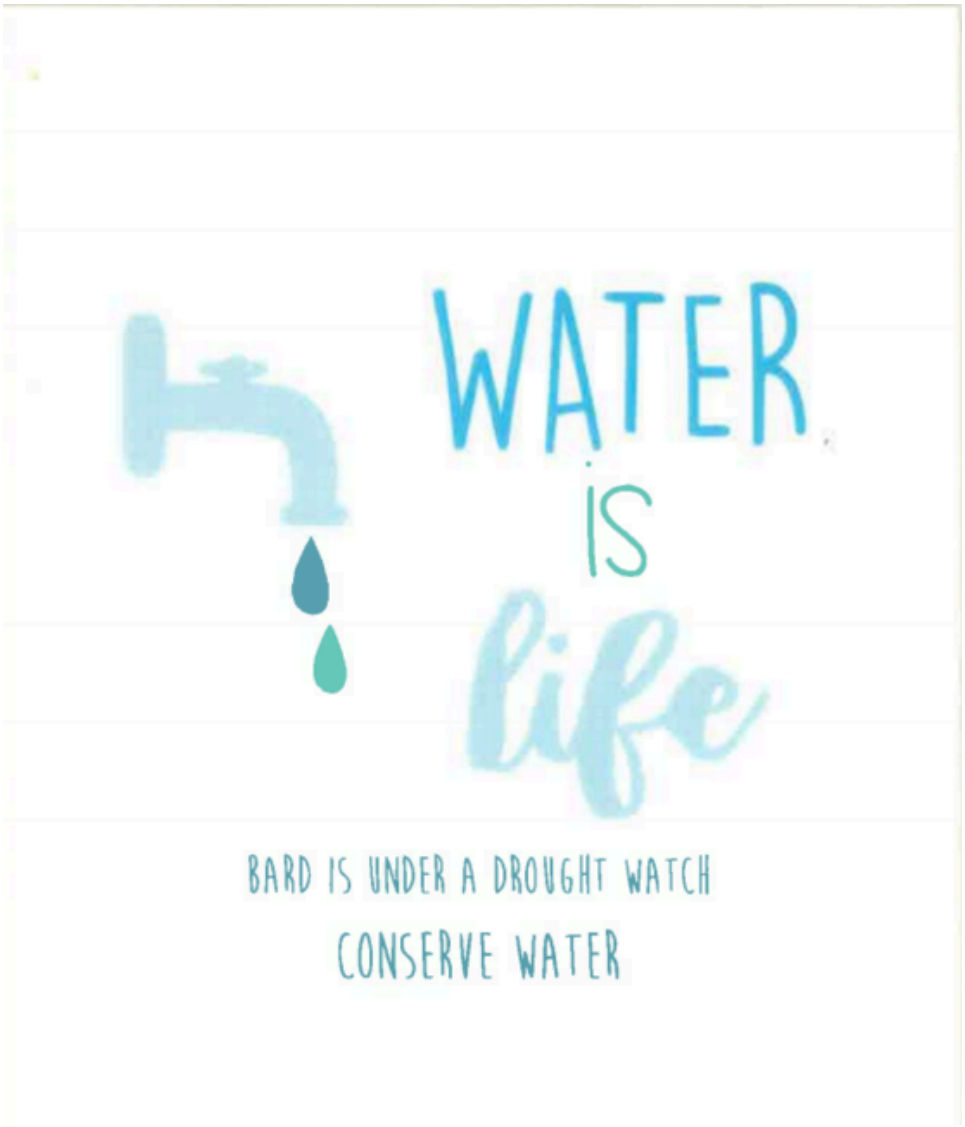


Figure 3: "Water Is Life" found in most bathrooms at Bard College

As we continue on into what is most commonly recognized as the Anthropocene, 'nature' is no longer a sociocultural background with which human life transpires. Rather. It has become an entity defined both physically and nominally by people. With regards to water, we are entering an age of scarcity in which resources available are dwindling as populations skyrocket. As geographer Jeremy J. Schmidt noted, by the mid 1990's, humans started consuming nearly half of the planets yearly available fresh water (Schmidt 2017: 2). With prominent examples like the Colorado or Indus rivers, which are drying up before they reach the ocean, it is becoming

clear that the watercourses of the world cannot sustain the current consumption rates of modern capitalism. We see with the depletion of groundwater, where the rate of consumption far exceeds the rate of recharge, as caches of water, stockpiled over hundreds years, are diminished within a fraction of that time. 'Normal water', a program that Schmidt recognizes as bringing water's social and evolutionary possibilities into the service of (Neo)liberal forms of life, then manifest and is maintained through the objectification of liquid substance that is then processed into material resource.[6] Done so through bringing water under a single guise, in this case a resource. Schmidt uses the concept to discuss the philosophy of water management, in which water requires monitoring in light of a historic lack thereof. Even so, many question whether the elusive liquid that can barely be grasped, so fluid that it does not stay a liquid, can be managed at all (Schmidt 2017: 3). From the narrative of normal water emerge three conclusions about the material: that it was once abundant, has become scarce, and through such scarcity has become a issue of security, human development, and planetary health (Schmidt 2017: 41).

Returning to the sign, and how it posits the stream it is trying to conserve, we see here an interesting connection to Schmidt's exploration of water and global water management, in which, water is ontologically scarce. The question that needs to be asked here, then, is what exactly is water, and how does that fit within a model of scarcity? Schmidt, through the means of James Scott, sees manageable water as an extension of 'high modernism.' Scott uses the terms, in reference to the,

> supreme self confidence about continued linear progress, the development of scientific and technical knowledge, and the rational design of social order, the growing satisfaction of human needs, and, not least, an increasing control over nature (Scott 1998: 89).

[6] Schmidt made the explicit choice not to use the term 'neoliberal' using just 'liberal' in its stead. Nonetheless, his reasoning was not clear, nor was is his clarification that 'liberal' was being used in such a way made until much later in his book.

As water, which is recognized component of a constructed nature, becomes organized through the institutional forces of science and technology, it is subject to what philosopher Michel Foucault calls 'governmentality.' As described by anthropologist, Arturo Escobar, 'governmentality' is a "modern phenomenon where vast domains of daily life are appropriated, processed, and transformed by expert knowledge and the administrative apparatuses of the state" (Escobar 1999: 6). Thus, not only does science and technology form the guiding powers that then place the chaotic and unrefined materialities of water into a contained category, but then privileges scientific expertise as the proprietor of it, as something to be known. The label 'resource,' then, marks a categorization through which water is unified as an inherently quantifiable material that can be extracted from, and through such relationships, unifies water as a singular entity operating on a global scale. While defining water as a resource implies the nominal diffusion throughout material water, solutionization of that identity, is not complete**.**

Like the discrepancies drawn between surface and subsurface waters, as conceptual partitioning that experiences tangible ramifications, the term 'resource' is the thin film that flows on top of the complexities of the subsurface. On the visual and the ontological level, surface water serves as the membrane that marks the boundary between the outside world and the depths below. It is, very literally, the lens through which one sees into the stream—as light penetrates into waters below, so to follows vision—the transparency of surface waters then effects light penetration, and in turn, visibility. [7] However, in drawing comparison between the metamorphic conceptualization of water as resource and the thin layer boundary of water molecules that designate the surface, there is the danger of describing such conceptualizations as superficially

[7] While surface waters are not the only actant that effects light penetration, as runoff and sediment can be transported by water at any depth, surface waters mark an initial boundary. Therefore, if one were to look at South Tivoli Bays in the Summer, you could infer that where there a thick layers of water chestnut (*Trapa natans)* that float along the surface, there is little to no light penetration.

misleading. If the intention of this chapter was to discover the ever mythologized 'complete understanding' of water, perhaps such judgement could be made. Nonetheless, the superficiality of 'resource water,' albeit there, is simply a testament to the potentiality of water as substance, or perhaps any material substance for that matter. Instead of perceiving hegemonic constructions of water like leaf debris, matts of duckweed, or an algal bloom, that can obscure visibility, they should be perceived as stimuli that prompt the imaginative process through which subsurface waters are visualized as being part of the mediative lens, that is the surface. [8] Moreover, it should be clarified that the acknowledgement of a lack of traditional visibility, that is what can be seen with one's eyes, can be utilized as a way to also visualize subsurface transpiring—not seeing then becomes a form of seeing.

We can look towards how scientists understand harmful algal blooms as one example through which not seeing can, in turn, actually be an effective form of visualization. Harmful algal blooms, which are emerging as a threat to modern forms of water, can be recognized by the overpowering green color that dominates streams and rivers. In such an event, scientists can 'visualize' both a subsequent increase in nutrients, possibly caused by runoff, particularly nitrogen and phosphorus, and the decrease in oxygen levels. In this example there is an indexical nature, in which, the algal bloom gives fruition to the increase in nutrients, despite the fact that nutrients are what allowed for the algal bloom to transpire in the first place. 'Water as resource' as a cultural construct, while perhaps not as visible as an algal bloom, operates similarly in that, it is an example of symbolic water that can then inform the contextual grounds through which, 'resource' can emerge as possible mode of water.

[8] I feel comfortable ascribing 'water as resource' hegemonic status based on the pervasive nature through which scarcity, as lack of resource, mediates contemporary contextualization of water.

Returning back to the sign that still persists in Bard bathrooms, the notion that water is a resource that can, and needs to be conserved, then denotes that a metaphorical subsurface is somehow scarce. Here 'water as resource' demands particular manifestations of physical water, namely that it be liquid. Such conclusions can be made by returning to the meditative powers of this sign, through which the Saw Kill enters into a global age of water scarcity. At the time of its initial circulation, the concern was with the abstraction of liquid water from its natural course, the Saw Kill, in which, in its current life marks an ontologized scarcity. While water is unified through the guise of resource, such ascriptions also rely on mediums through which they can be seen as permeating on a global scale; it is one thing to say water is unified through the label of resource, it is another thing for it to be true. Thus, an ontological unification under the identity of resource highlights a particular physicality, as I previously discussed, in which it is a singular thing that can be extracted from. Physical unification can be traced to the the hydrological cycle, as a conceptual model that qualifies chemical water, H_2O, as operating within a system of consistent movement. Despite utilizing the channels of movement and connectivity established by H_2O, it needs to be understood that these are two distinct strains of liquid. This can be observed primarily through the Law of Conservation of Matter, which dictates that, in a closed system, matter can neither be created nor destroyed. This is even demonstrated by the hydrological cycle, which maps the movement of chemical water through different phase changes. Thus if chemical water and 'water as resource' were the same, claims of scarcity would be proven defunct, as H_2O levels are unwavering. With this in mind, my definition of 'water as resource' requires an important revision, given that 'liquid water' encompasses two very distinct types of liquid, freshwater and Seawater (salinated water). Rather, it is all liquid water that is then palatable, in other words, fresh. Not to say the sea water cannot possess utilitarian value, as

it can both provide people with other services and, interestingly, can be made into 'water as resource' itself, but that on a conceptual level, lends itself to theorization differently (Helmreich 2011).[9]

In a literal sense saltwater and freshwater are prominently recognized, at least through scientific channels of reasoning, as diverging on the basis of salinity levels.[10] Even so, such dichotomies demonstrate their own constructed-ness on the basis of necessitated discrepancy drawn between the two by those who experience them. This is not to say that saltwater and freshwater are not different, or that culturally constructed emphasis of difference reduces the experiences of freshwater and saltwater to a sort psychocultural experience, but rather an effort to bring attention to the politics of differentiation that emerge in such situations.

Water as resource then marks divergence from water that is not resource, waters that are not depletable, waters that do operate within the subjectivities of abundance and scarcity. In many ways, water is a medium of inception (this being my own iteration of the liquid) as something that is, through its definition, giving rise to other subjectivities. The sign for example, not only paints water as a resource, enmeshed within currents of precarity, but also as a source of life. Now there are two main ways that this can be understood: (1) the identification of water as life bearing on a biological and spiritual level, a matrix of life if you will; and (2), referencing the integrality of water within capitalist systems as a consumable good, marks the water as essential to capitalist life, and therefore societal health.[11] Neither is really incorrect within the context of Bard and the Saw Kill, a relationship that I will make clearer in the following section. Regardless, in both cases water serves as a figurative and literal source of fuel, assuring

---

[9] Helmreich, Stephen. Nature/Culture/Seawater. American Anthropologist: Vol 113, Issue 1.(2011) : 132-144

[10] Although Freshwater contains salt, though these concentrations generally remain below 1%. Whereas, with Salt Water, the average concentration is 35 ppt, or 3.5%.

[11] "Matrix of life" was inspired by *Life's Matrix: A Biography of Water* by Bill Ball.

continuance of the organism or system. In this case, I would argue that the precarity that emerges with water scarcity, as global phenomena, is not solely about the looming possibility of a complete loss of water, though cities like Cape Town are now having to contend with that as very near future, it also surrounding the implication of decreased amounts of water on neoliberal models of life. More specifically, 'scarcity' may denote something just as terrifying as complete depletion, this being the need to to revise behavior and consumption on a societal or global level. Globalized scarcity then marks the fragile nature of a construed inherency of capitalism, where upon realization, fosters the ground through which such systems can be critiqued and done away with.

Even in such, conjuring of water however, we are introduced to notions of water as death, specifically through a lack thereof. Common associations of deserts, as locations lacking water, are in turn saturated with a dry air of inhospitality towards life, human or otherwise. We know of course that deserts are teeming with life, from colonies of microbes to established communities of people. Deserts prove to be a good to think with because they are environments where water is scarce but life somehow still persists. On an evolutionary level, it could be rationalized that such realites came about because water has always been scarce in the desert, and thus, life has grown accustomed to that.[12] It is clear then that Neoliberalism did not come about from the desertwhich assures us that water or any resource for that matter, was once abundant but now not, did not come from the desert.[13] This, however, is not the point of using the proverbial desert, rather, I chose it as categorical environment to note the context driven nature of scarcity. Moreover, 'Naturally' water scarce environments, that is, biomes where life has evolved to accommodate

[12] Though global warming has been seen to be contributing to increased desertification and increased scarcity within already water scarce environments.
[13] There are however very potent manifestations of neoliberal forms of life in deserts, one such example being Las Vegas, Nevada.

lower levels of water are capable of surviving life, while areas of newly manifested scarcity are thrust into states of disarray.

Schmidt's diagnosis of 'water as resource' and the assumptions that such a cultural project makes, particularly the universalization of water as formerly abundant, connotes an almost democratic equal distribution of water on a global scale. Moreover, because abundance cannot be quantified on a global scale, the assumption is that all potential localities possess the same amount of water: an abundant amount. Comparing the deserts to rainforest, they will tell us that such assumptions are not only untrue but misleading. The utopian vision that resources, water or otherwise, are naturally and equally distributed on a global scale is a perception of great political salience, which demonstrates a self-effacing encoding of neoliberalism within established natural domains of life. The global dissemination of 'resources' as concept, in this case, water as resource, marks a naturalization of neoliberal mentalities that enable such constructions to exist in the first place. Therefore, the assumption past global abundance, implies that the current global scarcity is a product of a general mismanagement, something that Schmidt alludes to, and through such implications, implicates a global public within such scarcity. The Anthropocene, as geological era and global temporality, with which such scarcity emerges, has a similar effect in assuming a collective culpability. Moreover, by marking this as a moment in time where humans have become a geological force, 'humankind' is connected through a shared and equal responsibility for the current condition of the planet. In either case, a collective and equal culpability presents neoliberal practices of consumption as inherent to human nature.[14]

[14] By 'human nature' I am referring to a supposed inherent behavior ascribed to human actors, something that ties us to the instinctual governing of animals, and thus, connected to the natural domains of the world and beyond.

Anthropologist Anna Tsing (2007) remarks on the neccesity of looking beyond the universal as 'self-fulfilling,' and in considering them an agent of global connectivity, explore how universals are cultural projects (Tsing 2007: 7). While universals like 'Water as resource' and by extension H_2O, appear to erase the making of global connection by addressing a unified world where connection is unnessesary, Tsing argues that they are too localized forms of knowledge in the sense that their understanding is contingent on historicially specific cultural assumptions. Such realizations do not satisfy, Tsing, who stresses the importance of acknowledging that 'universals,' despite local origins and interpretations, are manifestations of knowledge that move across localities and cultures, in turn, forming bridges, roads, and channels of circulation (Tsing 2007: 7). As mobile agents, universals fail to be everywhere at once, and rather, participate in speific moments of friction: "The unequal, unstable, and creative qualities of interconnection across difference" (Tsing 2007: 5).

Tsing's exploration of 'the' global commodity and how it experiences friction through tie commodity chain, provides insight into water as globalized resource. Unlike coal which is passed from storehouse to boat, water is already highly mobile, participating in a global cycle of movement. Nonetheless, while Schmidt's 'resource water' may comandeer the channels of movement established by the water cycle, it is not limited to them. 'Water as resoure' is contingent on both its utility and its abstraction. Therefore, it must be potable, liquid, and must also undergo a general abstraction from its 'natural' course. So while the water cycle can be seen as a 'transporter' and 'producer 'of 'water as resource' through terrestrial flow and precipitation, it is not representative of a commodity chain but rather a moment within it. By representing the global flows of water, it fails to acknoledge the presense of human's within that flow. Such failures are only made more potent when contextualized in a geological era defined by the effects

that particular humans have on the planet. While physically water cannot experience friction, it can however experience an ontological one, where differing understandings collide, and through such collisions, create hybrid forms of water. In heading Tsing advice, to start in the middle of things and becoming embroiled in the particular, I observe how water manifests with the Saw Kill.

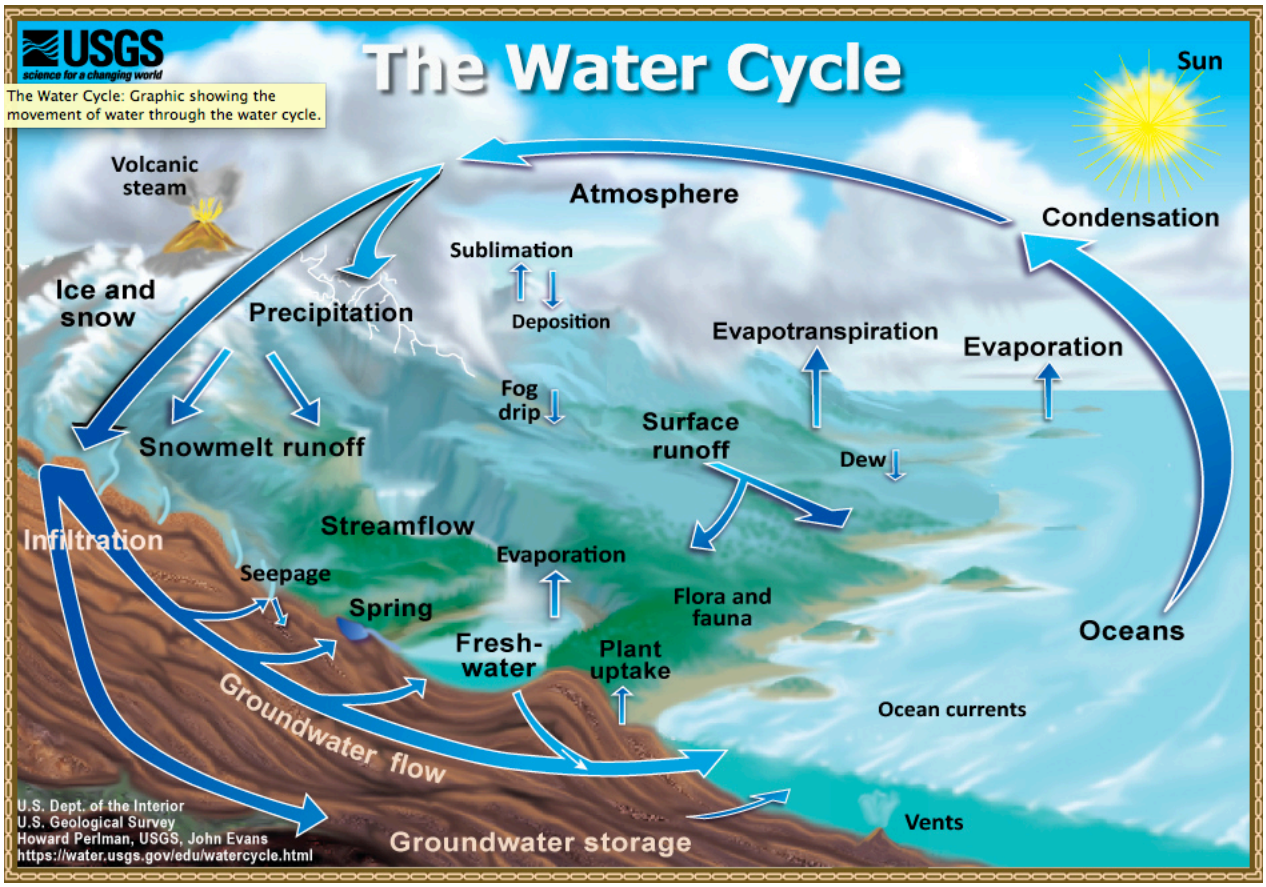


Figure 4: The Water Cycle, provided by the USGS

The Saw Kill

Grounding the Saw Kill within the broader explorations of water that preface this section, the stream is, above everything, an agent of connectivity, and through such channels, a force of

social entanglement. One of the greatest examples of this is experienced through the manifestation of the Saw Kill Watershed Community (SKWC), a collective of of individuals concerned with the daily happenings of not only the Saw Kill stream, but the watershed in its totality. Such concerns range from municipal water and land use to recreational activities and community events. The community meets officially once a month, and also has an informative website that covers a wide range of information surrounding the Saw Kill. Their message, which is written at the top of their website reads: "Protecting the Saw Kill watershed and its ecological, recreational, and historic resources through hands-on science, education, and advocacy" (SKWC Home).

As a collective interested in eliciting community engagement both through hands on recruitment and through deliberate curations of informative materials, the SKWC serves as an appropriate way to dive into the intense dynamics of the Saw Kill, and the overwhelming currents of water.[15] Using the SKWC as a point of entrance should not be falsely construed as a centralizing act, for even the physical Saw Kill does not manifest at the center of the entanglement that is occurring. The SKWC, however, is integral in that it follows the many diverging ideological and ontological flows of water, not just of the stream but the whole watershed, as best it can. In some ways the collective has become a scribe of sorts, telling the story of the area as they help write it.

Even so, the stream identified as the Saw Kill has not always been identified as such, nor has it always retained the same meaning throughout its many onto-nominal phases. Early accounts of the area recognize the stream as 'Metabasem,' in particular, there is a letter correspondence between Thomas Dongan, the colonial governor of New York and Colonel

[15] 'Currents' possess a double meaning here. The first is in reference to the physical and metaphorical movements of water within a current socio-political landscape. The second refers, albeit colloquially, to the contemporary modalities of water, and in turn the Saw Kill, which are themselves currents of the initial sort.

Pieter Schuyler, who apparently bought the surrounding land from the 'Indians'. Afterwards, an old map that belonged to Col. Henry B. Armstrong, would mark the geographical transition from its indigenous identification and that of colonial subjects (SKWC History). The Saw Kill, 'Kill' meaning stream or creek in Dutch, gained its name from the Saw Mills constructed along the stream. In Historian Pamela Goddard's, 'Incomplete History of the Saw Kill,' she recognizes the name as an English/Dutch hybrid, that emerged at some point around the second quarter of the eighteenth century, when English and Dutch families started to develop the land (Goddard 1988: 1). Moreover, upon European management of the surrounding lands, the stream became a hybrid landscape, in between two European powers and identities.

This brief history, which will be further developed later, then grounds the current Saw Kill within a context of colonial nature-politics.[16] Moreover, the ethnic identity of the stream, and the historic transitions of such, inform contemporary transpirings, be they economic, cultural, biological, or more likely a heterogeneous solution of them all, as a 'naturally' contested object. This manifests in many ways along the stream, but can broadly be defined as any legislative moment, where decision making processes regarding the Saw Kill, sometimes result in contentious discourse. As demonstrated in the previous section, water can embody many different meanings at once, a social quality that is only complicated when 'socially distinct constituents' recognize water in different ways.[17] The Saw Kill as a nominal channel and cultural project through which water is seemingly controlled and regulated, is afforded the same amorphous freedoms as the water it is trying to corral. In her exploration of conservation in

[16] Current is a bit of a misnomer, at least with regards to the Saw Kill as contemporary actor within local and trans-local landscapes. Moreover, the Saw Kill as a stream of water, is then something that is never fully accessible through the temporal state the present, rather as process, is more readily acknowledge within the lens of past or future.

[17] 'Socially Distinct Constituents' refers to municipal collectives that recognize themselves as distinct from other social collectives (I.e Bard College and the town of Red Hook are two examples), that later on, we realize are not as distinct as they might like.

Papua New Guinea, anthropologist Paige West explores how such environmental ethics become modes of bureaucracy and governance. In her placement of her fieldsite, West notes how the naming of location, in her case the hamlet Maimafu, was a cultural project of social simplification—the wild landscapes that came to be encompassed by name 'Maimafu,' were then made legible (West 2006: 12). The ascription, and reinforcing of 'Saw Kill' identity onto landscape can be understood in a similar vein, however, such projects of legibility are obfuscated by the amorphicity of water. As discussed in the previous section, water is an indiscriminate liquid that embodies any and all meanings ascribed to it. While the previous section recounts universal ascriptions and their implications, the Saw Kill, as geographic marker, can be understood as a more localized ascription to water. In the way that water embodies particular meanings but also challenges the rigidity of those identities, the Saw Kill as a manifestation of water, is saturated with a similar promiscuity. Here we see how the authority of geographic and environmental constructs imposed on water is decentralized, where, despite a nominal identification, the Saw Kill manifests as an entanglement of phenomena operating at different systemic scales. Such empowerments also come across at a price, by which, the original intention to render water to a controlled environment is lost. This is assuming that such rendering are anything more than cultural illusions, through which the taxonomizing of natural domains, particularly through scientific rhetorics, are seen as revealing of an inherent natural identity. [18]

While Goddard's 'incomplete history' is actually quite extensive in demonstrating the many transitions of land ownership around the Saw Kill, and with it, emergent political climates surrounding water use rights and management, the one historic transition of ownership that

[18] The greatest example of this being the recognition of a proverbial nature, that somehow, despite the obvious constructedness of this socio-physical domain, maintained inherency. Moreover, the very fact of nature as a linguistic existence, should then demonstrate its artifice, instead, language assumes its own inherencies that complicate notions of a culture / nature divide.

defines a contemporary Saw Kill in many ways is the partnership between Robert Donaldson and Louise Livivinston. As the respective owners of Blithewood Manor and Montgomery Place, Donaldson approached Livingston about the potential prospect of purchasing the land adjacent to the Saw Kill from John C. Cruger.[19] Donaldson was worried, in light of Cruger's desires to industrialize, that such interests would lead to the degradation of the Saw Kill, as contributing to the visual value of his property. [20] Moreover, he and Louise maintained the philosophy that the pleasure grounds "of a genteel river front estate" should provide recluse from the industrializing outside world (Goddard 1988: 13). In recognizing their contributions towards preserving the sublime landscapes of a non-industrialized Saw Kill, constituents like the SKWC highlight this historic narrative as one of the first historically recorded environmental "conservation covenants" (SKWC History). While such agreements were made in order to maintain a romantic and deindustrialized fantasy that they could exclusively enjoy, seeing that they owned the stream, the over-emphasis of a conservation mentality is what gives rise to the Saw Kill as an object of scientific study.

While the Saw Kill is more than just an object of scientific study, the historical context of this transaction has come to engulf the Saw Kill as stream, corridor, and watershed, within a imperative of conservation. Contrasting many of the other local tributaries of the Hudson, the Saw Kill is 'uniquely' clean or undisturbed by the historic effects that industrialization has had on the landscape. Thus, the Saw Kill then enters a interesting political landscape of the Hudson River Valley, which has come to be defined as the birthplace of contemporary Environmentalism

[19] Blithewood Manor and Montgomery Place are two estates that are situated on either side of the Saw Kill's lower reach.

[20] Such decisions marked a transition and move away from viewing the Saw Kill as possessing utilitarian value that earlier residents maintained. In its stead, Donaldson and Livingston embodies a 19th century romantic turn away from the Saw Kill as economically exploitable, in turn, choosing to see it, quite literally, as aesthetic object (Goddard 1988: 13)

within the United States.[21] As such, Robert and Louise's actions are then mediated through a more contemporary history of explicit environmentalism, which then informs how those actions are interpreted with a historic narrative. In the history section of their website, the SKWC, is also seen as construing a pre-colonial history of the Saw Kill, or the then Metabesem, as defined by environmentally concerned inhabitants. The section that address pre-colonial history is titled "10,000 years of Stewardship on the Metambesem?" in which, the website only references early European accounts of the stream, and does not explicitly address any environmentally oriented communities (SKWC History). Rather, it appears as though the SKWC is relying on the romanticized notion of indigenous communities as embodied collectives of the 'noble savage' are somehow closer to a natural domain. My intention is not to explore the possible validity behind such assumptions, but rather, use such examples in order to demonstrate the more contemporary constructions of a very temporally past Saw Kill/Metabesem, particularly its historic enshrinement within modes conservation and environmentalism.[22] Conservation, as historically defining, is almost naturalized, and through such ascriptions mark a narrative and rhetoric that dominate the Saw Kill in many ways.

Such historicized relationships, in some way, necessitate a similar contemporary socio natural relationship. Ways of addressing and engaging in relationships with the Saw Kill are then defined by conservation and environmentalism, which in contemporary climates, are channeled through scientific rhetoric and methodology. Anthropologist Veronica Strang notes that the way in which people relate to their physical surroundings is an extension of themselves and their

[21] Scenic Hudson, a grassroots organization, is credited with the confrontation of the Consolidated Edison Companies plan to build the largest pump storage hydroelectric plant in the world. After a Seventeen year long battle, they emerged victorious, and are credited today with mobilizing grassroots environmentalism. Such legal contestations are seen as responsible for some of the United States environmental legislation, such as the Natural Environmental Policy Act (NEPA) of 1969, which acknowledged, at the least, the equal importance of conserving natural resource to economic gain (Scenic Hudson History)

[22] The SKWC does include more contemporary histories of conservation along the Saw Kill that are revealing of a more concrete conservation mentality within the area.

identity (2013 : 34). Here, however, this extension is not only operating within a contemporary stage of the present, but also a way of avowing a historic continuity. 'Conservation' as model for socio-natural relationship becomes the appropriate means through which natural domains and cultural actors are bridged together. To return to West's notion of 'legibility,' conservation then becomes a way of making the Saw Kill legible, within a current climate of anthropogenic climate change, as object of scientific observation.

Along the Saw Kill, there are many scientific initiatives, ranging from the focus of this paper, the Saw Kill Monitoring Program (SKMP), to the Bard Eeling initiative, which is run in partnership with the Department of Environmental Conservation (DEC).[23] These initiatives only a fragment of the science that goes on along the Saw Kill, but they are good examples for two reasons: (1) they are explicit embodiments of a historic continuity of conservation on the Saw Kill; and (2) despite being scientific in nature, neither attempts to maintain a purely scientific guise. Science, is thus, not only a epistemological lens through which a Saw Kill landscape is interpreted and understood, but also a means through which actors, human and non-human, are connected within a web of social interaction. Science's ability to enable connection is really the work of water, in which the science, which in application is predominantly ecology and biochemistry, interestingly becomes a means through which many constituents gain voice. To that extent its role, while important, is completely circumstantial, predicated in the historic emergence of science as an epistemological progenitor of the environment.

Science is then brought along the Saw Kill, making use of water's movements to enter supposedly non-scientifically oriented discourses. As one veteran member of the SKWC aptly put,

[23] The Bard Eeling program is an initiative that is operated in tandem with a much larger project of the DEC which tracks populations of American Eel populations along the Hudson River's Tributaries.

> Watersheds connect people in multiple communities through a shared interest in water. Water doesn't respect municipal boundaries, so watershed protection encourages water users to form partnerships—not only among towns and villages, but also with colleges and universities (SKWC: Novemeber 27, 2017).

While this member was mainly focusing on how water defied the cultural and social boundaries established by ostensibly separate collectives, and with it the many resources that occur within and between these self-proclaimed constituencies, examples like the SKMP and Bard Eeling initiative demonstrate how science brings in non-human voices. As initiatives submerged within notions and practices of conservation, the SKMP and Bard Eeling initiative emerge as representatives of water and eels, and the stream as a larger whole.[24] As representatives, however, the voice of water and eels, respectively, are not solely reserved for their human compatriots.

While science brings water and eels to the forefront as things that are somehow essential to the Saw Kill, in acknowledging their presence, scientists are forced to consider them. In some ways, water and eels, through their acknowledgement, make scientists speak for them. While water seems to be the most obvious essential? of the stream, by considering water on biochemical scale and mode, scientist are forced to consider the Saw Kill through notions of ecological health and stability. Thus, as I will explore later, conceptualizing water as something that can be unhealthy, members of the SKMP are forced to give voice to not only water, but the chemical conditions it finds itself in. For example, one of the greatest concerned for my constituents at the SKMP is the level of Fecal Indicator Bacteria (FIB) found in the water on a given day. These levels, can indicate and implicate a whole number of actors that are given constitutive power within an assembled Saw Kill. Based on what is discovered, a process which

[24] Here water, refers to a biochemical liquid,that is experienced and understood through its chemical conditions. Moreover, this type of water, is the second form of modern Water that Linton discusses, the first being scarce water, the second being pollutable water.

I will explore in great length in the subsequent chapters, point sources of pollution like old dumps, or runoff from a recently fertilized golf course, can be brought to attention. It should be noted, that while human attention plays a large role in this, the SKMP's recognition of FIBs, or the Eeling initiative's attention toward American Eels, is not determining of their existence. [25]

Moreover as a multiplicity of things things like eels and FIBs are given new meanings through the ideological mixings of collectives, that on the surface, are different**.** For example, FIBs can be considered a pollutant that is introduced through both accidental and purposeful means, Bard's sewage outflow pipe being one such example of intentional pollution. FIBs gain new or additional meanings through the contextualization of their presence in the Saw Kill. In the case of the Bard outflow pipe, a location that the SKMP monitors, the introduction of treated waste becomes a necessary evil. The Saw Kill, as flowing water provides the service of whisking treated waste away, as long as such processes are monitored. In contrast, higher levels of FIBs have been observed in the Saw Kill after large precipitation events, a relationship that has been attributed to runoff that occurs in response such events. I bring these two examples into conversation because, despite being two very different episodes of FIB's introduction to the Saw Kill, they take on very different meanings with relationship to the SKMP that monitors them. The outflow pipe is an example of point source pollution and, as I said previously, where the introduction of wastewater can be monitored and controlled, or at least give the illusion of being under control. In contrast, runoff is far less localized and difficult to pinpoint the source of, not that there would be a single source to begin with, as the flow of runoff is another continuum of movement and transportation that collects and deposits transient things as it moves across land. While it may give the impression that I am following the obviously unchartable flows of the Saw Kills, the point of such aimless flows it to demonstrate the engaging qualities of the Saw Kill and

[25] The same holds true for American Eels and the Bard Eeling initiative.

its water. The fluidity of constitutive components and their emergent meanings, demonstrates that the Saw Kill is more than just an assemblage of functioning parts. Rather, it draws extreme likeness to what sociologists Michele Canon and John Law term the hybrid collectif (1997*)*.[26] Anthropologist Jason De Leon aptly applies the theory to his work with migrant crossings in the Sonoran Desert, in which he marks how agency of objects is acquired, rather than inherently embodied, through the interaction between heterogeneous actants (De Leon 2015: 41). De Leon recognizes that the interaction between United States Legislation, bodies, border patrol, non-human organisms, desert landscapes, and an assortment of other human and non-humans actors make up hybrid system, or collectif, of Prevention through Deterrence. Thus, the Saw Kill hybrid collectif is one of environmental citizenship, of human, animals, trees, dams, and FIB's all indicate their presense as residents of the landscape.

The Bard Water Lab and The Saw Kill Monitoring Program

Bard Water Lab then manifests in an interesting way within the this collectif as an initiative that is very much so a product and constitutive current within the Saw Kill collectif. To be specific, the monitoring of the Saw Kill, while conducted by the BWL, is recognized under the initiative guise of the Saw Kill Monitoring Program (SKMP). The SKMP itself is inspired by a historic monitoring of the Saw Kill, whose original experimental design was reworked into a more expansive outlook on water quality along the stream. The SKMP is then not only a continuance of a long legacy of conservation mindset, but also a reincarnated conservation initiave itself. The SKMP is then interesting because it reliese on this history as the foundation and justifcation for its operation with the area.

[26]Cannon, Michele. Law, John. Agency and the Hybrid Collectif. *Mathmatics, Science, and Post Clasical Theory.* Duke University. Duke University Press. (1997): 95-117.

This being said it is important to understand the discrepancy between the SKMP and the BWL, in which the latter fronts the former. This is important because it indicates how the BWL operates as a collective that is connected to the Saw Kill but somehow not wholy submerged. This is perhaps, demonstrated most clearly with the inception of the Roejan Kill Monitoring Program (RKMP) that is also operated partially by the BWL.[27]This should not be considered a example of infidelity on the part of BWL where it denies its ties, rather, it is simply demonstrative of the extemity of its founder's community based philosophy and how water provides a means through which traditional conception of spatial connection and integration are confronted. I should clarify that BWL is fully integrated into the politics and dynamics of the Saw Kill collectif, however, that does not mean that it constrains it. The lab, as its name indicates, is concerned with 'Water', and it is water that becomes the means through which obscure and fluid structures of community are established.

This can be further explored through SKMP's status as a citizen science initiative, which in a traditional sense, is seen as the scientific inclusion of local residents within a conservation process. Water as an agent of connectivity, then complicates the notions of locality, and with it, similarly localized conceptions of citizenship. Observing the diverse demographics of samplers who participate in the SKMP, as a mix of those who rely on the Saw Kill directly and those who might be spatially and sociallly alienated from it, then demonstrates how water can be used to avow citizenship.

Anthropologists Karsten Paerregaard, provides an interesting perspective on the this idea, through his exploration of the political implications of water use in the Peruvian Andes, developing the concept of 'water citizenship' to describe,

[27] The Roe Jan Kill is an abbreviated version of the Roecliff Jansen Kill

> …the discursive processes and institutional practices through which water user's create membership, belonging, and loyalty to water supplies and water infrastructure and through which they distribute, govern, and manage water (Parregard, Strensrud, and Anderson 2016: 200).

The act of monitoring water quality along the Saw Kill becomes a way in which community, and by extension, a sense of citizenship, are constructed. By acknowledging a broad ascription of citizenship to a diverse group of heterogenous constituents, it can, as an articulation of belonging, be understood "as an imperfect, unstable set of processes and practices always in the making, rather than a singular status being negotiated" (Ibid). Gaining citizenship through the participation in a community based, environmental monitoring program does not imply that samplers relate to the Saw Kill in the same way, but that in participating in the sampling process, samplers avow a particular sociophysical integration into the landscape, if only for a day. Participation as a reification of citizenship demonstrates a peculiar process where samplers are recognized as citizens by BWL regardless of whether or not they consider themselves such. Notions of citizenship and claims to it, are also complicated through the confusion of what these samplers are citizens of.

The asctiption of citizenship through sampling is, in light of Foucult's notion of governmentality, evocative of what political scientist Arun Agruwal calls 'Environmentality'. Exploring local residents relationships to forests in Kuamon, India, Arguwal uses the concept to describe the concurrent redescription of environment and subject through means of political economy (Agruwal 2005: 24). BWL as an environmental initiative, concerned with water quality, then provides a moment where the act of monitoring an environmental material incites the creation of 'environmental subjects,' as Agruwal calls them. Eli Dueker's strategic use of water and the Saw Kill to then draw connection, can be seen as an manifestation of his community based mentality mentioned in the introdcution. Therefore, by facilitating the

monitoring of an environmental feature, BWL participates in the redefinition of people's as environmental citizens. It should be clarified that BWL is not in a position to deny people citizenship, nor it is really particapiting in any ascription of it. Instead, by including local and not-so local residents into a monitoring program, BWL facilitates the self-relization of ones own environmental citizenship. Returning to the introduction, the proverbial notion of 'the environment,' is comandeered, not to construct connection, but to enforce it. The purpose of the SKMP is to help individuals realize that they are citizens of a biotic world, both in the local and universal sense.

Chp 2:
The Field and The Lab

A ring from the 'Belle'

It all begins with a ding of my phone, the lab calls to its citizen scientists through the form of email and text. Contacting people throughout the Hudson Valley, seemingly local or surprisingly distant, volunteers are called upon to convene for their monthly tradition of sampling. Responses are varying, a select few individuals have established themselves as the most responsive samplers, and through this consistency have become de facto leaders in and of the field. Others respond either privately or perhaps not at all, showing up on the day of sampling somewhat unannounced though never unwelcomed. Tierney is the one who coordinates it all; she is the organizing force that notifies everyone of that looming second Friday of every month. As a Bard Student, she has been working with the Bard Water Lab for almost her entire undergrad career, and as such has come to play a key role in its organization. She is the provider of purpose and direction, coordinating people through objective; she represents the samplers' initial interaction with the lab, a correspondence that positions them as somewhere else. Email as a form of communication only further cements this distance, in which her actual physical proximity to samplers becomes unimportant and she is imagined as residing within the Lab.

While Tierney is no stranger to the sampling in the field, her instrumental role in initiating first contact is revealing of her much larger contribution to the preparation of both the lab and field materials. The subject lines of her emails read "Water Lab!" reflective of the enthusiasm she feels for this project, one that is meant to inspire the community members she contacts. It is important to understand that Tierney is an employee, an insider, and despite her great relationships with the outside community, there is a differences between her and the

individuals she emails. More specifically, her initiation of the event, through a call for preparation and commitment, she evokes the integrality of the BWL in monitoring the Saw Kill. While, she one of select group that ventures in both domains, she is recognized, still, as it's on the ground representative. In many ways she becomes a communicative extension for Eli, not as someone loosing her own individuality, but as an agent that manages conversations between the residents of the Lab and Field.

Lab and Field

Sampling as a practice can to be understood through a samplers "expedition" into the proverbial wilderness of a scientifically organized world that is the "field". As anthropologist Robert Koehler notes, the concept of the 'field' was historically established during the laboratory revolutions of the mid to late 19th century (1840-1870), where a definitive understanding of the lab then necessitated the categorization the "not-lab" (Koehler 2014: 3-6). As locations oriented towards an industry of knowledge production, the imbuing of the 'Lab' and the 'Field', as imperatives within the spheres of scientific knowledge production, manifest as domains that contradict each other on both a structural and compositional level.

In the traditional sense, the 'Lab' is a space of control, of sanitizing isopropyl, autoclaved bottles, deionized water, and latex gloves. Ontologically, the lab is a self-contained institution and a finite spatiality that lacks contextual surrounding; the cultural and physical contexts of the bodies and objects that move through that heavyset door are lost in translation. This is not to say that the encompassing world does not exist, but rather, that upon entering the lab. The physical and instiutional strucutres that allow for it to manifest become unimportant and omitted . The lab then becomes self-informing, it builds itself from the inside out—a life world in itself. The lab as a place, as Koehler describes it, is saturated in 'placelessness', both in that

what physically inhabits or exists within that space never quite belongs, and that the proverbial Lab, also lacks a particular quality of belonging (Ibid: 6). It should be clarified that when I speak of a Lab-Field divide, it is in reference to the immaterial socio-spatial identities that are embodied by physical landscapes. In analyzing

For BWL this placelessness, emerges out of the mobility of the collective. More specifically, in my three years working with the BWL, there were three physical labs used at different times to process water samples. The mobility of the BWL is reflective of the , one that is an institution of objective science, to make refuge in physical labs, then evokes a sense of placelessness that Koehler is talking about. The mobilization of the BWL across Bard's campus, first the field stration, then in the RKC, and most recently into the Rose Laboratory, is interesting then, because it is concurrently evocative and dissillusioning of this sense placelessness.[28]

Both the sterility and the management of accessibility to the lab are explicitly at play when acknowledging the potency of this illusion. Conceptions of clenliness within the lab, that is, manifesting clearly through the practices of antisceptic technique, become a means through which the BWL can affirm the objectivity, and in tandem, the authority of its produced data. Sterility then becomes subject to managerial surveilance, in which, the access to the physical lab becomes an extension of a sort of 'lab hygiene'. While the very nature of BWL as a citizen science initiative is geared towards inclusivity and the realization of community, the lab governs ones ability to participate in the sampling event through mandated training. The untrained individual poses a contingency problem for the authority of the lab, where an ignorance to lab protocols can threaten the authority of data produced. Anthropologist Mary Douglas' notion of dirt as matter out of place (1996) is a useful lens to look at how both the categorical Lab

[28] 'RKC' is an acronym for Reem Kayden Center for Science and Computation.

constitutes itself in relationship to the field, and how BWL understands itself as a proveyor of reuputable data.

More specifically, Douglas' concept of dirt lends itself rather efficiently to analyzing both 'the' and 'a' lab, as space that is predicated in notions of sterility, or lack of dirt. In addition, the lab participates in a parralel practice of systematic ordering that then makes it suceptible to the structuralist notion of dirt. Analyzing this within a grander lab-field dichotomy, dirt as "the by-product of systematic ordering and classification of matter, in so far as ordering involves rejecting inappropriate elements" (Douglas 1966: 35) is then not a process that strictly occurs in the lab, but rather, is a phenomenon that occurs outside it, or at least should occur outside of it. With that in mind, the proverbial 'field' becomes a domain of dirt, where the phenomenological swamp of the outside world threatens the authoritative practices of objective science. In light of this, the historical inception of the lab is predicated on the santization of reputable science. More specifically, in tranporting the location of reputable science to the lab field science lost its authority based on the incalculable amount of variables that effect field produced knowledges. Scientific dirt is then any matter that cannot be controlled, where the moment that control is lost in the lab is the moment where authority is lost. That is why the lab must be imagined as ontologically distant from the field, because realizing the potential proximity of the field to the lab dissillusions the lab's claims to control. The inception of the field as categorical domain that occurs in response to of the construction of lab is then another a constitutive part of an assembled illusion of control, where alienation from the field maintains the sterility of the lab.

Returning to where they originally operated, field station provides an example where the lab-field border could not be maintained. The presense of mice and mold, were then problematic,

in that they deconstructed notions of control over the space. More specifically, they deconstructed any illusion of alienation between lab and its field. As the name suggests, the field station itself was not at all isolated from the proverbial field, manifesting rather explicitly a space, the woods, that threatened the security of the lab. The second lab that BWL used was located in the RKC was also where I conducted most of my thurough field work, ironically in a lab. While this lab maintained a more antisceptic environment and enabled the illusion of alienation, it was also a shared space, a fact that conflicted with BWL's ability to exert control. In contrast, Rose Labortories, the most recent place that BWL resides, affirms the illusions of the Lab through its obscurity on campus, that is, not many people know it exists. Such invisibility is then useful, in that BWL claims Rose as its own personal place, and through such claims, can exert notions of control and alientation.

Koehler's introduction to the Lab-Field dichotomy suggestively points to us towards an in between, or 'border zone,' as he calls it, as a way of problematizing the distinct hierarchies of knowledge production at play. Where the 'Lab' places itself, with respects to the field, becomes an essential question to understanding the dynamics of scientific knowledge production. Lab and field, as composing a world of knowledge production implies an inherency that is directly contrasting to the notion that they are mutually constitutive. While Koehler states that the lab beckons the emergence of the 'Field,' in true antithetical behavior, the Lab defines itself through means of what it is not. In that sense, while the 'Field' did not emerge until the Lab's acquisition of it, the knowledge making practices that saturate its landscapes have been in use since before its inception, taking on new meaning as they are implicated through their entangling with, and within, the field. Such practices that now inhabit a newly transfigured landscape, are simply

practices that have, through development of the scientific process, lost the authority they historically laid claim to.

Within an evolutionary map of science, the field as domain of knowledge production is then the progenitor of the lab, both of which gain individual identities through a historicized surpassment of one over the other. As the Lab and the physical domains that it is recognized through, replaces the Field as the superior producer of scientific knowledge, hierarchies of such production become apparent through valuations of developmentality. Division through channels of development, the Field and the Lab are then concurrently arrested as evolutionary cessations that then manifest outside any temporal continuum. Such domains then mark evolutionary outputs that seemingly lack the agency to both evolve and maintain their respective identities as the Lab and Field; the Lab becomes saturated with an authoritative presence, predicated in its temporal status as the final evolutionary step within the continuum of scientific knowledge production. As decontextualized from the temporal continua that help produce them, these domains and tools of ideological construction are organized hierarchically through a comparison of their evolutionary emergence. The Lab, then, as mandating a complete decontextualization, embodies what economist William Easterly calls the "Blank Slate" approach to history (Easterly 2014: 123-127).

Easterly analyzes the manner in which affects proesses of development, specifically analyzing how current practice of foreign aid acknowledges and ignore historical context of countries that it is meant to help. Easterly then diagnoses the historic emergence of democracy as the factor of discrepancy between developed and developing countries (Easterly 2014: 123-127) Thus, just how nations enter a cosmological categorization on an axis of 'developed' and 'developing', lab and field, as knowledge producing institutions, enter a dichotomy between a

teleological entity and its ancestral precursor. Thus, the Field becomes the Lab's methodological ancestor, one that it seeks to rid itself from, in order to justify a universal dissemination of produced knowledge.

Like other pervasive binaries within dialogues of social-natural relationships that find themselves situated in a rather volatile dichotomy of evolutionary development, culture-nature, human-animal, male-female, refined-raw, artificial-organic, etc, conceptualizations of lab and field operate on a temporal scale that then influences the type of knowledge that can feasibly be produced with either domain. And while all these dichotomies maintain separation in order to promote some sort of social hierarchy, the lab-field binary is different in that, on some level, it rejects the field as a historical counterpart, in turn laying claim to an inherency both in form and methodology. More specifically, in maintaining its superiority over the field as its contemporary within dynamics of knowledge production, their is an obfuscation of the historical time that connects the two. The lab, then ironically operates like a natural domain, or at least a most cultural iteration of natural, by erasing the means of its production, most importantly, its purportedly 'natural' origins. By drawing attention to the border zone as a socio-physical presence, Koehler then acknowledges a temporal continuity between lab and field. In doing so he maintains that, like the domain that is now recognized as the Field, which manifests as a plurality potential subjects, the Lab is subject to similar evolutionary processes, and more importantly, evolutions that mark non-universal transformations of the Lab into a multiplicity of labs.

While the Lab and Field as places are very tangible geographic markers within the landscape of scientific knowledge production, as identities they are epistemologically modal in nature. Thus, the lab, field, and their border zone in between them are a incorporeal identities

mediated through the physical environments scientist find themselves in, as a manner through which the identity of a scientist is embodied. Koehler points to this through his exploration of the field-lab border as a geographical place, in which he defines it as an intangible cultural space, " But that space or terrain is embodied and experienced in particular tangible places, and much of the evidence for its qualities is evidence of place—physical, geographical, nameable, pickable, kickable, place" (Ibid: 5) As we see with its manifestation as a channel of historical continuity, the 'border zone' is ironically both relied upon to mark the the lab as a placeless domain as well as the source of its dissolution as such. The border zone, reconnects lab and field through a newly multidirectional passageway, where both field and lab seep into each other. While the percolating of the field into the lab can obviously be considered subversive to the authority it lays claim to, moments where the Lab flows into the Field also stand to undermine the power of the Lab, by disillusioning the assumption that the purest scientific authority is reserved for the individuals, and their compositions, who work within the sanitized walls of a laboratory. 'Border crossing,' then takes on two meanings here, one being the physical or ontological crossing over of imaginary boundaries that are mapped onto space, in which modes and means of crossing implicate either a perpetuation or loss of authority. The other, an intertwining hybridization of Lab and Field where borders of both infringe upon the contrasting domain, like that of a venn-diagram, creating hybrid spaces of overlapping domain, the existence of which, in turn, disemploys the very boundaries that indicate both that hybrid space and the domains that partially constitute it. Thus, the Lab must operate

Moreover, as a placeless place, the lab requires a lack of context to exist, thus, if the field were to arrive at the doorstep of the lab, it would compromise the very security of the lab as self-

contained and self-constructed. Because the 'field' as a geographic marker is an imagined cultural landscape, the physical outside world can contain an incommensurable plurality of fields. The only catch is that they must be conceived through a sort of telescopic vision, as distant ontologically, physically, and construed as a location that needs to be journeyed toward and not simply entered.

In that regard, while field and lab must remain distant in all senses of the word, the lab as the source and vantage point of a objectifying gaze becomes enveloping of the field. While the lab gives rise to itself, the field as a distant location and as an object of study becomes castigated and corralled, through a rhetorical identification. As a construed chaos, and lacking recognizable patterning, the codification of the field is then a ideologically salient move through which a multiplicity of sociobiological worlds are recognized under a singular appellative guise. By nominalizing the Field, from a detached perspective, the Lab, decentralizes subjects from localities, freeing individuals from their contextual prisons. Ironically, such universalizings castigate objects through their dissemination into the field, as part of the field, and in consequence, can only be known on a universal level. Such boundary making occurs at a distance, for the very fact that boundaries serve as agents of differentiation, but also as sites where such differentiation can be undone. Moreover, upon entering the field, the illusion of its domestication dissipates.

Such claims are purely oriented towards contending with lab and field as ontological domains that, while ascribed hegemonic form, are capable of expanding beyond them. By arguing that the lab contains the field, I am not trying to misrepresent or underplay the vastness of the potential field in relationship to the relatively contained white walled room that we all think of when hearing the word 'Laboratory'. Rather, I am pointing to the rather curious power

dynamics present between the lab and the field that, through the production of different types of knowledge, enable and ascribe such ontological authority to the relatively small physical space that is the lab. Not just the authority to observe the field from afar, but one where the field never gazes back. The rhetorical positioning of the lab as containing of the field and the border between the two then is intrinsically ingrained in the types of information contained within, and knowledges produced from, each domain.

Lab sciences represent a more delineated logic of observable correlative relationships—the lab is then a domain of linear tests; of control and experimental variables, that present the world through a seemingly unmediated lens. The field, in contrast, emerges as a chaotic zone where observed phenomena are saturated within the contextual ground that they transpire in—linear causational relationships are then supplanted with rapidly shifting assemblage. In many respects the dichotomy between lab and field evolves out of an already present divisions of nature and culture as domains of reference on the basis that the proverbial field is evocative of an ostensibly natural environment, whereas the lab becomes a space of isolation from the environment. Carol P. MacCormack, in her introduction to *Nature, Culture, and Gender*, stresses the commonly understood notion that while culture is not at all natural, as we conceive it, nature is a completely cultural term (MacCormack 1980: 4). In that regard, the field is a term and object that belongs to the lab, and through this ascription enables the ascendency of laboratory based logics over field ones. The relationship between 'field' and 'nature' connect also through their otherness to evoked domains of control, to which the field manifests as identical to a Levi-Straussian conception of 'nature' as a phenomenological outside world (MacCormack 1980: 3).

Categorizing the movement from one zone to the next, the transformative relationship between nature and culture that McCormack outlines, one of appropriate transformation from

nature into culture, resembles the hierarchy between lab, border, and field produced knowledges. Returning to the notion that these geographic identities are ascribed, the lab, border, and field are encoded onto physical places whose formations fit within the epistemologies of the human bodies that inhabit them. Different scientific epistemologies then become the ontologies of the spaces that they mediate. Logics oriented around studying within phenomenological world steep their realities within a solution of phenomena that cannot be fully separated from each other. While those who study it from the confines of the lab, construct worlds through the experimental identification of its constitutive parts, they then conceptualize of the world of phenomenon as deconstruct-able or decipherable. The lab then, is not explicitly or solely a refuge from such entangled transpiring's of nature, but a way that said entanglements are seemingly unraveled and understood. For this to be true, the lab becomes indebted to the field as a source of observable material and subject, without it the lab loses its meaning as an institution of knowledge production.

By arguing that the lab contains both the field in an ontological sense, the traffic of objects from one domain to the other, for the Bard Water Lab: samples, field equipment, and bodies, mark an interesting point of analysis within this dichotomy of scientific knowledge production. Koehler notes the connection between lab and field by acknowledging that the objects of the lab's study are originally from the field, both in the physical and an ontological sense. As such, there are objects that are, manufactured in the Lab, that then help samplers maneuver the field more efficiently. Through the introduction into the field, objects like site sheets, sample bottles, Dippers, and YSI sensors, adopt new, perhaps even more purposeful meanings as they are acclimated into the phenomenological world, like bodies that carry them.

More specifically, I the field constitutes a use-based value of these objects, imbuing them with purpose, in contrast to rather lacking shelf lives while in the lab.

With the Bard Water Lab, the physical object of study is water from the Saw Kill, where as ontologically, the labs object of study is the constituting phenomena that give meaning to that object in a lab setting. The extraction of water then marks the journey of an object from the field to the lab, and yet the journey of a water sample is never so linear. Samples as extracted objects of the lab rely on the bodies of samplers to get to the lab, so they must follow samplers as they venture to different sampling sites. Saw Kill water decontextualized from its natural flowing state then comes to embody a completely different meaning in sampling sites that a respective sample was not extracted from.

Very literally the object phenomenon of all phenomena, the field as an object of the lab as Ahkil Gupta and James Ferguson critique in *Beyond "Culture": Space, Identity, and the Politics of Difference.* By creating the field into place, which they describe as discontinuous space, one informs the relationship between lab and field as fractured or alienated (1992: 6). Such relationships are complicated with the movement between two places like the lab and the field, as Koehler attempts to do with the acknowledgement of the borderlands. For Gupta and Ferguson, if difference is then measured across disjuncture, then what is contained in place becomes homogenized. While the epistemological location of the lab lends itself to such conceptualization as a place of placelessness, the field is far more complicated, retaining homogeneity up until one enters it. Upon entering this fabled phenomenological world, notions of containment are all seemingly destroyed, as this object of study suddenly becomes intoxicatingly complex and difficult to maneuver. The bodies of field scientists and not field scientists alike are then assimilated into socio-physical dynamics of the landscape, they

themselves becoming constituting phenomenon in an indoctrinating assemblage. As an assemblage, the field then becomes a sprawling entity of incommensurable scale as it simultaneously expands and contracts; materializes and vanishes; congeals and then liquefies. By construing the field as uninterrupted space, its relationship to the lab and the field-lab border is akin to Gupta and Ferguson's reconceptualization of space as hierarchically interconnected. In doing so, difference between lab and field, and difference within the field itself becomes oriented through connection rather than 'a matter cultural contact and articulation' (Gupta and Ferguson 1992: 8)

The Saw Kill as an object of study is saturated in the many scales that is can be represented through as the field, be it the stream itself, the stream corridor, or the watershed, and as such is an amorphous object of study. Thus, whether the Saw Kill is part of the field or constituting it entirely, as an object of study, its dynamic conditionality makes it a difficult object to 'come to know'. Koehler notes that because the field manifests and gains salience through its particularity and variability, or as I have come understand it, its place-fullness', knowledge of the field must be rooted in particular locales (Koehler 2014: 6). Thus, sampling sites mark the ground for field-produced knowledge, in which, by becoming familiar with contained place, samplers are able to lay claim to a familiarity with what lies just beyond these places. Site becomes the variable of control utilized by the lab as an institution of experimental design, in the sense that it is the only guaranteed consistency. In the tumultuous world of phenomenon that is the field, not even water or the Saw Kill itself can be relied upon, therefore what is held as a constant is the location that phenomenon are perceived from. The establishment of site then enables samplers to move through field with purpose. However, for the site to manifest, multiple

layers of construction must be considered. Architects Carol J. Burns and Andrea Kahn note that sites have three distinct areas: the area of control, the area of influence, and the area of effect

Site as location of knowledge making then becomes a marker of value, to which phenomenon perceived at a site are deemed more important. Nonetheless, such value judgments are made not for the sake segmenting the Saw Kill and erasing parts of it, rather each site represents a unique location along the stream that through their utilization can give insight to the diverse conditions that the Saw Kill and its water experience. Sites are not devaluations of the stream as a grander object under observation; rather, samplers use them in order to acknowledge the extreme heterogeneity of the Saw Kill stream, as something recognized as a singular environmental feature. Choosing sites, and the sites chosen, then mark not a valuation of these locations along the stream as more integral portions of the stream, rather, then are chosen as lenses that will provide the greatest and most diverse glimpse into an assembled Saw Kill.

Chapter 3:
Sampling the Saw Kill

The Site Sheet

The Site sheet is a tool that retains very different roles with regards to where it appears. In the field, this laminated sheet is an instrument of visualization from which sampling sites are described, becoming both the foundation of constructed place and the locale through which sampling bodies do not just enter and experience the field, but inhabit it as well. Inhabitation as means through which intimate knowledge of the field is constructed enables sampling individuals to assume an authoritative role over what is being observed. In this sense, the different observational sections of the site sheet (Observations or changes to Site; Water level changes; How's the water?, How's the Weather?, and General Observations) all point towards the 'Site' as a rhetorical tool through which landscapes are designed. While sampling sites are spatially constrained locations on the map of a sampler's course, as a discernable place, they experience immediate transformations upon a sampler's arrival. Pre-contact, sites are notations on a conceptual map of the field. They are strategically organized destinations chosen under the authoritative gaze of the lab, that through their unification as sampling sites, provide a partial, but purportedly diverse, perspective of the water quality of the Saw Kill on a sampling day. Pre-contact, they are more of a collection of amorphous or hypothetical subjects that lack meaning beyond their role as points of interest. They would be more appropriately defined as a 'partial places,' in that they are recognizably distinct from the engulfing field, but not entirely divorceable from it. Similar to how lab-sourced perceptions of the field as place and location become disillusioned, at least partially, when one partakes in the field, sampling sites take on new meanings when sampled from.

The act of filling out a site sheet then marks the creation of a new type of place, one that, while undoubtedly tied to the physical locations sampled from, is a distinct landscape in itself. Here location and landscape diverge on the basis of materiality and experiential quality. Physical place as location becomes abstracted as a mapped object; it is a locality that is conceived in respects to other localities. As Gupta and Ferguson state,

> the identity of place emerges by the intersection of its specific involvement in a system of hierarchically organized spaces, with its cultural construction as community or locality (Gupta and Ferguson 1992:8).

Put plainly materiality of location as place, is conceived on the basis of what it is not that location. Location is, therefore, not concerned with the physical form that is may come to represent, but instead is oriented along the horizontal span of a neutral space. Mapping of space promotes the mentality that anthropologist Tim Ingold refers to as the global model of dwelling, in which the world is collapsed and existed on top of. Site as location is informed by a lab mentality, in which witnessing of the world, in this case 'the field,' is done by leaving it. According to Ingold, by divorcing observer from an observed world or reality, knowledge of such subjects is formulated, not by engaging with the objects that constitute it, but by learning to represent them in the form of a map (Ingold 2000: 211, 213). The materiality of landscape, in contrast, is an experienced place that is crafted through visual mediations of it. Notions of dwelling or existing within the space of place are contingent of the limitations of sensory perception. This 'field of vision,' is then all that is, and can be, seen. The dichotomy of mapped location and experience landscape is then reminiscent of political theorist Timothy Mitchel's diagnosis of the colonial mapping of Egypt along economic channels as, hinging the world on an axis of image and object or, representation and reality (Mitchel 2002: 83).

Landscape architects Carol J and Andrea Kahn's definition of site helps us understand why sites along the Saw Kill can exist as both a location and inhabited landscape. More specifically, they claim that from a design perspective sites consist of three different areas: the areas of control, influence, and effect. The area of control then represents the delimintated space observed, where in contrast, the areas of control and effect, respectively represent the areas that encompass forces that act upon the area of control, and spaces that are, in turn, acted upon it. Site is then understood as physically limited space, that is considered through referential acknowledgement of its surrounding context. (Burns and Kahn: xxi) As Burns and Kahn put it

> The concept of site, then, simultaneously refers to seemingly opposite ideas: a physically specific place and a spatially and temporally expansive surround. Incorporating three distinct areas, two divergent spatial ideas, and past, present, and future timeframes, sites are complex. (Burns and Kahn: xxi)

Sampling sites as mapped destinations are numerically organized objects (1-14) that guide the expedition of the sampler as they follow the stream. Oriented chronologically, site numbers indicate where they occur along the stream, the higher the site number the further upstream samplers venture. While their numeral identifier corresponds to their position along the stream, there is no correlation between it and the physical landscape that samplers are brought to. Marking positional distance along an observed subject, they are not indicative of a standardized measurement of space. Space or 'measureable distance' then becomes arbitrary, as proverbial distance, not peculiar distance, is necessitated in the establishment of sampling sites as their own locales. Moreover, their chronology is solely representative of the amount of locations that need to be visited, and sampled from, holding no effect on the order of collection.

When samplers begin their treks through the wilds of the 'Field,' they contend with the complex landscapes that house these sites. Be it by car or foot, the 'getting to the site' becomes an integral part of a sampler's methodology, as continued return to sites enables the

experimentation with the methods through which samplers arrive. The journey to and from sites takes on a strategic form, as the mentality of the sampler becomes perfuse with necessary efficiency. The order of sampling is informed by the point at which samplers enter the field, with the recognition that the final destination is the lab. Samplers' bodies then become saturated with a similar logic of the stream. Where gravity pulls water through the path of least resistance, often painting water as fluid, flexible, and infused with a mobile rationality, samplers mimic their subject, efficiently navigating landscapes by moving like water.

"Here at the Bard Water Lab, we behave like water," told as a cheesy pun that caused visible cringing amongst veteran members, this statement held great influence over my fieldwork and how I interpreted behaviors in both the field and in the lab. While a seemingly inconsequential remark, likening the Water Lab to water itself is revealing of how members behave at different phases of the sampling process. More specifically, samplers embody different 'watery' modalities at different points. Thus, by moving like water, they embody a particular strain or conceptualization of it,that then reflects onto how they behave at particular points in the field. Mentioned in Chapter 1, water as mobile agent is recognized under the guise of H2O, a chemical compound that both constitutes and fuels the hydrological cycle. By embodying this particular expression of water, one that is distilled, chemically constituted, and decontextualized, samplers are not flowing through landscapes; rather they are flowing over and around them.

Sampling the Lower Reach

Driving down to the field station, we exit the car with our hands filled. Clipboards containing site sheets and pens are squeezed under an arm; a water dipper rests on a shoulder; a YSI sensor, contained within a black shoulder bag, is held by a few fingers; and backpacks holding sample bottles and ice packs, clunk against each other, one strap from each bag

dedicated to one of my shoulders. We trek sideways down the steep but brief path that leads to site 1 where we prepare to take the first of our samples. Damian, my partner for the sampling event, takes out the YSI sensor, gently tossing the probe end a couple feet into the shallow waters in front he has to wait for the sediment to settle, given that the disruptive effects of the probe entering the water may misrepresent the actual condition of the stream. Putting the equipment down I take out the corresponding site sheet and begin fill in each section.

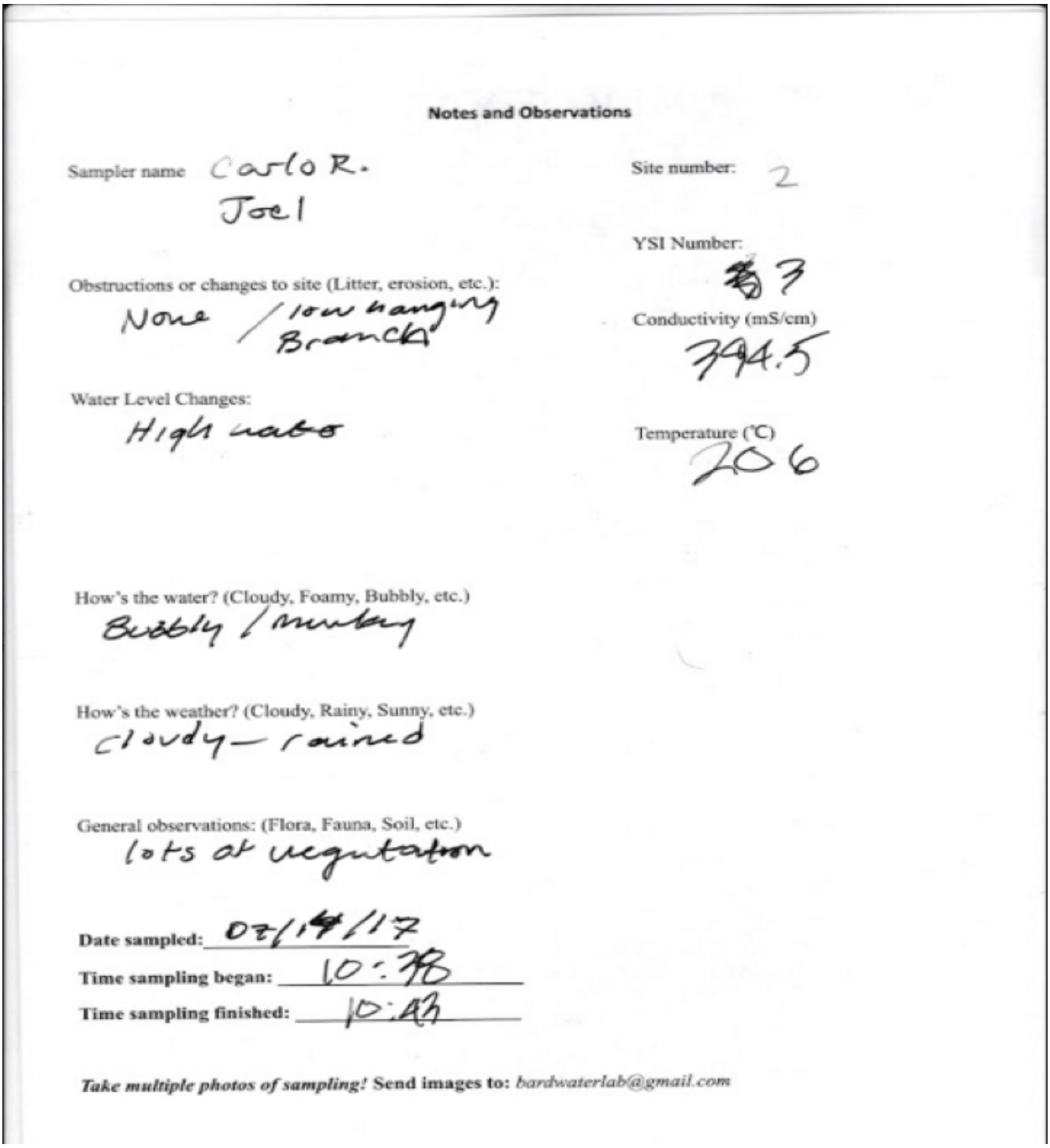
Entering a concentrated zone, I fill out the site sheet with quick succession. Samplers: Carlo and Damian. Site #: 1. Obstructions or Changes to site (litter, erosion, etc.): I survey the area for any changes, any noticeable physical disruptions, the only noticeable difference is an increase in leaf debris on the surface, evident of season change. Water Level Changes: it is low tide (which makes water level changes very explicit here at the mouth of the Sawkill). I also feel the need to include this in the previous section, given that the entire mouth of the stream has completely changed—the discrepancy between what is understood as land and water have been reoriented as the bank has grown a good twenty feet in some directions. How the water (Cloudy, Foamy, Bubbly, etc) is: cloudy, with water flowing in from the bay, there is also an increase in debris in general. How the Weather is: It is partly cloudy, with some wind, and a temperature of 56 degrees Fahrenheit. General Observations (Fluara, Fauna, etc.): There is some Duckweed floating on the surface, and a catfish swimming a couple feet away. Snapping out of my trance, I turn away from the sheet towards Damian, who is now holding the sensor ready to read the numbers. Conductivity: 485 ms/cm (check the units). Temperature: 14.7 °C . YSI sensor #2.

The YSI translates the invisible chemical conditions of the water into numerical values that will be then understood through comparing and contrasting to its corresponding site sheet, and the data acquired at other points of the stream. Putting YSI probe away, we don latex gloves

and prepare to extract the sample. After rinsing the dipper and sample bottle three times, I begin filling the bottle with sample water. It takes about six consecutive dips until the sample is filled, at which point I quickly cap it, isolating it from an outside world of purported contaminants. I look at the water with complete awe and confusion, despite doing this for over a year now I am still perplexed and fascinated by the transparency of water, not only as invitation to observe it, but by how misleading that clarity can be. Snapping back into the task at hand, I place the bottle between two ice packs in bag to reduce the chance of change among the invisible bacteria present. Making note of when we began and ended sampling, I jot those times down of the site sheet and commence to pack up, heading off to site 2 .

Filling Out the Sheet

Site sheets are then the gate into 'really' being in field and just passing through it, and as artifact mark the transition from fretting on the border of the field and fully submerging oneself. Where one side of the sheet describes a site, with its geographic coordinates and visual markers so that people can recognize them, the other asks samplers to enter and observe a localized slice of said field. These aforementioned sections of the site sheet (Observations or changes to Site; Water level changes; How's the water?, How's the Weather?, and General Observations) can be seen as an extension of the lab as a ideological model for looking at the Saw Kill and the surrounding environment.



Notes and Observations

Sampler name Carlo R. Joel

Site number: 2

YSI Number: 3

Obstructions or changes to site (Litter, erosion, etc.): None / low hanging Branch

Conductivity (mS/cm) 794.5

Water Level Changes: High water

Temperature (°C) 20.6

How's the water? (Cloudy, Foamy, Bubbly, etc.) Bubbly / murky

How's the weather? (Cloudy, Rainy, Sunny, etc.) cloudy — rained

General observations: (Flora, Fauna, Soil, etc.) lots of vegetation

Date sampled: 02/14/17

Time sampling began: 10:38

Time sampling finished: 10:43

Take multiple photos of sampling! **Send images to:** *bardwaterlab@gmail.com*

Figure 5: The Site Sheet, taken by Author

The site, as a composition of different categorical phenomenon is saturated with what I can 'Invisible Significance' or perhaps 'immaterial significance,' which marks a type of ascribed meaning that diverges from 'visible-' or 'material significance'. Moreover, imaterial significance manifests through the curating and organization of particular physical objects or occurrences, that make up a conceptual system that then gains materiality. Sites are then akin to the 'ecosystem' as a conceptual model. 'Visible-' or 'material significance' is meaning ascribed to an object or occurrence through the assumption that its materiality is fully its own, an individuality that can be discerned on visual level. 'Sites' as objects of invisible significance, are constructed from objects of visible significance. Therefore, the historicization of the ritual of the a sampling site, enables samplers to conceptualize themselves as returning to the same objectified location of the site. The site, as an invisible entity that is then imagined through it constitutive parts, becomes a lens of complete clarity, through which its building blocks can be realized. There is then a reflexive nature of the site, as tool not to simply look at the Saw Kill as field, but to look at itself, and through such reflexive behavior, lay claim to itself as a self. Site as an embodiment of invisible or immaterial significance, highlights the materiality of particular things, in which, the significance of the material/visible is realized through the immaterial/invisible. To make use of cultural critic Ivan Illich's concept of imagination as visualization, the dialogical constitution of sites through the notation of observations then gives rise to the construction of an initially invisible site as a naturally occuring construct (Illich 1985: 11).

We see here, that the field is contained within the lab, not it a spiritual sense nor in physical one, but rather as an object of visual appraisal—the Saw Kill is locked in the indirect gaze of the lab. As an institution of knowledge production, the lab then claims authority of the

methodological design of sampling, and as a result, how sites in the field are analyzed is directly done under the tutelage of the lab. While these qualities seem like normal things to observe when in 'the environment,' the assumption that they somehow give greater insight into the quality of the Saw Kill's water on a given day is a truth reified by the lab's authorization these cateogories

While the lab holds influence over what is observed in the field in this case, this does not imply that these citizen science samplers lose their agency completely, nor should that be a concern. Despite any apparent connotations that citizen science volunteers are not traditional scientists and therefore lack the expertise to create formalized scientific knowledge, samplers do bring with them particular expertise to the field. More specifically, samplers as a demographic are composed of teachers, students, engineers, photographers, self-proclaimed ecology buffs, biologists, and more, none of which are mutually exclusive, all of which help them fill out the site sheet in their own particular way. Differences in site sheets are not stark but they are telling, while some can recognize erosion along the banks of the stream others point towards the presence of deer tracks. Site sheets may be a looking glass through which the lab conducts preliminary analysis of the field, but is also where the field realizes its true potential as a composite of many social worlds. Koehler states "nature connects field biologist to other social worlds," he is referring to the presence that non-scientists individuals have in the field and how scientist must contend with objects of study that are not exclusively interacting with them (2014: 7). In contrast to samplers, where the effects of non-samplers are contended with very explicitly, the multiplicity of social worlds is also seen with a site sheets embodiment of converging worlds. As site sheets reflect the particular expertise of samplers, they embody different epistemological worlds mediated by the bodies of samplers that belong to them. While this may seem like a flaw

in the lab's training, a complication that has gone unaccounted for, it is the very purpose of the Bard Water Lab as a citizen science initiative.

One of the main goals of the Bard Water Lab, as told to me by the organizing force of the lab, Elias Dueker, a marine microbiologist, "is to make science accessible, as well as useful". Such desires seemingly manifest out of a popular critique of science, and perhaps all academically oriented fields, as being exclusive and elitist. Making science both accessible and useful is then entirely contingent on the inclusion of stakeholders in the sampling process. More specifically, site sheets participate in the technicalization of the informal language of samplers—personal expertise is regarded as appropriate expertise. The site sheet then is the apparatus through which this monitoring program becomes a citizen science initiative. By incorporating stakeholders in the process, notions of citizenship are fulfilled through a completion of the site sheet.

Sampler Name

The first section of the section of the site sheet, "Sampler Names", calls upon samplers to identify themselves within the sampling process. While this may seem like the least telling of all the sections, given that it does not reveal anything about the observed physical conditions of the site, it does hold fruitful exploraiton. More specifically, while citing your name as a sampler could be seen as an act of admitting one's responsibility within the production of field knowledge, such notations are placing the samplers within the observed field. Placement here refers not physical dwelling, though such sections might indicate this, but to an almost spiritual saturation where sites embody samplers—filling out the site sheet becomes an episode where samplers and sites come to be known through each other. Within the process of observing a site, noting what should be included and what should not is extremely difficult. While the sheet itself

attempts to guide you through its parenthetical suggestions in each section (see image 5), whatever is observed is implicated through the presence of the samplers. Since visual signs are described through their linguistic signifiers, what its observed and how it is chosen to be presented, are choices that hold transformative effects on how those observations are then understood later on.

When samplers begin filling out the site sheet they are positioned interestingly as both part of the landscape, and detached from it as an object of study. The site sheet, while a map to the site itself, also operates as a guidepost through the observation process. The categories that compose the sheet are then, structuralist in nature, warranting a constant mode of observation. Moreover, physical phenomenon acting on the quality of water then percolate into the five categories pertaining to visible observations, denoting an inherent value to the categories that somehow distinguishes them. Moreover, the descriptive practices of filling out a site sheet must be construed as analytic. In anthropologist Hugh Raffles exploration of forrest based ecologist in the Amazon, he explains that field methodoloy is devised for the crucial goal of producing materials that can masquerade as data(Raffles 2002: 171). Raffles example in the Amazon provides interesting juxtaposition to the field science occuring along the stream, simply on the seemingly contrasting materiality of both subjects. Trees, Mahogany or otherwise, are very literally rooted into the ground, whereas water is an agent of flux, it cannot be immobilized even in its most fixed state. The dissemination of site sheets throughout the field, however, demonstrates a similar scientific necessity of replication that Raffles is pointing to, in which, such practices fall short on the basis of absorbing variability as well as a general porosity of field surveillance. Raffles notes that while replication within experimentation is a methodological tool that is meant to acknowledge the extreme heterogeneity on the landscape, in its application, it

makes “distinct experimental units” indiscernible. Beyond that, the number of replications decided upon is full of arbitrariness (Raffles 2002: 169). Therefore, while the multiplicity of sites are meant to provide a diverse look at the Saw Kill, the actual number, is random.

Here emerges the hierarchy of knowledge production between Lab and Field, in which the explicit deconstruction of an assemblage of phenomenon that inform water quality and the conditional context that the Saw Kill finds itself in, provides a language through which site sheets can grasp at a small amount of universality, at least on a cross-site basis. Moreover, the question that needs to asked, at least in the rhetorical sense, is what empowers these categories, (Observations or changes to Site; Water level changes; How’s the water?, How’s the Weather?, and General Observations) and what makes them appropriate or effective at revealing the ‘true’ condition of the stream?

The Site sheet, while existing, and transforming within the contexts of the field, still maintains a visual appraisal of the stream, at least through the context of these categories, these conditions become the composing currents of a Saw Kill stream in its totality. John Herron’s historic exploration of Panorama of North American Plants and Animals at the Chicago World Fair provides insight into the site sheet as particpating in an identicial rendering of a natural world. More specifically, both panorama and site sheet present nature or a site as though it were “happening all at once” (Herron 2015: 53). Moreover, as the universal qualities through which ‘Landscape sites’ are observed and mediated, they are drawn into a relational continuum through a methodology of observation and the mobile subject of water. The standardizing of these categories as defining of the conditional existence of water along all sites, then enables a universalizing of them, as they dissolve into the perpetual flow of the Saw Kill, streaming into the areas of unknown, or not-site, that connect them. Site sheets are then a filtration device that

empower the presence of visible phenomenon that fit into these categories, in which, by infusing them with the incorporeal spirit of data, they then become decipherable containers of information that can be pulled out of the raging flux of the phenomenological field. Notating phenomenon through these categories, the site sheet engages in the construction of a natural history of that site. In light of the sheet asking for one's name, samplers are encoded into the natural histories they help draft.

YSI

YSI probes, which enable samplers to observe temperature and conductivity in the context of the Saw Kill, though not contained to just those conditions, also plays a role in this standardization. The YSI is then an apparatus of translation, converting chemical conditions of a moving watercourse into a stream of numeric values. Such translations mark the most useful production of data within the field, outside of sample extraction, which is not contented with until the lab. Moreover, the segmentation of the Saw Kill into sites and not-sites, then enables a comparative outlook at the chemical conditions of the stream. As previously stated the YSI reveals some of the chemical conditions of water, conductivity and temperature, flowing through a site. Within a stream composed of sites and not-sites, only sampling sites can 'truly' be known. Nevertheless, that which is not-site, as the in-between spaces, can be understood as ecotones of chemical transformation. These zones are the socio-physical space that establish sites as relational constructs. Not-site zones can then be understood as space through which the conditions from the upstream site transform into those of a lower site. Nonetheless, such rationalizations domesticate the coursing waters, subjecting them to linear rationality where sites become naturalized beginning and ends within a continuum of water quality. In contrast to such

simplifications, and through other work that I have conducted along the Saw Kill, I know that such assumptions erase the erratic sploshing of water quality that lacks any apparent rationality.

YSI probes, like the site sheet, are another tool through which the Saw Kill is objectified and simplified. Moreover, in conjunction with the initial writing phase, I was enrolled in a class titled 'Water,', where of the many concepts we learned was 'stream heterogeneity'. By using a YSI at different distances across a stream channel, we learned that water quality at and within sites is not consistent. Stream heterogeneity, then indicates the omni-directionality of difference within Saw Kill water. In contrast, YSI's are only used once at a site, generally adjacent to where samplers have extracted water. As a result, the values that it detects are disseminated throughout the sampling site, where the saturation of one salinity and temperature measurement within site gives the impression that these conditions are inherently tied to this location. Even the process through which this is observed demonstrates the illusion of a unified physio-chemical condition as probes demonstrate a single value, but change in quality over time. The YSI is then an apparatus of translation, converting chemical conditions of a moving watercourse into a stream of numeric values. Such translations mark the most useful production of data within the field, outside of sample extraction, which is not contended with until the lab. YSI are then mechanic encapsulations of the lab: seemingly devoid of history, proponent of a disentangling translation, and creators of universal knowledge.

Nonetheless, the fact that samplers do not account for stream heterogeneity does not mean that they are lazy individuals incapable of accessing the true capabilities of a YSI probe, rather such realities to not serve the purpose of the monitoring. Moreover, if the intention is to help grasp a general condition of the stream over time, then becoming too enmeshed into the diversity becomes more detrimental than helpful. The knowledge that the monitoring program is

trying to produce is not neutral by any fault. Rather, the intention is to help inform local constituent so that they can make educated decisions based on community water use, and other general practices that can affect water quality. With this in mind, 'knowing the field' in this case is not at all concerned with attempting a complete understanding of each site. By verging into the entangling diversity of the field, the goal of sampling may be obfuscated by a general pursuit to uncover a more indepth knowledge of nature. Ironically, the further one dives into the informational whirlpool that is diversity, the less and less nature appears to be a singular thing. While a more romantic side of me may pride a decentralization of nature as socio-physical domain, nature as biological unification, is a useful tool through which people govern their interactions with the constitutive assemblages that constitute nature physically, and ontologically.

Site heterogeneity is an acknowledged phenomenon in itself, but one that must be contended with through localization. If the SKMP's sampling efforts were only concerned with a single site, such directions would warrant value, yet this is obviously not the case. Thus, the establishment of multiple sites as demonstrative of a diverse Saw Kill, only contend with diversity to the point that allows for the unification of the stream as environmental feature. Sampling sites are then confusing locations of knowledge production because the standardization of observation practices, delocalizes them. Methodologically, sites are constructed not for the purpose of observing diversity at site level, but instead at the scale of the stream. Therefore, the mentality with which they are used is not at all concerned with localizing knowledge, but rather the distinct dividing of a watercourse that was never inherently whole, to then draw connection and form a recombinant Saw Kill.

By comparing the site furthest upstream with that at the mouth, claims can be made about this grand inbetween zone, as objectified form of the Saw Kill, that while supplemented with the presence of sites, shows the transformational continuum oriented along the channel of space and time. Any form of categorization, whether oriented along morphological conditions of a stream corridor or the chemical conditions of a constituting water, then brings the lab into the field, as the site sheet becomes a disentangling entity of structuralist logics. Categories order the phenomenon that occur at the streams bank, both in the physical sense and a metaphorical one, in which, like the notating of names as saturating act, the site sheet as a whole, becomes a point source of pollution, enacting ideological/epistemological runoff. Such comparisons are not to accuse scientific field practices as polluting of the waterway, at least not in the negative sense. Rather, I use a runoff analogy to indicate the foreignness of scientific ideologies, or perhaps their lacking inherency, noting there presence as informing of a more cosmopolitical condition of water that then gives insight into a physical one. In turn, by segmenting the Saw kill into sites and not sites, and then into different types of categories, a potentially 'truer' complexity of the 'Saw Kill Stream' is then lost, in which, kill becomes object through its subjectification.

The phrase "Saw Kill Stream" is actually a misnomer that I became aware of early on in my research, when a former teacher of mine interrupted our conversation to say, "it is not a stream, it is a kill". Despite learning that 'Kill' refers to creek in Dutch, my field notes and writings are brimming with the redundant label, so much so that this nominal mistake has provided insight into the politics of nature and its recognition through ascription. 'Saw Kill' then contextualizes an ideological confinement of the watercourse within a history of early Dutch colonialism, tying the historic flow of water through a temporally past space to a the historic

construction of a Saw Mill. The 'Saw Kill', as an identifier is then naturalized, giving the watercourse an 'ethnic' identity, but maintaining such taxonomies as natural.

I use "Stream" in conjunction with the 'Saw Kill' to then demonstrate multiple ideological flows, like that of the surface and subsurface, that then place the stream in between two forms and two worlds. On one hand, the word 'stream' then makes reference to the objectifiable feature of the landscape as a "body of water". Liquid corpus, the object Saw Kill is then distilled from the field and collapsed. In contrast, as streaming also refers to a continuous flow or process, through which the Saw Kill is not one discernable formation of water but the manifestations of a intermixing of an incommensurable amount waters. The phrase "Saw Kill Stream" then marks this dichotomous entity as one between the field and lab, as somewhere between distinct object subject to the visual valuation of the lab, and part of the phenomenological weave of the field. Like the aforementioned delineation of waters between surface and subsurface, these two understandings of the Saw Kill, while conceptually alienable, are visually irremovable from each other.

Obstructions or Changes to Site (Litter, Erosion, etc.) and Water Level Changes:

To note changes to obstructions or changes to a sites requires, and implies, that samplers are imbued with a particular cultural memory of that site. It assumes a historically constituted familiarity, one that that laid claim to by consistent return to the site. Yet in the case of the SKMP, sites are only visited, at least officially, once a month. Therefore, the process of change that is being notated, is constructed on a monthly increment that does not account for the changes that between two sampling dates. Similar to how the enframing of non-site between sites enables an understanding of the conditional existence of the stream as rationalized through logics of the sequence and continuum, this meaning, that the non-site between sampling sites is the space

where the qualities of one site transition into the other. Here, like transition zones between sites, there is a stagnation of change, where the conditions observed at two sites or at sampling events is manifested as a linear moving, goal-oriented entity. Changes that occur at a site between sampling events, that is, changes that have had the visible markers of their existence erased, disappear with their material bodies. Regardless of whether or not the effects of those changes still reverberate through the water, such connections may never be drawn, even after samples are observed in the lab. The notation of change then conjure a predominantly ahistorical field that only gains history through human excursion into it.

The next section also assumes or requires a familiarity with the site, as it is calling for the comparison between the current and previous conditions of the stream. While samplers generally return to the reaches that they are most familiar with, the likelihood that they remember the exact water level at that sight is unlikely. Regardless, samplers still find the means to fill this section out, revealing of a preconceived notion of normal conditions of stream manifestation. Moreover, water level, at least on this site sheet, is not quantified, rather it is garnered from the interpretive faculties of samplers. Thus, a majority of this section is composed of low, high, and normal water levels. Here we see the naturalization of particular manifestations of the stream, and divergence of that as atypical. A lecturer in one of my environmental design courses aptly noted a naturalization of norms within a preconceived nature, coincidentally, noting the normalization of flowing water when it remains within the confines of the stream channel, but then garners, as flood, when it exceeds these boundaries. Here, discrepancy from a normal flow is seen as an event, whereas, conceptions of a normal water become unremarkable, at least on the site sheet. The ascription of a natural norm helps concieve of the Saw Kill as a single entity or body of water, rather than a flowing process of watery occurrences, because it assumes a comfortable and

consistent discharge is to be expected. This example is not to question this expectation , for it would be very alarming for the Saw Kill to suddenly dry up, but rather to point how the field that is being observed lacks any neutrality.

How's the Water(Cloudy, Foamy, Bubbly, etc)? How's the Weather(Cloudy, Rainy, Sunny)?

Such categories represent the more qualitative categories, as samplers are tasked with describing the visual qualities of the water as substance, as well as, the meteorological conditions that this water finds itself in. Interestingly, these sections are never left blank, as these categories are framed so that there is not standard, outside these qualities as agents that inform water quality in some way. Despite being phrased similarly, these categories represent two very different processes of informing water quality. The first asks samplers to observe an already experienced condition of water, albeit, vague and strictly visual. In which, the notated visual qualities imply different conditional states. For example, while clear water my give evidence to clean water, bubbles or froth may indicate some form of runoff or point source of pollution. In contrast, weather is acting upon water, as a worldly condition that it finds itself in. A warm Sunny day may explain warmer water, while rain can explain a subsequent rise in water level.

General Observations (Soil, Flaura, Fauna, etc.)

In my personal experience this section is the most difficult part of the site sheet to complete. Moreover, it is the least constrained of all sections, and in its vagueness, demonstrates the true arbitrariness of these categories in general. More specifically, the fact is, all of the observations that are diverted into the sections, can fall under general observations. Nonetheless, following the other sections it is often uncertain what needs to fill this section and in light of that it is often left blank. Because sampling is constrained by resources and the schedules of all the volunteers both in and outside of the lab, sampling is always as time efficient as one can hope.

The final section for observations, then enables samplers to stretch their creative eyes, and find other ‘general observations’ that do not fit into the aforementioned sections. Therefore, pondering what's left to be observed then introduces samplers to the blinding qualities of a rhizomatic field without beginning and end. It is then difficult to include what is worth noting and what is not—samplers are put into a scenario where too much vision becomes vision impairment, which often avoided by leaving the section blank.

Time Sampled and Date

As the final step before the completion of the site sheet, marking down the time span and the date with which this sampling occurred cement those observations, and extracted sample, in time. Freezing them in time, then renders the site sheet a frozen landscape, that is no longer undergoing constant transformation. The visuality of the Saw Kill then draws it near to what anthropologist Arturo Escobar would call ‘capitalist nature’ (Escobar 1999: 1-5). Through a political ecology, Escobar draws distinctions between three regimes of nature: organic nature, techno-nature, and the aforementioned capitalist nature. This regime marks the creation of a linear perspective, linked to the freezing effects of realist landscape painting, which places the viewer outside of the picture, nature, and its history. Escobar elucidates on the concept, marking its contribution to the connection between words and things, allowing “one to see and to say”, as a result integrating both the individual and biological into, what philosopher Michel Foucault calls, rational discourse (Escobar 1999: 6). Taking Alexander Wilsons notion that landscape is a way of seeing, the cessation of time then represents the preservation of a sampler’s sight (Wilson 1992: 11-13). Nonetheless, this vision is in many not soley their, as the site sheet is an apparatus of the lab’s design. Therefore, while samplers use the site sheet to observe the field, the lab uses the site sheet as a way to observe samplers within the field

Chapter 4:
BWL: The Manifested Lab

Rose Laboratory

Exiting **Joel's** car, we shuffle with the sample bags and equipment, making our way up to Rose Laboratories from the parking lot. As the often unnoticed extension of Hegemon Hall, Rose is part of a collection of buildings (Stevenson Library, Olin Hall, Kline Commons, and Hegemon Hall) compose as a central social hub of campus. The proximal positioning of these building incites a conglomeration of human traffic and socializing, as students, teachers, and tour groups convene on their journeys to, from, and between buildings.[29] As the new residence of the Bard Water Lab (BWL), Rose, which is most obscured from the general public of campus life, becomes a terminal of convergence on multiple levels: where field meets lab, contamination meets sterility, samplers meet lab workers, observations meets data, and samples meet spreadsheets.

Coincidentally, the indirect introduction of the Saw Kill into a central hub of campus through the BWL, is reflective of the sentiment that the stream, in light of Bard College's recent acquisition of Montgomery Place, has become the new center of campus.

It's the first sampling day since the Bard Water Lab was set up in its summer residence, then RKC.[30] Entering the old elevator, it stalls before ascending to the top floor, seemingly unaccustomed to more recent, regularized, use of it. Opening up to a dark empty hall, we turn the corner to face a distant sign that says "Bard Water Lab" with an arrow pointing left. Arriving at a

[29] While there are other buildings that manifest within this social hub of collective movement, like Warden Hall, Stone Row or Rose Laboratories, they manifest more so as contextual background or features of a manicured campus landscape. In, addition, while the span of the central social space can be expanded to include the Bertelsmann Campus Center, its distance from the the aforementioned social hub, renders it more of a satellite that directs movement from the center.

[30] The Gabrielle H. Riem and Herbert J. Kayden Center for Science and Computation, or for short, RKC, was the site of BWL's second Lab and where I conducted most of my extensive fieldwork.

wide metal door, I push it open and am greeted by bright light from outside, illuminating BWL's newly set up lab.

Placing the field gear on the closest counter, I remove the samples from the the field packs and store them in a fridge where they await preliminary processing. Damian has disappeared into the back room to discuss something with Eli. After storing all the field equipment at the far end of the lab, away from the procedural happenings of water quality analysis, I begin to fill out the chain of custody.

Composed of eight different sections (site name, site #, sample source, samplers, date of sampling, time of sampling, time received, and processor), the chain of custody marks the transferral of ownership of the sample from field samplers to the lab. In other words, it acts as a receipt of lab-field exchange, that upon completion, marks the official end of field based work. After its completion, I bring the chain of custody to whoever is doing data input, and prep for lab work. Hands washed and constrained by latex gloves, I head over to the IDEXX station and await the first aliquots.

The Sample Bottle: An Ideological Apparatus of the Lab

Aliquoting is one of the most essential steps in the Lab, is the act of extracting water from the original sample, Maria divides the field-collected sample into many different smaller bottles, also labeled with the site from which the water was sampled. Before each extraction, Maria inverts the large sample bottle, back and forth, slowly swirling the water in circles. She does this to reverse any settling that has happened during the sample's journey to the lab. This gentle stir is then another methodological step, homogenizing the contained water, so that when it is aliquoted the samples are identical. There is no way to prove this, and most would admit that the claim that they are identical is probably false. However, the simple act of stirring allows the Bard

Water Lab to express confidence in the ostensible identicalness of these aliquots. This act is a scaled down example of a larger process of simplification in the presence of extreme heterogeneity. While the original collection of the sample demonstrates a very stark absence of recognition of heterogeneity, the inversion of the sample bottle is a far more controlled ritual of erasing diversity. Marking the extraction of water and its subsequent containment within a plastic bottle as the deliberate construction of a sample is important because it reaffirms the scalability of the subject of study, a notion that we are first introduced to through the site sheet. Furthermore, positioning water as a sample from a site then implies that it is a smaller but complete reflection of the water at that site. However, as outlined in the previous chapter, understand water as belonging to and at a site becomes difficult in light of its mobile state. Thus, the sample is acknowledged in many ways as an accurate representation of a site, that is, everything that is happening in that moment. At the same time, there are many ways that BWL acknowledges the heterogeneity of water; the multiplicity of sites can attest to that. Moreover, the site sheet already credits the site and its water with an apparent heterogeneity, but a structured heterogeneity that understands sites and the water within them as homogeneously composed.

Because the sample bottle is seen as an epitomization of the site, it becomes the stage through which the lab can very efficiently lay claim to certain privileges of control. Moreover, the relationship between sample and bottle as one of containment is a material metaphor for how the field is contained within the lab. The autoclaved sample bottle acts as a sort of ideological apparatus utilized to disseminate the authority of the lab into the field in an anachronistic fashion. [31]To be specific, the water within the sample bottle represents a preserved field, one that

[31] 'Autoclaving' is a process of sterilization prominently used in microbiology, medicine, podiatry, tattooing, body piercing, veterinary medicine, mycology, funeral homes, dentistry, prosthetics fabrication, etc. Many autoclaves are

is in a chronostasis. The autoclaved bottle, as a neutral vessel, one that has physically been cleansed of contaminants, is a materialized form of the lab, in so far as it lacks belonging within the field, and instead is an exterior architect of it. In other words, the bottles ability to contain am all encompasing sample is

The containing nature of the sample bottle is a metaphoric delineation of the boundaries of the site. Although the the site sheet privileges visual ways of knowing through physical demarcation of boundaries, there is a disconnect between the visual markers that serve as boundaries of the site, and the location from which the water is extracted. The flow and currents and stream ensure that water, and whatever else is in it is being mixed. Water is then taken from the flow that is right in front of the sampler, under the assumption that it is homogenous. There is, thus, an assumption that the water at the point of extraction engages with the phenomenological occurrences noted on the site sheet, and that all the water across the site is affected in the same way.

Citing biologist James R. Karr's renowned piece, *Rivers as Sentinels: Using Biology of Rivers to Guide Landscape Management (1996),* the titular construction of rivers is key to understanding the SKMP's philosophy of water. Karr notes that rivers are indeed sentinels that serve as a circulatory system of continents, and in studying these circulations of water, just as with blood, scientists can become privy to the health of not only the river or stream, but the environment around it (1996: 503). As I have stated previously, water is an agent of both metaphorical and physical connection. Karr, then, describes the physical connectivity of water through four different categories:

> Water is connected in four dimensions: upstream and downstream (longitudinally); across channels and hyporheic and groundwater zones

---

used to sterilize equipment and supplies by subjecting them to high-pressure saturated steam at 121 °C (249 °F) for around 15–20 minutes depending on the size of the load and the contents. (https://en.wikipedia.org/wiki/Autoclave)

> (vertically); on the surface from uplands through riparian corridors to the channels (horizontally); and through the water cycle from clouds to precipitations to surface and then groundwater (temporally). (Ibid: 504)

For Karr, such connections are then important in the role of water, which is a naturally acting sentinel. Dueker echoed this idea through his succinct statement in my interview with him, that "water tells you when something is wrong". What both Karr and Duker are getting at is that everything, good or bad, ends up in water, be it through Sewage outflow pipes or runoff. This is then an assumption that must be made by everyone who participates in the event, that water has somehow felt the touch or influence of that which is around it.[32] This implies that physical occurrences that are spatially distant from the point of extraction can still have an effect on the water in that specific location.

Analyzing the bottles' materiality, the combination of transparency and apparent hydrophobicity, or the quality through which a material repels water, indicates a between sample bottle and site. Sites are invisible structures to the extent that they are places imputed onto physical space and there is nothing inherently visible about them. They are then saturated with what I call 'invisible significance,' so that they are spatially restricted but those restrictions are not abundantly clear.

Returning to the the sample bottle's material qualities, the combination of its transparency with its ability to contain water presents us with a scenario where water can be looked at as though it is in a vacuum. The only problem with conceptualizing water as constrained to site is then addressed clearly in Raffle's statement understanding of water as concurrently local and translocal (Raffles 2002: 182). The concurrent local and translocal nature

[32] One example that I remember from my exploration of past site sheets was the notation of migratory birds in South Tivoli Bays during a groups sampling of site 1. In such an event, the water that was a couple hundred feet away from these birds could somehow feel their influence upon water and then reflect that back in manifested water quality.

of water then mandates that not only physical observations at the site are addressed but also observations made at other sites. This dual translocal and local quality then lends itself to how BWL acknowledges the stream through universals. Locally produced or grounded knowledge about water at a site can then transcend such imaginary boundaries because the water it comes to know extends beyond the site. Nonetheless, the translocality of water, and with it the site, undermines the use of site as apparatus that attempts to erase the ever engulfing heterogeneity of the field.

The sample bottle supports the reality of the site, as demonstrated by the Sharpied label scribbled across the bottle, not as "Site # sample" but as "Site #". Although this action is not at all explicitly intentional, by treating the contained water as an epitomization of the site from which it is extracted from, the 'sample' as a smaller manifestation of the water at the site echoes the aliquoted water that was extracted from the original sample. In each case, the homogeneity of the sample, despite continual minimization of material water, reveals how liquid water, as retainer of water quality, has become a scalable project. By analyzing different moments of the sampling event, we see how water's composition is conceived as constant, despite the many instances of abstraction, where liquid water is subject to extreme divisions. By treating water as scalable, the Bard Water Lab intends to treat the produced data that is later compiled into the spreadsheet, as final aliquot of the original sample, and in turn the site.

The Aliquots

Maria, who is waiting patiently to finish aliquoting, fills two smaller sample bottles with the original sample, one of which is given to those conducting turbidity and fluorescence

measurement, and the other to the IDEXX station.[33] Until Maria gives us these aliquoted samples, we cannot begin testing any of the assigned assays. She aliquots the sample water after ensuring the homogenization, pouring from the large sample bottle into two smaller ones. Dividing the sample into smaller,identical replicants is meant to increase time efficiency so that assays can be conducted concurrently. Maria, or whoever is filling in for her, then creates two aliquots to be shared between the four assays conducted by regular volunteers.[34]

From a desire to maintain and increase efficiency within the lab, the creation of aliquots is also utilized to minimize potential error, most notably, the contamination of the sample. As I have stated previously, samples in the lab need to deny their translocality in order for the lab to lay authority over the knowledge that pertains to the site. The main way to disrupt this illusion is through the contamination of the sample. More specifically, lab workers generally use pippeters(paired with a pipette) to extract specific amounts of water from the sample. Once a pipette has been used for a sample, it can not be used for any other sample. The pipetter/pipette as parallel to the field's dipper provide illuminating insight into how BWL manages and conceives of contamination in different phases of the sampling process. While the dipper is utilized across sites, each sample is given its own pipette. The pipette is a highly monitored object, in that, it can only come into contact with the sample that it pertains to, instances where there that rule is broken renders both the pipette and the aliquoted sample useless. The dipper, on the other hand, is not restricted by the same regulation of contamination. in light of the trans-site use of a dipper, as was explored in the previous chapter, contamination is contended with by washing the bucket with water at the site before using it for sample collection. The act of

[33] The IDEXX station refers to the assay that tests for FIB's, looking in particular at both total coliform and e-coli levels; and enterococcus (Despite the same process these two. The station gets it name from the company that produces the materials used to conduct the assay, IDEXX Laboratories.
[34] Turbidity and Fluorescence share one aliquot, and Enterolert and Colilert share the other

decontaminating the dipper is then achieved through a sort of overriding recontamination of it. Cleansing the dipper of the residual matter or mark a site is done by replacing that with the mark of a new site, the old mark being washed away by the flowing stream.

As the object that bridges the pipette and dipper through the lab-field exchange, the sample bottle and its many aliquots, materialize a water that contrasts with Linton's assertion that water is a process. In light of the realization that sample water is more than just water, and in many ways is everything but water, the sample can be seen as a manifestation of contamination. BWL's purpose is to observe water quality in an effort to manage and police the practices that may endanger the surrounding communities' reliance on the Saw Kill. If water is to provide insight into the daily happening of the surrounding world, then monthly sampling can be seen as the tracking of contamination. The contamination I speak of is not as negative as more traditional definitions, nor is it strictly positive, rather it refers to the general tendency of things to end up in the water. Just as the surface of the Saw Kill reflects the image of the world around it, so too do the constitutive elements within water reflect the world that creates it. Therefore, contamination is what I mean when I argue that 'water is in many ways everything but water'. In addition, the tools that samplers and lab workers are equipped with originate within the lab (e.g, dipper, pipette, bottle), and in their preparation and imbuing of meaning within said lab, are subject to the same potentiality of contamination. This reveals how the effects and perceptions of 'contamination' as a phenomenon are domain specific.

The sample bottle is then where contamination is introduced into the lab in pacified form that renders these liquid contaminations capable of being contaminated themselves. While contamination is then a lab oriented anxiety, field based water can also be understood? as contamination in light of the lab-centric perspective that pervades the sampling process. The

alienation of the field from the Lab that Kohler introduces us to, does not denote that 'contamination as phenomenon' is strictly reserved for the lab, rather that it means something entirely different in the field. As Chapter 2 implies, the field is the embodiment of contamination; however, this contamination is one that is evocative of a multispecies understanding of relationality. More specifically, in *Multispecies Studies: Cultivating Arts of Attentiveness,* the idea of 'becoming' as becoming with, then allows for the application of Tsings concept of contamination as collaboration (Tsing 2015: 27). More specifically, Tsing claim that, people, locations, and anything for that matter, is constituted by an intermingling contamination. While the sample bottle is meant to preserve the coconstituted water extracted from a site, the threat of contamination, it a threat to the illusion that the bottle enables a samples self-autonomous existence. The field's continued process of becoming renders it an illegible mess that must be made sense of by the Lab. Therefore, the embodied field, in this case the sample, must be acknowledged as contamination because it always exists in opposition to the Lab.

Returning to the notion that contained contamination can become contaminated in itself, the fact that water can contaminate other water that was collected from the same stream becomes all the more fascinating when put into conversation with Raffles' (trans)local understanding of this elusive liquid. As the site sheet helps realize, time is the only way of truly isolating water within space—freezing time means freezing change. The sample bottle metricizes water as a particular moment or time-span. Geographer James Linton's argument that water is more an emergent process rather than a fixed thing is interesting in the context of the sample bottle, because it acknowledges water as a process by attempting to freeze it (2010: 4). The contamination of the sample can then be thought as the disastrous moment of where two frozen temporalities converge

Akin to how samples are imagined as homogeneous, even the smallest contamination renders the entire sample completely, and homogeneously, contaminated. The equivalence between any contamination and complete contamination is attributed to the fact that contamination cannot be separated from the sample. This allows us deconstruct notions of difference between samples, in that the sample bottle becomes the only means through which difference can be tracked. Therefore, when a pipette that has carried another sample enters a new sample bottle, contamination is homogenized as well. As a result, the lab cannot afford to contaminate the entire sample because that would require recollection of that sample, something that is not possible due to lack of manpower. In addition, one the frozen moment is lost it is impossible to return to the Thus, in order to maintain the illusion of an unhampered lab, the lab must create methodology where contamination can be avoided all together.

The Quanti-trays: A Material Transformation

Moving on from Maria's meaningful act of aliquoting, I begin to orient myself within the IDEXX station.[35] Making sure to read over the protocol, I begin the long process of looking at Fecal Indicator Bacteria (FIB) in the sample water. While regarded as one station, IDEXX is comprised of two different assays because there are two different types of FIB's being observed, and with them come different protocols. These assays diverge on the basis of the utilized medium: enterolert is used to detect enterococcus, while colilert is used to detect total coliforms and e-coli.[36]

The station is set up with a collection of 100ml bottles, where for the most part, each site possesses two bottles, one for each medium. We see divergence from this rule with site 2.5,

[35] The process of Detecting FIB's is named IDEXX-ing after the corporation, IDEXX Laboratories, that produces the mediums used.

[36] Depending on the sample and medium being utilized there are diverging dilutions. For enterolert you generally add the medium to 100 ml of sample, whereas for colilert is added either to a dilution of 10:1 or 100:1.

which is Bard College's sewage outflow pipe.[37] In addition to all the samples, there are also two controls that are run through every assay, which are DI water sample and DIPC water sample.[38] These are utilized to ensure that lab workers are following protocol, particularly that they are maintaining antiseptic technique, when handling different samples sequentially.

DI water provides an interesting contrastive substance to the field born samples brought into the Lab because it can be seen as being a lab-born water. As an additive that does not disrupt the homogeneity of the sample to which it is added, DI water assumes a similar neutrality to the lab DI stands for Deionized water, implying the extraction of mineral ions, and through such processes, the loss of the constitutive non-H2O components of water that demarcate a place of origin or occurrence. If sample water is frozen in time through its extraction, stuck within the small timespan that frames the sampling of a site, DI water lacks temporal context completely, as a substance that is perpetually contained within sterilized bottles. Within regulations of purity and contamination, DI water cannot be contaminated by other DI water even if it is from different bottles. Contamination of sample water operates with the same extremity of sample homogenization. Similarly, contamination of DI water marks the reionization of it. The use of DI water in sample dilution marks a moment where contamination of sample within the lab is appropriate.

Pipetting samples into 100 ml IDEXX bottles is similar to that of the initial aliquoting done by Maria, because it is a process where already aliquoted sample water is pipetted into an even more condensed form. What avows this similarity, is the mandated inversion of the aliquot, again utilized in order to counteract settling. Once again returning to the act of mixing, gentle

[37] As such site 2.5 is tested for enterolert at a dilution of 1:10 and a whole sample. Colilert on the other hand receives a dilution of 1:10 and 1:100.Samples are diluted with Deionized Water (DI water) as a neutral liquid. This can be explained by the fact that by sampling at the point of discharge, FIB levels are expected to be higher. Moreover, because the IDEXX system has limitations on how many (figure this explanation out)

[38] DIPC water stands for Deionized water that is run through the entire process, that is every and all samples.

stirs and slow inversions recreate the turbulence of free flowing water, positioning mixing as a homogenizing act that recreates the mobility of the Saw Kill's water. If sample water is an epitomization of a moment of water,or a temporal fragment of a 'water process', then simulation of natural mixing can be understood as sample's continual process of becoming within that sample. Any form of stillness then implies a moment where settling has occurred, and is therefore misleading in light of the highly mobile waters of the Saw Kill. Inversion then reveals a moment where the illusion of the sample as a complete reflection of the water at a site, is disempowered—it cannot participate in the constant mixing of moving water. Once the required dilutions of sample are in the 100ml bottles, the medium (enterolert or colilert) is added to the water, upon which the sample is gently stirred once again. Homogenization is important here, in that the medium needs to be fully dissolved in order for the Bard Water Lab to observe FIB levels. The mediums are added to the sample as a reactant to the presence of FIB's in the water. Grabbing the Quanti-tray around the outside of its opening, we pour the contents of the IDEXX bottle into the tray.

As an object, the tray is composed of forty eight large and and forty eight small wells, that together hold the 100 ml of sample. Once settled at the bottom, the tray is flicked in order to release any air bubbles that may be stuck in the wells. Once complete, the tray is put through a quanti-sealer, which automatically pushes sample water in 96 different wells, sealing it with heat. Ideally, the water should fill each well, oftentimes this is not the case, and empty wells can either be attributed to either human or mechanical error.

Figure 8: The Quanti Tray, photo by DelAgua

After it is sealed, all trays are labeled with site number, the medium inputted, the name of the processor, and the time of its processing. Such an example is interesting in that it reflects the same mentality of the field, where producers of field based knowledge are identified so that they can be held accountable in light of any errors observed by the SKMP. What is different is the fact that this is occuring within the lab, where the acknowledgement of individuality marks a contrasting project to the lab's claims to be a homogenous organism that lacks individuality.

Once all the trays are completed, they are sorted into two different incubators based on the medium that was added. After a twenty four hour incubation period, the quanti-trays are taken out and observed, in which each type of FIB (Enterococcus, Total coliforms, and E-Coli) has its own color oriented indicator. For both enterococcus and E-Coli, you place the tray under the UV light box and count the number of large and small wells with a bright, blue fluorescence, which indicates where added medium, enterolert or colilert, has reacted with its correspondent

FIB.[39] To measure total coliforms, the number of dark yellow wells, evaluated with a provided comparator, are counted, noting the number of big and small wells.

Figure 9: Quanti Tray's after Incubation, provided by Food Navigator

The preceding inversion of the homogenization is different in that the specific sample water is homogeneously heterogeneous, as see with the spatial discrepancy, in which water is not a homogenous solution where FIB's are equally dispersed in the wells. The wells provide a very visual indication of heterogeneity, like the field, based on discrepancy in coloration as an index of FIB's. The notation of the processor of the quanti-tray evokes similarities with examples of field based knowledge like the site sheet, which call for the identification of samplers. The quanti-tray is, however, designed to confront and transform the very heterogeneity of the sample

[39] Bard Water Lab, IDEXX Enterolert Protocol.

water, in which the ratio of small to big well allows for a quantification of Enterococcus, Total coliforms, E-Coli levels in colony forming units per 100 mL (CFU/100 mL). More specifically, constructing this unit as pertaining to the number of FIB's at a site during sampling, the scalability of water is once again demonstrated as every 100 mL of water at a site (an indiscernible amount) is saturated with the observed CFU. In contrast to the other preliminary practices that reinforce notions of scalability, the quanti-tray introduces a metric that is contingent on water quantity. In other words, manifestation of water, FIB's, and tray allows for the translation of material water into numerical sign. Anthropologist Bruno Latour's explores a similar exchange between field and lab with the use of 'pedocomparator,' an apparatus that sorts soil by color, redering it mapable diagram (Latour 2001: 53). The Qunati-tray, then participates in a similar process where the recontaiment of water in the tray, transforms the water .

The Spreadsheet: A Stream of Numbers

The Spreadsheet is a culmination of all the data produced during the entire event. Kept on Google drive, only select lab members have access to this material. Before I began my ethnographic research on the Bard Water Lab and the Saw Kill, most of the work that I did for the Bard Water lab was inputting data into this sheet. To that extent, this archive of data was one of my initial introductions to this hybrid collectif that is the Saw Kill. Analyzing its general structure, the spreadsheet, in reality, is a collection of spreadsheets that are organized based on the different types of data that are inputted. I will be predominantly discussing the inputting of data pertaining to the Site Sheets, as a way to continue the exploration of the previous chapter. I will acknowledge the organization of different types of data within this archive, and explore the implications of such organization in light of discussions between lab and field, and how that

divide is established and maintained within the lab. Moreover, I understand data organizations as an extension of methodology, not of practicing lab workers, but of the architects of BWL itself.

Data is organized based on the assay that it pertains to; consequently, even though the physical observations and the YSI data are collected during the same moment in the field, often at the same time, the data is kept separate. Nonetheless, such divisions can probably also be linked to a divergence in the type of data produced, as the physical observations are qualitative in nature and the YSI reports conductivity and temperature back in quantitative form. The other sections pertain to assays completed in the lab like turbidity, fluorescence, IDEXX, etc. The categorical organization of data based on assay is then reflective of the organization of site sheet as another document of data organization. With both, the composition of divergent data is then understood as the constitutive parts of a converging whole. The compiling of this data then represents one of the greatest abstractions of the Saw Kill, in which the conditional existence of water that constitutes the "Saw Kill stream"—turbidimeters, pipettes, and sample bottles—renders the Saw Kill a stream of numbers and arbitrary observations.

As an archive that is continually expanding with the intention of contributing more and more data, this stream of numbers then marks a body of flowing water moving through time, as data collections from past sampling events are put into conversation with each other, and in turn, given new meaning. Because there is a supposed standardization of site, water, and assay, the spread sheet allows for a cross-temporal comparison of conditions at a site. This marks the creation of a multiplicity of places recognized under the same guise of a site, a phenomenon in itself, that I will call s*ite multiplicity.* Given that the spreadsheet is a continuous project of collection, comparative relationships that are established across sampling sites are also established between sampling events. The assortment of different sites and the multiplicity of

individual sites from multiple sampling events that mark an increase in site multiplicity, then harken back to an interesting nostalgia that is pervasive in the conservation ethos that saturates the Saw Kill, both in the traditionally historic and contemporary sense. More specifically, since the spread sheet emerges in order to construct patterns

The spreadsheet is, thus, the site in which the conservation ethos that pervades the Saw Kill, manifests clearly for the SKMP. On its own, the SKMP's sampling process marks the collection of data, and is in no way directly preserving or conserving the Saw Kill through extraction. How the the spreadsheet is utilized by the BWL beyond just an archive, is integral to understanding how the SKMP is a conservation initiative. Taking a cue from anthropologist Jonathan Marks, who argues that the undirected collection of data, which is the collection of data for data's sake, is not science, then demands that the spreadsheet be more than just an archive (Marks 2009: 1-3).

The implies that like the Saw Kill, the spreach sheet has to be continually returned to and extracted from. Through such cyclical relationships—relationships that operates in tandem with the continued extraction from the physical Saw Kill—both the Saw Kill and the archive gain new meanings through their relationship with their respective samplers. Despite attempts to draw discrepancy between the physical stream and the spreadsheet, they are both manifestations of the same thing. One physical, the other numerical, they represent a flowing index of the surrounding world. Moreover, both the physical stream and the data stream operate as retainers of unknown, and potentially decipherable information. The relationship between both streams and the SKMP is one of extraction, through which data/information is taken from the stream to create new data and, in turn, new streams.

Swimming, figuratively, back up this ideological current, the notion of indexing qualities of water during sampling day unmistakably marks the represented water as an anachronism. By indicating the date and sometimes time (with site sheet data), data is captured within a historical narrative. Therefore, the continual additions to the data set mark an increasing process and project of historicizing the Saw Kill, through which the past conditions of water are archived. In doing so, change in water quality can be followed through time, and patterns can be contextualized within grander social and geophysical contexts. Patterns are observed through comparative analysis of past events, in this case, the physical and biochemical conditions of water and its social contexts allow for the discovery of 'potential patterns'. The trends are hypothetical relationships constructed from the intentional curating of particular groups of data values, that then take on new meanings, often conceived as being more important that individual value. One such example of this, follows an SKWC meeting [December 13th] where Eli showed two years of temperature data across sites, which was established along the axis of time and space. In his presentation, he compared temperature values at a single site across sampling events between two years, and noted that there was a potential trend of increasing water temperature that could fit into global trends of warming.

Interestingly, while data is divided up by the types of assays that it pertains to, their is a clear discrepancy between how field and lab produced data are treated. Moreover, field data diverges from lab data outside of the domain of its production, through the acknowledgement of its producers. More specifically, the inputting of site sheets into the 'physical observations' section includes the names of the samplers who observed and sampled from the site, while the YSI data is directly tied to the specific probe used. In comparison, the producers of lab data are identified through the collective identity of the 'SKMP'. There is an interesting anonymity

awarded to lab workers, not out of a desire to erase their identities per se, but as revealing of an implicit bias towards lab produced knowledge. Ascribed anonymity points towards the efficiency of the lab. Where the identity of individual producers of knowledge then mark the possibility of mistake or error, the collective identity of the lab represents an entity of objective perspective. The individuality of each lab worker is filtered out, their subjectivities—that which makes them individual—are exchanged for the sake of constructing an entity that lacks the ability to make mistakes. This spreadsheet is then the most potent manifestation of the Lab, because it reaffirms the authority of it by presenting the data collected as a complete look, even if the Bard Water Lab does not intend to make it so. The spreadsheet then establishes the lab, not as a subjective actor constrained by the cultural context of the hybrid collectif that is the Saw Kill, but rather as an extraterrestrial entity, an alien world in itself. And inasmuch as it is alien, or fully foreign, it is not constrained or distracted by the ever confusing, contaminated, and thoroughly terrestrial field. The spreadsheet as a the purest and wholest manifestation of the scientific eye, the unhampered visual prowess of the lab. Yet this data, the spread sheet that is, cannot remain solely in the possession of BWL. As Mark demands that science be more than just a process of data collection, the BWL applies the philosophy that "science needs values to work". In many ways this phrase means two very interconnected things: (1) that it need quantitative values, as relfective of empirical data that can be used to make decisions about water management, and (2) that it utilize this qualitiative data, cultural values are needed to drive both the interpretation of data and the actions that said interpretations incite.

Conclusion:
Clean Up

In concluding this project it is fitting to understand that the sampling event does not have a definitive moment of ending. For samplers, the moment samples leave their possession—after it has been taken out of the protective confines of the field pack, processed through the chain of custody, and stored in a refrigerator for subsequent assays—is the moment samplers end their day. Some field workers do not even make it to the lab, leaving midway through the sampling process. Lab workers to come and go based on availability. For those who can stay longer, the duration of the assay being conducted is generally defining of how long they stay. As the initiative based in volunteer work, the only people who are really expected to stay are those who work for BWL. Generally, the completion of the spreadsheet, that is, for this particular sampling day, marks a more definitive ending to BWL's activity. As a synthesis of both Field and Lab based labor, it is the final product, an abstracted reflection of the Saw Kill stream on that day. But as much as it marks an ending, the spreadsheet is an expecting archive, one that demands continued return and addition too. Thus, as much as it marks an end as the manifested culmination of effort, it also triggers the preparation for the next sampling event. The spreadsheet, then, does not provide a suitable end, as it consistently concerned with the future.

Instead, the sampling day ends with the erasure of it ever happening. More specifically, the process of cleaning the lab and associated equipment becomes the moment where the residual materials from the sampling day are disposed of. Despite any claims to sterility and practice of antiseptic technique, processing samples is a messy task. In light of this, the completion of the

spreadsheet marks the moment when they have to address the rubble that remains after attempting to maintain the illusion of the lab's sterility.

I spend the next ten minute throwing out the mountains of almost empty media packets and wet paper towels, used to soak up fugitive water; wiping countertops down with sanitizing isopropyl; and washing and recycling used IDEXX bottles. Understandably, most lab equipment, like that of pipettes, are disposed of, their contamination rendering them useless, and by extension, threatening to the sanctity of the lab. In contrast, Field based materials like the dipper and sample bottle, are set to the side to be autoclaved for the next sampling event. There continual return to the field, in turn, making them in some way resistant to the contaminating effects of the field.

Now translated into a more mobile form of numerical values, water samples, frozen in time, are once again temporalized as they are cast back into motion. Poured down the drain, this now just water is guided back by invisible infrastructure, where it is then reintroduced into the Saw Kill in the form of diluted contamination. Such acts are a poetic reinforcing of the Lab's reliance on the field, where the Saw Kill must reintegrate water that the BWL has abstracted from its 'natural' course.

Cleaning the site sheet, as a sampler's introduction into the field, is then a fitting ending to the monitoring event. As the former BWL member in charge of the spreadsheet, I was always the last person to handle the sites sheets. As a result, I took it upon myself to always clean them, or at least try. If site sheets were supposed be the easiest part of the field phase, they could easily be labeled the most difficult part of the lab phase. Sitting around for hours, the site sheets, which were laminated for the sake of efficient reuse, would become stained with the stubborn ink of sharpies used in the field. Laying the site sheets out and dosing them with isopropyl, I begin my

struggled attempts to clean them. Scrubbing them with paper towels, a pile of ink stained, alcohol sodden paper begins to accumulate. Switching for sheet to sheet, I scrub and scratch the ink off to varying degrees of success. Stuck in a hypnotic isopropyl fume filled frenzy, Maria is the one to bring me back; letting me know I can take a break. Stepping outside, I breathe in some fresh hallway air and collect myself before challenging the sheet again. After a while, it becomes clear that my cleaning attempts have reached their limits. While I manage to clean some, most are left with faded spectral-like notations from samplings past, collecting into a faded grey smudge. These spectral observations, from samplings past, are symbolic then of the entire struggle behind scientific knowledge production within the dynamics of the lab and field. In many ways, the staining of the site sheet is indicative of an integration of the lab in way that may be compromising to its authority. In light of the BWL always looking towards the future, the question that needs to be asked is, where does science go from here? How will the Lab and the Field evolve? More specifically, with the increasing era infrastructural instability, how will Lab maintain its placelessness? And with a turn, with a turn to more localized forms of knowledge, how will Labs become consensual local actors?

Bibliography

Agrawal, Arun. *Environmentality: Technologies of Government and the Making of Subjects*. Durham: Duke University Press, 2005.

Burns, Carol J., and Andrea Kahn. "Why Site Matters." Introduction to *Why Site Matters: Design Concepts, Histories, and Strategies*, edited by Carol J. Burns and Andrea Kahn, XVI-XXIX. Routledge: Taylor and Francis Books, 2005.

Ingold, Tim. "Culture Nature, Environment: steps to an ecology of Life." In *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*. London: Routledge, (2000): 13-26.

De Leon, Jason. *The Land of Open Graves: Living and Dying on the Migrant Trail*. Oakland, CA: University of California Press, 2015.

Douglas, Mary. *Purity and Danger: An Analysis of Concept of Pollution and Taboo*. London: Routledge, 2003.

Easterly, William. *The Tyranny of Experts: Economists, Dictators, and the Forgotten Rights of the Poor*. New York: Basic Books, a member of the Perseus Book Group, 2013.

Escobar, Arturo. "After Nature Steps to an Antiessentialist Political Ecology." *Current Anthropology* 40, no. 1 (February 1999): 1-30.

Goddard, Pamela. *An Unfinished History of the "by no means beautiful village called Annandale*. Historic Hudson Valley, 1988. https://sawkillwatershed.files.wordpress.com/2015/08/goddard-1988-history-of-annandale-saw-kill.pdf.

Gupta, Akhil, and James Ferguson. "Beyond Culture: Space, Identity, and the Politics of Difference." *Cultural Anthropology* 7, no. 1 (1992): 6-23.

Helmreich, Stefan. "Nature/Culture/Seawater." *American Anthropologist* 113, no. 1: 132-44.

Helmreich, Stefan, and Eban Kirksey. "The Emergence of Multispecies Ethnography." *Cultural Anthropology* 25, no. 4: 545-76.

Herron, John. "Stuffed: Nature and Science on Display." In *Rendering Nature: Animals, Bodies, Places, Politics*, edited by Phoebe S. K Young and Marguerite S. Shaffer, 48-69. Nature and Culture in America. Philadelphia, PA: University of Pennsylvania Press, 2015.

"History of the Saw Kill." SKWC: Saw Kill Watershed Community. https://sawkillwatershed.wordpress.com/about/historical-information/.

Illich, Ivan. *H2O and the Waters of Forgetfulness: Reflections on the Historicity of "Stuff."* Dallas: Dallas Institute of Humanities and Culture, 1985.

Karr, James R. *Rivers As Sentinels: Using the Biology of Rivers to Guide Landscape Management*. N.p., 1998.

Kohler, Robert E. *Landscapes and Labscapes: Exploring the Lab-field Border in Biology*. Chicago, IL: University of Chicago Press, 2010.

Latour, Bruno. "Circulating Reference: Sampling the Soil in the Amazon Rainforest." In Pandora's Hope: Essays on the Reality of Science Studies, 24-79. Cambridge, Mass.: Harvard University Press, 2001.

Linton, Jamie. *What Is Water?: The History of a Modern Abstraction*. Vancouver: UBC Press, 2010.

MacCormack, Carol P. "Nature, Culture, and Gender: A Critique." In *Nature, Culture, and Gender*, edited by Carol P. MacCormack and Marilyn Strathern, 1-24. Cambridge: Cambridge University, 1980.

Marks, Jonathan. *Why I Am Not a Scientist: Anthropology and Modern Knowledge*. Berkeley: University of California Press, 2009.

Mitchell, Timothy. *Rule of Experts: Egypt, Techno-politics, Modernity*. Berkeley: University of California Press, 2002.

Paerregaard, Karsten, Astrid Bredholt Stensrud, and Astrid Oberborbeck Anderson. "Water Citizenship: Negotiating Water Rights and Contesting Water Culture in the Peruvian Andes." *Latin American Research Review* 51, no. 1.

Raffles, Hugh. *In Amazonia: A Natural History*. Princeton, N.J.: Princeton University Press, 2002.

Schmidt, Jeremy J. *Water. Abundance, Scarcity, and Security in the Age of Humanity*. New York: New York University Press, 2017.

Schneller-McDonald, Karen. "College and Community: A Watershed Partnership." *SKWC: Saw Kill Watershed Community* (blog). Entry posted November 27, 2017. https://sawkillwatershed.wordpress.com/.
(Written by SKWC member Karen Schneller-McDonald and Copied from the Cornell University Blog)

"SKWC Home." https://sawkillwatershed.wordpress.com/.

Strang, Veronica. *Gardening the World: Agency, Identity and the Ownership of Water*. New York: Berghahn Books, 2009.

Tsing, Anna Lowenhaupt. *Friction: An Ethnography of Global Connection*. Princeton, NJ: Princeton University Press, 2005.

———. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton: Princeton University Press, 2015.

Van Dooren, Evan, Eben Kirskey, and Ursula Munster. "Multispecies Studies: Cultivating Arts of Attentiveness." *Environmental Humanities* 8, no. 1 (2016): 1-23.

"The Water Cycle." Table. The Water Cycle- -USGS Water Science School. https://water.usgs.gov/edu/watercycle.html.

West, Paige. *Conservation Is Our Government Now: The Politics of Ecology in Papua New Guinea*. New Ecologies for the Twenty First Century. Durham: Duke University Press, 2006.

Wilson, Alexander. *The Culture of Nature: North American Landscape from Disney to the Exxon Valdez*. Cambridge, MA: Blackwell, 1992.